Michael Gessler, Karen Evans, Victor M. Hernandez,
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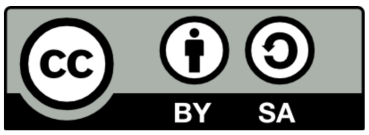

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Mathematical Skills of Students With Special Educational Needs in the Area of Learning (SEN-L) in Pre-Vocational Programs in Germany

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Abstract

Context: Students with special educational needs in the area of learning (SEN-L) attend vocational trainings to be provided with qualifications for the labor market. Competences in arithmetic operations and comparing quantities such as weights and lengths are indispensable for obtaining a vocational qualification. Therefore, the study investigates whether students with SEN-L in Germany convert job-relevant quantities and master arithmetic operations accurately and with a certain speed before beginning vocational training.

Methods: 152 students with SEN-L in pre-vocational training programs in southern Germany were examined using curriculum-related computer tests for formative assessment. Three skill-based tests were constructed as progress monitoring tests comparing weights and lengths and arithmetic operations including a speed component.

Results: All newly developed tests meet the requirements of the Rasch model. Students' performance on the lengths test and the weights test correlates with a significant linear relationship ($r = 0.64$). Only weak correlations ($r > 0.29 < 0.45$) are found between the performance in the arithmetic operations and the weights and lengths tests. For items in the weights and lengths tests, participants show on average significantly higher probability of solving than in the arithmetic operations test. Furthermore, students with SEN-L show slow processing speed (median processing speed weights test 6.37 seconds, lengths test 6.26 seconds, arithmetic operations test 33.97 seconds on average per item). The students solve more items

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of the weights and lengths tests correctly than of the operation test (median for weights 25 items, for lengths 24 items, for arithmetic operations 7 items).

Conclusion: The majority of the students with SEN-L were not able to solve the expected number of items correctly and show that the participants' accuracy in dealing with arithmetic operations and quantity comparison is low. It can be assumed that this might lead to difficulties in mastering mathematical items in the context of vocational training. This is the case, in particular, where a certain speed is required (fluency). Math instruction in pre-vocational programs needs a stronger focus on building up and expanding arithmetic operations and quantities and has to be complemented by monitoring the learning process of students with SEN-L.

Keywords: Mathematical Skills, Special Educational Needs in the Area of Learning, SEN-L, Germany, Pre-Vocational Training Programs, Vocational Education and Training, VET

1 Introduction

Students with special educational needs (SEN) require support in developing basic mathematical skills to qualify for the training and labor market. Several studies indicate associations between early mathematical competencies and later mathematics achievement (e.g., Duncan et al., 2007; Krajewski & Schneider, 2009; Nguyen et al., 2016; Seitz & Weinert, 2022). The lack of basic skills in the areas of reading, writing and arithmetic as well as an overall low level of learning and performance are considered to be key obstacles to the successful integration into the training and labor market especially for students with special education needs (van Essen, 2013; Wocken, 2007). Difficulties in reading and mathematical skills have long-term effects on academic achievement, the successful completion of secondary school, and thus on the educational careers of young adults. This mainly affects male students whose achievement scores in mathematical skills were lower the more special education support they received (Holopainen & Hakkarainen, 2019). So far, however, too little is known about the mathematical performance level of students with SEN before they enter vocational training (Gebhardt et al., 2015).

1.1 Transition Problems of Students With Special Educational Needs (SEN) Into Vocational Training in Germany

After attending inclusive schools or special schools, there are several reasons why students with SEN receive further support for their vocational training in Germany (Secretariat of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder

in the Federal Republic of Germany [KMK], 2021). On the one hand, these students are overburdened in the academic competences and rarely obtain qualifying vocational qualifications (van Essen, 2013; Wocken, 2007). On the other hand, these students fail in the open application process for such training. For this reason, many students with SEN undergo special measures and attend programs of vocational education (Gebhardt et al., 2011; Hofmann et al., 2021; Tretter et al., 2011).

The legal right to additional resources and support is linked to the identification of special educational needs in many school systems. But the approaches to special education vary significantly from state to state (O'Hanlon, 2018). In Germany, funding and resources are based on the determination of the need for support, with concepts differing between the German federal states. The same applies in the area of vocational education and training, which is regulated by law (Spichtinger & Valaikienė, 2013). For in-company vocational training, the legal regulations are primarily found in the Vocational Training Act (Berufsbildungsgesetz, BBiG) and the Handicrafts Act (Gesetz zur Ordnung des Handwerks – Handwerksordnung, HwO) (KMK, 2021).

Vocational training for young people receives financial support in Germany. According to financing statistics, 66.1 billion euros were spent on general and vocational schools in Germany in 2017. In the area of vocational education and training, about 9.6 billion euros were allocated to vocational schools and about 2.6 billion euros to funding in the transition system area (KMK, 2021). The goal is to keep youth unemployment as low as possible, as career prospects of young people with SEN are unfavorable and their risk of remaining unemployed or working in precarious employment is high (Jochmaring, 2019). As KMK (2021) declares, it is the "function of all the courses of education at lower secondary level […] to prepare pupils for courses of education at upper secondary level, at the end of which a vocational qualification or the right to access higher education is acquired" (KMK, 2021, p. 123). For this reason, many measures in the area of vocational training are state-subsidized to successfully lead young people to vocational qualifications. But this aim is not reached for all.

To receive financial state support, a distinction is drawn between people who need support during training in order to complete it successfully to lead an independent professional life and people who also need support in life after completion of the training (Bundesministerium für Bildung und Forschung [BMBF], 2022). Therefore, the vocational education system distinguishes between students with special educational needs in the area of learning (SEN-L) or with learning disabilities and students with intellectual disabilities (SEN-ID). After completing vocational training, state support for young adults with learning difficulties ends, whereas adults with intellectual disabilities continue to receive life-long support.

Different vocational education programs are offered for students with SEN-L depending on the support they need. There are three main types:

1. Students without SEN usually take up a so-called *dual system vocational training*. This is also possible for students with low support needs. Combining theoretical and practical learning, the training takes place on a dual basis in a company and at a vocational school (Anselmann et al., 2022). The young people primarily acquire the practical content and skills in a company subsidized, if applicable, by the German Federal Employment agency. A vocational school complements this training on-the-job with theoretical content (Wieland, 2015). In some federal states in Germany (e.g., Baden-Württemberg, Nordrhein-Westfalen), students with SEN-L can receive individual support at the vocational school. In other German federal states (e.g., Bavaria, Sachsen), students with SEN-L have the option of choosing a special education vocational school as a dual learning place instead of a vocational school or can attend special classes at the vocational school. The main differences between special education vocational schools and vocational schools are reduced class sizes, special pedagogical staff, individualized instruction, intensive training support and targeted support measures for vocational preparation. The students primarily end up in craft occupations (e.g., bricklaying, painting), simple sales occupations, or cleaning and hospitality occupations (Autorengruppe Bildungsberichterstattung, 2020). Many of these occupations as for instance painter, hairdresser or carpenter are regulated by law in the Handicrafts Act (HwO) and supplemented in the Vocational Training Act (BBiG), which applies throughout Germany (KMK, 2021). They require plenty of manual skills and are less technical in nature. Vocational education and training lead to a vocational qualification for skilled work as qualified staff, e.g. in accredited occupations requiring formal training. Towards the end of the vocational training, an exam is held under the supervision of a competent body (§ 71 BBiG) as e.g. the Chamber of Trades and Industry or the Chambers of Handicrafts (Wieland, 2015). About 50 percent of the students in any given year opt for a two-, three- or three-and-a-half-year apprenticeship in one of the 324 occupations requiring vocational training (Bundesinstitut für Berufsbildung [BiBB], 2021; KMK, 2021).

2. Students with SEN-L who would be able to start vocational training but do not have sufficient theoretical knowledge attend a state-financed vocational preparation year (Spichtinger & Valaikienė, 2013). *Pre-vocational programs* provide a basis for subsequent vocational training or employment. Students gain experience in vocational fields such as e.g. business and administration, horticulture, home economics, building, metal or wood technology. Various programs offer young people the opportunity to improve their individual chances of starting an apprenticeship, enable them to catch up on (missing) school-leaving qualifications and bridge the time until the prospective entry into training. This is important in that the majority of young people in the transition area have comparatively low or no school-leaving qualifications; 26.4 percent do not have a lower secondary school leaving certificate (BMBF, 2022). It is about 21 percent of the students

who participate in a vocational preparation measure after leaving school (Autorengruppe Bildungsberichterstattung, 2020).

3. If the need for support is so high that no dual training can be taken up, there is the option of attending special vocational training (§ 66 BBiG, § 42r HwO). Often, special vocational training courses are started after the completion of one (or more) vocational preparation programs. They are intended to be completed by persons for whom training in an accredited training occupation is not an option due to the nature and severity of their disability (BMBF, 2022). Special vocational training courses that are based on the corresponding standard occupations are mostly theory-reduced (Jochmaring, 2019), e. g. wood technician. In 2021, almost 7,000 new training contracts were concluded nationwide on the basis of § 42r HwO in so-called specialist trainee or worker training programs, corresponding to 1.5% of all training contracts concluded in that year (BMBF, 2022).

The training regulations, e.g. the Handicrafts Act, specify for each accredited training what must be met in order to pass the examinations after two or three years of training (Deissinger, 1996). Anyone who successfully completes the training acquires a qualification for skilled work as qualified staff accredited (KMK, 2021). In the vocational school, skills, knowledge and abilities that determine the occupational profile are taught in various so-called learning fields (Riedl & Schelten, 2010). For example, the learning field "preparing and coating surfaces" includes the competence to prepare surfaces according to customer orders, to carry out an initial coating and to comply with requirements for the set-up and safe use of workplaces (Bayerisches Staatsministerium für Unterricht und Kultus [StMUK], 2021a). The descriptions of the competences in the individual learning fields are binding, indicate the level of qualification at the end of the learning process and represent the minimum scope (Bayerisches Staatsministerium für Unterricht und Kultus [StMUK], 2021a).

Meeting the standards of complex knowledge- and technology-based jobs, requiring general skills and increased specific occupational and professional qualifications (Carnevale & Desrochers, 2002) is very difficult for students with SEN-L. They often fail because of poorer performances and slow working speed paired with a lack of school qualifications and basic general skills (van Essen, 2013; Wocken, 2007). Therefore, it is necessary that basic skills must be acquired as a solid foundation.

1.2 Difficulties of Students With SEN-L Meeting Mathematical Requirements in Vocational Education in Germany

Catching up on lacking basic skills is therefore an important step in gaining a foothold in professional life: All apprenticeship occupations require the mastery of basic mathematical

skills. As soon as material requirements have to be determined, goods purchased, invoices issued or measurements taken, dealing with these units is indispensable (StMUK, 2021a). Learning basic mathematical skills and thus also logical thinking is therefore not linked to technical professions, but can be found in all areas of the working world. Practice and consolidation of basic mathematical knowledge and skills must be conducted to a sufficient extent throughout the vocational training (StMUK, 2021a).

For math, the curriculum for vocational preparation states four objectives (StMUK, 2021b): 1. Grasping basic mathematical structures and written calculation procedures in the area of basic arithmetic, the rule of three, fractions and percentages, 2. acting independently on the basis of a real (vocational) situation with quantities, measures and units of measurement, 3. developing a notion of geometric constructions and shapes with calculations, 4. acquiring basic skills for solving linear equations and formulas. These requirements concerning basic mathematical skills described in the curriculum for vocational preparation represent requirements that are needed in all occupations and must be mastered by young people, regardless of their disability or special educational needs, to enable them to successfully complete vocational training.

In addition to accuracy, the percentage of correctly solved tasks, fluency, the speed with which arithmetic tasks are solved, are considered essential for the development of computational strategies and mathematical competence (Carr & Alexeev, 2011). The reliable mastering of arithmetic operations and the converting and comparing of quantities, especially quantities relevant to everyday life and work such as weights and lengths are of enormous importance in all occupations (see e.g., vocational school curriculum for the occupation painter and varnisher, StMUK, 2021a). These skills must be mastered confidently and automatically, and also at a certain speed to succeed in professional life.

Weakly developed basic skills are a predictor of later mathematical achievement (Ennemoser et al., 2015). Failure to build a sustainable mathematical understanding and basic mathematical skills during the elementary school years often leads to difficulties in acquiring secondary school subject matter, as difficulties in learning mathematics manifest during the school years (Scherer et al., 2016). Basic skills are not limited to early developmental stages, but continue to evolve and differentiate in higher grades (Ennemoser et al., 2011). Building on a solid concept based on natural numbers, learners first develop an understanding of decimals and then fractions, but only a limited number of students have understood the dense structure of rational numbers by the end of the elementary school years (van Hoof et al., 2018). Children have difficulties in estimating quantities and working on factual tasks before entering school, and also still in their third and fourth school years and as adults (Häsel, 2001; Lobemeier, 2005; Stinken, 2015).

For students with SEN-L, one of the challenges is the development of basic mathematical skills (Gebhardt et al., 2013; Lehmann & Hoffmann, 2009; Moser Opitz, 2013). Difficulties

in learning mathematics become evident in the three central content areas of basic arithmetic that characterize mathematics learning in elementary school and have implications for mathematics learning in secondary school (Moser Opitz, 2013; Rensing et al., 2016): 1. Understanding natural numbers, 2. understanding the decimal place value in the number system, 3. understanding arithmetical operations (Gaidoschik et al., 2021). Arithmetic skills are a prerequisite for the conversion of units of measurement (Franke & Ruwisch, 2010) and a lack of skills is often the reason for difficulties of students with SEN-L in factual arithmetic (Häsel-Weide, 2020). One third of students with SEN-L who completed special education have difficulties in dealing appropriately with numbers and solving simple division tasks (Lehmann & Hoffmann, 2009).

Despite various interventions, effective school-based support has only been successful to a limited extent for students with SEN-L. Several studies, such as the PISA 2012 Oversample of special schools, display insufficient mathematical competencies for students with SEN-L in special schools after grade 9 (Gebhardt et al., 2015). In the 2018 PISA assessment, 21.1% of 15-year-old students (including students with and without SEN) remained below level 2 of mathematics proficiency, making it difficult for them to interpret without direct instruction and to recognize how a simple real-life-situation can be represented mathematically. They are considered to be particularly at risk and do not have adequate mathematical literacy to make decisions in personal or professional situations (Organisation for Economic Co-operation and Development [OECD], 2019). To qualify for the training and labor market, students with SEN-L require support in developing basic mathematical skills.

Students with SEN-L need adaptive instruction that addresses their difficulties. Formative assessment as monitoring of learning progress is particularly effective for students with SEN-L (Fuchs & Fuchs, 2006; Hosp et al., 2016; Vaughn et al., 2003). In 2012, the European Agency for Development in Special Needs Education elaborated European Patterns of Successful Practice in Vocational Education and Training. It drew particular attention, among other things, to learner-centered approaches that are influenced by the use of innovative teaching and assessment methods, the implementation of individualized plans and flexible curricula focusing on learners' capabilities (European Agency for Development in Special Needs Education, 2013). In order to address each student's individual abilities and, as teachers, to determine if they need to modify their curriculum, materials, or instructional procedures, it is useful to monitor student progress (Deno, 2003; Fuchs & Fuchs, 2006; Jungjohann et al., 2018). With progress monitoring, small learning successes can be made visible and comprehensible. Experience with assessment formats that serve to monitor the learning process within the framework of a course (formative assessment) or to check results after completion of a course (summative assessment) plays a role for only around three tenths of vocational school teachers (Autorengruppe Bildungsberichterstattung, 2020).

2 Research Questions

As basic mathematical skills are indispensable for obtaining a vocational qualification, we developed new web-based tests to measure three occupationally relevant skills: Arithmetic operations and comparing quantities such as weights and lengths. To date, only a few studies are available that demonstrate these skills in students especially with SEN in the area of learning (SEN-L) prior to entering vocational training. For this reason, the study focuses on arithmetic operations and comparing weights and lengths within a curriculum-based measurement framework for students with SEN-L in pre-vocational programs. It describes test development and analyzes task difficulty. In addition, the study explores what arithmetic skills young people with SEN-L have before entering vocational training and how this performance in the areas of arithmetic operations compares with their weight and length comparison skills.

The following research questions can be specified:

1. Do the newly developed instruments fit the heterogeneous group of students with SEN-L in pre-vocational programs?

2. What skills do students with SEN-L possess and are they measurable by item range as a power test on the first 30 items?

3. Which skills can be processed sufficiently quickly and confidently within five minutes to be sufficiently competent for the job?

3 Materials and Methods

To answer the research questions, three skill-based speeded tests comparing weights and lengths and arithmetic operations were developed. They were used to examine 152 students with SEN-L in vocational preparation programs in southern Germany.

3.1 Instruments

To assess and compare the performance in the areas of arithmetic operations, length and weight comparison, three skill-based speeded tests were constructed as progress monitoring tests with a drawing algorithm for multiple measurement time points. They can be conducted digitally on a tablet and were implemented in the online platform www.levumi.de ("Levumi"). Levumi is a self-operated, free online platform for learning progress assessment operating since 2015, which complies with the data protection regulations of the German federal states (Gebhardt et al., 2016).

The performance of students in Levumi speeded tests is determined not only by the number of correctly and incorrectly solved items, but also by their processing speed and thus the total number of items solved. The completion time of the speeded tests we constructed was set to five minutes, as this duration had been found to be optimal for students with SEN-L in previous analyses (Ebenbeck et al., 2021; Schurig et al., 2021).

Weights and Lengths Test

A test for comparing weights and a test for comparing lengths were newly constructed as speeded tests based on the curriculum because there are no tests available in German-speaking countries that exclusively offer items for comparing quantities with a time component. In common test procedures for school performance, for example, only individual items on variables are found. The weights and lengths tests are designed as speeded tests with a time limit of five minutes, which makes them suitable for learning progress monitoring and formative assessment (Jungjohann et al., 2018; Schurig et al., 2021). They are conceived as multiple-choice tests. Participants enter the relation sign.

To design the tests as fairly as possible for heterogeneous groups, item categories with different difficulties are formed. If the quantity comparison items include a decimal number, they fall into the hard item category. The comma notation poses an additional challenge (Franke & Ruwisch, 2010) and can lead to misinterpretations if the student has no idea of it (Peter-Koop & Nührenbörger, 2008). In addition, the relation sign to be used in each case is included as a further rule (equal (=), smaller (<), larger (>)). Thus, a total of six groups of items were formed and a pool of 240 items was created for each of the two comparison tests.

Arithmetic Operations Test

There are no comparative tests of arithmetic operations for older students that take into account both accuracy and fluency, as required in everyday working life. Therefore, a test on arithmetic operations, similar to tests in elementary school, such as the Heidelberg Arithmetic Test (Heidelberger Rechentest - HRT) (Haffner et al., 2005), was newly developed. It can also be used with older students and includes a speed component.

The goal of the test is to determine the value of the placeholder in the four arithmetic operations addition, subtraction, multiplication and division in the number range up to 100. Research results on the development of mathematical competencies show that the position of the placeholder in the item has an influence on the difficulty. Determining the placeholder of the first position or the second position requires a higher level of mathematical competence than determining the result (Gebhardt et al., 2013, 2014; Mittelberg, 2004). The difficulty of an addition or subtraction task is further influenced by crossing the tens boundary (Anderson et al., 2022; Beishuizen et al., 1997; Benz, 2007). Correspondingly, the types of multiplication tables up to ten also have an influence on the difficulty of the item (Gaidoschik, 2014;

Gasteiger & Paluka-Grahm, 2013; Padberg & Benz, 2021). In total, 16 item categories with different difficulties were formed.

A pre-test was conducted with individual students in advance. The item formats and individual test items were developed with experts from vocational schools and special education.

3.2 Sample

Participants were students with SEN-L in pre-vocational programs in southern Germany (n = 152). 29% reported themselves as female, 69% as male and 2% as non-binary. Students were on average 17.16 years old (SD = 1.28). The test was conducted at the end of the school year during which arithmetic operations and exercises on various quantities had been practiced in class. All participants worked on their own on a tablet. Trained instructors provided guidance on which strategies students should use to perform optimally in the speeded tests. After sample comprehension clarification items, the items of the three tests were to be completed in any order as fast as the participants were able to. Participants were advised to enter the result zero if no result could be calculated in an arithmetic operation test. This opened up the possibility of completing further items in the given time. All tests had a time limit of five minutes and were administered consecutively in class. A variation in the order of completion was made possible for the participants as they selected the test order freely.

3.3 Statistical Analysis

To ensure that the constructed test procedures are appropriate for use in vocational schools with students with SEN-L, the test goodness is first checked using the Rasch model. The Rasch model is an item response theory (IRT) model. In tests that conform to the Rasch model, a person's likelihood of solving an item depends on the difficulty of the particular item (item difficulty) and the person's overarching ability (person ability). If speeded tests are constructed on the basis of the Rasch model, on the one hand a good fit between item difficulty and person ability and on the other hand an item difficulty that is as homogeneous as possible within a test are aimed for (Bock & Gibbons, 2021).

Next, student performance is contrasted for the three different tests. For this purpose, the mean sum scores are compared by means of a one-factor analysis of variance (ANOVA) and the relation between the test results at student level is analyzed by means of Pearson correlations. In a Latent Profile Analysis, different groups of students are additionally singled out depending on their performance patterns in the three tests.

4 Results

In the first part of the results section, we describe, if the newly constructed tests meet the requirements of the Rasch model. Moreover, we examine the solution probabilities of students. In the second part, we figure out different students' performances in a latent profile analysis[1].

4.1 Power Test Analysis

The two newly constructed tests for comparing weights and lengths meet the requirements of the Rasch model. For a power analysis of the tests, the first 30 items of the item pool are used, since this item range has all difficulty-generating characteristics and can be answered by most students in five minutes. In a power analysis, both tests show good test reliability (Lengths: WLE = 0.86, Weights: WLE = 0.84). The infit and outfit statistics of the items are within the required range between 0.5 and 1.5 (Lengths: Outfit Min = 0.6, Outfit Max = 1.4, Infit Min = 0.7, Infit Max = 1.3; Weights: Outfit Min = 0.6, Outfit Max = 1.5, Infit Min = 0.7, Infit Max = 1.4). Item difficulty coincides with students' estimated person abilities, suggesting a fit between the tests and student performance (Figure 1). The items of both tests show a homogenous item difficulty, since all items are in the logit range between -2 and 2. For a median split of persons, the graphical model test does show only little irregularities on the item level, which indicates a fit of the item pools to the Rasch model (Figure 2). Two items seem to be easier for students with high abilities (Weights: *3 t > 3 kg*, Lengths: *2 cm > 2 mm*). These items contain the same single-digit number and differ only in the unit of measurement. Thus, they control the knowledge of units of measurements in a small number space, no conversion is necessary. Because these items are particularly simple, they are not expected to test unfairly with respect to low-achieving students. They may just be less meaningful than other items in the item pool. To make for having simple items in the item pool that can be solved by many students and lead to a sense of accomplishment, these items are kept in the item pool.

Figure 1: Item-Person-Map of the First 30 Items of Weight and Lengths Tests

1 Data and Code for R are available on OSF.io: https://osf.io/nkyxt/?view_only=75ed8232c84c478b86dc7f9b2fcc7667

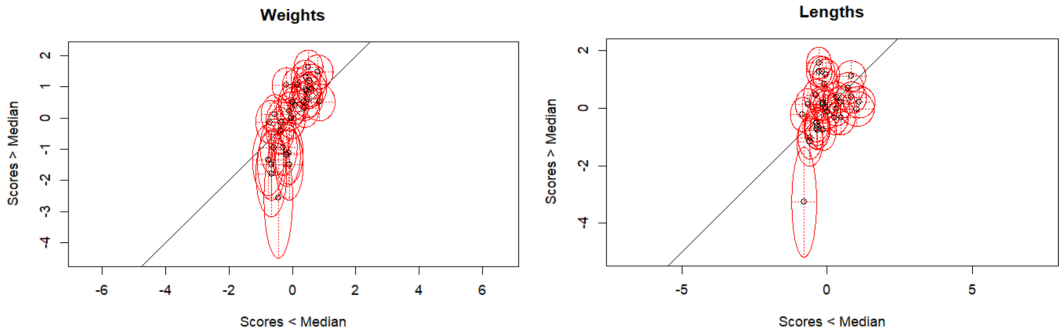

Figure 2: Graphical Model Test of the First 30 Items of Weight and Lengths Tests

Note: The graphical model test compares item fit for two median split groups of subjects tested. The red circles show the standard deviation of every item. If the red circle intersects with the bisecting angle, the respective item shows no difference for the two groups.

The test for arithmetic operations measures four different operations: Addition, subtraction, multiplication and division. However, since the items are processed as placeholder items, the mathematical operations of the addition and subtraction items as well as the multiplication and division items can hardly be separated. Therefore, the items are divided into two dimensions and estimated in a two-dimensional Rasch model. For a power analysis of the tests in a two-dimensional Rasch Model, the first 32 items of the item pool are used, as this item range covers all difficulty-generating characteristics to the same extent (Figure 3). In the two dimensions, the test shows good reliability (addition & subtraction: EAP = 0.85, multiplication & division: EAP = 0.84).

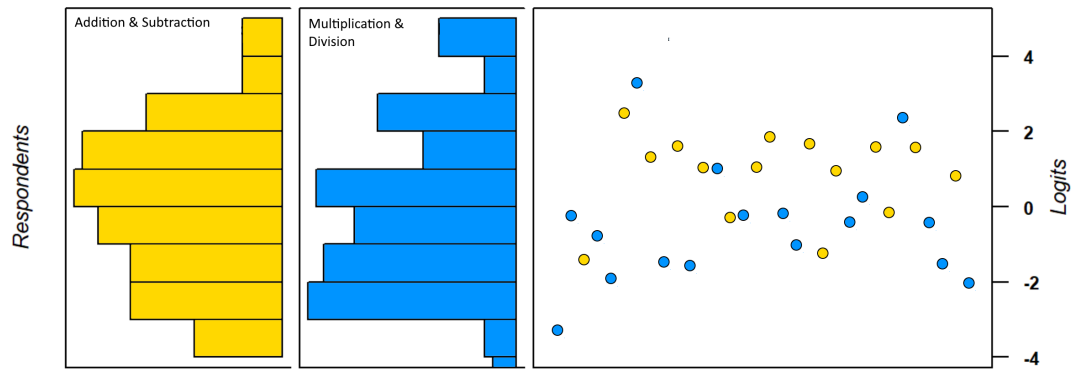

Figure 3: Item-Person-Map of the First 32 Items of the Operations Tests With Two Dimensions

For items in the weights and lengths tests, students show on average significantly higher probability of solving than in the arithmetic operations test (Figure 4).

The solution probabilities of students differ significantly between the tests ($F(3) = 71.5$, $p < 0.001$) with the highest differences in solution probabilities lying between the tests of arithmetic operations and weights or lengths ($diff > 15.39 < 34.33$, $p < 0.001$). Only between tests or dimensions with the same instructions (lengths and weights, addition & subtraction and multiplication & division) no significant difference could be detected. In the context of arithmetic operations, students work on the multiplication and division problems with the highest probability of solution (Figure 4). Students' performance on the lengths test and the weights test correlate ($r = 0.64$). Only weak correlations ($r > 0.29 < 0.45$) are found between the performance in the arithmetic operations and the weights and lengths tests. Performances within the arithmetic operations test between the different dimensions (addition & subtraction, multiplication & division) are moderately correlated ($r > 0.6 < 0.82$) because these are fundamentally independent scales that provide different values and information for educators.

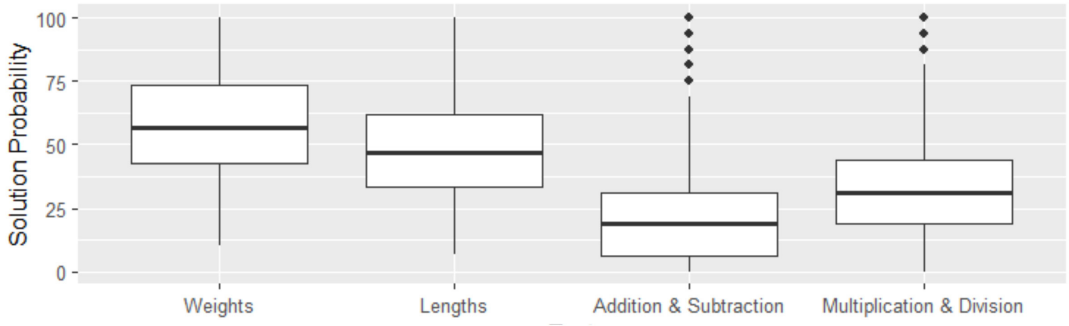

Figure 4: Range of Solution Probabilities

The average solution probabilities are between 55% and 20%, with only a few students showing more than 75% solution probability in the tests. Especially in the arithmetic operations, the solution probabilities are low and only few students solve all items correctly. Since the construction of the tests on comparing lengths and weights allows a guess probability of 30%, this 30% must be subtracted from the calculated solution probability. Thus, the solution probabilities of all tests are between 20% and 35%.

4.2 Speed Test Analysis

When the item pools are evaluated as speed tests, the increase in item difficulty is evident as the test progresses (Figure 5). The necessary speed component of students' performance can be seen, as items in the back get harder. A fast student can solve more items and only a fast student can solve those items in the back.

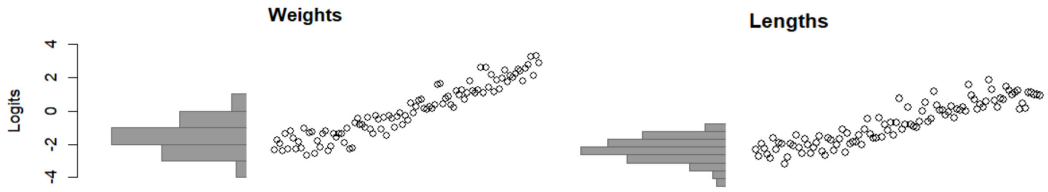

Figure 5: Item-Person-Map for Weights and Lengths Tests as Speed Test

In comparison, the students solve more items of the weights and lengths tests correctly than of the operation test (Figure 6). The median for weights is 25 items, for lengths 24 items and for operations 7 items. Four different performance classes emerge. The largest class is class 4 (purple) with a total of 82 students, who show the lowest abilities in all three tests. The second largest class is class 2 (blue) with a total of 50 students, who also show the lowest abilities in operations, but medium abilities in lengths and weights calculation. Class 1 (red) comprises 9 students, who have the highest sum scores in regards to the other students and low to medium abilities in operations. Class 3 (green) with a total of 8 students is the smallest class. These students show the best scores in arithmetic operations, but medium abilities in lengths and weights.

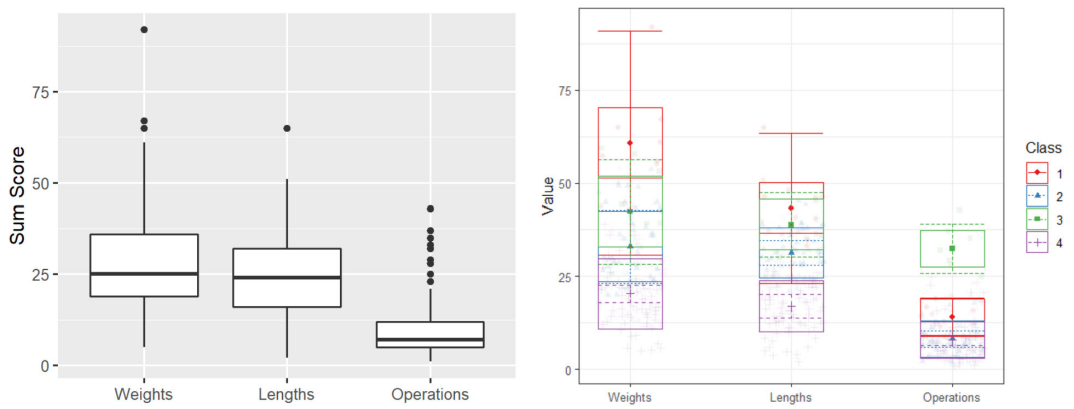

Figure 6: Range of Sum Scores of the Speed Tests as Box Plots (Left) and in a Latent Profile Analysis With Four Profiles (Right)

Also, students show slow processing speed. In the weights test, the median processing speed is 6.37 seconds, with the fastest 10% needing 3.8 seconds and the slowest 10% 11.9 seconds on average per item. The lengths test is processed somewhat faster on average. The median processing speed is 6.26 seconds, the fastest 10% need 3.1 seconds and the slowest 10% 13.3 seconds on average per item. The test on arithmetic operations is processed the slowest. On average, 17.15 seconds are needed per item, the fastest 10% need 6.9 seconds and the slowest 10% 33.97 seconds on average per item.

5 Discussion

The three newly constructed tests of weights and lengths comparison as well as the arithmetic operation test for students with SEN-L in pre-vocational training programs are appropriate for this population and correspond to the test-theoretical assumptions of the Rasch model. The tests are designed to be used both cross-sectionally and longitudinally as curriculum-based measurement (Schurig et al., 2021). The test items are relatively easy and correspond to the learning content of the third and fourth grade of the German elementary school in mathematics. Students should therefore be familiar both with comparing lengths and weights and with applying the basic arithmetic operations and a solution probability of 100 percent should be possible in the vocational school, since even fourth graders at the lower proficiency levels are quite capable of ordering representatives of different quantities (Lobemeier, 2005). With a certain amount of errors or technical problems, such as pressing an answer incorrectly, we expect that 90 percent of the items should be solved correctly (accuracy). The majority of the sample, however, was not able to solve the expected number of items. Although the students tested are an at-risk group due to their special needs, these results are only partly in line with our expectations, as their performance in all areas was weaker than anticipated. From this we conclude that they are likely to have difficulties in the later vocational theoretical tests.

One item in each of the two quantity tests was particularly easy, especially for students with higher abilities, and can be seen as differential item functioning (DIF). However, since these two items were very easy, this may also be due to a sampling effect. These items control the knowledge of units of measurements in a small number space. Items with a solution probability of ≈ .80 are referred to as "icebreaker items" (Moosbrugger & Kevala, 2020) and provide a sense of achievement for a large proportion of participants. Therefore, they will be kept in the item pool for motivational reasons.

All students complete fewer items correctly in the operations test than in the weights and lengths tests. The lower number of items processed and the resulting slower processing speed can be attributed to the different instructions of the tests. Whereas the tests for weights and lengths are multiple-choice, in the operation test a number must be actively entered via a number field. A longer processing time may therefore be decisive for the lower total score.

In addition, there is a lower guess probability for the operational tests. However, since a significantly lower number of solution probabilities is also found for the operation test in all dimensions, difficulties in arithmetic skills and calculating with operations can be proven for all students, which fits the findings for ninth graders of Gebhardt et al. (2013, 2014).

In the context of the operational test, multiplication items in particular are solved with a higher solution probability. Multiplication items are learned by heart and the result is therefore not calculated but retrieved from long-term memory. The use of placeholder tasks impedes recall from memory and was also found to be difficult for some seventh- and eighth-graders in secondary school (Mittelberg, 2004). However, students in these high grades are presumably already so familiar with placeholder items that they should not represent a significantly higher hurdle than regular arithmetic items. A confident use of arithmetic operations, as demanded in occupational life (StMUK, 2021a), requires a flexible application of arithmetic logic, e.g. to solve reversal tasks, as demanded in placeholder tasks. Therefore, all arithmetic skills must be covered intensively in vocational school instruction as well.

Since the students showed very heterogeneous performances, further profile analyses were conducted. We used latent profile analysis to identify groups of students with similar patterns in their mathematical skills. Comparing the three tests, four different performance profiles can be carved out:

One group of students (6%) consistently performs best, but also completes fewer arithmetic operations correctly. Thus, it is questionable here whether this top group of students can live up to the theoretical expectations or whether this group's performance, with approximately 40 to 50 correctly solved items per test, is already too weak in the tested areas. With a high solution probability, there is potential for improvement here, especially in calculation speed. We believe this group to have the best chance of progressing to an apprenticeship.

The second group of students (33%) shows medium to good performance in the weights and lengths test, but weak performance in the arithmetic operations. This profile includes students who show an understanding of quantities and, potentially, have also memorized the conversion of quantities. However, there is a calculation weakness or a problem in arithmetic, which is why the items cannot be solved correctly. This may lead to problems when it comes to successfully completing vocational training.

The third group of students (5%) shows the best scores in arithmetic operations, but medium skills in lengths and weights. This profile includes students who have a secure grasp of arithmetic operations but do not yet have a solid understanding of quantities. Increased treatment of length measurement and items and activities in curricula that specifically address student challenges are also called for by Smith et al. (2013). Through targeted exercises in comparing lengths as well as weights, existing gaps can perhaps be closed so that vocational training can be started.

The fourth and largest group of students (55%) shows weak performance in all three tests. There is neither a suitable understanding of weights and lengths nor are arithmetic

operations correctly mastered and applied. Fundamental difficulties are evident in all areas. Here, support must be provided with regard to all basic mathematical skills. For example, a flexible application of multiple strategies such as the strategy "subtraction by addition" in addition to the direct subtraction strategy could be useful here, for all children, not only those with mathematical learning disabilities, as suggested by Peters et al. (2014). For the fourth group, it is to be expected that successful completion of vocational training is more difficult.

All four groups clearly show that the participants' accuracy in dealing with arithmetic operations and quantity comparison is low. This is consistent with OECD (2019) findings on at-risk students. It can be assumed that this might lead to difficulties in mastering mathematical items in the context of vocational training. This is the case, in particular, where a certain speed is required to solve the item, as all participants show slow processing speed in all of the three tests. The core question of the study, namely whether, at the end of a pre-vocational training program, students with SEN-L will have all the skills for the conversion of occupationally relevant quantities and the reliable mastering of arithmetic operations to enable them to successfully start and complete a vocational training, has to be answered in the negative for the largest group of the participants in this study.

Here the limitation of the study becomes evident. The sample is not representative of all students with SEN-L in pre-vocational training programs in Germany. In addition, the present study did not examine students without SEN as a comparison group in order to derive, for example, solution probability. In further studies, the reported results should therefore be tested and compared with data on students without SEN. Likewise, testing with a broad item pool of the same dimensions could also be conducted in other grades or at other times, in addition to students in pre-vocational training programs. This would be easily possible because the items are relatively simple and correspond to the learning content of the third and fourth grades of German elementary school in mathematics.

It has been demonstrated by this study that math instruction in pre-vocational programs needs more focus on building up and expanding arithmetic operations and quantities. Learning field-oriented teaching in vocational schools for developing occupational competencies is important (Riedl & Schelten, 2010), but needs adaptive support for students with SEN-L, especially with regard to basic mathematical skills. Evidence-based programs and progress monitoring can be used to support at-risk children (Mononen et al., 2014). Targeted support with direct instruction (Scherer et al., 2016) combined with strategy instruction (Swanson & Hoskyn, 1998) and a monitoring of learning through learning progress assessment appear to be effective methods. Therefore, we intend to provide structured support for occupationally relevant mathematical skills for a similar group of students with SEN-L in addition to their vocational instruction. To this effect, the newly developed curriculum-based progress monitoring tests will be used in formative assessments.

References

Anderson, S., Sommerhoff, D., Schurig, M., Ufer, S., & Gebhardt, M. (2022). Developing learning progress monitoring tests using difficulty-generating item characteristics: An example for basic arithmetic operations in primary schools. *Journal for Educational Research Online/Journal für Bildungsforschung Online*, *14*(1), 122–146. https://doi.org/10.31244/jero.2022.01.06

Anselmann, S., Harm, S., & Faßhauer, U. (2022). Input from the grassroots level — reflecting challenges and problems for VET professionals in Germany. *International Journal for Research in Vocational Education and Training*, *9*(2), 239–268. https://doi.org/10.13152/IJRVET.9.2.5

Autorengruppe Bildungsberichterstattung. (Eds.) (2020). *Bildung in Deutschland 2020: Ein indikatorengestützter Bericht mit einer Analyse zu Bildung in einer digitalisierten Welt*. wbv. https://doi.org/10.3278/6001820gw

Bayerisches Staatsministerium für Unterricht und Kultus. (StMUK) (2021a). *Lehrplanrichtlinien für die Berufsschule: Fachklassen Maler und Lackierer/Malerin und Lackiererin*. http://www.isb.bayern.de/download/26008/bs_lpr_maler_und_lackierer.pdf

Bayerisches Staatsministerium für Unterricht und Kultus. (StMUK) (2021b). *Lehrplan für die Berufsvorbereitung: Berufsvorbereitungsjahr (BVJ), Berufsintegrationsklasse (BIK), Berufsintegrationsvorklasse (BIK/V), Deutschklassen an Berufsschulen (DK-BS)*. https://www.isb.bayern.de/download/26001/lehrplan_fuer_die_berufsvorbereitung.pdf

Beishuizen, M., van Putten, C. M., & van Mulken, F. (1997). Mental arithmetic and strategy use with indirect number problems up to one hundred. *Learning and Instruction*, *7*(1), 87–106. https://doi.org/10.1016/S0959-4752(96)00012-6

Benz, C. (2007). Die Entwicklung der Rechenstrategien bei Aufgaben des Typs ZE +/- ZE im Verlauf des zweiten Schuljahres. *Journal für Mathematik-Didaktik*, *28*(1), 49–73. https://doi.org/10.1007/BF03339333

Bock, R. D., & Gibbons, R. D. (2021). *Itemresponse theory*. Wiley. https://doi.org/10.1002/9781119716723

Bundesinstitut für Berufsbildung. (BiBB) (2021). *Verzeichnis der anerkannten Ausbildungsberufe 2021*. https://www.bibb.de/dienst/veroeffentlichungen/de/publication/show/17368

Bundesministerium für Bildung und Forschung. (BMBF) (2022). *Berufsbildungsbericht 2022*. https://www.bmbf.de/SharedDocs/Downloads/de/2022/berufsbildungsbericht-2022.pdf?__blob=publicationFile&v=1

Carnevale, A. P., & Desrochers, D. M. (2002). The missing middle: Aligning education and the knowledge economy. *The Journal for Vocational Special Needs Education*, *25*(1), 3–10. https://files.eric.ed.gov/fulltext/EJ903935.pdf

Carr, M., & Alexeev, N. (2011). Fluency, accuracy, and gender predict developmental trajectories of arithmetic strategies. *Journal of Educational Psychology*, *103*(3), 617–631. https://doi.org/10.1037/a0023864

Deissinger, T. (1996). Germany's vocational training act: Its function as an instrument of quality control within a tradition-based vocational training system. *Oxford Review of Education*, *22*(3), 317–336. https://doi.org/10.1080/0305498960220305

Deno, S. L. (2003). Developments in curriculum-based measurement. *The Journal of Special Education*, *37*(3), 184–192. https://doi.org/10.1177/00224669030370030801

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L. S., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Duckworth, K., & Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, *43*(6), 1428–1446. https://doi.org/10.1037/0012-1649.43.6.1428

Ebenbeck, N., Jungjohann, J., Mühling, A., & Gebhardt, M. (2021). *Die Bearbeitungsgeschwindigkeit von Kindern mit Lernschwierigkeiten als Grundlage für die Testentwicklung von Lernverlaufsdiagnostik*. [Manuscript submitted for publication]. Universität Regensburg.

Ennemoser, M., Krajewski, K., & Schmidt, S. (2011). Entwicklung und Bedeutung von Mengen-Zahlen-Kompetenzen und eines basalen Konventions- und Regelwissens in den Klassen 5 bis 9. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, *43*(4), 228–242. https://doi.org/10.1026/0049-8637/a000055

Ennemoser, M., Sinner, D., & Krajewski, K. (2015). Kurz- und langfristige Effekte einer entwicklungsorientierten Mathematikförderung bei Erstklässlern mit drohender Rechenschwäche. *Lernen und Lernstörungen*, *4*(1), 43–59. https://doi.org/10.1024/2235-0977/a000091

European Agency for Development in Special Needs Education. (Eds.) (2013). *European patterns of successful practice in vocational education and training: Participation of learners with SEN/disabilities in VET*. European Agency for Development in Special Needs Education. https://www.european-agency.org/sites/default/files/european-patterns-of-successful-practice-in-vet_vet-report_en.pdf

Franke, M., & Ruwisch, S. (2010). *Didaktik des Sachrechnens in der Grundschule (2nd ed.). Mathematik Primarstufe und Sekundarstufe I + II*. Spektrum. https://doi.org/10.1007/978-3-8274-2695-6

Fuchs, D., & Fuchs, L. S. (2006). Introduction to response to intervention: What, why, and how valid is it? *Reading Research Quarterly*, *41*(1), 93–99. https://doi.org/10.1598/RRQ.41.1.4

Gaidoschik, M. (2014). *Einmaleins verstehen, vernetzen, merken. Strategien gegen Lernschwierigkeiten*. Klett, Kallmeyer.

Gaidoschik, M., Moser Opitz, E., Nührenbörger, M., Rathgeb-Schnierer, E., & Götze, D. (2021). Besondere Schwierigkeiten beim Mathematiklernen. *Special Issue der Mitteilungen der Gesellschaft für Didaktik der Mathematik*, *47*(111S). https://doi.org/10.13140/RG.2.2.15952.64004

Gasteiger, H., & Paluka-Grahm, S. (2013). Strategieverwendung bei Einmaleinsaufgaben – Ergebnisse einer explorativen Interviewstudie. *Journal für Mathematik-Didaktik*, *34*(1), 1–20. https://doi.org/10.1007/s13138-012-0044-8

Gebhardt, M., Diehl, K., & Mühling, A. (2016). Online Lernverlaufsmessung für alle SchülerInnen in inklusiven Klassen. *Zeitschrift für Heilpädagogik*, *66*(10), 444–453. https://doi.org/10.5283/epub.43877

Gebhardt, M., Oelkrug, K., & Tretter, T. (2013). Das mathematische Leistungsspektrum bei Schülerinnen und Schülern mit sonderpädagogischem Förderbedarf in der Sekundarstufe. Ein explorativer Querschnitt der fünften bis neuen Klassenstufe in Münchner Förderschulen. *Empirische Sonderpädagogik*, *5*(2), 130–143. https://doi.org/10.5283/epub.43746

Gebhardt, M., Sälzer, C., Mang, J., Müller, K., & Prenzel, M. (2015). Performance of students with special educational needs in Germany: Findings from programme for international student assessment 2012. *Journal of Cognitive Education and Psychology*, *14*(3), 343–356. https://doi.org/10.1891/1945-8959.14.3.343

Gebhardt, M., Tretter, T., Schwab, S., & Gasteiger-Klicpera, B. (2011). The transition from school to the workplace for students with learning disabilities: Status quo and the efficiency of pre-vocational

and vocational training schemes. European Journal of Special Needs Education, 26(4), 443–459. https://doi.org/10.1080/08856257.2011.597181

Gebhardt, M., Zehner, F., & Hessels, M. (2014). Basic arithmetical skills of students with learning disabilities in the secondary special schools: An exploratory study covering fifth to ninth grade. *Frontline Learning Research*, *2*(1), 50–63. https://doi.org/10.14786/flr.v2i1.73

Haffner, J., Baro, K., Parzer, P., & Resch, F. (2005). *Heidelberger Rechentest: Erfassung mathematischer Basiskompetenzen im Grundschulalter, HRT 1–4*. Hogrefe.

Häsel, U. (2001). *Sachaufgaben im Mathematikunterricht der Schule für Lernbehinderte: Theoretische Analyse und empirische Studien. Texte zur mathematischen Forschung und Lehre: Bd. 14*. Franzbekker.

Häsel-Weide, U. (2020). Sachrechnen. In U. Heimlich & F. B. Wember (Eds.), *Didaktik des Unterrichts im Förderschwerpunkt Lernen: Ein Handbuch für Studium und Praxis* (4th ed., pp. 303–318). Kohlhammer.

Hofmann, C., Häfeli, K., Müller, X., & Krauss, A. (2021). Transition from low-threshold vocational education and training to work in Switzerland: Factors influencing objective and subjective career success. *International Journal for Research in Vocational Education and Training*, *8*(2), 136–159. https://doi.org/10.13152/IJRVET.8.2.1

Holopainen, L., & Hakkarainen, A. (2019). Longitudinal effects of reading and/or mathematical difficulties: The role of special education in graduation from upper secondary education. *Journal of Learning Disabilities*, *52*(6), 456–467. https://doi.org/10.1177/0022219419865485

Hosp, M. K., Hosp, J. L., & Howell, K. W. (2016). *The ABC's of CBM: A practical guide to curriculum-based measurement (2nd ed.). The Guilford practical intervention in the schools series*. The Guilford Press.

Jochmaring, J. (2019). Übergänge von Schüler/innen mit sonderpädagogischem Förderbedarf in die Berufsausbildung. Eine Auswertung von Sekundärstatistiken. *Zeitschrift für Pädagogik*, *65*(3), 335–354. https://doi.org/10.25656/01:23946

Jungjohann, J., DeVries, J. M., Mühling, A., & Gebhardt, M. (2018). Using theory-based test construction to develop a new curriculum-based measurement for sentence reading comprehension. *Frontiers in Education*, *3*(115). https://doi.org/10.3389/feduc.2018.00115

Krajewski, K., & Schneider, W. (2009). Exploring the impact of phonological awareness, visual-spatial working memory, and preschool quantity-number competencies on mathematics achievement in elementary school: Findings from a 3-year longitudinal study. *Journal of Experimental Child Psychology*, *103*(4), 516–531. https://doi.org/10.1016/j.jecp.2009.03.009

Lehmann, R., & Hoffmann, E. (Eds.) (2009). *BELLA. Berliner Erhebung arbeitsrelevanter Basiskompetenzen von Schülerinnen und Schülern mit Förderbedarf "Lernen"*. Waxmann. http://www.ciando.com/ebook/bid-40156

Lobemeier, K. R. (2005). *Welche Leistungen erbringen Viertklässler bei Aufgaben zum Thema Größen? Untersuchungen zur mathematisch-naturwissenschaftlichen Kompetenz im Grundschulalter im Rahmen von IGLU*. Universitätsbibliothek. http://d-nb.info/977261212/34

Mittelberg, A. (2004). *Rechenschwächen in der Hauptschule - eine Studie zu den Rechenleistungen in den Klassen 7 und 8. Universität Hannover* [Doctoral dissertation]. https://www.repo.uni-hannover.de/bitstream/handle/123456789/6461/392143917.pdf?sequence=1

Mononen, R., Aunio, P., Koponen, T., & Aro, M. (2014). A review of early numeracy interventions for children at risk in mathematics. *International Journal of Early Childhood Special Education*, *6*(1), 25–54. http://hdl.handle.net/10138/232676

Moosbrugger, H., & Kelava, A. (2020). *Testtheorie und Fragebogenkonstruktion*. Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-662-61532-4

Moser Opitz, E. (2013). *Rechenschwäche/Dyskalkulie: Theoretische Klärungen und empirische Studien an betroffenen Schülerinnen und Schülern (2nd ed.). Beiträge zur Heil- und Sonderpädagogik, 31*. Haupt.

Nguyen, T., Watts, T. W., Duncan, G. J., Clements, D. H., Sarama, J. S., Wolfe, C., & Spitler, M. E. (2016). Which preschool mathematics competencies are most predictive of fifth grade achievement? *Early Childhood Research Quarterly*, *36*, 550–560. https://doi.org/10.1016/j.ecresq.2016.02.003

Organisation for Economic Co-operation and Development. (OECD) (2019). *PISA 2018 Results (Volume I): What students know and can do*. OECD Publishing. https://doi.org/10.1787/5f07c754-en

O'Hanlon, C. (2018). *Special education integration in Europe*. Routledge. https://doi.org/10.4324/9780429503887

Padberg, F., & Benz, C. (2021). *Didaktik der Arithmetik (5th ed.). Mathematik Primarstufe und Sekundarstufe I + II*. Springer Spektrum.

Peter-Koop, A., & Nührenbörger, M. (2008). Größen und Messen. In G. Walther, M. den van Heuvel-Panhuizen, D. Granzer & O. Köller (Eds.), *Lehrer-Bücherei. Bildungsstandards für die Grundschule: Mathematik konkret* (pp. 89–117). Cornelsen Scriptor.

Peters, G., Smedt, B. de, Torbeyns, J., Verschaffel, L., & Ghesquière, P. (2014). Subtraction by addition in children with mathematical learning disabilities. *Learning and Instruction*, *30*, 1–8. https://doi.org/10.1016/j.learninstruc.2013.11.001

Rensing, J., Käter, C., Käter, T., & Hillenbrand, C. (2016). Konstruktion und Überprüfung eines curriculumbasierten Testverfahrens im Fach Mathematik für die vierte Klasse. *Empirische Sonderpädagogik*, *8*(4), 346–366. https://doi.org/10.25656/01:12940

Riedl, A., & Schelten, A. (2010). Bildungsziele im berufsbezogenen Unterricht der Berufsschule. In R. Nickolaus, G. Pätzold, H. Reinisch & T. Tramm (Eds.), *Handbuch Berufs- und Wirtschaftspädagogik* (pp. 179–188). Klinkhardt UTB. http://riedlpublikationen.userweb.mwn.de/pdf/riedlschelten-2010handbuchbwp.pdf

Scherer, P., Beswick, K., DeBlois, L., Healy, L., & Opitz, E. M. (2016). Assistance of students with mathematical learning difficulties: How can research support practice? *ZDM*, *48*(5), 633–649. https://doi.org/10.1007/s11858-016-0800-1

Schurig, M., Jungjohann, J., & Gebhardt, M. (2021). Minimization of a short computer-based test in reading. *Frontiers in Education*, *6*, Article 684595. https://doi.org/10.3389/feduc.2021.684595

Secretariat of the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany. (KMK) (Eds.) (2021). *The education system in the federal republic of Germany 2018/2019: A description of the responsibilities, structures and developments in education policy for the exchange of information in Europe*. https://www.kmk.org/fileadmin/Dateien/pdf/Eurydice/Bildungswesen-engl-pdfs/dossier_en_ebook.pdf

Seitz, M., & Weinert, S. (2022). Numeracy skills in young children as predictors of mathematical competence. *The British Journal of Developmental Psychology*, *40*(2), 224–241. https://doi.org/10.1111/bjdp.12408

Smith, J. P., Males, L. M., Dietiker, L. C., Lee, K., & Mosier, A. (2013). Curricular treatments of length measurement in the United States: Do they address known learning challenges? *Cognition and Instruction*, *31*(4), 388–433. https://doi.org/10.1080/07370008.2013.828728

Spichtinger, U., & Valaikienė, A. (2013). Prevocational training situation of young people with special educational needs (SEN) in Germany. *Social Welfare: Interdisciplinary Approach*, *3*(1), 138–148. https://doi.org/10.15388/sw.2012.28214

Stinken, L. (2015). Schätzkompetenz von Schülerinnen und Schülern in der Sekundarstufe I. *PhyDid B, Didaktik der Physik, Beiträge zur DPG-Frühjahrstagung*, *2015*, 1–6. http://www.phydid.de/index.php/phydid-b/article/view/600

Swanson, H. L., & Hoskyn, M. (1998). Experimental intervention research on students with learning disabilities: A meta-analysis of treatment outcomes. *Review of Educational Research*, *68*(3), 277–321. https://doi.org/10.3102/00346543068003277

Tretter, T., Spindler, K., & Gebhardt, M. (2011). Berufsvorbereitung in Vollzeit (BVV) - Evaluation eines Modellversuchs zur beruflichen Eingliederung von benachteiligten Jugendlichen. *Vierteljahresschrift für Heilpädagogik und ihre Nachbargebiete*, *80*(2), 137–150. https://doi.org/10.2378/vhn2011.art09d

van Essen, F. (2013). *Soziale Ungleichheit, Bildung und Habitus. Möglichkeitsräume ehemaliger Förderschüler*. Springer VS. https://doi.org/10.1007/978-3-658-01618-0

van Hoof, J., Degrande, T., Ceulemans, E., Verschaffel, L., & van Dooren, W. (2018). Towards a mathematically more correct understanding of rational numbers: A longitudinal study with upper elementary school learners. *Learning and Individual Differences*, *61*, 99–108. https://doi.org/10.1016/j.lindif.2017.11.010

Vaughn, S., Linan-Thompson, S., & Hickman, P. (2003). Response to instruction as a means of identifying students with reading/learning disabilities. *Exceptional Children*, *69*(4), 391–409. https://doi.org/10.1177/001440290306900401

Wieland, C. (2015). Germany's dual vocational-training system: Possibilities for and limitations to transferability. *Local Economy: The Journal of the Local Economy Policy Unit*, *30*(5), 577–583. https://doi.org/10.1177/0269094215589318

Wocken, H. (2007). Fördert Förderschule? Eine empirische Rundreise durch Schulen für optimale Förderung. In I. Demmer-Dieckmann & A. Textor (Eds.), *Integrationsforschung und Bildungspolitik im Dialog* (pp. 35–60). Klinkhardt. https://doi.org/10.25656/01:15316

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How do Vocational Teachers Learn? Formal and Informal Learning by Vocational Teachers in Kenya

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Abstract

Context: Participation in Continuing Professional Development (CPD) supports the development of vocational teacher competencies. However, it is often not clear what learning methods vocational teachers use in their CPD. This study therefore investigated the CPD practices of vocational teachers in Kenya, with a specific focus on the formal and informal learning methods used.

Approach: The study used a questionnaire survey to collect data from TVET teachers randomly drawn from six Technical and Vocational Colleges in Kenya's Nairobi Metropolitan Area. Descriptive and inferential analysis of the data was used to determine how frequently different learning methods are used and to identify associations between CPD practices and teacher characteristics.

Findings: TVET teachers in Kenya were found to use different learning methods depending on the availability of the learning methods and the learning goals teachers have. Formal academic learning and discussions with colleagues are frequently used while collaborative learning methods and practice-based learning activities are less frequently used. Rarely used are written reflections about practice and its outcomes. Despite viewing Lecturer Industrial Attachment (LIA) as important and therefore wishing to attend LIA, more than a third of the participants indicated that they had never attended LIA. The use of professional literature

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is restricted to text books with limited use of primary and secondary literature. CPD activities such as mentoring, supervising other teachers, and school visits were found to form a unique category of CPD activities that is more frequently used by teachers with administrative responsibilities.

Conclusion: The limited use of active learning methods that involve critical evaluation of practices and their outcomes risks limiting the ability of vocational teachers in Kenya to transform and adopt better practices. It is recommended that vocational teachers in Kenya are encouraged to adopt a broad conception of teacher CPD that embraces collaborative, reflective, and practice-based learning.

Keywords: Teachers, Continuing Professional Development, Formal and Informal Learning, TVET, VET, Vocational Education and Training, Kenya

1 Introduction

Improving the professional competencies of vocational teachers is essential for ensuring the quality of vocational education. The United Nations Educational, Scientific and Cultural Organization (UNESCO) uses the term Technical and Vocational Education and Training (TVET) and has defined TVET as a broad set of educational processes which enable the development of technical competencies related to occupations in various sectors of the economy and social life in addition to supporting the acquisition of general knowledge, skills and attitudes (UNESCO, 2001). This broad scope of TVET highlights the need for TVET teachers to possess a broad range of competencies and in light of rapid scientific and technological changes, TVET teachers must continually update their knowledge, skills and competencies. Accordingly, the Continuing Professional Development (CPD) of TVET teachers is critical in the provision of quality vocational education and training (Cedefop, 2016; Gamble, 2013; Wheelahan, 2010).

Richter et al. (2011) defined teacher CPD as the ongoing formal and informal learning activities that deepen and extend teachers' professional competencies. The learning enables TVET teachers to offer relevant and up to date content and to deal with the challenges of vocational teaching (Anselmann et al., 2022; Dymock & Tyler, 2018; Hoekstra et al., 2018). TVET teacher CPD is thus essential to ensuring quality of vocational education and training (Gamble, 2013; Misra, 2011; Winch, 2013).

Despite its importance, effective TVET teacher CPD remains unavailable to many teachers across the world (Axmann et al., 2015; Rawkins, 2018) and especially in Sub-Saharan Africa (Grijpstra & Papier, 2015). Kenya is one such country in Sub-Saharan Africa where a key concern over the years has been that TVET teachers in the country have been unable to improve their professional competencies (Akala & Changilwa, 2018; Sifuna, 2020). Moreover,

there exists no formal policy on the Continuing Professional Development of teachers. In the absence of policies and professional guidelines, teacher CPD in Kenya remains under resourced and poorly targeted (Lowe & Prout, 2018). Within this context and given the limited research into the CPD practices of TVET teachers in Kenya, it remains unclear how TVET teachers in Kenya improve their professional competencies, and in particular, the formal and informal CPD practices they use. To address the existing research gap into the CPD practices of teachers in Kenya and to potentially identify appropriate measures to support TVET teacher CPD in Kenya, this study sought to investigate and profile the CPD practices of TVET teachers in Kenya with a specific focus on the formal and informal learning methods used.

To guide the study, a narrative review of literature focusing on the learning methods vocational teachers use and the factors that influence participation in teacher CPD was carried out. These are described below followed by a description of the context of the study, its design and findings.

1.1 TVET Teacher CPD

Researchers have in the past sought to identify the different learning methods vocational teachers use and the frequency of using such methods. In their systematic review of literature on the professional learning of vocational teachers, Zhou et al. (2022) identified four categories of learning methods that vocational teachers have been observed to use. These are: (a) Pre-defined professional development programs which are purposefully designed and therefore formal in character such as formal education and academic workshops, (b) self-directed learning activities which involve learning by doing, reflection and active exploration of new ideas and approaches in the workplace, (c) collaborative learning activities in the school which involve the active exchange of ideas and practical information through activities such as peer collaboration or informal discussions, and (d) industry-based learning activities whereby vocational teachers visit industries and other work places for the purposes of learning. Similar learning methods were identified in studies focusing on the CPD practices of TVET teachers in Sweden (Andersson & Köpsén, 2015, 2018), China (Zhou et al., 2021) and Britain (Broad, 2016).

While vocational teachers in different countries use similar learning methods, variations have been observed in how frequently vocational teachers in different countries use the learning methods available to them. For example, in a study focusing on Swedish vocational teachers and using a questionnaire survey on vocational teacher participation in different CPD activities, Andersson & Köpsén (2018) found that reading professional literature was the most common learning method followed by study visits and students' placement respectively. Focusing on vocational teachers in England, Broad (2016) used a questionnaire survey supplemented by interviews to identify how frequently vocational teachers in Britain use

different learning methods. Reading journals and books together with accessing materials and resources online were the most commonly used methods, while industrial placement was among the least commonly used. Focusing on vocational teachers in different countries and using a combination of desk work, interviews and surveys, Stanley (2021) observed wide variations in how frequently vocational teachers in different countries used the learning methods available to them.

With respect to factors influencing what learning methods teachers use in their CPD, a range of factors have been identified. In particular, the choice of learning method has been linked to teachers' career stages, available learning methods, and organisational practices such as the recognized learning methods (Njenga, 2022). For example Barrera-Pedemonte's (2016) review of literature found that across different countries, access and participation to different forms of professional development varies with teachers' characteristics such as age, and completion of pre-service training. For example, in a study focusing on German secondary school teachers, Richter et al. (2011) found that the use of formal and informal learning practices differed along career stages with formal in-service training being used most frequently by mid-career stage teachers. Other studies have shown variations in participation rates due to educational attainment, age, occupational area, and prior CPD experiences (Appova & Arbaugh, 2018; de Vries et al., 2013; Njenga, 2022). In Serbia, Maksimovic (2016) found that young vocational teachers participate in fewer CPD activities and report fewer hours of CPD compared to their older and more experienced teachers. In similar studies focusing on VET teachers in Turkey (Durgun, 2016) and Sweden (Andersson & Köpsén, 2015), regional disparities in participation rates were observed. Other studies have linked CPD practices to contextual factors such as the type of school and policies guiding the professional development of teachers. Other factors include clear opportunities to participate in CPD, availability of resources and incentives for participation (Andersson & Köpsén, 2015; Appova & Arbaugh, 2018; Boylan et al., 2018; Desimone et al., 2007; Organization for Economic Co-operation and Development [OECD], 2014; Sancar et al., 2021; Stanley, 2021).

The reviewed literature shows that TVET teacher CPD consists of all learning that TVET teachers engage in with the aim of improving their professional competencies. The literature also shows that TVET teachers use multiple learning methods and that the learning methods used do not differ radically from the learning methods used by general education teachers. However, due to the dual character of vocational teaching, TVET teachers make use of additional methods such as work or industry placement for vocational teachers (also referred to as Lecturer Industrial Attachment) whereby teachers visit work places or industrial firms for extended periods of time to maintain and improve their knowledge and skills related to emerging technologies and modern work process (Andersson & Köpsén, 2018; Broad, 2016; Kaske et al., 2022; Zhou et al., 2022).

The reviewed literature also shows that participation in teacher CPD and the use of different learning methods is influenced by both personal and contextual factors. Personal factors relate to teacher characteristics such as age, career stage, and prior educational qualifications. Contextual factors relate to the institutional and organizational conditions within which teachers work. These include regulations on teacher CPD, available opportunities for CPD, and the support and resources availed to teachers from their employers or government (Appova & Arbaugh, 2018; Boylan et al., 2018; Desimone et al., 2007; OECD, 2014; Sancar et al., 2021; Stanley, 2021).

To explain the use of different learning methods, the study adopted the view that teachers are adult learners and their professional development is adult education (Appova & Arbaugh, 2018; Beavers, 2009; Lawler, 2003). As Lawler notes, such a view allows the incorporation of ideas from the field of adult learning into teachers' professional development. The study therefore borrowed from literature on adult learning and in particular, the view that adults are self-directed learners, i.e., adults tend to be able to diagnose their learning needs, identify appropriate learning approaches and evaluate their learning outcomes (Brookfield, 2009; Gordon & Ross-Gordon, 2018; Henschke, 2009; Merriam & Bierema, 2014). In addition, to take into account the role of context, the study adopted Njenga's (2022) conceptualization of teachers' CPD as context-bound and goal-oriented adult education, characterized by multiple aims, diverse content, and a broad range of learning methods.

Accordingly, vocational teachers were viewed as adult learners who are self-directed in their learning and who therefore choose learning approaches that best suit their learning needs within their working contexts. This implies that teachers are strategic and selective in their choice of learning methods. Thus, rather than passively use whatever learning methods are available to them, teachers selectively choose and use specific learning methods from those available to them depending on their underlying learning goals and the dictates of the institutional context (Njenga, 2022). For example, Stanley (2021) found that in cases where vocational teachers pursue goals such as licensing or career progress, the learning methods vocational teachers choose align with the conditions for licensing and incentives set for career progress. Moreover, vocational teachers could only use the learning methods that they could access. Accordingly, it can be concluded that the learning methods that vocational teachers use and the frequency of using such methods depends on the learning methods that are available to vocational teachers in a particular context and how well the available learning methods support vocational teachers to meet their learning needs and goals.

1.2 Context of the Study

As a developing country with a large youth demographic, Kenya views TVET as vital for her social and economic development. TVET is seen as critical for the development of the manufacturing and services sectors of the economy and in solving the problem of youth

unemployment. Both formal and informal systems of vocational education exist in Kenya. Within the formal system of vocational education, public and private institutions offer training in engineering trades, agricultural studies, and business studies, among others (Ministry of Education Sector Working Group, 2019; Sifuna, 2020; Technical and Vocational Education and Training Authority [TVETA], 2020).

Formal TVET training leads to different qualifications depending on the entry characteristics of students and training institutions may be classified based on the characteristics of students and the qualifications students obtain. Vocational Training Centres or Youth Polytechnics offer training to students with primary level education (i.e., International Standard Classification of Education (ISCED) level 2) and study programs lead to the award of artisan certificates. Technical and Vocational Colleges (TVCs), often referred to as Technical Training Institutes, offer training to students with secondary level education. As non-university training institutions, TVCs offer craft certificate programs that run for two years (ISCED level 3) and diploma certificate programs that run for three years (ISCED level 4). National Polytechnics offer training leading to the award of diploma certificates or the Higher National Diploma (ISCED level 5) (UNESCO Institute of Statistics, 2022). This study focused on vocational teachers in public Technical and Vocational Colleges (TVCs) who teach craft and diploma level students.

1.3 Vocational Teachers in Kenya

Vocational teachers working in public TVCs, often referred to as TVET teachers, are responsible for providing theoretical and practical instruction in their trade areas. Ideally, all TVET teachers in Kenya should have received some form of teacher training in addition to formal training in their trade areas before being employed as teachers. This is usually a minimum of diploma or craft certificate in their trade area (International Centre for Technical and Vocational Education and Training [UNESCO-UNEVOC], 2018).

Vocational teachers may receive pedagogical training at the Kenya Technical Teachers Colleges (KTTC), leading to the award of a non-university diploma in teacher education. Vocational teachers may also receive training in a university and obtain a Bachelor of Education degree. However, there is no requirement for prior work experience to be admitted for teacher training or to be employed as a vocational teacher (Ronoh et al., 2013). Moreover, not all teachers have received pedagogical training while others lack the requisite educational qualifications. For example Kariuki (2013) found that one third of the teachers at two of the country's largest Technical Training Institutes had only diploma qualifications yet they were responsible for teaching diploma level students.

TVET teacher training in Kenya has been criticised for failing to provide adequate training in the practical skills that TVET teachers are later expected to teach (Sifuna, 2020).

TVET teachers are also largely responsible for their in-service training, although the government in conjunction with donor agencies may provide short in-service training programs (UNESCO-UNEVOC, 2018).

These conditions highlight the need for TVET teacher CPD in Kenya as well as research insights that can be used to improve TVET teacher CPD in Kenya. However, it remains unclear what learning methods TVET teachers in Kenya use in their CPD and the frequency of using the different learning methods available to them. It is also unclear what factors influence their choice of learning method and how teacher characteristics influence their choice of learning method.

2 Methods and Research Questions

This study therefore sought to investigate and profile TVET teacher CPD practices in Kenya with a focus on the formal and informal learning methods used. Further the study sought to investigate how TVET teacher characteristics influence the choice of learning methods used. To guide the study, the following two research questions were posed:

a. What formal and informal learning methods characterize TVET teacher CPD in Kenya?

b. How do TVET teacher characteristics influence the choice of learning method?

To attain the aim of the study and answer the research questions, it was necessary to collect empirical data on the learning methods used by a broad cross section of TVET teachers in Kenya and relate that data to the characteristics of the teachers providing the data. A survey questionnaire approach to data collection was therefore adopted for the study. This was in line with the approach used by similar studies in the past, e.g. Andersson & Köpsén (2018).

The review of literature showed that the CPD development practices of vocational teachers largely mirror those of general education teachers. Accordingly, rather than duplicate past efforts and develop an entirely new instrument that is similar to existing instruments, the questionnaire items were adopted from those used in the Teaching and Learning International Survey (TALIS) to explore the CPD practices of teachers (OECD, 2014, 2018). Moreover, this was in line with past studies that adopted the TALIS items to examine and compare the CPD practices of vocational teachers in nine countries in Western Balkans and Turkey (Stanley, 2021).

The questionnaire asked participants to indicate how frequently they used various learning methods in the past one year, and to provide basic information about themselves such as age, gender, educational qualifications, and career stage. However, the items were adapted to better fit the Kenyan TVET context. Thus, items specific to TVET, such as those focusing on participation in Lecturer Industrial Attachment, were added. The questionnaire was then

piloted in three Technical and Vocational Colleges and based on the response patterns, the final questionnaire was developed. For example, items with very low response rates were deemed unsuitable for the Kenyan context and were consequently removed.

For purposes of analysis, the CPD activities used in the questionnaire were categorized into two main categories i.e., formal and informal CPD activities. The informal category was further split into three sub-categories: Collaborative, self-paced, and practiced based. The four categories are described below.

a. Formal CPD activities referred to structured and formally organized learning activities that are often facilitated by an expert. Examples include activities such as workshops and seminars, short and long courses offered by colleges and universities, and educational conferences.

b. Collaborative CPD activities referred to CPD activities that rely on teamwork and peer-learning. Examples of collaborative CPD activities include co-teaching and lesson observation, mentoring and coaching other teachers, and participation in teacher clubs.

c. Self-paced CPD activities referred to learning activities undertaken by and directed by the individual teacher and include studying professional literature, watching videos and online content relating to teaching content and teaching methods, and discussions with colleagues to solve practice challenges.

d. Embedded and practice based CPD activities relate to work activities that are characterized by a high degree of learning and require teachers to step out of their normal routine and relook at content, practices and outcomes. These include participating in designing content and learning materials, curriculum development, and developing and marking national examinations. Other embedded activities include participating in research activities, writing reflections about practices and their outcomes, and participating in Lecturer Industrial Attachment (i.e., work placements for the vocational teachers in industries or other workplaces).

In line with the focus of the study, the study population were TVET teachers in Technical and Vocational Colleges (TVCs) in Kenya. Nairobi Metropolitan Area was chosen as the study location, owing to its size and representativeness. The area is Kenya's principal economic and cultural centre and consists of five of the 47 counties in Kenya's devolved system of governance (Mundia, 2017). The five counties are, Kiambu County, Kajiado County, Nairobi City County, Machakos County and Murang'a County.

In each county, there are between two and three TVCs and the sampling plan was to pick one TVCs from each county. However, due to access challenges following the Covid-19 pandemic, it was not possible to access any of the TVCs in Machakos County. Accordingly,

Machakos County was substituted with Nyeri County, a county neighbouring the metropolitan area, and one of the TVCs in Nyeri County was chosen by convenience. In the course of looking for a substitute for a TVC from Machakos County, a second TVC from Nairobi County accepted to participate in the study. In the end, six TVCs took part in the study, two from Nairobi County, and one from each of the other four counties.

At the institute level, participants were selected by simple random sampling. It was deemed acceptable to use simple random sampling because there was no reason to assume that teachers in the TVCs are not homogenous. Additionally, it was not possible to access data to develop a more sophisticated sampling plan.

After ethical permission was obtained from the Ethical Committee of the Faculty of Pedagogy and Psychology at Eötvös Loránd University, a research licence was obtained from Kenya's National Council for Science and Technology, after which data collection commenced. A pilot study was then conducted which helped refine the survey questionnaire. Data collection for the main study took place between January and February 2021 after the partial lifting of the Covid-19 restrictions in Kenya. Principals of the selected TVCs were approached to allow data collection in their respective TVCs, and with their help or assistance from a contact teacher, individual teachers were requested to fill in the questionnaires. The sample size set was 200 teachers, (i.e., 40 teachers from each of the five TVCs). The survey data was then analysed through descriptive and inferential analysis to determine the learning methods frequently used and associations between CPD practices and teacher characteristics.

3 Findings

In this section, the survey findings are presented. The section begins with a description of the participants followed with a description of CPD activities TVET teachers in Kenya were found to participate in.

3.1 Description of the Participants

From the issued questionnaires, 170 validly filled questionnaires were returned. By gender, 116 respondents were male and 54 were female, translating to 68% male and 32% female. The sample distribution by gender matched the national distribution of TVET teachers. In August 2020, the Directorate of Technical Education reported that of the 5,622 TVET teachers employed by the Public Service Commission, 65.36% were male while 34.61% were female (Ministry of Education-Directorate of Technical Education, 2020).

By age, 26.5% were below 30 years of age, a third (35.3%) were between 31 and 40 years of age, while 23.5% were between 41 and 50 years of age. The rest, 14.7%, were above 50 years of

age. With respect to educational qualifications, majority of the respondents had a Bachelor's degree (57.6%), while a quarter (24.7%) had a Master's degree, and 1.2% had a PhD degree. The rest, 16.5%, had a Diploma Certificate issued by a non-university tertiary educational institution.

By teaching area, teachers in science, technology, engineering, and mathematics (STEM) were the majority (72.4%), while those in business and social studies were 27.6 per cent. Two thirds of the respondents received pre-service teacher training before they were employed to work as teachers, 14% received teacher training after they started working as teachers, and a fifth have not received formal teacher training.

Majority of the respondents had a non-teaching responsibility (70.6%), which was either administrative (26.5%) or non-administrative (44.1%). Administrative responsibilities included being a principal, deputy principal, or head of an academic department, while non-administrative responsibilities included responsibility for student guidance and counselling and sports.

With respect to career stages, three career stages were defined; Early Career stage for teachers who had worked for less than five years, Middle Career stage for teachers who had worked for between six and twenty years, and Late Career stage for teachers who had worked for more than twenty years. The Early Career stage was further split into New Teachers, for teachers who had worked for less than two years, and Junior Teachers who had worked for between three and five years. The Middle Career stage category was the largest with 37% of the respondents followed by the Junior Teachers category with 23.5% of the respondents. The New Teachers and Late Career stage categories were roughly equal at 19.4 % and 20% respectively.

When the distribution of the participants across career stages was compared to their distribution across the non-teaching responsibilities held, a statistically significant association was found between career stage and having a non-teaching responsibility, $\chi 2\ (6) = 39.95$, $p < 0.001$. Late Career stage Teachers are more likely to have a non-teaching responsibility. On the other hand, New Teachers frequently do not have any responsibilities. The distribution of non-teaching responsibilities by career stages is shown in Table 1.

Table 1: Career Stages by Non-Teaching Roles

		Career Stages				
		New	Junior	Middle CS	Late CS	Total
Non-teaching roles	None	18	13	15	4	50
	Administrative	-	4	22	19	45
	Other	15	23	26	11	75
	Total	33	40	63	34	170

3.2 Participation in Formal and Informal CPD Activities

The study focused on the formal and informal CPD activities that TVET teachers in Kenya participate in. These were categorized into formal, collaborative, embedded and self-directed CPD activities. In this sub-section, the survey findings on how frequently teachers participate in these activities are presented together with analysis focused on how participation in the activities varies with the background characteristics of teachers.

3.2.1 Formal CPD Activities

Teachers reported a high prevalence of formal CPD activities. Other than for participation in educational conferences, more than three quarters of the survey participants indicated that they had participated at least once in a workshop or seminar, a short training course or a university course. Further, at least half of the participants indicated that they had participated twice or more in such formal CPD activities. However, teachers appear to lack opportunities for participating in educational conferences, with more than a third indicating that they had never attended an educational conference. Results are indicated in Table 2.

Table 2: Frequency of Participation in Formal CPD Activities

Organized and Formal CPD Activity	Never (%)	Once (%)	At least twice (%)
Workshops and Seminars	13.50	27.10	59.40
Short training courses	14.10	33.50	52.40
College and university courses	23.70	26.60	49.70
Online courses	26.50	24.10	49.40
Educational conferences	35.50	25.40	39.10

To assess the use of formal academic education as part of teachers' CPD, the educational qualifications of the participants at the start of their teaching careers were compared with their current educational qualifications. It was found that 34 per cent of the participants started teaching with only a Diploma Certificate and 64.7 per cent started teaching with a Bachelor's degree. At present only 16.5 per cent still have a Diploma Certificate while 57.6 per cent have a Bachelor's degree. On the other hand, while only 2 (i.e., 1.2%) of the respondents started teaching with a Master's degree, the proportion of teachers with a Master's degree has increased to 42 (i.e., 24.7 %). Further, two of the participants have acquired a PhD degree. There has thus been significant progression in academic qualifications, implying the use of formal academic CPD to improve educational qualifications. The cross tabulation of entry qualifications with present academic qualifications is shown in Table 3.

Table 3: Educational Qualifications at Entry Into Teaching by Current Educational Qualifications

		Highest level of education at present				
		Diploma	Bachelor	Masters	PhD	Total
Entry qualifications into teaching	Diploma	28	21	8	1	58
	Bachelor	-	77	32	1	110
	Masters	-	-	2	-	2
	Total	28	98	42	2	170

When participation in formal CPD activities was compared against different characteristics of teachers, a statistically significant association was observed between participating in conferences and having a non-teaching responsibility $\chi 2\ (12) = 20.81$, $p < 0.001$. Teachers with administrative responsibilities were found to participate more frequently in educational conferences compared to their colleagues without non-teaching responsibilities.

3.2.2 Collaborative CPD Activities

With respect to collaborative CPD practices, co-teaching and mentoring are the most popular collaborative CPD practices, i.e., three quarters of the participants indicated that they had participated in mentoring and coaching other teachers at least once. On the other hand, practices such as participating in teacher clubs, visiting other schools, and supervising other teachers, are relatively rare with more than half of the participants indicating that they had never participated in such activities. This could be due to the absence of such opportunities and the costs associated with participating in such activities. Table 4 summarizes the frequencies reported in the survey with respect to collaborative CPD activities.

When participation in collaborative CPD activities was compared against different teacher characteristics, teachers in their middle and late career stages were found to participate more frequently in mentoring and coaching activities compared to teachers in the early career stages $\chi 2\ (4) = 15.024$, $p = 0.005$. Middle and late career stage teachers were found to have participated more often in supervising other teachers than their early career stage teachers $\chi 2\ (4) = 33.835$, $p < 0.001$.

Table 4: Frequency of Participation in Collaborative CPD Activities

Collaborative CPD activity	Never (%)	Once (%)	At least twice (%)
Co-teaching (teaching the same lesson with another teacher)	28.80	25.90	45.30
Lesson observations (Lesson study with other teachers)	30.60	35.90	33.50
Mentoring and coaching of other teachers	25.30	25.30	49.40
Participation in teacher clubs	55.30	23.50	21.20
Visiting other institutes and schools to observe their teaching practices	52.90	26.50	20.60
Supervising other teachers	49.70	20.70	29.60

An association was also found between having being trained to work as a teacher and mentoring and coaching other teachers ($\chi 2$ (4) = 27.667, $p < 0.001$), supervising other teachers ($\chi 2$ (4) = 14.183, $p < 0.001$) and participating in educational conferences ($\chi 2$ (4) = 13.993, $p < 0.001$). Teachers who have received teacher training, either before or after they started teaching, reported that they participated more frequently in these activities than those who are yet to receive teacher training. It is likely that teacher training sensitises teachers on the value of CPD and gives them confidence to participate in mentoring and coaching activities. On the other hand, since trained teachers are the ones more likely to be appointed into supervisory positions, they are more likely participate in mentoring and coaching activities, as well as get opportunities to participate in educational conferences.

3.2.3 Embedded CPD Activities

The survey revealed that participation in embedded CPD activities is relatively rare. For example, more than half of the survey participants indicated that they had never written reflections about their practices and outcomes, while only a quarter of the participants said they had participated in curriculum development activities in two or more occasions. The results are captured in Table 5.

Table 5: Frequency of Participation in Practice Based and Embedded CPD Activities

Practice based CPD activity	Never (%)	Once (%)	At least twice (%)
Lecturer Industrial Attachment	35.9	29.4	34.7
Designing and improving content and learning materials	30.0	35.9	34.1
Writing reflections about practices and their outcomes	53.5	28.2	18.2
Being involved in research activities	29.4	34.1	36.5
Curriculum development	37.6	35.9	26.5
Developing or marking of national exams	42.9	17.6	39.4

When participation in practice based CPD activities was compared against different characteristics of teachers, a statistically significant association was observed between participation in designing and improving content and the non-teaching responsibilities held by teachers $\chi 2$ (4) = 14.75, $p < 0.05$. Teachers with administrative responsibilities were found to participate more frequently in designing and improving content and materials than teachers without administrative responsibilities. Moreover, teachers with administrative responsibilities participated more frequently in curriculum development activities than teachers without administrative responsibilities $\chi 2$ (4) = 11.825, $p < 0.05$. A similar pattern was observed with respect to career stages where an association between career stage and participation in designing and improving content was observed, $\chi 2$ (4) = 20.99, $p < 0.001$, as well as, between career stage and participation in curriculum development $\chi 2$ (4) = 22.17, $p < 0.001$. Middle career stage teachers and late career stage teachers participated more frequently in designing and improving content as well as in curriculum development compared to early career stage teachers.

While Lecturer Industrial Attachment (LIA) plays an important role in keeping TVET teachers up to date with modern work practices and emerging technology, more than a third of the participants indicated that they had never attended LIA. Asked for their views on LIA, more than 90 per cent of the participants agreed that LIA is important for teachers. In line with this view, 87 per cent of the respondents wished to attend LIA. However, only 40 per cent of the respondents were willing to pay to attend LIA. With respect to the preferred frequency and duration of LIA, the most popular preference was once a year for four weeks.

3.2.4 Self-Directed and Self-Paced CPD Activities

Compared to the CPD activities presented above, self-paced learning activities are much more common. For example, nearly nine in ten of the survey participants indicated that they participate in discussions about practice occasionally, while more than three quarters of the participants indicated that they frequently read about their teaching subjects. More than two thirds of the participants indicated that they watch videos related to their teaching subjects. However, reading educational theory is less common with a quarter of the participants saying they never or rarely read about educational theory. Results are shown in Table 6.

Table 6: Frequency of Participation in Self-Paced CPD Activities

Self-Paced CPD activity	Never/rarely (%)	Occasionally (%)	Frequently (%)
Discussions about teaching practices with other teachers (professional dialogue)	11.80	44.40	43.80
Watch videos about teaching methods and practices	26.40	33.50	40.00
Read about my teaching subjects	5.30	19.50	75.20
Watch videos about my subjects	12.90	20.60	66.50
Read educational theory	24.80	36.10	39.10

Related to the use of self-paced CPD activities is the use of professional literature. The survey revealed that teachers rarely use primary and secondary literature but rely more on text books for their professional learning. Primary literature was classified as original research articles found in journals, while secondary literature was classified as review articles, and practice guidelines. Tertiary literature was classified as text books, handbooks and encyclopaedias. Finally, grey literature referred to policy and curriculum documents etc. This contradicts the expectation that TVET teachers would use primary and secondary literature to keep abreast of new developments in their fields. Table 7 shows the frequency of using different types of professional literature. However, this agrees with the finding that teachers do not frequently engage in research activities (see Table 5 and Table 8).

Table 7: Frequency of Using Professional Literature

	Never/Rarely (%)	Occasionally (%)	Frequently (%)
Primary Literature	49.40	28.20	20.60
Secondary Literature	40.60	31.80	25.90
Tertiary Literature	16.50	28.80	54.10
Grey Literature	35.30	32.90	30.00

Asked why they read professional literature, majority of the study participants indicated that they use professional literature to keep their knowledge up to date, with only one in five participants using professional literature as part of their post-graduate studies or for research purposes. Only a third of the respondents indicated that they use professional literature as part of their work. Findings are summarized in Table 8.

Table 8: Reasons for Reading Professional Literature

	Per cent of respondents (%)	No response (%)
Keep my knowledge up to date	88.8	11.2
As part of my work	28.2	71.8
As part of my Masters or PhD studies	20.6	79.4
I am involved in research	19.4	80.6

4 Discussion

A key aim of this study was to identify the CPD practices of TVET teachers in Kenya. A sample of 170 TVET teachers drawn from six TVET institutes in Kenya's Nairobi Metropolitan Area provided the data with CPD activities categorized into four categories i.e., formal, collaborative, self-paced, and embedded CPD activities.

From the category of formal CPD activities, the most frequent CPD activity was attending workshops and seminars, followed by short training courses and college and university

courses respectively. In the collaborative learning activities category, mentoring and coaching was the most frequent, and from the self-paced CPD category, reading on subject matter was the most popular followed by watching videos about subject matter. Teachers also frequently engage in discussions about teaching practices. Overall, the most frequent CPD activities were reading and watching videos about subject matter, followed by attending workshops and short training courses.

The least frequent CPD activities were in the collaborative category. These were participation in teacher clubs and visiting other institutes. Writing reflections is very rare, with more than half of the respondents indicating that they never engage in reflective writing about their practice and outcomes. Supervising other teachers is the fourth rarest CPD activity. In the self-paced category, watching videos about teaching methods ranked as the least popular, while in the formal CPD activities category, attending educational conferences was the least popular.

When educational qualifications of the participants at the start of their teaching careers were compared with their current educational qualifications, a large progression in academic qualifications was observed. The progression shows significant use of formal academic CPD to improve educational qualifications and qualify for promotions and other forms of career progress. This is likely the case because TVET teachers have previously been observed to seek in-service training in the hope of better placement (UNESCO-UNEVOC, 2018).

Informal learning methods such as discussions with colleagues are also frequently used, but likely with the aim of finding solutions to practice challenges and because the methods are easy to use. Other collaborative learning methods such as lesson observations are however rarely used, likely because the methods are more time consuming. These tentative explanations are based on the theoretical framework, i.e., as adult learners, TVET teachers use the learning methods available to them and that enable the teachers to attain their learning goals. Further research to verify the reasons for the observed use patterns is called for.

The results in this study mirror findings by other researchers. In TALIS 2018, the most frequently attended professional development activities were courses and seminars attended in person (76% of teachers in the survey) and reading professional literature (72% of the survey respondents). On the other hand, participation in collaborative forms of professional development was found to be much more infrequent, with only 44% of the respondents indicating that they had participated in coaching, peer-observation, and networking (OECD, 2019). Similarly, Broad (2016) identified that formal CPD methods are relatively popular in the Further Education sector in the United Kingdom, with 60% of her survey respondents indicating that they had attended workshops, while 51% indicated that they had attended a short course and 18% indicated that they had attended a long course.

Similar to the finding by Lecat et al. (2019) that teachers frequently use informal learning methods, TVET teachers in Kenya also use a variety of informal learning methods such as

the self-paced use of online resources and participation in professional dialogue. This finding is similar to Broad's (2016) finding, where 81 per cent of the further education teachers in the UK were found to read journals and books, while 68% indicated that they accessed learning materials online. However, for TVET teachers in Kenya, use of professional literature is restricted to text books with limited use of primary or secondary literature.

Based on the reviewed literature, it was expected that the choice of learning method is influenced by the characteristics of teachers. The findings of the study supported this expectation. The characteristics found to frequently influence participation were the career stage of the teachers, holding non-teaching responsibilities, and whether or not a teacher has received Initial Teacher Education (ITE). Teachers who have received ITE were found to participate more frequently in many of the CPD activities surveyed. Based on the theoretical framework, this was attributed to the positive role ITE plays in sensitizing teachers about the value of teacher CPD and the learning methods that they could use.

Despite viewing Lecturer Industrial Attachment (LIA) as important and therefore wishing to attend LIA, more than a third of the participants indicated that they had never attended LIA. The finding agrees with an earlier finding that TVET teachers in Kenya rarely have the opportunity to participate in Lecturer Industrial Attachment (Sang et al., 2012) and aligns with the theoretical framework that teachers in a given context use the learning methods that they are aware of and are able to access and use.

CPD activities related to attending educational conferences, mentoring and supervising other teachers, reading grey literature, and visiting other institutions formed a unique category of CPD activities that teachers with administrative responsibilities frequently took part in compared to teachers without administrative responsibilities. This finding mirrors the finding in TALIS 2018 that principals attend more CPD activities than other teachers (OECD, 2019). Middle and Late Career stage teachers were found to participate more frequently in coaching and mentoring activities, curriculum development, and the design and development of learning materials and content. Further research to verify these observations is called for.

The survey findings should be interpreted taking two limitations into account. First, self-reports of previous CPD activities may not be exhaustive. However, they likely represent general patterns. Second, the fact that the study participants were drawn from one region of the country limits the generalizability of the findings. Accordingly, further research using other methods of data collection and focusing on TVET teachers in other regions of the country is called for.

Given the limited scope of the study, the influence of contextual factors, such as conditions for promotion, were not investigated. Accordingly, the influence of institutional and organizational conditions could only be hypothesised from the data available. Further research is therefore called for.

5 Summary and Conclusions

TVET teachers in Kenya were found to use formal academic learning and discussions with colleagues frequently. However, collaborative learning methods and practice-based learning activities are less frequently used. TVET teachers in Kenya were also found to rarely engage in written reflections about practice and its outcomes. Further, the use of professional literature is restricted to text books with limited use of primary and secondary literature.

The limited use of active learning methods that involve critical evaluation of practices and their outcomes risks limiting the ability of TVET teachers in Kenya to transform and adopt better practices. TVET teachers in Kenya should thus be encouraged to engage in active and critical evaluation of their practices as well as critical exploration and adoption of new practices. Teachers should also be encouraged to participate more frequently in curriculum reviews and in the development of teaching and learning materials to help them develop a deeper understanding of the curricular they implement and learning materials they use. It is further recommended that TVET teachers in Kenya are encouraged to adopt a broad conception of teacher CPD that embraces collaborative, reflective, and practice-based learning. This may be achieved by recognizing and rewarding informal learning practices.

The low rates of participation in Lecturer Industrial Attachment (LIA) put to risk the currency and up-to-datedness of TVET teachers' knowledge of modern technology and work processes. TVET teachers should therefore be encouraged and facilitated to seek LIA to ensure that they keep up to date with developments in industry. A clear policy requiring TVET teachers to attend LIA every year for four weeks as suggested by the majority of participants is recommended. Finally, in the absence of research insights in the use of different learning methods, further research to verify the possible reasons for the use patterns observed is called for.

Ethical Statement

Ethical permission was obtained from the Ethical Committee of the Faculty of Pedagogy and Psychology at Eötvös Loránd University (permit no. 2019/243). The main ethical concerns in the study were informed consent and the privacy of the participants. These were addressed by informing the participants about the aims of the study and getting their fully informed consent, respecting their privacy (for example, the survey questionnaire did not collect names or other identifying information) and secure storage of the data in line with the data protection rules.

References

Akala, W. J., & Changilwa, P. K. (2018). Status of technical and vocational education and training (TVET) in post-secondary education in Kenya. *Journal of Popular Education in Africa*, *2*(7), 15–25. https://cedred.org/images/Issues/july2018jopeaissues/PDF_-_Akala_and_Changilwa_-_Status_of_Technical_and_Vocational_Education_and_Training_TVET_in_Kenya.pdf

Andersson, P., & Köpsén, S. (2015). Continuing professional development of vocational teachers: participation in a Swedish national initiative. *Empirical Research in Vocational Education and Training*, *7*(7). https://doi.org/10.1186/s40461-015-0019-3

Andersson, P., & Köpsén, S. (2018). Maintaining competence in the initial occupation: Activities among vocational teachers. *Vocations and Learning*, *11*(2), 317–344. https://doi.org/10.1007/s12186-017-9192-9

Anselmann, S., Harm, S., & Faßhauer, U. (2022). Input from the grassroots level — reflecting challenges and problems for VET professionals in Germany. *International Journal for Research in Vocational Education and Training*, *9*(2), 239–268. https://doi.org/10.13152/IJRVET.9.2.5

Appova, A., & Arbaugh, F. (2018). Teachers' motivation to learn: Implications for supporting professional growth. *Professional Development in Education*, *44*(1), 5–21. https://doi.org/10.1080/19415257.2017.1280524

Axmann, M., Rhoades, A., Nordstrum, L., La Rue, J.-A., & Byusa, M. (2015). Vocational teachers and trainers in a changing world: The imperative of high-quality teacher training systems. I*LO Working Papers*. https://ideas.repec.org/p/ilo/ilowps/994879203402676.html

Barrera-Pedemonte, F. (2016). High-quality teacher professional tevelopment and classroom teaching practices: Evidence from Talis 2013. *OECD Education Working Papers*, No. 141, OECD Publishing. https://doi.org/10.1787/5jlpszw26rvd-en

Beavers, A. (2009). Teachers as learners: Implications of edult Education for professional development. *Journal of College Teaching & Learning*, *6*(7), 25–30. https://clutejournals.com/index.php/TLC/article/view/1122/1106

Boylan, M., Adams, G., Coldwell, M., Willis, B., & Demack, S. (2018). Theorising variation in engagement in professional and curriculum development: Performativity, capital, systems and purpose. *Review of Education*, *6*(3), 360–407. https://doi.org/10.1002/rev3.3140

Broad, J. H. (2016). Vocational knowledge in motion: Rethinking vocational knowledge through vocational teachers' professional development. *Journal of Vocational Education and Training*, *68*(2), 143–160. https://doi.org/10.1080/13636820.2015.1128962

Brookfield, S. D. (2009). Self-directed learning. In R. Maclean & D. Wilson (Eds.), *International Handbook of Education for the Changing World of Work* (pp. 2615–2627). Springer. https://doi.org/10.1007/978-1-4020-5281-1_172

Cedefop. (2016). Professional development for VET teachers and trainers. A guarantee of quality in vocational education and training. *Briefing Note*. https://www.cedefop.europa.eu/files/9112_en.pdf

de Vries, S., van de Grift, W. J. C. M., & Jansen, E. P. W. A. (2013). Teachers' beliefs and continuing professional development. *Journal of Educational Administration*, *51*(2), 213–231. https://doi.org/10.1108/09578231311304715

Desimone, L. M., Smith, T. M., & Phillips, K. J. R. (2007). Does policy influence mathematics and science teachers' participation in professional development? *Teachers College Record, 109*(5), 1086–1122. http://www.tcrecord.org/Content.asp?ContentId=12896

Durgun, A. B. (2016). *Continuing professional development for vocational teachers and trainers in Turkey*. European Training Foundation. http://www.etf.europa.eu/web.nsf/pages/CPD_Turkey

Dymock, D., & Tyler, M. (2018). Towards a more systematic approach to continuing professional development in vocational education and training. *Studies in Continuing Education*, *40*(2), 198–211. https://doi.org/10.1080/0158037X.2018.1449102

Gamble, J. (2013). Why improved formal teaching and learning are important in technical and vocational education and Training (TVET). In *Revisiting global trends in TVET: Reflections on theory and practice* (pp. 204–238). UNESCO-UNEVOC.

Gordon, S. P., & Ross-Gordon, J. M. (2018). Foundations of adult development and learning: Implications for educational supervision. In S. J. Zepeda & J. A. Ponticell (Eds.), *The Wiley Handbook of Supervision* (pp. 45–73). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781119128304.ch3

Grijpstra, D., & Papier, J. (2015). *TVET teacher education in Africa. Synthesis report*, 23(9). https://ockham-ips.nl/Portals/57/OpenContent/Files/4902/tvet_lecturer_education_Africa_2015_B028.pdf

Henschke, J. A. (2009). A perspective on the history and philosophy of andragogy: An international sketch. In *IACE Hall of Fame Repository*. https://trace.tennessee.edu/utk_IACE-browseall/429

Hoekstra, A., Kuntz, J., & Newton, P. (2018). Professional learning of instructors in vocational and professional education. *Professional Development in Education*, *44*(2), 237–253. https://doi.org/10.1080/19415257.2017.1280523

Kariuki, S. I. (2013). Technician engineering training and employability in Kenya: Focus on Thika and Meru technical training institutes [Doctoral thesis, Catholic University of Eastern Africa]. https://www.academia.edu/87058501/Technician_Engineering_Training_and_Employability_in_Kenya_Focus_on_Thika_and_Meru_Technical_Training_Institutes

Kaske, A., Torres, R., & Jeon, S. (2022). P*romoting work-based learning for vocational teachers. In Technical and Vocational Teacher Education and Training in International and Development Co-Operation* (pp. 67–82). Springer. https://doi.org/10.1007/978-981-16-6474-8_5

Lawler, P. A. (2003). Teachers as adult learners: A new perspective. *New Directions for Adult and Continuing Education*, *2003*(98), 15–22. https://doi.org/10.1002/ace.95

Lecat, A., Raemdonck, I., Beausaert, S., & März, V. (2019). The what and why of primary and secondary school teachers' informal learning activities. *International Journal of Educational Research*, *96*, 100–110. https://doi.org/10.1016/J.IJER.2019.06.003

Lowe, G. M., & Prout, P. F. (2018). Reframing teacher in-service training in Kenya: Recommendations from the literature. *Africa Education Review*, *16*(3), 54–66. https://doi.org/10.1080/18146627.2017.1340803

Maksimovic, I. (2016). *Continuing professional development for vocational teachers and trainers in Serbia* (TD/TNC 125.220; Continuing Professional Development for Vocational Teachers and Trainers). European Training Foundation. http://www.etf.europa.eu/web.nsf/pages/CPD_Serbia

Merriam, S. B., & Bierema, L. L. (2014). *Adult learning: Linking theory and practice*. Jossey-Bass Publishers.

Ministry of Education - Directorate of Technical Education. (2020). *Staff and student returns: May-August 2020*. Ministry of Education. https://ia601507.us.archive.org/29/items/tvet-tti-staff-and-student-returns-october-2020/TVET-TTI-Staff_and_Student_Returns-October-2020.pdf

Ministry of Education Sector Working Group. (2019). *Medium term expenditure framework 2020/21-2022/23- 2019 Education sector report*. The National Treasury, Government of Ke-

nya. https://www.treasury.go.ke/wp-content/uploads/2021/05/Final-Education-Sector-MTEF-2021-2023-10012020.pdf

Misra, P. K. (2011). VET teachers in Europe: Policies, practices and challenges. *Journal of Vocational Education & Training*, *63*(1), 27–45. https://doi.org/10.1080/13636820.2011.552732

Mundia, C. N. (2017). Nairobi metropolitan area. In Y. Murayama, C. Kamusoko, A. Yamashita & R. C. Estoque (Eds.), *Urban development in Asia and Africa* (pp. 293–317). Springer. https://doi.org/10.1007/978-981-10-3241-7_15

Njenga, M. (2022). Teacher participation in continuing professional development: A theoretical framework. J*ournal of Adult and Continuing Education*, 0(0). https://doi.org/10.1177/14779714221123603

Organization for Economic Co-operation and Development. [OECD] (2014). *TALIS 2013 technical report*. OECD Publishing. https://www.oecd.org/education/school/TALIS-technical-report-2013.pdf

Organization for Economic Co-operation and Development. [OECD] (2018). *TALIS 2018 technical report. OECD Publishing*.

Organization for Economic Co-operation and Development. [OECD] (2019). Attracting and effectively preparing candidates. In *TALIS 2018 results (volume I) teachers and school leaders as lifelong learners*. OECD. https://doi.org/10.1787/dd6dd4bc-en

Rawkins, C. (2018). *Joint ILO-UNESCO committee of experts on the application of the recommendations concerning teaching personnel (CEART). A global overview of TVET teaching and training: Current issues, trends and recommendations*. https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/meetingdocument/wcms_675275.pdf

Richter, D., Kunter, M., Klusmann, U., Lüdtke, O., & Baumert, J. (2011). Professional development across the teaching career: Teachers' uptake of formal and informal learning opportunities. *Teaching and Teacher Education*, *27*(1), 116–126. https://doi.org/10.1016/j.tate.2010.07.008

Ronoh, J. K., Okinyi, H. D., & Wanyonyi, J. S. (2013). Preparation of graduate automotive teachers for the world of work in Kenya. *African Journal of Education,Science and Technology*, *1*(1), 205–218. http://www.ajest.info/index.php/ajest/article/view/146

Sancar, R., Atal, D., & Deryakulu, D. (2021). A new framework for teachers' professional development. *Teaching and Teacher Education*, *101*. https://doi.org/10.1016/J.TATE.2021.103305

Sang, A. K., Muthaa, G. M., & Mbugua, Z. K. (2012). Challenges facing techinical training in Kenya. *Creative Education*, *3*(1), 109–113. https://www.scirp.org/pdf/ce20120100016_70192643.pdf

Sifuna, D. N. (2020). The dilemma of technical and vocational education (TVET) in Kenya. *Journal of Popular Education in Africa*, *4*(12), 4–22. https://kenyasocialscienceforum.files.wordpress.com/2020/12/pdf-sifuna-2-the-dilemma-of-technical-and-vocational-education-tvet-in-kenya.pdf

Stanley, J. (2021). *Listening to vocational teachers and principles. Results of the ETF's international survey 2018*. https://doi.org/10.2816/151700

Technical and Vocational Education and Training Authority. [TVETA] (2020). *National TVET standards*. TVETA. https://www.tveta.go.ke/wp-content/uploads/2021/02/National-TVET-Standards-Kenya-Report-2020-5.12.-2020-2.pdf

International Centre for Technical and Vocational Education and Training. [UNESCO-UNEVOC] (2018). *TVET country profiles: Kenya*. UNESCO-UNEVOC. https://unevoc.unesco.org/wtdb/worldtvetdatabase_ken_en.pdf

United Nations Educational, Scientific and Cultural Organization. [UNESCO] (2001). *Technical and vocational education and training for the twenty-first century: UNESCO and ILO recommendations* (pp. 1–51). UNESCO. http://unesdoc.unesco.org/images/0012/001260/126050e.pdf

UNESCO Institute of Statistics. (2022). *Kenya ISCED 2011 mapping*. UNESCO Institute of Statistics. https://isced.uis.unesco.org/visualizations/

Wheelahan, L. (2010). *Literature review: The quality of teaching in VET*. L. H. Martin Institute for Higher Education Leadership and Management Melbourne Graduate School of Education. https://www.academia.edu/32171786/Literature_review_The_quality_of_teaching_in_VET

Winch, C. (2013). The attractiveness of TVET. In K. Ananiadou (Ed.), *Revisiting global trends in TVET: Reflections on theory and practice*. UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training.

Zhou, N., Tigelaar, D. E. H., & Admiraal, W. (2021). Understanding vocational teachers' professional development in work placement: Learning goals, activities, and outcomes. *Studies in Continuing Education*, 1–19. https://doi.org/10.1080/0158037X.2021.1960496

Zhou, N., Tigelaar, D. E. H., & Admiraal, W. (2022). Vocational teachers' professional learning: A systematic literature review of the past decade. *Teaching and Teacher Education*, *119*(103856). https://doi.org/10.1016/J.TATE.2022.103856

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Effectiveness of Collaboration in VET: Measuring Skills for Solving Complex Vocational Problems With a Multidimensional Authentic Technology-Based Assessment

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Abstract

Context: Dealing with professional complexity has been of scientific interest in the research field of vocational education and training for decades. So far, there is a lack of empirical evidence regarding how professional complexity finds its way into learning processes in VET. A common option is to model complexity through authentic simulations and/or problem-solving tasks. This study does both: Complex problem-solving tasks are integrated into an authentic office simulation and are expanded to include collaborative elements, using computer-based agents. Collaboration is used to improve learning, but it is also an authentic representation of current work processes, so we ask whether apprentices perform better in the individual or in the collaborative test setting.

Methods: To compare skills used for complex problem-solving tasks within an authentic business simulation, the test settings are systematically varied between individual and collaborative test settings. The test environment is a technology-based assessment (TBA). Test tasks reflect a complex professional problem; they are presented in an office simulation, in which apprentices can collaborate with a computer-based agent. Multi-group confirmatory factor analysis is conducted to test for measurement invariance across test settings, and the two-dimensional Rasch-model incorporating between-item multidimensionality with

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correlated dimensions is used for ability estimation. We also conduct ANOVA tests to determine if there is a statistically significant difference regarding the problem-solving ability between the individual and collaborative test settings.

Findings: The study provides various findings: First, collaboration helps apprentices to deal with complexity. Second, to solve complex problem-solving tasks, two bundles of skills are activated: Cognitive and social skills. The two-dimensional construct of skills with correlated dimensions showed better fit than the unidimensional construct. The scalar measurement invariance was established after excluding three items. ANOVA tests confirmed that the collaborative setting enhances the problem-solving ability of learners significantly regarding both, cognitive skills and social skills, with cognitive skills being fostered more.

Conclusion: The findings suggest the validation of the two-dimensional construct with cognitive and social skills in economic domains. The results show the effectiveness of collaboration with a computer-based agent. In the practice of vocational training and education, teachers can use digitalized collaborative approaches to enhance learning.

Keywords: Multidimensional Construct, Collaboration, Performance Measurement, Economic Domain, Web-Based Simulation, VET, Vocational Education and Training

1 Designing Learning Processes in VET: The Increasing Importance of Collaboration

Increasingly rapid changes in technology and the use of new information and communication technologies are factors that explain the emergence of teamwork and collaboration in work processes. Consequently, academic inquiries into the transversal competencies which are necessary to cope with complex requirements at the workplace suggest a re-modeling of the content of vocational training in line with the transformations in the practical field. In this section, we outline our theoretical conceptualization of skills needed to solve complex problems individually and collaboratively.

1.1 Modeling the Complexity of Practice for Learning Processes in VET

Work processes are complex, and their complexity is increasing. This development can be explained by increasing rationalization through technical progress and the use of new information and communication technologies (Achtenhagen et al., 1992). Consequently, work processes are changing. Current research programs at national and international level are looking at future technologies and show that "digitization of work", or "Industry 4.0",

is leading to a change in work and production processes across all industries (e.g., Hasenbeck, 2019; Hirsch-Kreinsen, 2017). The current, especially digitally driven, transformations have far-reaching effects on existing organizational structures and processes, on customer relationships, and on business models, which are being realigned according to the digitalization of products, services, and processes (Sczogiel et al., 2019). Transformation in business and work processes has an impact on commercial workplaces: Jobs are changing and with that, the competency requirements as basis for professionally adequate action are changing, too (Brötz et al., 2014). In a complex environment, teamwork and collaboration become more important (Schlicht, 2019). A closer look at the developments of Industry 4.0 provides opportunities for making vocational education and training (VET) more attractive (Esser, 2015). In this context, learning processes in vocational training should be made to focus more on competency development (Anselmann et al., 2022; Spöttl & Windelband, 2021) and require apprentices to make enterprise-specific decisions in more complex and authentic scenarios. Regarding the resulting consequences for content-related training priorities, teamwork skills, negotiation skills, and the willingness to learn and collaborate (Ahrens & Spöttl, 2015) are particularly relevant – these transversal competencies are at the core of the framework curricula for vocational training.

The few empirical studies on the re-modeling of the content of vocational training in line with the transformations in the practical field that are currently available focus especially on participation and communication as conditions for success in the construction of learning processes. The study by Schlicht (2019), for example, points to the following learning situations that are gaining in importance:

- Learning situations that emphasize communication and cooperation in business processes. Communication and cooperation are highly relevant for shaping social and business relationships, for entrepreneurial success, and for the personal development of experts and leaders.

- Learning situations that address typical (industry-specific) problem situations linked to the current and future (projected) developments of a sustainable economy.

Learning processes should consider both the digital and employee-related changes that are currently taking place in real work processes.

1.2 Skills Needed to Solve Complex Problem-Solving Tasks

Complex work and training situations are, e.g., work processes in which, in addition to routine activities, economic decisions must be taken, and work results presented and reflected

on. Work is increasingly done in project teams and across departmental boundaries. Such work requirements show characteristics of complex problems. Thus, coping with complex requirements is not only about accuracy and speed, but above all about acting strategically and coping with a "strategic moment". This includes

- the ability to control cognitive operations,
- the availability of heurisms, and
- the "wisdom" of the problem solver (Dörner, 1986).

Furthermore, a complex problem demands the operational intelligence of the problem solver. This includes, e.g., a balanced elaboration and negotiation of goals and self-management. Solving a complex problem thus implies the efficient interaction between a solver and the situational demands and requires cognitive and social skills and knowledge, as well as emotional and personal regulation (Frensch & Funke, 1995). Against this background, we model and assess two sets of skills for solving a complex problem: *Cognitive and social skills* (Funke, 2003; Hesse et al., 2015, Table 1). The cognitive skills focus on the complex problem-solving process itself, and in particular on task regulation and knowledge building in the solution process; the social skills address the interpersonal or interactional skills for successful work processes and are primarily reflected in individual opportunities for participation, perspective taking, and social regulation (Andrews-Todd & Kerr, 2019; Davier et al., 2018; Hesse et al., 2015).

Table 1: Cognitive and Social Skills Needed to Solve Complex Problem-Solving Tasks (Hesse et al., 2015)

Cognitive skills	**Social skills**
– Task regulation	– Participation
– Learning and knowledge construction	– Perspective taking
	– Social regulation

To solve complex problems, both skills must be applied, regardless of whether the problem is dealt with individually or collaboratively. Both dimensions are correlated. The relevance of social skills for cognitive processes is quite obvious, which has also been referenced in team research (Salas et al., 2017). With reference to these findings, it can be assumed that collaboration has a positive effect on the solution quality of a complex problem. On the one hand, the competencies of several people are needed for complex work processes, and on the other hand, the focus is increasingly on professional solutions developed collaboratively through

changed forms of learning and work. Accordingly, collaboration in complex work processes can be defined as *the potential to act in a cognitively and socially appropriate manner in specific, technically complex problem situations.*

So far, complex problem scenarios in VET have usually been modeled as situations that had to be mastered alone. To add more authenticity to the learning tasks here, problem scenarios are expanded to include collaborative components. This can be done in different ways; in this study, computer-based agents are used as simulated colleagues, who interactively offer (standardized) support. Regarding the changes in commercial workplaces, it is helpful that technical progress in the field of computer technology, network technology, and telecommunication (can) create new possibilities for cooperation and more efficiency in the collaborative processing of a task (Barkley et al., 2014; Borghoff & Schlichter, 2000; Haake & Pfister, 2010). For example, computer-supported cooperative learning seeks to make working on a collaborative task more efficient and easier (Barron, 2003; Dillenbourg & Traum, 2006). A special kind of collaboration is that between learners and computer-based agents. The first technical implementation of such collaboration was in PISA 2015 (He et al., 2017). The computer-based agents communicated with the learner in text-based chats and simultaneously evaluated the learner's problem-solving skills based on the given, pre-formulated answers. Thus, the agents were able to observe performance, knowledge, skills, and psychometric abilities and enabled a standardized large-scale assessment (LSA; Graesser et al., 2017).

2 Goal and Research Question of the Study

The studies on problem-solving in complex problems (Funke, 2003) and collaborative problem-solving (Hesse et al., 2015) clearly indicate that problem-solving is a multidimensional construct. In the present study, we assume a two-dimensional construct that differentiates between cognitive and social skills. The cognitive skill bundle is operationalized via task regulation and knowledge construction; the social skill bundle includes participation, perspective taking, and social regulation as indicators.

The studies on the didactics of complex problems in VET (Rausch et al., 2017; Seifried et al., 2016; Winther & Klotz, 2016; Winther, 2011) show that learning in complex learning arrangements can improve vocational competencies in economic domains. So far, however, there are no findings on how well learners can handle complex, vocational tasks. The studies (summarized for ASCOT: Beck et al., 2016) show that apprentices have difficulties in grasping complexity and translating it into task solutions. Transferred to the assessments, this means that test items are often not used to their full potential because the apprentices cannot fully resolve the complexity. One may assume that learners are better at dealing with complexity when they collaborate. Thus, in this study, collaboration takes place with simulated colleagues in the form of computer-based agents.

Against the background of the theoretical considerations, two research questions are addressed:

1. Can the two-dimensional construct of cognitive and social skills for complex problem-solving be empirically represented?

2. Can the complexity of vocational situations be dealt with more successfully with collaborative support from a computer-based agent?

3 Measurement Environment: Using a Business Simulation as TBA

To answer the research questions, a complex learning arrangement is used. Commercial tasks for learning and measurement are deployed through the office simulation LUCA. LUCA computer-based agents could offer learners different kinds of hints/scaffolds (learning environment) and at the same time record and measures learners' performance (measurement environment). In this section, we describe how test items are integrated in LUCA and how LUCA is used both for individual and collaborative settings.

3.1 Understanding the Task "Supplier Selection"

LUCA is an adaptive learning environment for enabling complex learning processes (Rausch et al., 2021). LUCA simulates real everyday working life and thus supports commercial learning (learning environment). The office simulation can also be used as a measurement environment. For this purpose, complex problem-solving tasks are set as performance tests. The present study refers to the complex problem-solving task "supplier selection" as an example.

In the authentic problem scenario "supplier selection", the apprentices are required to select a suitable supplier from several offers. The task contains a large amount of information and additional attachments that must be viewed and processed. The task "supplier selection" is a domain-typical problem scenario in the business context (design principles of complex scenarios, see Ma et al., 2022; Paeßens & Winther, 2021; Paeßens et al., 2022; Paeßens & Winther, 2023b). The scenario can be placed in the value creation processes of companies and here in particular in the area of purchasing. The vocational requirement is to decide for a supplier, which is worked out by the apprentices in the office simulation in various substeps. The apprentices first view various offers and then prepare a utility value analysis to evaluate the offers. Supplier selection has a high curricular and practical relevance in the field of commercial-vocational education, involves various economic procedures, and focuses on reasoned decisions; thus, it is particularly suitable as an illustrative example for a complex vocational situation.

In this authentic vocational task, the complexity of vocational activity was constructed in such a way that it can be experienced and processed by the apprentices. Working with complexity is systematically but equally varied for both test settings. As theoretically described, both test settings have in common that cognitive and social skills are necessary for solving complex problems (cf. Hesse et al., 2015). The cognitive and social skills involved in both, individual and collaborative problem-solving are measured with validated test items (for individual problem-solving: Paeßens et al., 2023a; for collaborative problem-solving: Paeßens & Winther, 2023b). Table 2 outlines how cognitive and social skills are modeled as theoretically described sets of sub-performances and measured through the different indicators. In the present study, only task regulation is tested as an indicator for cognitive skills.

Table 2: Indicators Measuring Sub-Performance for Cognitive and Social Skills

Primarily cognitive sub-performance	**Primarily social sub-performance**
Task regulation: Screening different attached offers	Social regulation: Reasons for choosing a supplier
Task regulation: Screening relevant information for the benefit analysis	Social Regulation: Written presentation (considering paragraphs, greetings, salutations, and general politeness)
Task regulation: Attaching the modified benefit analysis to the email	Perspective taking: Transfer of the weighting into the benefit analysis
	Participation: Considering the test result sent by email later on

The different indicators testing the corresponding sub-performances are collected in standardized task items and then embedded in various complex problem scenarios. Therefore, the cognitive and social skill sets are evaluated based on the responses of learners to task items. For example, in the problem scenario "supplier selection" for social regulation (a sub-performance of social skills), learners' skill-level is evaluated according to the criteria of quantity and quality of the reasons for choosing a supplier. To obtain a better insight into the tasks in the applied technology-based assessment (TBA), an indicator within the complex task for perspective taking (a sub-performance of social skills) is presented in Figure 1. Learners work through complex problem scenarios in an authentic office environment where various applications (email client, spreadsheet, ERP, etc.) are available. The department manager "Timur Demir" explains in his email with which weighting the factors price, delivery time, and quality should be considered in the benefit analysis. The learners are expected to transfer the information into their own mental model and ultimately into the benefit analysis for other colleagues. Learners in both, the collaborative and the individual test settings need to be able to understand information from other colleagues and their intentions and then integrate this into their work process. This item shows that, in addition to cognitive skills, social skills are also necessary for complex problem-solving in both test settings.

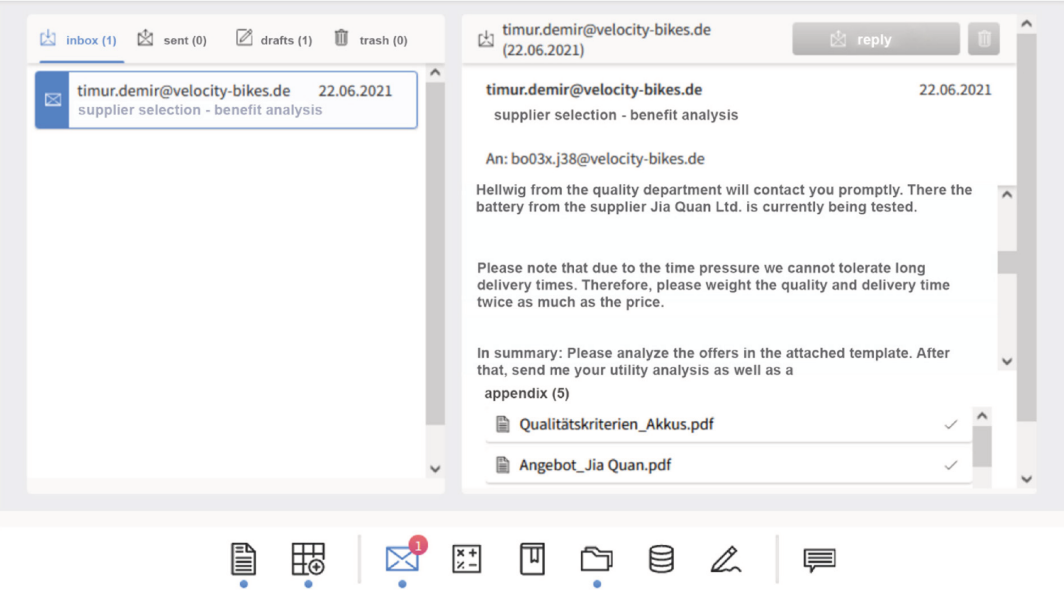

Figure 1: Representation of the Primarily Social Sub-Performance "Perspective Taking" in the Office Simulation LUCA

3.2 Expanding the Task by Collaborative Interaction

In this study, the existing items from the technology-based office simulation are used in two different test settings. The sub-performances are equivalent in content in both test settings. The collaborative test setting is expanded with various interaction formats that provide general as well as specific solution hints and concretely address both cognitive and social skills. Learners are given guidance via computer-based agents. For example, overlays in the office simulation (see Figure 2) simulate instructor interactions or contacts with colleagues. When learners respond to the computer-based agent, they receive procedural information by email that addresses, e.g., specific perspective taking, prompts for individual activities in the overall collaborative process, or suggests general problem-solving heuristics.

Figure 2: Simulated Interaction with a Colleague "Rene Eßer" and Response of the Computer-Based Agent in the Form of an Email From the Colleague

To sum up, the measurement environment is based on a business simulation, in which day by day work tasks have to be mastered. The performance of the apprentices in solving the task "supplier selection" is recorded. This problem-solving task requires both cognitive and social skills. While the apprentices have to master the complex problem-solving task on their own in the individual test setting, they are supported by a computer-based agent in the collaborative test setting.

Thus, the computer-based agent provides on the one hand interactions with learners to support problem-solving processes and on the other hand a diagnostic function (for the use of this particular strength of LUCA, see Paeßens & Winther, 2023c). The measurement environment fulfills the requirements of individual and collaborative learning processes in the way that

- Vocational learning takes place largely in social situations – namely, in a business process in which third parties are involved.

- Sub-performance can be assigned to both cognitive and social skills, which are important for problem-solving of complex problems.

- Computer-based agents are used in collaborative test settings to help deal with complexity.

4 Research Design

The theoretical conceptualization emphasizes that skills needed to solve complex problems is a multidimensional construct composed of two key dimensions, one of which is cognitive skills and the other one is social skills. In this section, we adapt the theory-driven framework of cognitive and social skills involved in complex problem-solving into statistical model to process the data statistically.

4.1 Model and Hypothesis

The hypothesized two-dimensionality of the social and cognitive abilities involved in problem-solving in individual and collaborative settings is illustrated in the model below (Figure 3). In this model, the cognitive dimension and the social dimension are two distinct latent dimensions. That is, there are learners who might have high ability in one dimension but not in the other. However, according to the theoretical framework, the two dimensions are related (for the relation between the two dimensions, see Hesse et al., 2015; chapter 1).

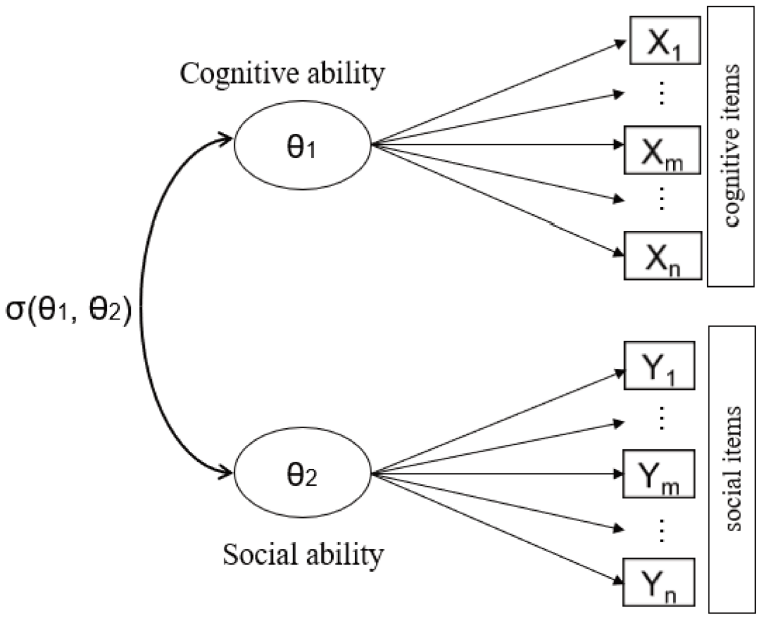

Figure 3: Schematic Illustration of the Two-Dimensional Rasch-Model Incorporating Between-Item Multidimensionality (adapted from Hartig & Höhler, 2009)

To test this latent two-dimensional ability construct, the digital authentic assessment described above was used. The assessment is designed to measure the abilities in the cognitive and social dimensions involved in solving the different items. Multidimensional IRT models (MIRT) can be employed to investigate the construct validity of tests with multiple dimensions (Baghaei, 2013; Embretson, 1980; Field, 2013; Janssen & De Boeck, 1999; Santelices & Caspary, 2009; Wilson & Moore, 2011) and assess learners' abilities separately for the dimensions involved.

Therefore, we state the following two hypotheses:

1. The theoretical two-dimensional construct of the test form is valid. To confirm this hypothesis, the two-dimensional construct should be compared with the unidimensional construct regarding the fit indices.

2. Learners show significantly higher ability in both, the cognitive and the social dimension in the collaborative test setting than in the individual test setting. To test this hypothesis, the comparability between the collaborative and the individual test settings should first be confirmed. After the comparison of learners' abilities in both test settings, it should also be analyzed which dimension will be influenced more strongly by the test setting.

4.2 Sample

505 commercial apprentices from Germany participated in the study. 240 were male, 240 female, 3 divers, and 22 values for sex are missing due to technical problems. The age of the learners ranged from 17 to 42 years (M = 20.92; SD = 2.41). These data were collected at 21 vocational schools and in 28 classes in North Rhine-Westphalia. All participants were in their first year of training. 250 of them worked in the individual test setting and 255 were assigned to the collaborative test setting. The assignment was random at class level.

4.3 Measures

The 11 items within the task are developed according to theory-based design principles and are empirically validated (Paeßens et al., 2023a; Paeßens & Winther, 2023b). The construction of the items is presented in Table 2. The item "participation" in the social dimension, for example, refers to the sub-performance how a problem-solver considers a test result from a supplier that will be sent to them by email later on. The 11 items are embedded in the web-based office simulation and a questionnaire. Seven items belong to the social dimension and four items to the cognitive dimension. Equal test items were used in two test settings; in the individual test setting, the learners processed the supplier selection alone, while in the collaborative test setting, agents were available as a group partner to interact with the learners.

5 Statistical Analyses and Results

The analysis presented in this section begins with testing the first hypothesis and involves two primary steps: (1) Comparing model fit between the Unidimensional Rasch model and the two-dimensional Rasch model —and then (2) testing for measurement invariance between individual and collaborative test settings. The primary purpose of these two steps is to examine how the theoretical two-dimensional construct of the test form performs. The analysis then proceeds to the examination of the second hypothesis that the complexity of vocational situations can be dealt with more successfully with collaborative support from a computer-based agent.

5.1 Comparing Model Fit: The Unidimensional Rasch Model and the Two-Dimensional Rasch Model

This step aims to test the hypothesis that this is a two-dimensional construct. For this purpose, a unidimensional and a multidimensional Rasch model are applied to the test results and we compare the fits of these models. The results of the ANOVA test are is summarized

in Table 3. The two-dimensional model with a significantly smaller model deviance, larger log likelihood, smaller AIC, and smaller BIC fits better to the data compared to the unidimensional model. The theoretical construct of the cognitive and social dimensions is thus, statistically confirmed.

Table 3: Model Fit Statistics for the Unidimensional and Multidimensional Models

Model	loglike	Deviance	Npars	AIC	BIC	Chisq	df	p
uni	2697.273	5394.545	12	5418.545	5469.240	187.222	2	<.001
multi	-2603.662	5207.323	14	5235.323	5294.467			

5.2 Testing for Measurement Invariance

To test for measurement invariance, we ran five rounds of Multi-Group Confirmatory Factor Analysis (MG-CFA) using the R statistics package. The main outputs of model fits are summarized in Table 4. Firstly, we ran an MG-CFA without cross group equality constraints; this configural model shows a good fit (CFI = 0.975, RMSEA = 0.053, SRMR = 0.061) according to Kline (2010). Following configural invariance, we tested for metric invariance with equality of the factor loadings across groups. Although model fit indices (CFI = 0.963, RMSEA = 0.061, SRMR=0.077) show that the metric model is acceptable, a change of 0.012 in CFI (ΔCFI > 0.01) when comparing the metric model and the configural model implies non-invariance according to Chen (2007). Chen (2007) recommends the following alternative cutoff criteria for model comparisons due to the sensitivity of the most commonly used $\chi 2$ test for goodness of fit (Cochran, 1952) to sample size: For testing loading invariance with a sample size larger than 300, a change of ≥ -.010 in CFI, supplemented by a change of ≥.010 in RMSEA or a change of ≥.030 in SRMR would indicate non-invariance; for testing intercept or residual invariance, a change of ≥ -.010 in CFI, supplemented by a change of ≥ .010 in RMSEA or a change of ≥ 0.10 in SRMR would indicate non-invariance.

Table 4: Model Fit Incidents for 3 Levels of Measurement Invariance

	Configural model	Metric model	Partial metric model	Scalar model	Partial scalar model
CFI	0.975	0.963	0.966	0.928	0.958
RMSEA	0.053	0.061	0.059	0.084	0.071
SRMR	0.061	0.077	0.075	0.078	0.066

This study shows that partial metric invariance is achieved across the test settings when releasing only one item of social dimension among the total 11 items. Then we tested for scalar invariance by constraining the factor loadings and the intercepts across groups. Partial scalar invariance is established when releasing two additional intercept parameters for two items. A total of three items were excluded from further analyses. The reasons why they have significant influence on measurement invariance is discussed further down. The established measurement invariance implies that the instrument assesses the psychometric equivalence of a construct across test settings.

5.3 Comparing Abilities: The Individual Group and the Collaborative Group

Before person abilities are estimated using the multidimensional Rasch model, we examine correlations between the two dimensions and reliabilities of the two dimensions. As Table 5 shows, a correlation coefficient of .342 is considered moderate correlation between the cognitive and social dimensions in the individual test setting and is smaller than a correlation coefficient of .542 in the collaborative test setting, which corresponds to a large effect size. This finding supports the theoretical consideration that the correlation between cognitive and social dimensions in the collaborative test setting is stronger than in the individual test setting.

Table 5: Correlations and Reliabilities of Dimensions and Average Person Abilities on Dimensions

		EAP Reliability		**Person abilities (logits)**	
	Correlations between dimensions	Cognitive dimension	Social dimension	Cognitive dimension	Social dimension
Individual test setting	0.342	0.690	0.591	-0.075	-0.208
Collaborative test setting	0.542	0.634	0.681	1.044	0.188

The EAP reliability of dimensions ranges from 0.591 to 0.690 (see Table 5). Note that the EAP reliability is sensitive to the length of the test, and two items from the social dimension as well as one item from the cognitive dimension were excluded after testing the measurement invariance. We used the Spearman-Brown formula to predict the reliability of the original test. After Spearman-Brown correction, the lowest EAP reliability is .68, slightly less than 0.7. Since the test is not used as a psychometric scale or an individual diagnosis, this value is considered appropriate for the empirical structuring and description of the ability model.

We can see in Table 5 that the leaners in the collaborative group show higher abilities in both, the cognitive and social dimensions. Two rounds of one-way analysis of variance were conducted to test whether the means of the individual group and the collaborative group differ statistically significantly. The summary of ANOVA shows that the choice of test setting has a significant impact both on the ability of the cognitive dimension ($F(1,503) = 38.41$, $p < .001$, partial $\eta^2 = .071$, $n = 505$) and on the ability of the social dimension ($F(1,503) = 7.64$, $p < .001$, partial $\eta^2 = .015$, $n = 505$). The partial eta square is converted here into the effect size f according to Cohen (1992). For the cognitive dimension, the effect size is $f = .276$ and corresponds to a medium effect according to Cohen (1988). Regarding the social dimension, the effect size is $f = .123$ and corresponds to a medium effect according to Cohen (1988).

6 Conclusion and Discussion

Work processes are complex and are increasing in complexity through transformations. This complexity must be taught in the VET processes. For this purpose, we offer complex learning arrangements and complex vocational tasks. The web-based office simulation LUCA is a complex learning arrangement and, as it were, a TBA; commercial competency development can be fostered and the performance in typical commercial situations can be assessed with it. Two test settings were implemented in LUCA for this study:

- Test setting 1: Solving an authentic problem with high complexity alone;
- Test setting 2: Solving an authentic problem with high complexity supported by a computer-based agent.

In test setting 1, apprentices must deal with the complexity of the problem on their own; in test setting 2, they receive specific support. It is important that this support is not classic solution support, but rather simulates authentic collaboration situations. Test setting 2 thus extends authenticity. To be able to meaningfully compare both test settings, an indicator model is chosen; in this case, components of complex problem-solving (cf. Hesse et al., 2015). Complex problem-solving - whether handled with individually or collaboratively - requires the knowledge necessary for problem-solving (regarding both, task regulation and knowledge construction) and social skills (perspective taking, social regulation, and identified participation). While in test setting 2, the cognitive and social aspects are fostered by the agent, this support in dealing with complexity does not exist in test setting 1. The hypotheses are confirmed: (1) The test settings both measure complex problem-solving. The construct is two-dimensional in both test settings. Cognitive and social skills are necessary to solve a complex vocational task. (2) Higher performance is shown in the collaborative test setting.

The results confirm that the demands of a complex problem are both cognitive and social and learners are better able to deal with complexity through modeled collaboration than when they solve the task without a tutor.

Furthermore, the cognitive dimension is more sensitive to the change of the test setting. This result can be interpreted such that by listening to other viewpoints, considering other positions, and reconsidering own ideas, more cognitive processes are activated to gain a more complete understanding as a group. For the practice of VET, the findings imply that (1), collaboration is effective if the task involved is designed based on didactic principles, especially in terms of its complexity and (2), a collaborative approach actively engages learners to process and synthesize information both in the cognitive and the social dimensions. Regarding the findings in the collaborative test setting, we need to discuss to which extent the learners collaborate. Overall, it can be stated that the interaction with an agent represents a basic form of collaboration. The agent responds adaptively to learner input and, thus, simulates collaboration. To evaluate social embeddedness, Braunstein et al. (2022) develop a theory-driven framework and adapt it for the office simulation LUCA (Rausch et al., 2021). Within the office simulation, the agent can be classified as a social interaction. The use of computer-based agents makes an empirical and future-relevant contribution to VET. Besides this empirical goal, web-based office simulations also have an impact on the practice of VET. VET should respond to digitization, which is changing the world of work and will have employees undergo further training to be able to act competently within the new business processes in companies and on the labor market (Hirsch-Kreinsen, 2017; Dengler & Matthes, 2015). Whether at school or at the workplace: Collaboration should be facilitated and integrated into learning and working processes.

The complex LUCA environment has also important implications for the way researchers and practitioners organize collaboration. Firstly, as a learning environment, LUCA can provide instructional interventions, learners receive different kinds of hints and scaffolds from the computer-based agent to construct their collaboration process in the form of human-to-agent interaction. Secondly, a strength of LUCA is that it combines a specific pedagogy with integrated measures, so it is also an innovative assessment tool. Collaboration at the highest level – between colleagues or learners as a form of human-to-human interaction (see framework Braunstein et al., 2022) – requires different tools for measuring interaction. The tools must be able to evaluate the collaboration process in a standardized and, ideally, automated way. Motivational and emotional factors influence the collaboration process. Various approaches impressively show that attributing individual performance in a group process is challenging (vignettes in King et al., 2004, forced decisions in Salgado & Táuriz, 2014, third-party evaluations in Connelly & Ones, 2010; Oh et al., 2011, Situational Judgment Test in Motowidlo et al., 1990; Weekley et al., 2004; Whetzel & McDaniel, 2009, cooperative games and simulations in Griffin, 2017; Hao et al., 2017, multiplayer games in Zhu & Bergner, 2017).

In PISA 2015, collaboration with automated agents was standardized for learners (Graesser et al., 2018; He et al., 2017). The innovation here was that individual performance, particularly social and cognitive skills, could be observed at individual level in a group setting (He et al., 2017; Organisation for Economic Co-operation and Development, 2017). Standardization seems necessary in an LSA, although standardization could also be achieved using an external test instrument to measure collaboration. The use of automated assessments, such as those generated by RIFF, has innovative potential. Automated evaluation promises to observe learners' collaboration performance in real time and make it accessible to empirical assessment. While it has, so far, only been possible to realize the attribution of individual performances with the help of agents in collaborative assessments (cf. Graesser et al., 2017; He et al., 2017), in RIFF, learners can collaborate with each other "for real". Instructional designs have been developed in RIFF that can be used to build and develop technical as well as collaboration skills for commercial apprentices (see Paeßens & Winther, 2021; Paeßens et al., 2022; findings of this study). Collaboration is not the ideal modus operandi in every learning and working situation. The problem has to be complex and different learners have to bring in their specific knowledge to work out a solution. In the future, it should be worked out which complex (sub) tasks are suitable for collaborative settings to foster learners' abilities in the collaboration process as well as in the collaborative performance (first approaches in Ma et al., 2022). Another limitation of the study is that we limited the number and range of items for this first-time validation. We recommend that future research extends the items by taking domain-specific and domain-related competencies into account.

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Ethics statement

The authors state that they have heeded the ethical principles in this submission.

References

Achtenhagen, F., John, E., Preiß, P., Tramm, T., Schunck, A., & Seemann-Weymar, H. (1992). Grundgedanken des Projektansatzes — Lernen, Denken, Handeln in komplexen ökonomischen Situationen — Forschungsidee und Projektkonzeption. In F. Achtenhagen, E. John, P. Preiß, T. Tramm, A. Schunck & H. Seemann-Weymar (Eds.), *Lernhandeln in komplexen Situationen* (pp. 1–27). Gabler. https://doi.org/10.1007/978-3-322-90323-5_1

Ahrens, D., & Spöttl, G. (2015). Industrie 4.0 und Herausforderungen für die Qualifizierung von Fachkräften. In H. Hirsch-Kreinsen, P. Ittermann & J. Niehaus (Eds.), *Digitalisierung industrieller Arbeit* (pp. 184–205). Nomos. https://doi.org/10.5771/9783845283340-172

Andrews-Todd, J., & Kerr, D. (2019). Application of ontologies for assessing collaborative problem solving skills. *International Journal of Testing*, *19*(2), 172–187. https://doi.org/10.1080/15305058.2019.1573823

Anselmann, S., Harm, S., & Faßhauer, U. (2022). Input from the grassroots level — reflecting challenges and problems for VET professionals in Germany. *International Journal for Research in Vocational Education and Training*, *9*(2), 239–268. https://doi.org/10.13152/IJRVET.9.2.5

Baghaei, P. (2013). Development and psychometric evaluation of a multidimensional scale of willingness to communicate in a foreign language. *European Journal of Psychology of Education*, *28*, 1087–1103. https://doi.org/10.1007/s10212-012-0157-y

Barkley, E., Cross, K., & Major, C. (2014). *Collaborative learning techniques: A handbook for college faculty*. Wiley.

Barron, B. (2003). When smart groups fail. *The Journal of the Learning Sciences*, *12*(3), 307–359. https://doi.org/10.1207/S15327809JLS1203_1

Beck, K., Landenberger, M., & Oser, F. (2016). T*echnologiebasierte Kompetenzmessung in der beruflichen Bildung: Ergebnisse aus der BMBF-Förderinitiative ASCOT*. wbv. https://doi.org/10.3278/6004436w

Borghoff, U., & Schlichter, J. (2000). Computer-supported cooperative work. In *Computer-supported cooperative work* (pp. 87–141). Springer. https://doi.org/10.1007/978-3-662-04232-8

Braunstein, A., Deutscher, V., Seifried, J., Winther, E., & Rausch, A. (2022). A taxonomy of social embedding. A systematic review of virtual learning simulations in vocational and professional learning. *Studies in Educational Evaluation*, *72*. https://doi.org/10.1016/j.stueduc.2021.101098

Brötz, R., Kaiser, F., Kock, A., Krieger, A., Noack, I., Peppinghaus, B., & Schaal, T. (2014). *Gemeinsamkeiten und Unterschiede kaufmännisch-betriebswirtschaftlicher Aus- und Fortbildungsordnungen: Abschlussbericht.*

Chen, F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling*, *14*(3), 464–504. https://doi.org/10.1080/10705510701301834

Cochran, W. (1952). The $\chi 2$ test of goodness of fit. The Annals of mathematical statistics, 23(3), 315–345. https://doi.org/10.1214/aoms/1177729380

Cohen, J. (1988). Statistical power analysis for the behavioral sciences. Lawrence Erlbaum. https://doi.org/10.4324/9780203771587

Cohen, J. (1992). Statistical power analysis. *Current directions in psychological science*, *1*(3), 98–101. https://doi.org/10.1111/1467-8721.ep10768783

Connelly, B., & Ones, D. (2010). An other perspective on personality: Meta-analytic integration of observers' accuracy and predictive validity. *Psychological Bulletin*, *136*, 1092–1122. https://doi.org/10.1037/a0021212

Davier, A. von, Zhu, M., & Kyllonen, P. (2017). *Methodology of educational measurement and assessment: Innovative Assessment of Collaboration*. Springer. https://doi.org/10.1007/978-3-319-33261-1

Dengler, K., & Matthes, B. (2015). *Folgen der Digitalisierung für die Arbeitswelt: Substituierbarkeitspotenziale von Berufen in Deutschland*. IAB-Forschungsbericht 11/2015. https://doku.iab.de/forschungsbericht/2015/fb1115.pdf

Dillenbourg, P., & Traum, D. (2006). Sharing solutions: Persistence and grounding in multimodal collaborative problem solving. *The Journal of the Learning Sciences*, *15*(1), 121–151. https://doi.org/10.1207/s15327809jls1501_9

Dörner, D. (1986). Diagnostik der operativen Intelligenz. *Diagnostica*. *32*(4), 290–308.

Embretson, S. (1980). Multicomponent latent trait models for ability tests. *Psychometrika*, *45*, 479–494. https://doi.org/10.1007/BF02293610

Esser, F. (2015). "Wer vorsieht, ist Herr des Tages" – Digitalisierung erfordert vorausschauendes Handeln. In Bundesinstitut für Berufsbildung (Eds.), Lernen für die digitale Wirtschaft. *BWP*, *6*(3), p. 3.

Field, J. (2013). Cognitive validity. In A. Geranpayeh & L. Taylor (Eds.), *Examining listening: Research and practice in assessing second language listening* (pp. 77–151). Cambridge University Press.

Frensch, P. A., & Funke, J. (1995). Complex problem solving: The European perspective. Lawrence Erlbaum. https://doi.org/10.4324/9781315806723

Funke, J. (2003). *Problemlösendes Denken*. Kohlhammer. https://doi.org/10.11588/diglit.18679#0015

Graesser, A., Fiore, S., Greiff, S., Andrews-Todd, J., Foltz, P., & Hesse, F. (2018). Advancing the science of collaborative problem solving. *Psychological science in the public interest: A Journal of the American Psychological Society*, *19*(2), 59–92. https://doi.org/10.1177/1529100618808244

Graesser, A., Dowell, N., & Clewley, D. (2017). Assessing collaborative problem solving through conversational agents. In A. von Davier, M. Zhu & P. Kyllonen (Eds.), *Innovative assessment of collaboration. Methodology of educational measurement and assessment* (pp. 65–80). Springer. https://doi.org/10.1007/978-3-319-33261-1_5

Griffin, P. (2017). Assessing and teaching 21st century skills: Collaborative problem as a case study. In A. von Davier, M. Zhu & P. Kyllonen (Eds.), *Innovative assessment of collaboration. Methodology of educational measurement and assessment* (pp. 113–134). Springer. https://doi.org/10.1007/978-3-319-33261-1_8

Haake, J., & Pfister, H. (2010). Scripting a distance-learning university course: Do students benefit from net-based scripted collaboration? *International Journal of Computer-Supported Collaborative Learning*, *5*(2), 191–210. https://doi.org/10.1007/s11412-010-9083-7

Hao, J., Liu, L., Davier, A. von, & Kyllonen, P. (2017). Initial steps towards a standardized assessment for collaborative problem solving (CPS): Practical challenges and strategies. In A. von Davier, M. Zhu & P. Kyllonen (Eds.), *Innovative assessment of collaboration. Methodology of educational measurement and assessment* (pp. 135–156). Springer. https://doi.org/10.1007/978-3-319-33261-1_9

Hartig, J., & Höhler, J. (2009). Multidimensional IRT models for the assessment of competencies. *Studies in Educational Evaluation*, *35*(2-3), 57–63. https://doi.org/10.1016/j.stueduc.2009.10.002

Hasenbeck, F. (2019). *Macht die Digitalisierung alles komplexer?* Roundtable.

He, W., von Davier, Matthias, Greiff, S., Steinhauer, E., & Borysewicz, P. (2017). Collaborative problem solving measures in the Programme for International Student Assessment (PISA). In A. von Davier, M. Zhu, & P. Kyllonen (Eds.), *Innovative assessment of collaboration. Methodology of educational measurement and assessment* (pp. 95–112). Springer. https://doi.org/10.1007/978-3-319-33261-1_7

Hesse, F., Care, E., Buder, J., Sassenberg, K., & Griffin, P. (2015). A framework for teachable collaborative problem solving skills. In E. Care, & P. E. Griffin (Eds.), *Assessment and teaching of 21st century skills: Educational assessment in an information age* (pp. 37–56). Springer. https://doi.org/10.1007/978-94-017-9395-7_2

Hirsch-Kreinsen, H. (2017). Digitalisierung industrieller Einfacharbeit. *Arbeit*, *26*(1), 7–32. https://doi.org/10.1515/arbeit-2017-0002

Janssen, R., & De Boeck, P. (1999). Confirmatory analyses of componential test structure using multidimensional item response theory. *Multivariate Behavioral Research*, *34*, 245–268. https://doi.org/10.1207/S15327906Mb340205

King, G., Murray, C., Salomon, J., & Tandon, A. (2004). Enhancing the validity and cross-cultural comparability of measurement in survey research. *American Political Science Review*, *98*(1), 191–207. https://doi.org/10.1017/S000305540400108X

Kline, R. (2010). *Principles and practice of structural equation modeling*. The Guilford Press. https://doi.org/10.1080/10705511.2012.687667

Ma, B., Paeßens, J., & Winther, E. (2022). Wir machen das zusammen oder: Worin unterscheiden sich individuelle und kollaborative Aufgabenbearbeitungen in der kaufmännischen (Berufs-)bildung? *Berufsbildung*, *3*(22), 49–53. http://u.wbv.de/bb2203w013

Motowidlo, S., Dunnette, M., & Carter, G. (1990). An alternative selection procedure: The low-fidelity simulation. *Journal of Applied Psychology*, *75*(75), 640–647. https://doi.org/10.1037/0021-9010.75.6.640

Organisation for Economic Co-operation and Development. [OECD] (2017). *PISA 2015 Assessment and analytical framework: Science, reading, mathematic, financial literacy and collaborative problem solving*. OECD Publishing. https://doi.org/10.1787/9789264281820-en.

Oh, I., Wang, G., & Mount, M. (2011). Validity of observer ratings of the five-factor model of personality traits: A meta-analysis. *Journal of Applied Psychology*, *96*(4), 762–773. https://doi.org/10.1037/a0021832

Paeßens, J., Ma, B., & Winther, E. (2022). *Von wo aus arbeitest du? Analog, digital und hybrid lernende Gruppen in der beruflichen Bildung*. Weiterbildung - Zeitschrift für Grundlagen, Praxis und Trends (5), 35–37.

Paeßens, J., & Winther, E. (2021). Kollaboratives Problemlösen in kaufmännischen Geschäftsprozessen. In E. Wittmann, D. Frommberger & U. Weyland (Eds.), *Jahrbuch der berufs- und wirtschaftspädagogische Forschung 2021* (pp. 67–82). Budrich. https://doi.org/10.25656/01:23408

Paeßens, J., Winther, E., Grünkemeyer, T., Schäufele, F., Braunstein, A., Deutscher, V., Gentner, S., Mayer, C., Seifried, J., Brandt, S., Ludwig, S., & Rausch, A. (2023a). *Ganz schön tricky: Wie kaufmännische Auszubildende in der Bürosimulation LUCA berufliche Komplexität bearbeiten* (können). [Manuscript submitted for publication]. Vocational and Educational Training, University Duisburg-Essen.

Paeßens, J., & Winther, E. (2023b). *Kollaboration, aber sinnvoll: Wie sich mit komplexen Problemszenarien berufliche und kollaborative Kompetenzen erfassen lassen*. [Manuscript submitted for publication]. Vocational and Educational Training, University Duisburg-Essen.

Paeßens, J., & Winther, E. (2023c). *Kollaboration als transversale Kompetenz in der kaufmännischen Ausbildung*. [Manuscript submitted for publication]. Vocational and Educational Training, University Duisburg-Essen.

Rausch, A., Deutscher, V., Seifried, J., Brandt, S., & Winther, E. (2021). Die web-basierte Bürosimulation LUCA–Funktionen, Einsatzmöglichkeiten und Forschungsausblick. *Zeitschrift für Berufs- und Wirtschaftspädagogik*, *117*(3), 372–394. https://doi.org/10.25162/zbw-2021-0017

Rausch, A., Kögler, K., Frötschl, C., Bergrab, M., & Brandt, S. (2017). Problemlöseprozesse sichtbar machen: Analyse von Logdaten aus einer computer-basierten Bürosimulation. *Zeitschrift für Berufs- und Wirtschaftspädagogik*, *113*(4), 569–594. https://doi.org/10.25162/zbw-2017-0024

Salas, E., Reyes, D., & Woods, A. (2017). The Assessment of teamp. In A. von Davier, M. Zhu & P. Kyllonen (Eds.), *Innovative assessment of collaboration: Methodology of educational measurement and assessment* (pp. 21–36). Springer. https://doi.org/10.1007/978-3-319-33261-1_2

Salgado, J., & Táuriz, G. (2014). The five-factor model, forced-choice personality inventories and performance: A comprehensive meta-analysis of academic and occupational validity studies. *European Journal of Work and Organizational Psychology*, *23*(1), 3–30. https://doi.org/10.1080/1359432X.2012.716198

Santelices, M., & Caspary, K. (2009). Development of a multidimensional measure of academic engagement. *Journal of Applied Measurement*, *10*(4), 371–393.

Schlicht, J. (2019). *Kommunikation und Kooperation in Geschäftsprozessen: Modellierung aus pädagogischer, ökonomischer und informationstechnischer Perspektive*. wbv.

Sczogiel, S., Schmitt-Rueth, S., Malapally, A., & Williger, B. (2019). *Future Digital Job Skills: Die Zukunft kaufmännischer Berufe*. IHK Nürnberg für Mittelfranken.

Seifried, J., Rausch, A., Kögler, K., Brandt, S., Eigenmann, R., Schley, T., Siegfried, C., Egloffstein, M., Küster, J., Wuttke, E., Sembill, D., Martens, T., & Wolf, K. (2016). Problemlösekompetenz angehender Industriekaufleute – Konzeption des Messinstruments und ausgewählte empirische Befunde (DomPL-IK). In K. Beck, M. Landenberger & F. Oser (Eds.), *Technologiebasierte Kompetenzmessung in der beruflichen Bildung – Ergebnisse aus der BMBF-Förderinitiative ASCOT* (pp. 119–138). Bertelsmann. https://doi.org/10.3278/6004436w

Spöttl, G., & Windelband, L. (2021). The 4th industrial revolution–its impact on vocational skills. *Journal of Education and Work*, *34*(1), 29–52. https://doi.org/10.1080/13639080.2020.1858230

Weekley, J., Ployhart, R., & Harold, C. (2004). Personality and situational judgment tests across applicant and incumbent settings: An examination of validity, measurement, and subgroup differences. *Human Performance*, *17*(4), 433–461. https://doi.org/10.1207/s15327043hup1704_5

Whetzel, D., & McDaniel, M. (2009). Situational judgment test: An overview of current research. *Human Resource Management Review*, *19*(3), 188–202. https://doi.org/10.1016/j.hrmr.2009.03.007

Wilson, M., & Moore, S. (2011). Building out a measurement model to incorporate complexities of testing in the language domain. *Language Testing*, *28*(4), 441–462. https://doi.org/10.1177/0265532210394142

Winther, E., & Klotz, V. K. (2016). Berufliche Kompetenzniveaumodellierung – Eine Blaupause für die kaufmännische Domäne. *Unterrichtswissenschaft*, *44*(2), 131–146.

Winther, E. (2011). Kompetenzorientierte Assessments in der beruflichen Bildung – Am Beispiel der Ausbildung von Industriekaufleuten. *Zeitschrift für Berufs- und Wirtschaftspädagogik*, *107*(1), 33–54. https://doi.org/10.25162/zbw-2011-0002

Zhu, M., & Bergner, Y. (2017). Modeling collaboration with social network models. In A. von Davier, M. Zhu & P. Kyllonen (Eds.), *Innovative assessment of collaboration: Methodology of educational measurement and assessment* (pp. 303–314). Springer. https://doi.org/10.1007/978-3-319-33261-1_19

Biographical Notes

Jessica Paeßens is a PhD student and her research focuses on collaborative problem-solving among commercial apprentices. The research, which is both empirical and relevant for (school) practice, focuses on the extent to which collaboration can be empirically measured at individual and group level. Measuring collaboration at the individual level is challenging; she uses innovative digital tools from practice for it. With the help of these tools, she explores how collaboration processes and the resulting performance are related and which tasks are suitable for collaborative problem-solving.

Beifang Ma is a PhD student and her current work focusing on psychometrics and educational measurement includes the structural equation modeling and validating of instruments in the research area of competence assessments in vocational education and training. She works on a project investigating the growth of professional competence and decisive context factors influencing it in vocational education and training. She aims at characterizing the trajectories and causal relationships of professional competence development to optimize the quality of training and education.

Esther Winther, Dr rer. pol. habil., is Full Professor of Vocational Education and Training, her main research interests are in the areas of empirical teaching-learning research with focus on psychometric competence modeling and measurement, the development of training and continuing education programs, and the conception of innovative and digital teaching and learning scenarios for professional and operational fields of action. As a project participant in large national research networks (DFG priority program, SAW research funding, BMBF research initiatives ASCOT and ASCOT+), she develops innovative and workplace-oriented assessments that record the status quo and the foreseeable development of vocational competences.

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Psychological Capital and Job Search: A Systematic Literature Review and Agenda for Future Research

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Abstract

Purpose: There is consistent evidence that a positive mindset could foster the job search process. Psychological capital, defined as a tendency to hold cognitions and positive appraisals of one's ability, could highlight the importance of individual cognitive appraisal in the job search process. Nevertheless, psychological capital's impact on job seekers is still unclear.

Methods: The purpose of the present study was to explore the role of psychological capital in the job search process. The author conducted a systematic review following the PRISMA-P guidelines. This systematic review sought answers to three questions: 1) What theories are applied to explain the relationship between psychological capital and the job search process? 2) How is the association between psychological capital and the job search process? 3) Did the psychological capital interventions positively influence the job search process? The review focused on quantitative studies carried out between 2007 and 2021 on job seekers. Finally, 11 studies fit the inclusion criteria.

Results: Overall, the literature review supports the significant association between psychological capital and the job search process. On the one hand, the studies analyzed have shown the resonance of psychological capital on the job search outcomes and job seekers' well-being. On the other hand, the results showed insufficient evidence to make any firm conclusions concerning psychological capital interventions' effects on the job search process improvement.

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Conclusion: It is concluded that psychological capital may be a valuable advantage for helping job seekers engage in their job search process. The results presented in this study could have important implications for job seekers and public and private employment agencies. Even so, it is necessary to continue contributing to its development. Particularly, there is still considerable scope for improvement in the study of psychological capital and the job search process in terms of the study design we apply, the variables we study and their measure, and the theoretical background we use to explain the previous relationship.

Keywords: Psychological Capital, Job Search, Unemployment, Job Seekers, Vocational Education and Training, VET

1 Introduction

In recent years, there has been a growing interest in analysing job search process backgrounds. As the job search is the main route for obtaining a job, it is important to find resources for promoting the job search process and helping job seekers to overcome the difficulties of this arduous process (Georgiou & Nikolaou, 2019; Klehe & Van Hooft, 2016).

Certainly, it is generally agreed that contextual variables are involved in the job search process. Some research carried out in the economic field suggests that labor market institutions have a direct impact on jobseekers' activities, especially in relation to the interaction between job seekers and employers (Arpaia & Mourre, 2005; Buscher et al., 2005). Without going any further, in a recent review, Wanberg et al. (2020) claimed that even the geographical region, country, or broader culture within which the job search process occurs is relevant for the experience of job search. Nevertheless, previous research has also suggested that certain individual features such as attitudes, cognitions, and motivations can also influence the chances of getting a job (Kanfer et al., 2001; Van Hooft, 2014).

Recent research efforts have mainly focused on the need for a positive mindset for helping people to adopt positive attitudes and behaviours related to the job search process (Georgiou & Nikolaou, 2019; Moorhouse & Caltabiano, 2007). Luthans et al. (2007) propose psychological capital as a second-order construct composed of four dimensions (optimism, resilience, hope, and self-efficacy). It is referred to as a tendency to hold cognitions and positive appraisals of one's ability (Luthans et al., 2007; Harms et al., 2018). Several studies have pointed out that individuals who appraise the job search process more positively find it easier to cope with stress, difficulties, and obstacles during their job search process (Klehe & Van Hooft, 2016; Wanberg et al., 2005; Zikic & Klehe, 2006). In line with this argument, psychological capital could be positively associated with the job search process (Chen & Lim, 2012; Georgiou & Nikolaou, 2019; Lim et al., 2016). Nevertheless, the systematic reviews performed to date have been mainly focused on psychological capital and work-related variables (Avey et

al., 2011; Luthans & Youssef-Morgan, 2017; Newman et al., 2014). Hence, this paper aims to identify, evaluate, and summarize the findings of relevant studies analyzing the direct or indirect influence of psychological capital on the job search context carried out by the active population. For that purpose, the author presents a systematic review focused on quantitative studies carried out between 2007 and 2021 on job seekers following the PRISMA-P guidelines. The main question this study would like to answer is if the psychological capital is a beneficial resource when people are searching for a job.

1.1 Theoretical Approach to the Concept of Job Search

There is broad agreement in the literature that job search consists of gathering information about potential employment opportunities to analyse different offers and select the most suitable among the existing ones (Barber et al., 1994). Next, a brief introduction to the main traditional theories applied to job search is offered. Aramburu-Zabala (1998) brings together the main psychological theories that have been applied to the field of job search and propose three large groups (cognitive theories, behavioural theories and cognitive-behavioural theories). Within the cognitive theories, in turn, further clarification could be made. On the one hand, the *motivation search theories*, whose objective is to analyze the decision-making process of people who are looking for a job. Hence, the *motivation search theories* include the Expectancy Theory (Vroom, 1964), the Theory of Planned Behavior (Ajzen, 1987), the Attribution Theory (Weiner, 2012) and the Self-Efficacy Theory (Bandura, 1977). On the other hand, there are theories dedicated to analyzing the causes that lead to the choice of an option between different alternatives. Accordingly, theories related to *decision-making* encompass the Search Hypothesis (Evans, 2002) and the Decision Theory and Confirmation (Levi, 1961). About behavioural court theories, it is necessary to mention the Theory of Reinforcement (Skinner, 1958). Whereas concerning the group of cognitive-behavioural theories, the Learned Helplessness Theory (Seligman, 1972) is remarkable.

Nevertheless, current literature supports the importance of the job search process for reemployment (Amato et al., 2016; Kanfer et al., 2001; Lopez-Kidwell et al., 2013; Wanberg et al., 2005). The prevailing hypothesis in the literature is that job search is a self-regulatory process, as it depends totally on the unemployed (Amato et al., 2016; Kanfer et al., 2001; Lopez-Kidwell et al., 2013; Van Hooft, 2016). The main characteristic of the job search process is that it is a process that depends totally on the job seeker. In line with this self-regulatory approach, some empirical evidence has suggested that beliefs about prospects positively influence job placement (Dickerson & Green, 2012; Knabe & Rätzel, 2010). The job seeker is the one that should identify, initiate and perform different actions to achieve a job. Hence, for those individuals who establish a clear employment goal and are committed to the search, the process is largely autonomous and subject to the ability to self-regulate activities, effort

and emotions (Wanberg et al., 2016). Thus, job seekers with high expectations of getting a job seek more intensely than those with low expectations (Vansteenkiste et al., 2005). Similarly, those who think the job search process is under their control dedicate more time and effort to looking for a job (Baay et al., 2014; Kanfer et al., 2001). Following the self-regulated approach, several authors have proposed an explanatory model of the job search process. This paper is framed in the Theory of Planned Job Search Behavior (TPJSB) proposed by Van Hooft (2016) because integrates the main perspectives that are important in the job search process, the motivational and the self-regulatory one. Regarding the motivational perspective, as the job search process is a difficult and complex task, keeping motivated could be the key to persisting in the job search process. Nevertheless, as for many people looking for a job could be also boring and unpleasant, job seekers need to be able to self-regulate their job search activities. The main premise of this theory is that job search intention is the immediate antecedent of job search behaviours. In turn, job search intention is preceded by job search attitude (the individual's -positive or negative- evaluation of job search and job attainment), subjective norm (or perceived social pressure to look for a job) and the degree of perceived control over job search behaviours (people's belief they can perform effectively when looking for a job) (Van Hooft, 2016). As a result, the more positive features people have of getting a job and the stronger they value these features, the more likely they are to persist in their job search process (Fernández-Valera et al., 2020; Van Hooft, 2016). This indicates that individuals could engage differently in job search behaviour (Vansteenkiste et al., 2005; Wanberg et al., 2005) and highlights the importance of analysing psychological resources that reinforces jobseekers' perception of the possibilities of inserting themselves in a specific labour market.

1.2 The Theoretical Foundation of Psychological Capital

Luthans et al. (2007) propose psychological capital as a second-order construct that brings together four resources (optimism, resilience, hope, and self-efficacy). Psychological capital could be defined as the tendency to hold cognitions and positive appraisals of one's ability characterised by: Having the confidence to face challenges and complex tasks (self-efficacy); making positive attributions about the present and future triumphs (optimism); visualise and persevering in the goals, as well as redirect the objectives when necessary to achieve success (hope); and recover and even emerge stronger from adversity (resilience).

Two fundamental theories support the construction of psychological capital: the Conservation of Resources Theory by Hobfoll (2001) and the Broaden-and-Build Theory of Positive Emotions by Fredrickson (2004). The Conservation of Resources Theory by Hobfoll (2001) defends that resources can be treated independently or integrated into more complex models. Herewith, the author pointed out that some psychological concepts are better understood as the representation of a global multidimensional factor. That is, this theory defends the

positive synergy between specific resources when they are part of a second-order construct (Luthans et al., 2015). Given the above, psychological capital research indicates that its four dimensions have an underlying common bond, making it a second-order construct. This argument means that, if we take into account the four dimensions of psychological capital as a whole, instead of focusing on them individually, their effects will have a more significant impact than each of the four dimensions separately (Avey et al., 2010; Luthans et al., 2007; Luthans et al., 2015).

The second perspective applicable to the theoretical construction of psychological capital is the Broaden-and-Build Theory of Positive Emotions by Fredrickson (2004). The research framed in this theoretical model suggests that people, both individually and in groups, work with better cognitive functioning when they report higher levels of positive emotions (Fredrickson, 2004). Although the feelings analysed under this model are different from the cognitive aspects examined in psychological capital, other research suggests a strong link between cognition and emotions (Lazarus, 1993). Supporting the premise that the relationship between emotions and positive cognitions would help explain the impact of psychological capital on other variables, such as performance (Luthans et al., 2015), job satisfaction (Luthans et al., 2007), well-being (Avey et al., 2010) or the job search process (Chen & Lim, 2012).

In line with the previous argument, a positive cognitive evaluation could help potentially negative or neutral situations be reinterpreted mentally in a more positive way (Luthans et al., 2015). Hence, several studies have pointed out that individuals who appraise their job search process more positively find it easier to cope with stress, difficulties, and obstacles (Van Hooft, 2016; Wanberg et al., 2005; Zikic & Klehe, 2006). Thus, psychological capital, as is referred to as a tendency to hold cognitions and positive appraisals of one's ability (Luthans et al., 2007; Harms et al., 2018), could have particular impact to the job search process (Chen & Lim, 2012; Georgiou & Nikolaou, 2019; Lim et al. 2016).

1.3 Psychological Capital as a Potential Motivator of the Job Search Process

For understanding how psychological capital could act as a direct or indirect antecedent of the job search process, Van Hooft (2016) proposes Vallerand's Hierarchical Model of Motivation (1997) as a useful frame to extend the Theory of Planned Job Search Behavior for analyzing which resources can help people to be engaged in the job search process. Vallerand's Model could be applied to any performance environment and explain motivation top down and bottom up from three hierarchical levels which vary in generality, stability and proximity to behaviour: a) Global-level motivating factors are generalized constructs that are stable over situations and apply to all life domains. They combine personality factors and individual perceptions; b) contextual-level motivating factors concern specific life domains (e.g.,

employment); and, c) situational-level motivating factors refer to specific behaviours, namely real-time, real-world actions, feedback, and consequences (e.g., the job search process) (Fernández-Valera et al., 2020; Taylor, 2015). In line with those arguments and following Fernández-Valera et al. (2020), psychological capital could be advanced as a global-level job search process motivator as it is defined as a tendency to hold cognitions and positive appraisals of one's ability, and motivational research has indicated that perception of positive situations could result in positive affective, behavioural, and cognitive consequences (Taylor, 2015). This model also indicates that probably the association of psychological capital with the job search process is not direct, and could be mediated or moderated by other variables (e.g., contextual-level motivating factors).

Indeed, most previous research has linked psychological capital dimensions and the job search process individually. Regarding self-efficacy, job search intensity, number of job interviews, number of job offers received as well as job achievement has been positively related with this variable (Saks et al., 2015; Sun et al., 2013; Wanberg et al., 2005). About optimism, empirical evidence shows that optimism moderated the effect of unemployment on psychological health (Kirves et al., 2014; Victor, 2016). Finally, among studies that analyse resilience and the job search process, results show, on the one hand, how resilience mediates the relationship between social support, job-seeking behaviours (Ślebarska et al., 2009), and length of unemployment (Fernández-Valera et al., 2019). On the other hand, Moorhouse and Caltabiano (2007) stated that job seekers with higher levels of resilience indicated fewer depressive symptomatology than those with lower levels, even though their job search process time was longer.

In short, following Chen and Lim (2012), job seekers who have high levels of psychological capital: Could be more likely to be confident about their skills and abilities to look for a job, hold optimistic views about their reemployment chances, can find pathways to attain their reemployment goals, and are resilient to usual job search process setbacks.

The main question of this systematic review is: What is the effectiveness of psychological capital for promoting the job search process and getting a job?

For that purpose, this paper has three specific research questions concerned with the content of papers included in the systematic review grouped in two largest categories (descriptive – question 1, and content-related questions – 2 and 3):

1. What theories are applied to explain the relationship between psychological capital and the job search process?

2. What kind of relationships are between psychological capital and the job search process?

3. Did the psychological capital interventions positively influence the job search process?

2 Method: A Systematic PRISMA-P Literature Review of Psychological Capital and the Job Search Process

Before the review, the author developed a protocol according to best practice PRISMA-P reporting guidelines (Gessler & Siemer, 2020; Page et al., 2020) to choose the criteria for including or excluding studies. This protocol was registered on PROSPERO, The International Prospective Register for Systematic Reviews (ID: CRD42020187767).

2.1 Criteria for Including or Excluding Studies for the Review

The author followed the PICOS approach to operationalise the inclusion/exclusion criteria research questions.

Population: The author considered any studies focused on the job search process in the active population.

Intervention: The review should identify studies that examined the relationship between psychological capital and the job search process. A study could be included if: The psychological capital variable should follow the definition proposed by Luthans et al. (2007) exposed above (that is, understanding psychological capital as a tendency to hold cognitions and positive appraisals of one's ability accepted as a second-order construct composed of optimism, resilience, hope and self-efficacy) and, in case of an interventional study, corroborates the existence of a control group whereas a pre-test and post-test strategy.

Comparators: The author were interested in knowing how psychological capital is related to the job search process but did not intend to compare specific features of job seekers. Ideally, in the case of intervention studies, the author wanted to be able to compare groups who had been subject to a psychological capital intervention in the context of job search process with a control group who had not.

Outcomes: Studies were included if they measure a change in the job search process or employment status concerning participants' psychological capital levels. For quantitative studies, following De Silva et al. (2005), the author used the following method for grouping the results. Each effect estimated was grouped into one of three categories: a) A positive relationship between psychological capital and the job search process at least significant at the 5% level; b) no evidence of association (effect not statistically significant at 5% level); c) an inverse relationship between psychological capital and the job search process (effect estimates significant at least at 5% level).

Study design: The author included only quantitative research (cross-sectional, longitudinal, or interventional studies).

Other: The author included empirical research published in peer-reviewed journals. Also, the searches were restricted to English and Spanish language because the author could not

search beyond these. The searches were limited to papers published between 2007 and 2021. This decision was based on the view that psychological capital under Luthans et al. (2007) consideration was released starting in that year.

2.2 Search Strategy

The electronic searches were performed up to the 22nd December 2021 on the following databases: Academic Search Premier, Medline, Econlit, Education Source, PsycArticles, PsycINFO, Psychology and Behavioral Sciences Collection, Psicodoc, Social Sciences Full Text, Social Sciences, Web of Science and Scopus. The search terms were developed based on the research questions and the inclusion/exclusion criteria detailed above. The terms used in the searches were the following: (Psychological Capital OR PsyCap) AND (Job Search OR unemployment OR reemployment).

2.3 Selection of Studies

The author aimed to identify all quantitative studies investigating the association between psychological capital and the job search process. The author sifted each paper's titles and abstracts independently against agreed criteria with a collaborator. Cohen's Kappa scores indicated a good level of agreement between the reviewers (Kappa = 0.84). In case of disagreement, it was resolved by discussion between the two reviewers.

Then, full papers were screened independently by two reviewers. Again, disagreements were resolved by discussion between the two reviewers. In this case, Cohen's Kappa scores indicated a good agreement between reviewers (Kappa = 0.89). Under these conditions, it were identified 161 records through the database search. Additionally, were identified another 2 records through a hand search and contacting directly to the author. In the following step of the search, 37 records were excluded because they were duplicated between the databases used. Next, after a detailed title and abstract shift, were excluded 108 records mainly because both variables (psychological capital and job search) did not appear in either the title or the abstract. For example, in some papers appeared job search and social capital (but not psychological capital), or appeared psychological capital but related to work-related variables and not to job search. Then, after an exhaustive full paper shift were excluded 6 records. Based on the PICO's strategy defined before, 2 of them were excluded because they did not follow the psychological capital definition by Luthans et al. (2007). Another 2 papers were entirely qualitative. One of them, even though contained job search and psychological capital in the abstract, its aims were not related to job search or labour insertion. And finally, in the last one, the authors did not work with psychological capital as a whole construct but with the four dimensions separately. Thus, after the data extraction followed during the process, the final number of records included in the systematic review was 11 (see Figure 1).

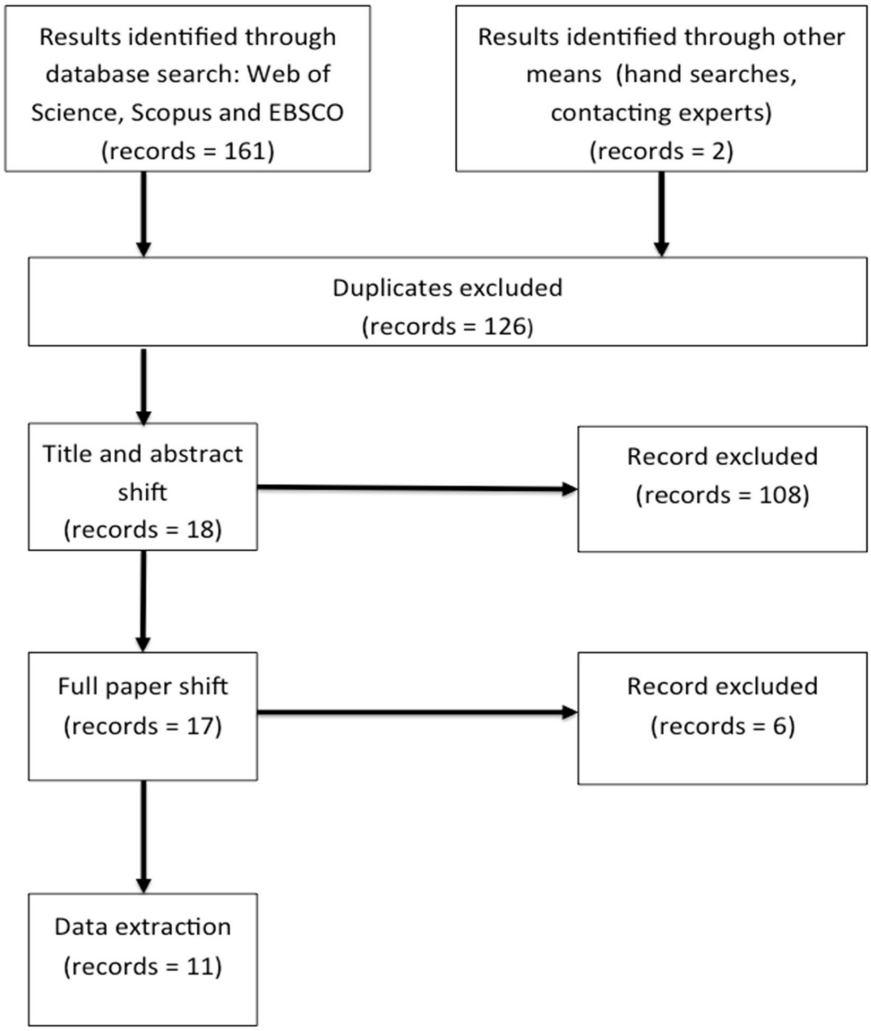

Figure 1: Selection of Studies

3 Results

Of the eleven studies reviewed, seven [2, 3, 4, 5, 6, 9, 10] were carried out in unemployed samples. In contrast, one was implemented in a sample of active workers [1], and the other is a sample of displaced employees [7]. In another study, the participants were Syrian refugees in Greece and the Netherlands [8]. Finally, the sample of one of the studies was also composed

of labour counsellors and job seekers [11]. Aditionally, three of the studies were an intervention [4, 5, 6], and of the eight remainders being purely quantitative, six were cross-sectional [2, 3, 8, 9, 10, 11], and three were longitudinal (one of the articles performed two studies, one longitudinal and one intervention) [1, 4, 7]. Keeping in mind the research questions exposed above, next, the studies will be described (see Appendix Table 1).

3.1 Theories Applied

Firstly, regarding theories applied for explaining the relation between psychological capital and the job search process, the great majority of studies choose The Conservation of Resources Theory by Hobfoll (2001) [1, 4, 5, 7, 11]. Nevertheless, the rest of the studies are pretty divided as far as the choice of explanatory theory is concerned. Hence, the Reverse Causation Model by Kasl (1982) [2], the Job Demand Resources Model (Bakker & Demerouti, 2014) [6], the Career Construction Theory (Savickas, 2002) [8], and the Luthans' et al. (2007) Multidimensional Model [10] have been chosen by other studies. Finally, some authors combined the Conservation of Resources Theory (Hobfoll, 2001) with Seligman's (1972) Concept of Learned Helplessness [4] and the Crossover Model by Westman (2001) [11]. Also, one study applied the Theory of Planned Job Search Behavior (Van Hooft, 2016) and Vallerand's (1997) Hierarchical Model of Motivation [3]. It is also necessary to mention that one does not cite any theory [9].

3.2 Psychological Capital and the Job Search Process Association

Secondly, according to the main findings and outcomes of the studies examined, the literature review supports the significant associations between psychological capital and the job search process. However, the associations were mixed because of the wide range of outcomes found. Only one study has been carried out in a sample of active workers (Avey et al., 2009) [1]. It aimed to examine some implications for combating occupational stress. As far as psychological capital and the job search process is concerned, they showed a significant and negative association between psychological capital and voluntary turnover. Specifically, they found that combining positive psychological resources such as efficacy, hope, optimism, and resilience could help employees to face occupational stress and, in turn, reduce their intentions to quit and their job search behaviours for finding another job.

Furthermore, a group of studies has analysed the associations between psychological capital and the job search process [2, 3, 8]. In all of them, the association was indirect. In one study [2], the authors distinguish between preparatory and active job search and relate them with psychological capital, perceived employability, and coping strategies among displaced employees in Singapur. The researchers observed a significant and positive associa-

tion between psychological capital and perceived employability. Likewise, those displaced employees with higher levels of psychological capital tend to perceive themselves as more employable than those with lower levels. Besides, their results suggest that psychological capital influences the job search process indirectly through perceived employability and coping strategies. Even in an adverse situation like unemployment, when job seekers have more positive prospects about their future, they will persevere harder in their job search process. Likewise, the study of Fernández-Valera et al. (2020) [3] showed that those unemployed youngsters who possessed high levels of psychological capital perceive more control over their job search process. The increase in perceived control over job search process was directly connected with their job search intention and will impact their final job search activities. In contrast with the previous study, the authors observed that psychological capital (in comparison with perceived employability) seems to be a more beneficial resource for keeping unemployed youngsters engaged in their job search process in an adverse economic context. Additionally, Pajic et al. (2018) [8] studied a sample of post-Syrian refugees in Greece and the Netherlands. They investigated the associations between psychological resources (e.g., psychological capital), career barriers, and job search self-efficacy. In line with the previous studies, their results showed that those participants with higher levels of psychological capital performed better in their job search process because of their career adaptability levels.

Another group of studies decided to focus on the job search outcomes as the employment status or the reemployment quality [4, 7]. Correspondingly, in Study 1 of Georgiou and Nikolaou (2019) [4], the authors linked the psychological capital with job search success in a sample of unemployed job seekers in Greece. Their results indicated that job search behaviour mediated the association between job seekers' psychological capital and the number of job offers, job interviews, and employment status after three months. Thus, the results of Lim et al. (2016) [7] provide additional support to the idea that psychological capital is also related to reemployment quality. They performed a study in a sample of displaced employees in Singapur to determine if financial difficulties and social exclusion could lead to job search fatigue. At the same time, psychological capital serves as a personal resource that reduces it. The authors observed that job search fatigue mediated the relationships between job seekers' social, financial, and psychological capital and their perceptions of reemployment quality. Job search success was estimated via affective commitment and intentions to stay within the new organisations after a year.

Concerning the studies [9, 10] that examined the role of psychological capital and unemployed job seekers' mental health, Rani (2015) [9] conducted a study in a sample of Indian unemployed people. The author exposed a positive and significant association between psychological capital levels and psychological well-being perceptions during unemployment. In line with this argument, Sabaitytė and Diržytė (2016) [10] also found positive and significant

correlations between psychological capital, life satisfaction, and self-compassion in Lithuanian youth unemployed people.

Lastly, Schmidt and Flatten (2021) [11] offer an original approach where job seekers' psychological capital is the outcome itself. Based on the crossover model, the authors examined if, because of the frequent interactions between employment counsellors (a formal tie) and job seekers, counsellors' psychological capital could cross over to job seekers to increase their psychological capital levels. The results indicate that job seekers acquire psychological capital by interacting with formal ties through the perceived social support from counsellors, which lowers their stress during unemployment.

Briefly, after evaluating the results of these papers as a whole, all of them have planned and shown a mediation model where psychological capital was related to job search related-outcomes (job search behaviour, active and preparatory job search, job search attitude, job search intention, job interviews, employment status, reemployment quality, job search self-efficacy and stress symptoms) through the influence of different mediators variables as perceived employability, job search strategies, job search fatigue, career adaptability and even the perceived social support of labour counsellors. None of the studies examined has shown a moderation model for explaining the association between psychological capital and job search. In general, these results indicate that those individuals with higher psychological capital are more confidently engaged and persistent in their job search behaviour as well as the quality of reemployment is also affected. Following the Conservation of Resources Theory (Hobfoll, 2001) this effect could be mostly due to their resource availability and coping strategies. Also following Vallerand's Hierarchial Model of Motivation (1997), psychological capital (a global-level motivator factor) impacts the job search process (a situational-level motivator factor) through mediator variables (e.g., perceived employability or career adaptability) categorized as contextual-level motivator factors.

3.3 Psychological Capital Intervention

Thirdly, regarding the interventional studies [4, 5, 6], the results generally support that psychological capital interventions positively influence the job search process.

Notably, two of them [4, 5] applied the validated Psychological Capital Intervention (PCI) training model developed by Luthans et al. (2006) to a group of job seekers registered in a business school career office and a recruitment agency. The findings suggested that psychological capital could be developed among job seekers through the PCI training model. Moreover, the results indicated that half of the people who participated in the PCI training found employment earlier than the control group participants. However, in the Georgiou and Nikolaou (2019) study [4], the control group participants also increased their Psychological

Capital levels. Nevertheless, both studies provide evidence of the usefulness of PCI training in the job search context (Georgiou et al., 2021).

Concerning the remaining study compressed in this category [6], Hulshof et al. (2020) designed the Job Search Demand-Resources (JSD-R) intervention based on the Job Demand Resources Model. It aimed to enhance the levels of reemployment crafting (understood as the self-initiated job search behaviours undertaken by the unemployed) and the psychological capital of unemployed people to increase well-being, job search behaviour, and reemployment chances. The results showed that the proposed intervention enhanced reemployment crafting and psychological capital levels. Hence, the JSD-R intervention could protect the well-being and foster job search behaviour. Remarkably, the intervention prevented decreased motivation while searching for a job. Also, it was responsible for increasing personal goal attainment, career exploration, and networking quality. Nevertheless, the authors could not show a significant effect of the intervention on reemployment status six months after.

4 Discussion

The present review aimed to explore the association between psychological capital and the job search process. This systematic review sought answers to the three questions exposed above.

Concerning the first question as the descriptive category, the Conservation of Resources Theory by Hobfoll (2001) was found to be the most applied one for explaining the association between psychological capital and the job search process, either alone or combined with other theoretical models. Hobfoll (2001) exposed the idea of "resources caravan" for defending that some psychological concepts are better understood as representing a global multidimensional factor. In line with this argument, Luthans et al. (2007) began to lay the foundations of the psychological capital construct and its synergy between the four dimensions. In addition to serving as a foundation for the construction of psychological capital, the loss and gaining resources cycle exposed in the Conservation of Resources Theory has been used to explain the impact of psychological capital in the job search context.

About the content-related questions category, concerning the second question, on the one hand, the association between psychological capital and the job search process is well-established. As only one study has been carried out in an employees sample, psychological capital has been found as a positive and significant antecedent of perceived employability, coping job search strategies, perceived control over job search, job search intensity, and job search self-efficacy. On the other hand, psychological capital has also significantly impacted job search success. Those participants with greater levels of psychological capital received more job offers, job interviews, and even higher quality jobs than those with low psychological capital levels. Psychological capital can also be seen as a personal resource able to protect

job seekers' well-being and prospects in the face of difficulties when looking for a job. In that line, some studies have exposed a significant and positive relationship between psychological capital with psychological well-being, life satisfaction, and self-compassion of job seekers. Lastly, an exciting finding put in great value the role of labour counsellors. A recent study exposed that job seekers could acquire higher levels of psychological capital by simply the formal interaction and perceived social support from their employment agency counsellors. In the studies analyzed, the association between psychological capital and the job search process was indirect, as it was mediated by perceived employability, voluntary turnover, job search activities, job search fatigue, career adaptability and social support from job seekers' counsellors.

Finally, about the third question, only three studies have performed an interventional design to improve psychological capital and examine its impact on the job search process. One of the tremendous psychological capital interests is it has been argued that its components are states open to change and development and therefore could be developed through training programs. Nonetheless, only two studies have investigated the Psychological Capital Intervention (Luthans et al., 2006) in the job search context. Their results suggest that those who participated in the experimental group increased their level of psychological capital and even found a job earlier than the control group. The remaining study proposes an intervention based on the Job Demand Resources Model, whose one of its outcomes is increasing job seekers' psychological capital. The results showed increased psychological capital, job seekers' motivation, and job search perseverance.

5 Gaps in the Literature and Future Research

This systematic review provides a helpful picture of what areas require more investigation regarding the impact of psychological capital on the job search context. The following areas are worthy of more discussion and research: theoretical development, psychological capital and job search outcomes, and fostering psychological capital interventions.

Firstly, all the studies reviewed cover relevant literature in their introduction section. One of the problems faced by most studies on the job search process is that empirical research has not been accompanied by a parallel development of the theory in this specific area. That could be why most of the studies analysed in this review have applied psychological theories developed in domains other than the job search process. Thus it is necessary to promote direct observation of the job search process to offer psychological theories arising directly from the object of study. Therefore, this would offer a more accurate explanation of the underlying mechanism of the relationship between psychological capital and the job search process.

Secondly, one of the difficulties detected during this systematic review is the lack of homogeneity when discussing the job search process. Almost every study has adopted a different way of analysing it. To face the lack of homogeneity next is offered different suggestions. Firstly, it is essential to consider examining the job search process from quantitative and quality paths. In this regard, along with the different scales for measuring the job search process from a quantitative perspective, a recent study has developed a scale for measuring job search quality to optimise the process of looking for a job (Van Hooft et al., 2022). Maybe, future studies could apply a double perspective. Secondly, it is also important to point out the need of unifying the consideration of job search success. When could someone say the job search process has been successful? If the job seeker has been able to dedicate a lot of time to looking for a job? If the job seekers have finally gotten the job? Or for example, if the job seeker has maintained the job for a long time? From the point, of view of the author, a more concise definition of job search success is also essential.

Thirdly, the impact of psychological capital interventions on reemployment status needs further investigation. Only three studies have implemented an interventional design. Only two have been based on the Psychological Capital Intervention (Luthans et al., 2006). Bearing in mind that great interest of psychological capital is the possibility of its development through intervention and the promising results of previous research, it is necessary to promote interventional studies in different contexts and populations.

The present systematic review has highlighted the association of psychological capital and the job search process. The results presented in this study could have important implications for job seekers and public and private employment agencies. The main practical implication is the necessity of fostering the job seekers' psychological capital development.

It is concluded that psychological capital may be an outstanding advantage for helping job seekers engage in their job search. Nevertheless, although psychological capital has experienced substantial growth since its emergence a little over a decade ago, it is necessary to continue contributing to its development through research to answer the questions still open. Particularly, there is still considerable scope for improvement in the study of psychological capital and the job search process in terms of the study design applied, the variables studied, and the theoretical background used to explain the previous relationship.

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Ethics statement

An ethics statement is not applicable because this study is based exclusively on retrieve and synthesise data from already published studies.

References in the Review

1. Avey, J. B., Luthans, F., & Jensen, S. M. (2009). Psychological capital: A positive resource for combating employee stress and turnover. *Human resource management*, *48*(5), 677–693. https://doi.org/10.1002/hrm.20294
2. Chen, D. J., & Lim, V. K. (2012). Strength in adversity: The influence of psychological capital on job search. *Journal of Organizational Behavior, 33*(6), 811–839. https://doi.org/10.1002/job.1814
3. Fernández-Valera, M. M., Meseguer de Pedro, M., De Cuyper, N., García-Izquierdo, M., & Soler Sanchez, M. I. (2020). Explaining job search behavior in unemployed youngsters beyond perceived employability: The role of psychological capital. *Frontiers in Psychology*, *11*, 1698–1710. https://doi.org/10.3389/fpsyg.2020.01698
4. Georgiou, K., & Nikolaou, I. (2019). The influence and development of psychological capital in the job search context. *International Journal for Educational and Vocational Guidance*, *19*(3), 391–409. https://doi.org/10.1007/s10775-018-9385-2
5. Georgiou, K., Nikolaou, I., & Turban, D. B. (2021). The impact of a training intervention developing psychological capital on job search success. *Journal of Career Development*, *48*(4), 369–384. https://doi.org/10.1177/0894845319852425
6. Hulshof, I. L., Demerouti, E., & Le Blanc, P. M. (2020). A job search demands-resources intervention among the unemployed: Effects on well-being, job search behavior and reemployment chances. *Journal of occupational health psychology*, *25*(1), 17–31. https:// doi.org/10.1037/apl0000419
7. Lim, V. K., Chen, D., Aw, S. S., & Tan, M. (2016). Unemployed and exhausted? Job-search fatigue and reemployment quality. *Journal of Vocational Behavior*, *92*, 68–78. https://doi.org/10.1016/j.jvb.2015.11.003
8. Pajic, S., Ulceluse, M., Kismihók, G., Mol, S. T., & den Hartog, D. N. (2018). Antecedents of job search self-efficacy of Syrian refugees in Greece and the Netherlands. *Journal of Vocational Behavior*, *105*, 159–172. https://doi.org/10.1016/j.jvb.2017.11.001
9. Rani, K. E. (2015). The role of psychological capital (PsyCap) in psychological well being of unemployed Indian youth. *Journal of Psychosocial Research*, *10*(1), 149–157. https://doi.org/10.25215/0403.087
10. Sabaitytė, E., & Diržytė, A. (2016). Psychological capital, self-compassion, and life satisfaction of unemployed youth. *International Journal of Psychology: A Biopsychosocial Approach*, *19*, 49–63. http://doi.org/10.7220/2345-024X.19.3
11. Schmidt, C. V. H., & Flatten, T. C. (2021). Crossover of resources within formal ties: How job seekers acquire psychological capital from employment counselors. *Journal of Organizational Behavior*, *43*(4), 604–619. https://doi.org/10.1002/job.2578

References not in the Review

Ajzen, I. (1987). Attitudes, traits, and actions: Dispositional prediction of behavior in personality and social psychology. *Advances in experimental social psychology*, *20*, 1–63. https://doi.org/10.1016/s0065-2601(08)60411-6

Amato, C., Baldner, C., & Pierro, A. (2016). "Moving" to a job. The role of locomotion in job search and (Re) employment. *Personality and Individual Differences*, *101*, 62–69. https://doi.org/10.1016/j.paid.2016.05.060

Aramburu-Zabala, L. H. (1998). *Transición a la vida activa: procesos de búsqueda de empleo en una muestra de universitarios madrileños (tesis doctoral)*. Universidad Complutense de Madrid.

Arpaia, A., & Mourre, G. (2005). Labour Market Institutions and Labour Market Performance: A Survey of the Literature. European Commission Economic Paper No. 238. https://doi.org/10.2139/ssrn.871093

Avey, J. B., Luthans, F., Smith, R. M., & Palmer, N. F. (2010). Impact of positive psychological capital on employee well-being over time. *Journal of occupational health psychology*, *15*(1), 17–28. https://doi.org/10.1037/a0016998

Avey, J. B., Reichard, R. J., Luthans, F., & Mhatre, K. H. (2011). Meta-analysis of the impact of positive psychological capital on employee attitudes, behaviors, and performance. *Human Resource Development Quarterly*, *22*(2), 127–152. https://doi.org/10.1002/hrdq.20070

Baay, P. E., de Ridder, D. T., Eccles, J. S., van der Lippe, T., & van Aken, M. A. (2014). Self-control trumps work motivation in predicting job search behavior. *Journal of Vocational Behavior*, *85*(3), 443–451. https://doi.org/10.1016/j.jvb.2014.09.006

Bakker, A. B., & Demerouti, E. (2014). Job demands–resources theory. *Wellbeing: A complete reference guide*, *3*(2), 1–28. https://doi.org/10.1002/9781118539415.wbwell019

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological review, 84(2), 191–215. https://doi.org/10.1037/0033-295x.84.2.191

Barber, A. E., Daly, C. L., Giannantonio, C. M., & Phillips, J. M. (1994). Job search activities: An examination of changes over time. *Personnel psychology*, *47*(4), 739–766. https://doi.org/10.1111/j.1744-6570.1994.tb01574.x

Buscher, H. S., Dreger, C., Ramos, R., & Surinach, J. (2005). The Impact of Institutions on the Employment Performance in European Labour Markets. *Economic Issues Journal Articles*, *14*(1), 17–34. https://doi.org/10.2139/ssrn.807429

De Silva, M. J., McKenzie, K., Harpham, T., & Huttly, S. R. (2005). Social capital and mental illness: A systematic review. *Journal of Epidemiology & Community Health*, *59*(8), 619–627. https://doi.org/10.1136/jech.2004.029678.

Dickerson, A., & Green, F. (2012). Fears and realisations of employment insecurity. *Labour Economics*, *19*(2), 198–210. https://doi.org/10.1016/j.labeco.2011.10.001

Evans, D. (2002). The search hypothesis of emotion. *The British Journal for the Philosophy of Science*, *53*(4), 497–509. https://doi.org/10.1093/bjps/53.4.497

Fernández-Valera, M. M., Soler-Sánchez, M. I., García-Izquierdo, M., & Meseguer de Pedro, M. (2019). Personal psychological resources, resilience and self-efficacy and their relationship with psychological distress in situations of unemployment. *International Journal of Social Psychology*, *34*(2), 331–353. https://doi.org/10.1080/02134748.2019.1583513

Fredrickson, B. L. (2004). Gratitude, like other positive emotions, broadens and builds. In R. A. Emmons & M. E. McCullough (Eds.), *The psychology of gratitude* (pp. 145–166). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780195150100.003.0008

Gessler, M., & Siemer, C. (2020). Umbrella review: Methodological review of reviews published in peer-reviewed journals with a substantial focus on vocational education and training research. *International Journal for Research in Vocational Education and Training*, *7*(1), 91–125. https://doi.org/10.13152/IJRVET.7.1.5

Harms, P. D., Krasikova, D. V., & Luthans, F. (2018). Not me, but reflects me: Validating a simple implicit measure of psychological capital. *Journal of Personality Assessment*, *100*(5), 551–562. https://doi.org/10.1080/00223891.2018.1480489.

Hobfoll, S. E. (2001). The influence of culture, community, and the nested-self in the stress process: Advancing conservation of resources theory. *Applied psychology*, *50*(3), 337–421. https://doi.org/10.1111/1464-0597.00062

Kanfer, R., Wanberg, C. R., & Kantrowitz, T. M. (2001). Job search and employment: A personality–motivational analysis and meta-analytic review. *Journal of Applied Psychology*, *86*(5), 837–855. https://doi.org/10.1037/0021-9010.86.5.837

Kasl, S. V. (1982). Strategies of research on economic instability and health. *Psychological Medicine*, *12*(3), 637–649. https://doi.org/10.1017/s0033291700055744

Kirves, K., Kinnunen, U., De Cuyper, N., & Mäkikangas, A. (2014). Trajectories of perceived employability and their associations with well-being at work: A three-wave study. *Journal of Personnel Psychology*, *13*(1), 46–57. https://doi.org/10.1027/1866-5888/a000103

Klehe, U. C., & van Hooft, E. A. (2016). *The Oxford handbook of job loss and job search*. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199764921.001.0001

Knabe, A., & Rätzel, S. (2010). Better an insecure job than no job at all? Unemployment, job insecurity and subjective wellbeing. *Economics Bulletin*, *30*(3), 2486–2494.

Lazarus, R. S. (1993). Coping theory and research: Past, present, and future. *Psychosomatic Medicine*, *55*(3), 234–247. https://doi.org/10.1097/00006842-199305000-00002

Levi, I. (1961). Decision theory and confirmation. *The Journal of Philosophy*, *58*(21), 614–625. https://doi.org/10.2307/2023537

Lopez-Kidwell, V., Grosser, T. J., Dineen, B. R., & Borgatti, S. P. (2013). What matters when: A multistage model and empirical examination of job search effort. *Academy of Management Journal*, *56*(6), 1655–1678. https://doi.org/10.5465/amj.2011.0546

Luthans, F., & Youssef-Morgan, C. M. (2017). Psychological capital: An evidence-based positive approach. *Annual Review of Organizational Psychology and Organizational Behavior*, *4*(1), 339–366. https://doi.org/10.1146/annurev-orgpsych-032516-113324

Luthans, F., Avey, J. B., Avolio, B. J., Norman, S. M., & Combs, G. M. (2006). Psychological capital development: Toward a micro-intervention. *Journal of Organizational Behavior*, *27*(3), 387–393. https://doi.org/10.1002/job.373

Luthans, F., Avolio, B. J., Avey, J. B., & Norman, S. M. (2007). Positive psychological capital: Measurement and relationship with performance and satisfaction. *Personnel Psychology*, *60*(3), 541–572. https://doi.org/10.1111/j.1744-6570.2007.00083.x

Luthans, F., Youssef, C. M., & Avolio, B. J. (2015). *Psychological capital and beyond*. Oxford University Press.

Moorhouse, A., & Caltabiano, M. L. (2007). Resilience and unemployment: Exploring risk and protective influences for the outcome variables of depression and assertive job searching. *Journal of Employment Counseling*, *44*(3), 115–125. https://doi.org/10.1002/j.2161-1920.2007.tb00030.x

Newman, A., Ucbasaran, D., Zhu, F., & Hirst, G. (2014). Psychological capital: A review and synthesis. *Journal of Organizational Behavior*, *35*(1), 120–138. https://doi.org/10.1002/job.1916

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Terzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E.W., Mayo-Wilson, E., McDonald, S., McGuinness, L. A., Stewart, L. A., Thomas, J., Tricco, A. C., Welch, V. A., Whiting, P., & Moher, D. (2020). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *Journal of Clinical Epidemiology*, *372*(71), 2–13. https://doi.org/10.1136/bmj.n71

Saks, A. M., Zikic, J., & Koen, J. (2015). Job search self-efficacy: Reconceptualizing the construct and its measurement. *Journal of Vocational Behavior*, *86*, 104–114. https://doi.org/10.1016/j.jvb.2014.11.007

Savickas, M. L. (2002). Career construction: A developmental theory of vocational behavior. In D. Brown (Ed.), *Career choice and development* (4th ed., pp. 149–205). Jossey-Bass.

Seligman, M. E. (1972). Learned helplessness. *Annual Review of Medicine*, *23*(1), 407–412. https://doi.org/10.1146/annurev.me.23.020172.002203

Skinner, B. F. (1958). Reinforcement today. *American Psychologist*, *13*(3), 94–99. https://doi.org/10.1037/h0049039

Ślebarska, K., Moser, K., & Gunnesch-Luca, G. (2009). Unemployment, social support, individual resources, and job search behavior. *Journal of Employment Counseling*, *46*(4), 159–170. https://doi.org/10.1002/j.2161-1920.2009.tb00079.x

Sun, S., Song, Z., & Lim, V. K. G. (2013). Dynamics of the job search process: Developing and testing a mediated moderation model. *Journal of Applied Psychology*, *98*(5), 771–784. https://doi.org/10.1037/a0033606

Taylor, B. M. (2015). The integrated dynamics of motivation and performance in the workplace. *Performance Improvement, 54*(5), 28–37. https://doi.org/10.1002/pfi.21481

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. *Advances in Experimental Social Psychology*, *29*, 271–360. https://doi.org/10.1016/s0065-2601(08)60019-2

Van Hooft, E. (2016). Motivation and self-regulation in job search: A theory of planned job search behavior. In U. C. Klehe & E. Van Hooft (Eds.), *The Oxford Handbook of Job Loss and Job Search*. Oxford University Press.

Van Hooft, E. A. (2014). Motivating and hindering factors during the reemployment process: The added value of employment counselors' assessment. *Journal of Occupational Health Psychology*, *19*(1), 1–17. https://doi.org/10.1037/a0035118

Van Hooft, E. A., Van Hoye, G., & van den Hee, S. M. (2022). How to optimize the job search process: Development and validation of the job search quality scale. *Journal of Career Assessment*, *30*(3) 474–505. https://doi.org/10.1177/10690727211052812

Vansteenkiste, V., Lens, W., De Witte, H., & Feather, N. T. (2005). Understanding unemployed people's job search behaviour, unemployment experience and well-being: A comparison of expectancy-value theory and self-determination theory. *British Journal of Social Psychology*, *44*(2), 269–287. https://doi.org/10.1348/014466604X17641

Victor, P. E. (2016). *Unemployment and resilience: The role of optimism in perception of lack of health* (Master's thesis, Nova School of Business and Economics). http://hdl.handle.net/10362/18580

Vroom, V.H. (1964). *Work and Motivation*. Wiley.

Wanberg, C. R., Ali, A. A., & Csillag, B. (2020). Job seeking: The process and experience of looking for a job. *Annual Review of Organizational Psychology and Organizational Behavior, 7*(1), 315–337. https://doi.org/10.1146/annurev-orgpsych-012119-044939

Wanberg, C. R., Glomb, T. M., Song, Z., & Sorenson, S. (2005). Job-search persistence during unemployment: A 10-wave longitudinal study. *Journal of Applied Psychology*, *90*(3), 411–430. https://doi.org/10.1037/0021-9010.90.3.411

Wanberg, C. R., Kanfer, R., Hamann, D. J., & Zhang, Z. (2016). Age and reemployment success after job loss: An integrative model and meta-analysis. *Psychological Bulletin*, *142*(4), 400–426. https://doi.org/10.1037/bul0000019

Weiner, B. (2012). An attribution theory of motivation. In P. A. M. Van Lange, A. W. Kruglanski & E. T. Higgins (Eds.), *Handbook of theories of social psychology* (pp. 135–155). Sage Publications Ltd.

Westman, M. (2001). Stress and strain crossover. *Human Relations*, *54*(6), 717–751. https://doi.org/10.1177/0018726701546002

Zikic, J., & Klehe, U. C. (2006). Job loss as a blessing in disguise: The role of career exploration and career planning in predicting reemployment quality. *Journal of Vocational Behavior*, *69*(3), 391–409. https://doi.org/10.1016/j.jvb.2006.05.007

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Appendix

Table 1: Description of Papers Included in the Systematic Review

No	Author (s) & Year	Study Design	Sample	Theory Applied	Main Findings/Outcomes
1	Avey et al. (2009)	Analytical and comparative, Observational and Longitudinal	Working adults from a wide variety of jobs and industries (N = 416)	Psychological Resources Theory	The study findings indicate that employees' Psychological Capital has a significant negative relationship with their intentions to quit and job search behaviours, both indicators of voluntary turnover.
2	Chen & Lim (2012)	Analytical and comparative, Observational and Cross-Sectional	Unemployed adults with at least tertiary education completed (N = 179)	Reverse Causation Model	The relationship between psychological capital and preparatory and active job search was mediated by perceived employability and problem-focused coping.
3	Fernández-Valera et al. (2020)	Analytical and comparative, Observational and Cross-Sectional	Unemployed youngsters (N = 459)	Theory of Planned Job Search Behavior and Vallerand's Hierarchical Model of Motivation	Results showed that job seekers who possess high levels of psychological capital have a higher perception of control over their job search process, directly linked with the amount of time they spend looking for a job. Analyses also revealed that psychological capital seems to be a more beneficial resource for keeping unemployed youngsters engaged in job search in an adverse economic context instead of perceived employability.
4	Georgiou & Nikolau (2019)	Study 1: Analytical and Comparative, Observational and Longitudinal Study 2: Analytical and Comparative, Interventional (Quasi-experimental design)	Unemployed job seekers. [Study 1: N = 447; Study 2: Treatment group (N = 220) and Control group (N = 141)]	Conservation of Resources Theory and Seligman's concept of learned helplessness.	Study 1: Psychological capital was positively and significantly related to job search behaviour. Therefore, job search behaviour mediated the relationships between psychological capital and job search outcomes. Study 2: Job seekers who received the psychological capital training intervention demonstrated an increase in psychological capital levels compared to the participants in the control group. However, the control group also demonstrated some change in psychological capital levels.
5	Georgiou et al. (2021)	Analytical and Comparative, Interventional (Quasi-experimental design)	Unemployed job seekers. (Treatment group: N = 220 Control group: N = 447)	Conservation of Resources Theory	Participants who received the Psychological Capital Intervention training had higher job search behaviour levels than participants in the control group. In this sense, results demonstrate significant and positive effects of the training intervention on job search behaviour three months following the intervention compared to the control group.

6	Hulshof et al. (2020)	Analytical and Comparative, Interventional (Quasi-experimental design)	Unemployed job seekers. (Treatment group: N = 146; Control group: N = 275)	Job Demands-Resources Model	The results show that the proposed intervention could protect the well-being and foster job-search behaviour. More specifically, not only was the intervention able to enhance levels of reemployment crafting and psychological capital among participants, but the analyses also showed that both constructs were responsible for the changes observed in job search performance.
7	Lim et al. (2016)	Analytical and Comparative, Observational and Longitudinal	Displaced Employees (Time 1: N = 180; Time 2: N = 89)	Conservation of Resources Theory	On the one hand, financial difficulties and social exclusion were positively and significantly related to fatigue, while psychological capital was negatively and significantly related. On the other hand, Time 1 fatigue mediated the relationships between financial difficulties, social exclusion and psychological capital with Time 2 reemployment quality.
8	Pajic et al. (2018)	Analytical and Comparative, Observational and Cross-Sectional	Post-2014 Syrian refugees in Greece and the Netherlands (N = 330)	Career Construction Theory	This study shows how psychological capital represents an antecedent of Job Search Self Efficacy through its impact on career adaptability. In line with this, individuals who are more hopeful, optimistic, resilient, and assured in accomplishing the goals they set for themselves are also more confident in engaging in job search behaviour in the destination country.
9	Rani (2015)	Analytical and Comparative, Observational and Cross-Sectional	Unemployed Youth (N = 375)	No related	The results revealed a positive and significant relationship between psychological capital and psychological well-being between Indian unemployed youth.
10	Sabaityte & Diržytė (2016)	Analytical and Comparative, Observational and Cross-Sectional	Young Unemployed People (N = 80)	Luthans' et al. (2007) multidimensional model (PsyCap)	This study showed significant correlations between psychological capital, self-compassion and life satisfaction of unemployed youth.
11	Schmidt & Flatten (2021)	Analytical and Comparative, Observational and Cross-Sectional (Dyadic and multilevel design)	Counselors and unemployed job seekers from a branch office of an employment agency. (Counselors: N = 45; Job seekers: N = 209)	Conservation of resources theory and the Crossover Model	The results highlighted that job seekers acquire certain levels of psychological capital by interacting with their employment agencies counsellors. Furthermore, they show that the crossover of psychological capital within formal ties occurs indirectly through perceived counsellors' social support.

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The Implementation of Dual Vocational Education and Training in Spain: Analysis of Company Tutors in the Tourism Sector

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Absract

Context: Vocational education and training (VET) has become a key issue in today's highly dynamic business, technological and economic environment, with a complex diversity of systems within the European Union. This paper aims to study the implementation of dual VET in Spain, focusing on the working conditions of company tutors in the tourism sector of Andalusia and the Canary Islands.

Approach: Dual VET has been implemented in different ways, both between the different autonomous regions and professional areas since it was launched in 2012. In order to analyse these differences, interviews with teachers, head teachers, students and company tutors were carried out, between 2020 and 2021, in centres that had implemented dual vocational education training and centres that had not. The educational programme in dual VET implies a closer collaboration between schools and companies, as both are active training areas; the training objectives are shared between the school and the company. In this study, the company tutor is studied in his or her facet as trainer and assessor; but special emphasis is placed on the characteristics of the tourism sector, given its relevance in understanding the educational processes involved. Three dimensions underpin the analysis: the characteristics of the company tutor, the training and assessment processes implemented and the link that both maintain with the dynamics of tourism companies.

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Findings: In general terms, the initial assumptions put forward are confirmed. Firstly, the educational centre leads the process, taking the initiative yet without having the conditions of governance and negotiation typical of the Germanic countries from which these vocational education training systems originate. Secondly, the main characteristics of the company tutor are heterogeneity and informality. Thirdly, the contents and methodology are conditioned by the characteristics of the tourism sector. And finally, assessment also follows informal and changing procedures, generating tensions between the educational centre and company.

Conclusions: These results give rise to some theoretical reflections. If the education system is an institution based on the principle of equality, it is worth asking to what extent dual VET can alter this principle, as the company adapts some of the contents and learning outcomes to its specific needs. In addition, an important differentiating factor that marks the learning dynamics has been detected: the size of the company. The difference in size may also influence the future prospects of trainees joining the workforce after completion of VET studies.

Keywords: Vocational Education and Training, VET, Dual VET, Spain, Company Tutors, Tourism Sector

1 Introduction

Vocational education and training (VET) has become a key issue in today's highly dynamic business, technological and economic environment, with a complex diversity of systems within the European Union. In some cases, training is acquired on the job, in others in the education system. These differences have inspired a fruitful academic debate, ranging from international comparisons to governance analyses. Moreover, the success of the VET systems of Germany, Austria and Switzerland have triggered an interesting additional discussion about whether institutional isomorphism could appear because of the imitation effect between EU institutions (Martín Artiles et al., 2019).

This paper aims to study the implementation of dual VET in Spain, focusing on the working conditions of company tutors in the tourism sector of Andalusia and the Canary Islands. Dual VET has been implemented in different ways, both between the different autonomous regions and professional areas since it was launched in 2012. In order to analyse these differences, interviews with teachers, head teachers, students and company tutors were carried out, between 2020 and 2021, in centres that had implemented dual VET and centres that had not. Dual VET was launched in Spain by Royal Decree 1529/2012 (8 November, BOE no. 270, 9/11/12).

The approach to be developed is as follows. The educational programme in dual VET implies a closer collaboration between schools and companies, as both are active training areas; the training objectives are shared between the school and the company. This is a clear difference with respect to the VET developed so far in Spain. In this study, the company tutor is considered in his or her facet as trainer and assessor; but special emphasis is placed on the characteristics of the tourism sector, given its relevance in understanding the educational processes involved.

For this reason, the structure of this paper is as follows. First, some relevant academic discussions on VET are addressed, taking into account the recent process of implementation of dual VET in Spain and the characteristics of the tourism sector. Next, the objectives, hypotheses and methodology are defined. Finally, the results and conclusions are presented. Three dimensions underpin the analysis: The characteristics of the company tutor, the training and assessment procedures implemented and the link that both maintain with the dynamics of tourism companies. Based on the academic literature, the tourism sector is a particular case to study the relationships between the tendencies of the public education system and the approach given by the private sector. Also, it's interesting to study the introduction of dual vocational training in Spain; because its strongly academic tradition.

2 Theoretical Framework

It has been argued that the literature on VET is insufficient (Echeverría Samanes & Martínez Clares, 2019, 2021). However, over the last few decades, research and academic debate on VET has intensified. This has to do with accelerated changes in the organisational and technological processes of companies, and with changing dynamics in geographical terms, both towards greater globalisation and the workplace changes arising from COVID19. It is also due to the existence of international data sources that allow the comparison of academic and business performance between countries with different education systems. In Europe, this is the case of the European Research Network on Vocational Education and Training (Vetnet) and the European Centre for the Development of Vocational Training (Cedefop).

According to Hager (2019), VET was born in the 20th century to alleviate quickly the needs of the labour market by shifting from on-the-job learning (apprenticeship) to a more academic (student) approach. With globalisation, the trend has partially reversed, as VET attempts to meet the needs of the labour market in line with the needs of companies. Thus, these two trends come into conflict, which is likely to continue throughout the following decades. Deissinger and Hellwig (2005) summarise the philosophy of VET in two historically affirmed principles: The dualism of learning places (company-school) and the vocational principle. The latter refers to the characteristics of occupations, relatively independent of jobs, and to the standardised certification of qualifications. For Guile and Unwin (2019),

VET is a broad and complex field, not least because it is a relational concept: Learning as a social process is linked to the work process and organisations. Precisely for this reason, it is difficult to organise the collective construction of competences, as it involves different actors (Šćepanović & Martín Artiles, 2020).

The analysis of vocational education training can be carried out from an individual and/or institutional point of view. Therefore, in the characteristics of the skills to be learned, it is convenient to differentiate between the individual dimension (knowledge, capacity, judgement, ability to be autonomous) and the collective dimension (teams, relationships, co-production, occupations). Moreover, the application of knowledge to solve problems depends on a combination of elements -technical, community of practice, interpersonal and embodied- (Gog, 2019; Oliver et al., 2019).

Several academic discussions have been taking place around VET, some of which are relevant to this paper (general or specific competences, the relationship between VET and occupations, the different vocational education systems and the Spanish one, and the role of the company tutor).

The first concerns the preference for general or specific competences. Thus, companies often prefer specific competences, but it is common for the state to promote education systems oriented towards general competences. For Stuart (2019), employers have no incentive to train for fear that trained employees will leave to the competition; therefore, the state must intervene to finance and engage companies. For Oliver et al. (2019), the problem of financing training is at the heart of this discussion. For Busemeyer and Trampusch (2019), the types of skills depend on the training systems and their embeddedness in the labour and state structures of a country. They, therefore, propose a typology of skills training based on two dimensions: the initial investment of the company and the commitment of the state to finance VET. For Muehlemann (2019), although it is important to know the costs and benefits of training by companies, this is not so simple given the intervention of several variables.

On the other hand, while the rapid adaptation of specific skills to the job is highlighted, some authors consider that they do not adequately enable the development of innovation processes. For Carabaña (2011), school-based VET is universalist and work-based VET is particularist. The latter is not well adapted to technological changes, as it is coupled to the immediate needs of companies. Furthermore, it is not clear how social objectives can be met, the main one being that education should serve as a mechanism for social integration. See also Bentolila et al. (2020).

A separate but no lesser consideration concerns the relationship between VET and occupations. For authors such as Fuller (2019), learning also implies being part of an occupation. Although the growing weakness of occupations in the context of post-Fordist and informational capitalism has been raised, learning still involves content and know-how and with the regulation and culture of the occupational group (this is the German case). Competence-

based learning moves away from this traditional dynamic, as it is no longer so closely linked to integration into an occupational community. Without wishing to shift the focus of this paper, it is important to consider what is the priority in VET, whether it is the job, the individual, the company or the occupational group. Depending on the centrality of one or the other, training should be planned for each case (Oliver et al., 2019).

An additional topic of interest concerns the multiple classifications of VET systems, as they provide insights into national specificities, and in some cases, their strengths and weaknesses. For Deissinger (2019), VET is considered a system of collective training for qualifications, linked to the "Continental European variety of coordinated capitalism, associated with conservative-corporatist education and training" (Busemeyer & Schlicht-Schmälzle, 2014, p. 56), which differs from what occurs in countries where institutions are weak in the process of coordinating employment and training. These qualifications are considered dual because they combine an occupational approach with an educational strategy, and therefore have an educational and an occupational/employment orientation. This model starts from a corporatist tradition of company-linked training, which was later influenced by the importance of the education system in skills training. In short, the trainee has a dual status, student and apprentice. And training is not strictly linked to the job, but to occupational groups, but are subject to regulation by coordinating institutions such as chambers of commerce.

Thus, according to the relative importance of dimensions such as the presence of state, market or corporatist governance, the different vocational education systems can be classified. In each country, each of these dimensions is usually present to a greater or lesser extent. In this sense, the German model itself, a reference for the implementation of dual VET in Spain, has been undergoing a process of transformation since the second half of the 20th century. Baethge and Wolter (2015) focus on the crisis factors of the German educational model, on its scarcely liberal corporatist origin and subsequently its difficult adaptation to a context of neoliberal globalisation. In the Spanish case, corporate actors such as trade unions and chambers of commerce are practically absent in the organisation and implementation of dual VET (Martín Artiles et al., 2019). See also Oliver et al. (2019) who posits five forms of skills provisioning (state, corporatist networks, local networks, institutional companies, market).

The German model has been the reference in the implementation of Spanish VET, because it is considered a success story with the capacity to be exported to other places (Alemán Falcón, 2015; Euler, 2013; Flisi, 2020; Sotomayor Vázquez, 2017). In Spain, VET is linked to the Ministry of Education though some of the responsibility for its implementation and the issuing of diplomas has been transferred to the Spanish autonomous regions. Regarding vocational education training for employment, the Ministry of Labour and Social Security oversees issuing certification (García Morata, 2015) and providing training to employed and unemployed people.

Work experience in companies was regulated in Spain in 1974 and was first implemented in 1983-1984 as a voluntary module -then called alternance training. In 1990, work experience became compulsory for all VET students, when it received the name of Formación en Centros de Trabajo, or Workplace Training (WT), (Marhuenda et al., 2016; Marhuenda-Fluixá et al., 2019). For some authors, the initiative to implement VET does not come from the education system itself but instead has been sponsored by the European Union and other bodies such as the German chambers of commerce (Marhuenda-Fluixá et al., 2017). VET involves more actors in the training, in a way that requires greater coordination and collaboration between companies and the education system. However, it should be noted that as the number of actors involved and the contextual elements increase so does the complexity of the system and implementation times (Eichhorst et al., 2015).

The new VET model was regulated by a Royal Decree (1529/2012), a legal regulation approved by the executive branch of government. This RD addresses both the training activity inherent in training and apprenticeship contracts (the formalisation and monitoring of which are the responsibility of the Public Employment Service, which in turn reports to the Ministry of Employment), and the VET carried out within the education system (the responsibility for which lies with the Ministry of Education). Thus, we have a situation in which two administrative bodies at state level have legislative and monitoring powers in VET. In practice, the involvement of the two Ministries has enshrined a model that differentiates between two profiles: One of students in initial training (under the Ministry of Education), and the other of the "apprentice" who can be hired under a training and apprenticeship contract, subject to labour legislation (under the Ministry of Labour) (Sanz de Miguel, 2017). Some authors address the difficulties in incorporating apprenticeship contracts in VET (Moldes Farelo, 2020). Therefore, in the Spanish model, the figure of the apprentice is regulated through training and apprenticeship contracts; but what predominates is the figure of the student who, on occasions, receives a scholarship (Sanz de Miguel, 2017).

In March 2022, the Spanish Parliament passed a new law reordering Vocational Education and Training (Law 3/2022, of 31 March, on the organisation and integration of Vocational Education and Training), taking into account some of the conflicting issues in the implementation of dual VET highlighted in this article.

Royal Decree 1529/2012 regulates a dual vocational education training system that gives greater weight to in-company training. It establishes that at least 33% of the training must take place in a company, compared to the 20% stipulated in the traditional model (Sanz de Miguel, 2017). Hence, the insistence in the academic literature on the importance of governance, since, as Sanz de Miguel (2017) states, "complexity is a common feature of VET systems, especially dual systems, due to the variety of actors involved in decision-making, management and implementation" (p. 63). See also Bentolila and Jansen (2019) and Pozo-Llorente et al. (2020).

With the implementation of VET in Spain, a significant part of the literature has focused on teachers and the education system, and much less on the companies that have become central to this new system (Marhuenda et al. 2016; Pineda-Herrero et al., 2019; Pozo-Llorente et al., 2020). Thus, teachers' opinions on dual VET and its requirements have been analysed (Marhuenda et al., 2016). The strength of some ideas is important, such as the need to adapt VET to companies' needs, and the centrality of the problem of youth employment. Another part of the literature has focused on specific sectors (Bentolila & Jansen, 2019; Domingo Cebrián, 2018; Pérez Salguero & Gómez Cervantes, 2019; Pineda Herrero et al., 2018; Roure-Niubó & Boudjaoui, 2016). Several authors have put forward proposals for improvements to VET. This is the case of Echeverría Samanes and Martínez Clares (2018) and Echeverría and Martínez-Clares (2020).

Although there is still a long way to go, there is no shortage of research on *Training Companies* and on the processes of implementation and development of dual VET in Spain. In addition, some foundations are leaving their mark on this knowledge. This is the case of the Bankia Foundation for Dual Training (FBxFD) and the Bertelsmann Foundation (Amor García, 2019; Echeverría Samanes & Martínez Clares, 2019). From an international perspective, Orr (2019) highlights the limited research on tutors outside the education system.

In the work by Bentolila et al. (2020), companies participating in VET tend to established longer, larger and more profitable. They find that size positively affects participation up to a degree, beyond which the trend is reversed. Furthermore, there is a wide variation in VET programmes depending on the company's sector. They indicate that "in any case value added, investment and rate of return are significantly associated with a higher likelihood to participate in dual VET once participating in VET" (p. 2). They also propose that "the differential importance of the sector suggests that it is probably better not to regulate VET in different sectors in the same way" (p. 2) following the suggestions of Muehlemann and Wolter (2019).

As far as the role of the company tutor is concerned, the work of Ros-Garrido and Marhuenda-Fluixá (2019) reconstructs the characteristics of teachers and trainers and highlights the inadequacy of studies focusing on company tutors. On the other hand, studying the dual system, Leidner (2003) considers the contrast between the pedagogical qualifications required of formal trainers and the absence of these in company tutors (secondary trainers), who are in charge of apprentices. Analysing the work process within the company and its relation to apprenticeship training, Filliettaz (2011) focuses on the pedagogical perspective and possible characteristics of supervision, with special attention to tutor-apprentice communication and learning environments. Finally, not only the individual characteristics of company tutors and tutor-trainee interactions have been investigated, but also models of tutoring (Billet, 2009; Filliettaz, 2011) and studies on the learning environment or learning communities in companies (Fuller & Unwin, 1998).

Finally, it should be noted that in Spain, the growth of intermediate and tertiary VET in recent decades has been significant. Even so, Spain still has lower rates of VET than the rest of Europe (Echeverría Samanes & Martínez Clares, 2019; López Rouco, 2018).

Research in the tourism has highlighted the internal heterogeneity of the sector, the relative importance of small businesses, the frequent fluctuations in demand throughout the year but also during a week or a day in some sub-sectors (Baum, 2015; Ladkin, 2006; 2011; Lucas, 2004). This gives rise to different jobs, qualifications and employee profiles. Many of these jobs have long working hours and unbalanced work rhythms (Lillo-Bañuls & Casado-Díaz, 2011; Lucas, 2004; Park et al., 2016).

Moreover, it should be stressed that working with clients includes tangible and intangible elements (technical, emotional and aesthetic dimensions). Indeed, in tourism many important skills involve soft and non-formal competences (Korczynski, 2005; Veijola, 2009). All these components affect human resources policies (Marco-Lajara & Úbeda-García, 2013; Lucas, 2004), which must combine the presence of formal qualifications and on-the-job learning (Marhuenda et al., 2004). Thus, some authors have rethought the definitions of employment, qualification and competences for tourism and other service activities (Korczynski, 2005).

This varied presence of skills leads to problems in linking the skills offered by the education system to those demanded by the tourism sector, resulting in a certain historical mutual indifference between the two spheres (Marhuenda et al., 2004; Strietska-Ilina & Tessaring, 2005; Viktorovna & Avtandilovna, 2014; Vogelsang et al., 2021).

As can be seen, we have presented some of the most relevant discussions to define our approach. First of all, we agree with the idea that VET is an educational field subject to tensions and contradictory dynamics (Carabaña, 2011; Martínez García, 2016). In general, we consider the complexity to organise the collective construction of competences, as it involves different actors; specially in Spanish context, with a strong "academic" tradition of learning. On the other hand, the precarious balance between specific and general skills is essential, since in the tourism sector the experience acquired in the position is traditionally significant.

So, focusing on the working conditions of company tutors and on the learning process in the company, this paper aims to study the particular implementation of VET in the tourism sector, in Spain. The specific objectives are as follows:

1. To analyse the interrelationships between the educational centre and the tourism company.

2. To study the figure of the company tutor.

3. To analyse the contents and methodology of training.

4. To study the evaluation process followed by the company tutor.

The initial assumptions are as follows:

1. The educational centre leads the training process, while the company's behaviour is reactive.

2. Regarding the characteristics of company tutors, heterogeneity and informality are predominant.

3. The contents, methodology and assessment system are conditioned by the characteristics of the tourism sector, specially their heterogeneity, the employee profiles, the work rhythms and the skills required.

4. The methodology and the evaluation system used by the company tutor are informal, diverse and changing.

3 Methodology

The methodology is triangular, although mainly qualitative. The methodological reference for field work is the usage of comparative case studies, following the proposal of Bartlett and Vavrus (2017). These authors suggest three axes to establish this comparison: The horizontal, the vertical and the transversal. The horizontal helps us to compare similar policies in disparate locations that are socially produced. The vertical invites us to pay attention to different scales and through them. Finally, the transversal suggests us to historically situate the processes or relationships under study.

After carrying out a study of current legislation and secondary data, considering the Spanish context and VET literature, the school centre has been selected as the basic unit of analysis, the contact point to reach companies and tutors. The criteria to choose a school centre has been the provision of VET (dual or not) in the tourism sector. So, the selection of the sample has been based on the educational centres that provide professional training in tourism: from this unit of analysis (case) the relevant actors have been interviewed: Teachers, students, company tutors and company managers. In particular, for the selection of tutors, the size and type of company (hotel, restaurant, others) have been considered.

The fieldwork took place between 2020 and 2021; 11 educational centres have been studied: Six in Andalucía and five in Canary Islands, five of them providing non dual VET and six providing dual VET. 40 in-depth interviews were carried out: The interviewees were teachers/head teachers (21), students (8), company tutors/employers (7), managers/experts (4).

The interview scripts covered the following dimensions: history of the centre; steps of VET implementation; profile, motivations and selection of participant students; particularities of

training in hospitality and tourism; characteristics of companies involved; mechanisms for contacting companies; relations and coordination between school centre and company tutor; characteristics of the company tutor; teaching and evaluation of the company tutor.

After a thorough reading of all the interviews, we proceeded to select those sections mainly related to the following categories:

- The characteristics of company tutors.
- The delivery of the training and assessments.
- The characteristics of the business sector and company-centre relations that affect the two previous dimensions.

The information has been organised by category, also considering the point of view of the informant (teacher, student, company tutor, expert). A specific file for relevant verbatim citations has been created. The analysis of narrative information has been carried out following the dimensions presented in the theoretical framework with the addition of specific references and contributions related to findings.

4 Results

The results are presented according to the four specific objectives proposed: The interrelations between the educational centre and company, the figure of the company tutor, the contents and methodology of training and the evaluation process.

4.1 The Interrelations Between the Educational Centre and Tourism Company

The educational centres lead the training process in both conventional VET and dual VET. They organise the teaching, make the contacts with companies, select the students for each of them and monitor their progress. Although VET places the company in a more central position in the training-learning process, leadership is exercised by the education system. The initiative comes from regional Ministries of Education and progressively, since the publication of Royal Decree RD 1529/2012, they have been encouraging educational centres to set up VET projects with information days and courses. First, there is in an experimental phase, then more systematically through the presentation of projects based on explicit requirements. One of these requirements is to already have conventional VET courses. This will sometimes lead to groups where conventional and dual VET students coexist. Other authors have also highlighted this situation (Euler, 2013; Flisi, 2020; Marhuenda et al., 2016;

Marhuenda-Fluixá et al., 2019; Pozo-Llorente et al., 2020). The implementation of VET is based on conventional vocational training, where the point of contact between the centre and company is through Workplace Training (WT).

The implementation of the dual VET, still under the auspices of the regional education departments, is led by enthusiastic teachers, who look for companies and then organise the distribution of content and learning outcomes between the latter and the school.

In the implementation stage of VET, the commitment of the teaching staff has been the mainstay of the (experimental) operation of the system in the tourism sector in Andalusia and the Canary Islands. In this case, leadership based on the voluntarism of the centre's management teams or even on the individual initiatives of teaching staff creates notable differences between centres. In the relationship between educational centre and company, what is clear is that the basic connections are always activated from the centre, a result that is in line with teachers' opinions on dual VET, which are always worse regarding the involvement of the administration and with respect to attracting companies (Pineda-Herrero et al., 2019).

> *"Forty companies are told exactly the same thing. There is not even a standardised dossier to take to companies. We have to make our own publicity dossiers as if we were a private company looking for... in short. I don't think that they should start something as important as a dual education system, because I have my point of view and I'm going to put my point of view in the company's documentation and how I consider dual education to be, which may not be the best. My point of view does not necessarily have to be the right one. And maybe a colleague in Seville has a totally different point of view, who is promoting the same Dual system." (Interview 13, p. 12, Teacher - VET Coordinator)*

Previous experience with VET is vital to start up dual education, both in a positive and negative sense. The existence of a good network of contacts in the business world is a necessary condition for enthusiastic teachers to promote VET projects. The years of organising work experience placements (WT) have consolidated relations between educational centres and companies, creating shared knowledge of the characteristics and modus operandi of each actor. In this sense, good or bad experiences in WT clearly influence the decisions of the centre, promoter (or not) on dual VET projects.

> *"We think that dual VET is indeed the future, but in the field of hospitality and tourism, we have or consider that there are few companies that are capable of training our students throughout the school year. It is a very special sector." (Interview 11, p. 2, School Director)*

The positive or negative experiences in WT also show that relations between educational centres and the business context often exist and have both strengths and weaknesses. The characteristics of the business world emerge as one of the reasons for not implementing dual VET. This explanation refers to the complicated experience of WT in relation to the type of company in the region that can receive students. According to this interpretation, the

difficulties encountered in organising WT are due precisely to the business context, which is fragmented into different small companies. In addition, the influence of certain structural characteristics of tourism and hospitality companies, such as working hours, holiday shifts and seasonality (in Andalusia), make it difficult for apprentices to find work. This tends to put a brake on dual vocational education training projects.

In almost all the centres studied, the unit of collaboration is always the company, i.e., there is no other structured level that coordinates the agreements, such as a Chamber of Commerce or business associations in the sector. This atomisation of collaboration adds heterogeneity to the training experiences. This is one of the most evident results of dual VET in the tourism sector in the regions studied: The absence of an intermediate level of coordination between the public actor and the educational centres, as well as the scant role played by collective actors (chambers of commerce, business or trade union federations). Only in one school is there an incipient collaboration with the local Chamber of Commerce in order to establish connections with tourist companies.

If, on the one hand, the prevalence of the societal effect explained by Martín Artiles et al. (2019) is confirmed, on the other hand, it is worth questioning the specific weight of the structural characteristics of the tourism sector, added to the general lack of dialogue between social agents (Sanz de Miguel, 2107), which distances Spain from the German corporatist model. When considering the relationship between training and tourism, in addition to the historical indifference based on the mismatch between the demand for and supply of skills already pointed out (Marhuenda et al, 2004; Strietska-Ilina & Tessaring, 2005; Viktorovna & Avtandilovna, 2014), we should add at least two dimensions that emerge as difficulties in the implementation of VET in this sector: Organisational (evidenced by the model of relations between educational centres and companies described) and pedagogical-work-related (which will be dealt with in the following sections).

4.2 The Company Tutor

The complexity of the figure of the company tutor, a central actor in dual vocational education and training, leads us to investigate the profile of the person in charge of training students. The first relevant result is, once again, heterogeneity. The diversity of tutor profiles is added to the diverse models of collective tutoring (Filliettaz, 2011) as well as to secondary trainers: Employees who intervene in the training, without having the formal recognition of tutor (Leidner, 2003)

When considering tutors' profiles, there are notable differences according to the size of the company. In large chains of companies, tutoring is carried out by the training department. However, most companies that accept students (both in WT and dual VET) are medium-

sized or small. In this case, the tutor in the company is usually the person in charge of the department that takes on the students, for example the kitchen manager.

> *"It's not the same for a student to go to a hotel where there will be a trained chef, a purchasing department and so on, and then go to a mediocre restaurant and the chef is so overworked, so understaffed that he/she can't dedicate time to it. So that's the biggest problem I see." (Interview 23, p. 3, Entrepreneur)*

The heterogeneity of the tourism sector is not only related to the diversity of occupations and positions but also to the differences between large companies and family businesses, which offer similar services but operate with very unequal structures, organisation and dynamics. It is therefore important to consider the business context in which the company tutor is located. Companies participating in dual VET must be convincing in terms of their involvement and commitment to training, and this gives rise to complex and contradictory discourses about their role in training. Company size is key to understanding how this role is performed, whether there is the possibility of using a work team as a collective tutor, or the presence of standardised procedures, specific training departments or trainee rotation plans.

Within the variety of tutor characteristics, a common point can be detected: informality. There is no formal standardised recognition or set requirements to be the person in charge of training in a company. In general, the interviewees spoke of their tutors' commitment to the work or their vocation for training. This is a recurrent issue in many interviews and for all actors (teachers, students and tutors). The lack of specific and regulated training for tutors is highlighted as one of the main obstacles to the teaching-learning process in the company, and there is a call for a broader training plan for companies participating in VET. Moreover, the temporary nature and high turnover of staff in tourism companies can be considered a handicap in terms of training or potential investment in the training of tutors by companies. Although a more incisive intervention of the public administration is called for, only in one case is the active role of a Chamber of Commerce in the training of tutors identified.

> *"I think that there are times, not in my case, but in those of other companies, that the chefs and the people who are inside are not trained and are not sufficiently trained to be able to train a student. There are people who, yes, it is true that everyone knows that the hotel and catering business has always been a passing profession, i.e., I don't have a job, I don't have one, so I go into the hotel and catering business, or I go into construction much earlier. And in the end, there are people who have been trained, let's say, in that restaurant, they know what the restaurant is, yet I don't think they can train anyone else." (Interview 23, p. 3, Entrepreneur)*

4.3 Training Content and Methodology

Experiences have been uneven when analysing how training is delivered. The action of the tutors is very different depending on the case, and it ranges from the simple provision of prior basic information to carrying out tasks to a more individualised dedication with continuous accompaniment of the trainee. This diversity opens the door to varied solutions that we can analyse through the categorisation proposed by Filliettaz (2011). Thus, depending on the cases, we find examples of spontaneous, required, denied and distributed tutoring.

Additionally, there is a lack of formal planning of students' work and learning. In very few cases, reference is made to a training programme, either in WT or VET experiences. This lack of planning cannot be explained by the novelty of the process, since the training plan is one of the elements present from the beginning in workplace training (see, for example, the document *Manual de Formación en Centros de Trabajo del Consejo Superior de Cámaras*, 2000). Through this informal (spontaneous) mentoring, the encounter between the trainee or apprentice and the typical work process in the hospitality industry becomes specific.

In fact, time is probably the most salient element, in the words of the tutors providing the training. Often, teaching trainees (both in WT and dual VET) is incompatible with other tasks to be carried out in the company. The pressure of workloads, especially in small companies, where there are no training departments, prevents them from devoting the necessary time to training. The concerns of tutors are evident; they come to consider explanations to learners, the meetings with the centre and the documentation to be filled in and submitted as wastes of time. This "lost" time is sometimes compensated by the help that the trainees provide in the productive process; because of their ambivalent condition they are in training, but also part of the workforce.

> *"It's true that of course we waste time explaining things to the trainees in practice, but it's also true that in the end they are a help." (Interview 4, p. 1, Company tutor)*

> *"They do try to help us. What happens is that with all the work we have, it's impossible. Since a colleague at work says 'Look, we're going to explain such and such, come here for a moment and I'll explain it to you'. They don't have time and they try, but it's very vague." (Interview 2, p. 9, Student)*

> *"Anyone could tell you that having trainees is a waste of time and it's true. You have to fill in documentation about being a tutor for trainees... Because it's true that you must spend time depending on where the trainees come from, there are also tutors who come periodically, you have to meet with them for that, to tell them how they are going to follow up." (Interview 2, p. 4, Company tutor)*

Considering the low level of formalisation of learning processes, the solution to the contradiction inherent in the condition of being a trainee, i.e., learning and working, is "being part

of the team". Some basic notions open the way to insertion in the work unit with all that this may entail (minus the salary): Work rhythm, working hours, polyvalence. Only in a few cases is there a reasoned limitation of the apprentices' functions. Thus, on the one hand, tutoring distributed among the team creates the learning communities that Fuller and Unwin (1998) talk about, but on the other hand, it raises doubts about the real consequences of this attachment to the team in terms of the trainee's rights and duties and his or her contribution to the creation of value in the work process.

Another point that emerged from the stakeholder interviews concerns the polyvalence of trainees. Their rotation between departments, and the variety of tasks they have to perform is one of the issues present since the implementation of the WT, practically in all sectors. In the tourism sector, the diversity of the jobs and the scarce formalisation of the required competences open a range of possibilities on the contents taught in companies. More generally, this situation can be dealt with by inserting it into the debate on the preferences and priority of generic or specific competences in vocational education training, as presented in the theoretical framework of this paper. Schematically, in the actors' discourse, the points of view and interests are different and there is a tension:

- the demands of the education centres, which insist on the rotation of students in several departments.
- the ultra-specific nature of some experiences.
- the general interest of companies in filling vacancies in the workforce.

In terms of incidents or bad practices (tutoring required/denied) in the delivery of in-company training, we find non-compliance with the centre's training agreements (or plans, if they exist), little rotation between departments and single tasks that have no impact on a trainee's training. Excessive specialisation of the trainee in procedures, non-regulatory models and working styles of certain companies is another undesirable effect of workplace training experiences.

In addition, in the tourism sector, social and emotional competences are important (Korczynski, 2005; Veijola, 2009), so learning these must be added to the technical components of the training and linked to the (informal) pedagogical skills of company tutors. If soft skills are identified as indispensable abilities for future hospitality professionals, it is less clear who must teach these skills and whether the company tutor has sufficient didactic tools to train in this area. The heterogeneity of profiles and tutoring models is a factor that widens the inequalities in training experiences in companies.

Finally, the effects of training on the company itself and its employees are considered, a subject that has been little studied in the tourism sector. The most direct and obvious consequence is the possibility of having a partially trained (or in any case, immersed in a training process) workforce available to "help" the staff. In addition to this primary effect, the presence of trainees in the company can have a positive impact on employee motivation. Moreover, collaboration with education centres can offer companies marketing opportunities. On the other hand, the dual status of trainee and employee and the low formal recognition of the tutor's "teaching" work can have negative effects on the workforce and is in general an element to be considered in the delicate balances of industrial relations.

4.4 Assessment

Parallel to the semi-formal process of observed learning, assessment is based on informal and changing procedures. In this case, the collaboration between the company tutor and educational tutor is somewhat forced; the former is the one who must assess the actual learning through work, and the latter is the one who is formally in charge of supervising the assessment. Regarding assessment, there are several levels of communication between centre and company. All of them highlight the basic differences between educational and business systems: For example, it is impossible to directly transfer the semantic field of the academic world, articulated in learning outcomes and assessment criteria, to the business context.

Experimental solutions are varied and non-standardised. Some tutors talk of templates, others of worksheets, of assigning tasks, which are then supervised, sometimes accompanied by personal diaries and self-assessment. However, it is often the case that the learner carries out certain tasks alone; some tutors admit that the worst part is the monitoring of the learner's performance in the company.

However, far from having found a homogeneous solution, there is a clash between the formal procedures of the education system and the informal ones of the company, where learning is based on the repetitive execution of tasks. Taking a broader view, it makes sense to reflect on the contradiction, created in WT and reinforced by the implementation of dual VET, between assessment within educational centres, which is increasingly standardised and evidence-based, quantifiable, metric and subject to parameters of supposed quality, and assessment outside, in the company, which is left to the informality of the process and to the specific criteria of the tutor. The question arises as to what extent this situation derives from previous management of the WT, also informal.

> *"Unfortunately, we have not yet arrived at a well-done assessment. We are patching it up as best we can, on the understanding that we don't do a final exam and the student has a hard time with a lot of things, or the teacher ends up calling the company tutor and says look at what the student has done and how he/she has done it. We rely a lot on what the students put in their personal*

diaries. But to go from there to putting down on paper what learning outcomes the student has achieved, how he or she has achieved them, what degree of achievement, what mark that learning outcome entails- that's let's say- is rather irregular. And we have tried ten different systems." (Interview 13, p. 12, Teacher - VET Coordinator)

Interviewees from the VET implementation cases share concerns about assessment, as there are substantial differences in terms of hours, competences and expected learning outcomes. Educational centres with more experience in dual training have experimented with various alternative assessment systems, without finding a satisfactory result, yet.

5 Conclusions

In general terms, the initial assumptions put forward are confirmed. Firstly, regarding initial assumptions 1, the educational centre leads the process, taking the initiative yet without having the conditions of governance and negotiation typical of the Germanic countries from which these vocational education training systems originate. This leads it to rely on its own educational tradition to undertake this experiment. To a large extent, it can be seen that dual VET is based on individual initiatives for its development, never collective or institutional ones. The educational administration urges teachers, centres and departments to set up such systems, but the contacts and relations are between specific teachers and specific companies. At no time are chambers of commerce, business federations or specific administrative bodies involved. The unit of collaboration is always the company; there is no other structured level of coordination of agreements. The importance of small companies in the tourism sector accentuates the leading role of the educational centre and provides a better understanding of the organisational strengths that it must demonstrate.

Secondly, initial assumptions 2, the main characteristics of the company tutor are heterogeneity and informality. In terms of heterogeneity, the size of the company and the diversity within the tourism sector leads to different situations, ranging from those in which the company tutor is linked to the training department of a hotel chain to others in which a head of department is appointed as such. In terms of informality, the absence of formal accreditation in this group is a common feature.

Thirdly concerning initial assumptions 3, it is confirmed that the contents and methodology are conditioned by the characteristics of the tourism sector. The strategies used by company tutors are informal and diverse. Uneven experiences have been found when analysing how training is delivered, as examples of spontaneous and distributed tutoring are observed above all, and to a lesser extent, required and denied tutoring. In the case of spontaneous and distributed tutoring, it is always the urgency of the work process that triggers it. In this context, the tension between generic and specific competences emerges. It is the education system that pushes towards the former, while it is the company that partially orients towards

the latter. This in turn connects with a new tension, between conceptualising the trainee as a learner or as a student. The analysis of the interviews has shown that contents and methodology have been influenced mainly by the dimensions of heterogeneity of working conditions, employee profiles, work rhythms and skills required.

Finally, initial assumptions 4, in parallel to the above, assessment also follows informal and changing procedures, generating tensions between the educational centre and company.

These results give rise to some theoretical reflections. If we consider the education system as an institution based on the principle of equality, it is worth asking to what extent dual vocational education training can alter this principle, as the company adapts some of the contents and learning outcomes to its specific needs. This takes place by substituting generic contents by more specific ones. Depending on the company where the WT or dual VET takes place, different contents will be learned. Not all companies can provide all the contents, due to the specialisation of each one of them. The centres offer more generic and global training, but not the companies.

In addition, an important differentiating factor that marks the learning dynamics in both dual VET and WT has been detected: the size of the company. In general, large hotel chains are more prepared to take on trainees and may have specific internal training departments to support company tutors or directly take on trainees. By contrast, small and medium-sized companies operate in a less structured and more informal way. The difference in size may also influence the future prospects of trainees joining the workforce after completion of VET studies. As small companies seem to focus on the present benefit of "helping" trainees, while larger company chains link (not always) VET to possible long-term employment.

It can be concluded from the above that, at least in these initial phases of the implementation of dual VET in Spain, there is no 'induced effect' but rather a 'societal' one. Thus, VET is mainly implemented based on its own institutional traditions.

This research has some limitations that future empirical approaches can overcome. On the one hand, comparative analysis with training programmes in sectors other than tourism is needed, in order to know the relative importance and the influence of each activity area in the learning process. On the other hand, a quantitative approximation of the processes described is also necessary and complementary. Finally, given the last changes in dual VET regulation in Spain, a continuous monitoring of VET transformations must be carried out.

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Ethics statement

The authors declare that they have implemented the ethical principles of IJRVET during all the research process. The participants in our research have given an informed consent about the aims, funding, overall purpose, methods, and implications of the research; as well as they obtained all the necessary details about their rights and privacy.

References

Alemán Falcón, J. (2015). El sistema dual de formación profesional alemán: Escuela y empresa. *Educaçao e Pesquisa: Revista da Faculdade de Educação da Universidade de São Paulo*, *41*(2), 495–511. https://doi.org/10.1590/s1517-97022015021532

Amor García, P.A. (2019). Dualiza Bankia, la implicación de Bankia con la Formación Profesional Dual. *Revista de Educación, Innovación y Formación*, 0, 60–63.

Baethge, M., & Wolter, A. (2015). The German skill formation model in transition: From dual system of VET to higher education? *Journal for labour market research*, *48*(2), 97–112. https://doi.org/10.1007/s12651-015-0181-x

Baum T. (2015). Human resources in tourism: Still waiting for change? A 2015 reprise. *Tourism Management*, *50*, 204–212. https://doi.org/10.1016/j.tourman.2015.02.001

Bartlett, L., & Vavrus, F. (2017). *Rethinking Case Studies Research. A Comparative Approach*. Routledge.

Bentolila, S., Cabrales, A., & Jansen, M. (2020). ¿Qué empresas participan en la formación profesional dual? *Papeles de Economía Española*, *166*, 94–104.

Bentolila, S., & Jansen, M. (2019). La implantación de la FP dual en España: la experiencia de Madrid. *Información Comercial Española, ICE: Revista de economía*, *910*, 65–79. https://doi.org/10.32796/ice.2019.910.6923

Billett, S. (2009). Workplace participatory practices: The dualities constituting learning through work. In M. Durand & L. Filliettaz (Eds.), *Travail et Formation des Adultes* (pp.37–63). Presses universitaires de France.

Busemeyer, M. R., & Schlicht-Schmälzle, R. (2014). Partisan power, economic coordination and variations in vocational training systems in Europe. *European Journal of Industrial Relations*, *20*(1), 55–71. https://doi.org/10.1177/0959680113512731

Busemeyer, M. R., & Trampusch, C. (2019). The politics of vocational training: Theories, typologies, and public policies. In D. Guile & L. Unwin (Eds.), *The Wiley handbook of vocational education and training* (pp.137–164). Wiley.

Consejo Superior de Cámaras. (2000). *Manual de Formación en Centros de Trabajo*. Secretaría General Técnica. Centro de Publicaciones. Ministerio de Educación y Cultura.

Carabaña, J. (2011). *Algunas observaciones críticas a Learning for jobs. Revista de Ciencias y Humanidades de la Fundación Ramón Areces*, *4*, 130–138.

Deissinger, T. (2019). The sustainability of the dual system approach to VET In D. Guile & L. Unwin (Eds.), *The Wiley Handbook of Vocational Education and Training* (pp. 293–310). Wiley.

Deissinger, T., & Hellwig, S. (2005) Apprenticeships in Germany: Modernising the Dual System. *Education + Training*, 47(4/5), 312–324. https://doi.org/10.1108/00400910510601896

Domingo Cebrián, V. (2018). Los inicios de la Formación Profesional dual en Aragón. *Revista Complutense de Educación*, *29*(2), 371–385. https://doi.org/10.5209/RCED.52478

Echeverría, B., & Martínez-Clares, P. (2020). *Retos y estrategias de acción en torno a la investigación sobre Formación Profesional en España*. Fundación Bankia por la Formación Dual.

Echeverría Samanes, B., & Martínez Clares, P. (2018) Estrategias de mejora en la implantación de la Formación Profesional Dual en España. *EKONOMIAZ. Revista vasca de Economía* 94.02, 178–203.

Echeverría Samanes, B., & Martínez Clares, P. (2019). *Diagnóstico de la Investigación sobre la Formación Profesional Inicial en España* (2005–2017). Fundación Bankia por la Formación Dual y Fundación Bertelsmann.

Echeverría Samanes, B., & Martínez-Clares, P. (2021). Statu quo de la investigación sobre formación profesional en España: Análisis DAFO y CAME. *Revista EDUCARE-UPEL-IPB-Segunda Nueva Etapa 2.0*, *25*(1), 8–34. https://doi.org/10.46498/reduipb.v25i1.1459

Eichhorst, W., Rodríguez-Planas, N., Schmidl, R., & Zimmermann, K. F. (2015). A road map to vocational education and training in industrialized countries. *IlrReview*, *68*(2), 314–337. https://doi.org/10.1177/0019793914564963

Euler, D. (2013). *El sistema dual en Alemania - ¿es posible transferir el modelo al extranjero?* Bertelsmann Stiftung.

Filliettaz, L. (2011). Collective guidance at work: A resource for apprentices? *Journal of Vocational Education & Training*, *63*(3), 485–504. https://doi.org/10.1080/13636820.2011.580359

Flisi, S. (2020). *Building up evidence on Work-Based Learning in VET-A reflection on sources for possible indicators or benchmarks on WBL* (No. JRC118196). Joint Research Centre (Seville site).

Fuller, A. (2019). Does vocational education still need the concept of occupation? In D. Guile & L. Unwin (Eds.), *The Wiley Handbook of Vocational Education and Training* (pp. 81–96). Wiley.

Fuller, A., & Unwin, L. (1998). Reconceptualising apprenticeship: Exploring the relationship between work and learning. *Journal of Vocational Education and Training, 50*(2),153–73 https://doi.org/10.1080/13636829800200043

García Morata, I. (2015). Formación y mercado de trabajo: Análisis y evolución del sistema de Formación Profesional para el Empleo [Tesis Doctoral]. Universitat de València.

Gog, S. J. (2019). Excluded within the inclusive institution: The case of low-skilled, low-wage security employees. In D. Guile & L. Unwin (Eds.), *The Wiley handbook of vocational education and training* (pp. 207–226). Wiley.

Guile, D., & Unwin, L. (2019). *The Wiley handbook of vocational education and training*. Wiley.

Hager, P. (2019). VET, HRD, and workplace learning: Where to from here? In D. Guile & L. Unwin (Eds.), *The Wiley handbook of vocational education and training* (pp. 63–80). Wiley.

Korczynski, M. (2005). Skills in service work: An overview. *Human Resource Management Journal*, *15*(2), 3–14.

Ladkin, A. (2006). Careers and employment. In D. Airey & J. Tribe (Eds.), *An international handbook of tourism education* (pp. 437–449). Routledge.

Ladkin, A. (2011). Exploring tourism labor. *Annals of Tourism Research*, *38*(3), 1135–1155. https://doi.org/10.1016/j.annals.2011.03.010

Leidner, M. (2003). La cualificación pedagógica del personal que forma en los oficios artesanales de la construcción. *Revista Europea de Formación Profesional*, (28), 71-75. https://dialnet.unirioja.es/descarga/articulo/743453.pdf

Lillo-Bañuls, A., & Casado-Díaz, J. M. (2011). Capital humano y turismo: Rendimiento educativo, desajuste y satisfacción laboral. *Estudios de economía aplicada*, *29*(3), 755–780.

López Rouco, M.Á. (2018). Análisis y evolución de la formación profesional en España. Logros y retos en la formación de profesionales de la hostelería y el turismo. *Estudios Turísticos*, *215*, 61–77.

Lucas, R. (2004). *Employment relations in the hospitality and tourism industries*. Routledge.

Marco-Lajara, B., & Úbeda-García, M. (2013). Human resource management approaches in Spanish hotels: An introductory analysis. *International Journal of Hospitality Management*, *35*, 339–347. https://doi.org/10.1016/j.ijhm.2013.07.006

Marhuenda, F., Martínez, I., & Navas, A. (2004). Conflicting vocational identities and careers in the sector of tourism. *Career development international*, *9*(3), 222-244. https://doi.org/10.1108/13620430410535832

Marhuenda, F., Chisvert, M.J., & Palomares Montero, D. (2016). "La formación profesional dual en España: Consideraciones sobre los centros que la implementan." *RIO: Revista Internacional de Organizaciones*, *17*, 43–63. https://doi.org/10.17345/rio17

Marhuenda-Fluixá, F., Chisvert-Tarazona, M. J., Palomares-Montero, D., & Vila, J. (2017). Con d de dual: Investigación sobre la implantación del sistema dual en la formación profesional en España. *Educar*, *53*(2), 285–307. https://doi.org/10.5565/rev/educar.821

Marhuenda-Fluixá, F., Chisvert-Tarazona, M. J., & Palomares-Montero, D. (2019). *The school-based vocational education and training system in spain*. Springer. https://doi.org/10.1007/978-981-13-8475-2

Martín Artiles, A., Barrientos, D., Moles Kalt, B., & Lope Peña, A. (2019). Política de formación dual: Discursos con Alemania en el imaginario. *Política y sociedad*, *56*(1), 145–167. https://doi.org/10.5209/poso.60093

Martínez García, J. S. (2016). Formación profesional: tensiones y dinámicas sociales. *Revista Internacional de Organizaciones*, 17, 21–42. https://doi.org/10.17345/rio17

Moldes Farelo, R. (2020). ¿Por qué el Contrato para la Formación y el Aprendizaje no mejora la empleabilidad de los jóvenes? Aproximación cualitativa a las dificultades para implantar el sistema de Formación Profesional Dual en España. *Relaciones Laborales y Derecho del Empleo*, *8*(2), 68–91.

Muehlemann, S. (2019). Measuring performance in vocational education and training and the employer's decision to invest in workplace training. In D. Guile & L. Unwin (Eds.), *The Wiley handbook of vocational education and training* (pp. 187–206). Wiley.

Muehleman, S., & Wolter, S. (2019). *The economics of apprenticeship training: Seven lessons learned from cost-benefit surveys and simulations*. New Skills At Work J.P. Morgan, Bertelsmann Stiftung. https://www.bertelsmann-stiftung.de/index.php?id=5772&tx_rsmbstpublications_pi2%5bdoi%5d=10.11586/2019062&no_cache=1

Oliver, D., Yu, S., & Buchanan, J. (2019). Political economy of vocational education and training. In D. Guile & L. Unwin (Eds.), *The Wiley handbook of vocational education and training* (pp. 115–136) Wiley.

Orr, K. (2019). VET teachers and trainers. In D. Guile & L. Unwin. *The Wiley handbook of vocational education and training* (pp 329–348). Wiley.

Park, S., Yaduma N., Lockwood A., & Williams A. (2016). Demand fluctuations, labour flexibility and productivity. *Annals of Tourism Research*, 59, 93–112. https://doi.org/10.1016/j.annals.2016.04.006

Pérez Salguero, G., & Gómez Cervantes, M. M. (2019). La Formación Profesional Dual en el IES Ginés Pérez Chirinos: un ejemplo de buenas prácticas. *Revista de educación, innovación y formación: REIF*, 0, 47–59. https://doi.org/10.4438/1988-592X-0034-8082-RE

Pineda-Herrero, P., Fernández-de-Álava, M., & Espona-Bracons, B. (2018). Formación profesional dual. Las motivaciones de las empresas del sector de la automoción en España para involucrarse en formación profesional dual. *Revista de educación*, *382*, 33–56. https://doi.org/10.4438/1988-592X-RE-2018-382-391

Pineda-Herrero, P., Ciraso-Calí, A., & Arnau-Sabatés, L. (2019). La FP dual desde la perspectiva del profesorado: elementos que condicionan su implementación en los centros. *Educación XX1*, *22*(1), 15–43, https://doi.org/10.5944/educXX1.21242 .

Pozo-Llorente, M. T., & Poza-Vilches, M. D. F. (2020). Conditioning factors of sustainability of dual vocational educational training in Andalusia (Spain): Case study of three educational centres. *Sustainability*, *12*(22), 93–56. https://doi.org/10.3390/su12229356

Ros-Garrido, A., & Marhuenda-Fluixá, F. (2019). The education of VET teachers and trainers. In F. Marhuenda-Fluixá (Ed.), *The school-based vocational education and training system in Spain* (pp. 87–103). Springer. https://doi.org/10.1007/978-981-13-8475-2

Roure-Niubó, J., & Boudjaoui, M. (2016). Estrategias de profesionalización para la implementación de la formación en alternancia en educación superior en España: El caso del Instituto Máquina Herramienta (IMH) de Elgoibar (País Vasco). *Educar*, *52*(2), 315–336. https://doi.org/10.5565/rev/educar.748

Sanz de Miguel, P. (2017) Gobernanza de la formación profesional dual española: entre la descoordinación y la falta de objetivos. *Revista Española de Educación Comparada*, *30*, 77–98. https://doi.org/10.5944/reec.30.2017.18705

Šćepanović, V., & Martín Artiles, A. (2020). Dual training in Europe: A policy fad or a policy turn? *Transfer: European Review of Labour and Research*, *26*(1), 15–26. https://doi.org/10.1177/1024258919898317

Sotomayor Vázquez, A. (2017). Implantación y evolución de la formación profesional dual española. *Revista de Estudios e Investigación en Psicología y Educación*, 7, 58–61. https://doi.org/10.17979/reipe.2017.0.07.2525

Strietska-Ilina, O., & Tessaring, M. (2005). *Trends and skill needs in tourism*. Cedefop Panorama Series, Office for Official Publications of the European Communities.

Stuart, M. (2019). The industrial relations of training and development. In D. Guile & L. Unwin (Eds.), *The Wiley handbook of vocational education and training* (pp. 165–185). Wiley.

Veijola, S. (2009). Introduction: Tourism as work. *Tourist Studies*, *9*(2), 83–87. https://doi.org/10.1177/1468797609360748

Viktorovna, K. T., & Avtandilovna, C. N. (2014). Research of competence-based tourism educational system's conformity with requirements of a modern business-society. *World Applied Sciences Journal*, *30*(MCTT), 22–24.

Vogelsang, B., Röhrer, N., Fuchs, M., & Pilz, M. (2021). Cooperation between learning venues and its limits: The hotel industry in Cancún (Mexico). *International Journal for Research in Vocational Education and Training (IJRVET)*, *8*(4), 67–89. https://doi.org/10.13152/IJRVET.8.4.4.

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Leveling Entrepreneurial Skills of Vocational Secondary School Students in Indonesia: Impact of Demographic Characteristics

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Abstract

Context: This article aims to determine the entrepreneurial skills of Vocational Secondary School students after the implementation of a new curriculum that promotes entrepreneurship courses in Indonesia. The authors believe that after taking such courses, students will be able to generate entrepreneurial skills. This study also explores the effect of demographic characteristics on students' entrepreneurship skills level, especially with respect to gender, school, and family.

Approach: This study used a quantitative approach, with data collected through a questionnaire with five variables, that is, leadership, reflective communication, risk-taking, creatively innovative, and future orientation. Data were collected from 463 students who had taken entrepreneurship subjects that were chosen randomly. Data were analyzed using linear regression.

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Findings: 52.22% of our respondents had a moderate score for entrepreneurial skills, this is not in accordance with the expected learning outcomes, there are students who have entrepreneurial skills at a high level. With respect to creative innovation, in particular, a majority (53.15%) had a low score and 4.1% had a very low score. Moreover, family had a significant and positive effect on all dependent variables (leadership scores, reflective communication scores, risk-taking scores, creatively innovative scores, future orientation scores, and overall entrepreneurial skills scores). School demographic characteristics had a significant positive effect on the value of future orientation. These results indicate that private schools tend to strengthen the level of reflective communicative scores.

Conclusion: The entrepreneurial skills of most vocational students are middling. This indicates that entrepreneurship subjects at Vocational Secondary schools have not been able to achieve their expected learning outcomes or help students develop entrepreneurial skills at a high level. Thus, further research is needed to determine the causes behind the problem. Schools are expected to be able to establish harmonious relationships by involving families to support the improvement of an informal learning environment that supports the mastery of entrepreneurial skills of vocational students.

Keywords: Entrepreneurial Skills, Entrepreneurship Subjects, Vocational Secondary School, VSS, Demographic Characteristics, Vocational Education and Training, VET

1 Introduction

As recently as 2018, the entrepreneurial skills of Indonesians were still quite limited. Based on data from The Global Entrepreneurship Index (GEI), an institution that measures the quality of a country's entrepreneurial ecosystem on a global scale, Indonesians achieved a low GEI score of 21%, ranking them 94th out of the 137 countries in the world measured. The country with the highest ranking is the United States with a score of 83.6% (Global Entrepreneurship Index, 2019). In Southeast Asia, Indonesia was only able to outperform Myanmar (13.6%). The solution to bridging this widening gap is to develop appropriate entrepreneurial skills in your population. Entrepreneurs have the greatest opportunity for a share of the job market in the 21st century (Bongomin et al., 2018; Hameed & Irfan, 2019; Momani, 2017; Valliere & Peterson, 2009; Wiens & Jackson, 2015).

One strategy for increasing entrepreneurial skills is through education (Kirkley, 2017; Mwasalwiba, 2010; Norberg, 2016). More attention should be paid to schools to help students develop skills that are important for improving their lives, especially for work and entrepreneurship (The United Nations Educational, Scientific, and Cultural Organization [UNESCO], 2017). Education that provides opportunities for students to learn by doing will be more meaningful, in improving both soft skills (including entrepreneurial skills) and hard

skills. Vocational Secondary Schools (VSS) are one type of school in Indonesia with graduates who are ready to work and possess entrepreneurial skills.

The attractiveness of VSS is increased by the variety of vocational majors that students can choose from and faster employment opportunities compared to common Senior Secondary School (SSS) graduates (Johnson & Stokes, 2002). However, the increase in the enrolment rate in VSS has not been matched by an increase in the number of employment opportunities after graduation yet. In Indonesia, there are currently 14,301 units of VSS, where 25.33% are public and 74.67% are private. According to the database of Directorate General of Early Years, Basic, and Secondary Educations, the total number of public and private VSS students is more than 14000, divided into nine areas of expertise, 49 expertise programs, and 146 skill competencies (Directorate General of Early Years, Basic, and Secondary Educations, 2022).

Yet, the employment rate of VSS graduates is still below 50% of all graduates (Mutaqin et al., 2016). This adds to the high number of unemployed people in Indonesia, with the unemployment rates of VSS students consistently dominating the unemployment rates of students attaining other levels of education. According to the Statistics Indonesia (Badan Pusat Statistik), the unemployment rate of VSS graduates was 8.49% of the total workforce of 137.91 million people (Badan Pusat Statistik [BPS], 2020). This is higher than other educational level graduates. Government support and policies are needed to maximize the output of VSS graduates. Approximately 14.85 million (11.56%) VSS graduates are working. This is much lower than the 24.34 million people (18.95%) that represent the total working population. From a policy perspective, the government has issued a regulation to revitalize VSS aimed at improving the quality and competitiveness of the country's human resources. The regulation is aimed at increasing the competitiveness and independence of students at vocational schools so that the human resources of Indonesia are either seeking or creating jobs. Between 2030 and 2040, the population of people of productive age is predicted to reach 64% of the total population, which in turn is projected to be 297 million people (The Ministry of National Development Planning [Bappenas], 2017). For this reason, entrepreneurship at VSS is one of the educational programs that must be carried out to equip the predicted growth in the number of people.

Hisrich (2005) stated the importance of entrepreneurship as a dynamic process of creating additional wealth by providing value products or services. The product or service may or may not be new or unique, but the value must somehow be imbibed by the entrepreneur by receiving and locating the necessary skills and resources. Entrepreneurship is the dynamic, institutionally embedded interaction between entrepreneurial attitudes, entrepreneurial abilities, and entrepreneurial aspirations of individuals, which drives the allocation of resources through the creation and operation of new ventures (Global Entrepreneurship Index [GEI] 2019).

An individual who has a high level of entrepreneurial skills will be able to take advantage of the opportunities around them very well. There are several advantages to having well-developed entrepreneurial skills: (1) Generating freedom and opportunities to control one's destiny; (2) Providing opportunities to implement changes; (3) Providing opportunities to reach one's optimum potential; (4) Having the opportunity to make a profit; (5) Having the opportunity to play an active role; (6) Having the opportunity to do something that one is passionate about (Zimmerer et al., 2008). Furthermore, Isidro (2012) states that there are 10 benefits of having entrepreneurial skills:

1. The freedom to pursue your vision,
2. The control and flexibility you have over your own time,
3. The opportunity to learn and gain knowledge,
4. The highs and lows of self-employment,
5. The sense of pride and fulfilment in accomplishing things,
6. The confidence you gain in knowing that you can do it,
7. Potential earnings exceed a salaried employee,
8. Business owner reaps the full rewards,
9. Each new day is a challenge,
10. The chance to share your learning.

The Indonesian government has begun making improvements to entrepreneurial teaching patterns in VSS, by increasing the number of learning hours for subjects directly related to the mastery of entrepreneurial skills. The expected achievement is that students possess a high level of entrepreneurial skills. It is necessary to assess students' entrepreneurial skills after they study the relevant subjects. Furthermore, this study also attempts to reveal the effect of demographic characteristics on the level of students' entrepreneurial skills. To that end, the research questions that must be answered are:

1. What is the entrepreneurial skill level of most VSS students?
2. Do demographic characteristics affect students' entrepreneurship skill levels?

2 Theoretical Framework

This part reviews the concepts and measurement issues of entrepreneurial skills, entrepreneurial learning, and learning evaluation. Moreover, this part also reviews the previous empirical evidence on demographic characteristics' impact on entrepreneurial skills.

2.1 Entrepreneurial Skills

To achieve the desired level of entrepreneurism, individuals should be directed towards developing entrepreneurial practices in appropriate educational programs. European Commission (2008) states that entrepreneurial skills education significantly improves entrepreneurial behaviors. A study by Trevelyan (2009) reveals that for new entrepreneurs, their attitude towards work is important for differentiating searching strategies, the extent of organizing activity, and the initial operating status of their businesses. The more positively a person thinks about themselves and their career choices, the more likely he/she is to use a broad searching strategy to enhance the process of opportunity recognition. Kruger and Steyn (2021) propose a conceptual model that reviews business competencies and functions for entrepreneurs coping with the transformation of the traditional era into the industrial 4.0. These entrepreneurial competencies include innovation, creativity, the integration of business and technology skills, leadership and communication, networking, and sales.

Several studies have been conducted to identify the character or personality of entrepreneurs (entrepreneurial skills). Raine and Pandya (2019) state that indicators for the formation of entrepreneurial skills lead to three key factors for entrepreneurial success: Curiosity, creativity, and commitment. McClelland (1976) describes the entrepreneur's profile as (1) having a desire for responsibility; (2) preferring medium risk; (3) believing in his/her ability to succeed; (4) innately desiring feedback; (5) having high energy levels; (6) being future-orientated; (7) having organizational skills; and (8) assessing performance as being more important than money. In addition to these eight criteria, Zimmerer et al. (2008) suggest four additional entrepreneurial characteristics: (1) High commitment; (2) tolerance of ambiguity; (3) flexibility; and (4) tenacity. Other experts (Sanchez et al., 2020) simplify the indicators of entrepreneurial skills into five characteristics: (1) Need for achievement; (2) desire for autonomy, (3) creativity and opportunism; (4) risk-taking abilities, and (5) locus of control.

Furthermore, Schelfhout et al. (2016) formulated entrepreneurial skill instruments by considering 10 variables: (1) Performance orientation, (2) creativity, (3) taking the initiative, (4) taking calculated risk, (5) perseverance, (6) leadership, (7) communication skills, (8) planning and organizing, (9) collaboration, and (10) reflection. These instruments can be applied to self-evaluation, peer evaluation, and joint evaluation; they can also be used to presume students' initial skills at the beginning of the learning process.

Entrepreneurial skills are an essential aspect of learning, which determine students' attitudes. In addition, the development of entrepreneurship skills is crucial for supporting students who are motivated to be entrepreneurs. In this sense, entrepreneurial skills can be learned and not controlled by indelible personal characteristics or entrepreneurial education (Hattab, 2014; Ibrahim & Lucky, 2014). There are several characteristics of entrepreneurial skills that are levelled up through education. These characteristics form the basis of economic, social, and cultural entrepreneurship (Gontareva et al., 2018; Krasniqi, 2018; Madgerova & Kyurova, 2019).

Entrepreneurial skills affect students' entrepreneurial cognition in starting new businesses, in terms of identifying the most effective entrepreneurial skills in the education business (risk-taking, critical thinking, problem-solving, and innovation) that lead students to become self-employed. In line with Badawi et al. (2019), the influence of entrepreneurial skills in developing entrepreneurial attitudes through insights into relevant business curricula provides us with more case studies on risk analysis and the cultivation of greater thinking and problem-solving skills, especially through simulations relevant to real-life cases. Students who wish to be entrepreneurs should be able to develop innovative plans such that after graduating they can develop their own businesses; in this case, VSS function as business incubator.

This study measured entrepreneurial skills based on the following five aspects representing the comprehensive measurement of entrepreneurial skills: Leadership, reflective communication, risk taking, creative innovation, and future orientation.

Leadership is the first aspect of entrepreneurial skills, and its essence is reflected in how one can influence others to understand and agree on what needs to be done to achieve common goals. Leitch and Volery (2017) argued that upon closer inspection, the entrepreneur is a leader par excellence capable of identifying opportunities from various stakeholders and also taking advantage of said opportunities to create value. This makes leadership an important aspect of entrepreneurship.

The second aspect of entrepreneurial skills is reflective communication, which is a set of abilities that includes being able to explain, discuss, and market goods or services through interactions (Abbasi et al., 2011). Furthermore, Abbasi et al. (2011) stated that the importance of communication skills precedes that of social skills because the former includes important affective, cognitive, and behavioral aspects. In our study, the reflective communication indicators included (1) warmth in associating, (2) being flexible/adaptive, (3) being tolerant/cooperative, (4) ability to influence others, (5) willingness and ability to self-assess, (6) feeling free and safe, and (7) willingness to improve (receiving feedback).

The third aspect of entrepreneurial skills is risk taking, which is the act or fact of doing something that involves danger or risk to achieve a goal. Petrakis and Katsaiti (2014) distinguished the following four combinations of time orientation and risk predisposition:

Short-term, low-risk behavior; long-term, low-risk behavior; short-term, high-risk behavior; and long-term, high-risk behavior. Entrepreneurs may vary in their approach to risk taking.

The fourth aspect of entrepreneurial skills is creative innovation, which plays an important role in entrepreneurial success (Kabukcu, 2015). Entrepreneurship is often considered to be inseparable from creative innovation, which manifests in the act of starting and running a business (Baldacchino, 2009). Therefore, the value of creative innovation lies in providing an opening for astute entrepreneurship and actively seeking opportunities to do new things in extraordinary ways (Okpara, 2007).

The fifth aspect of entrepreneurial skills is future orientation. Petrakis and Katsaiti (2014) stated that entrepreneurial activities oriented toward innovation are developed by individuals with high levels of the Distant–Future Orientation axis. Entrepreneurs must be directed toward the future so that they are more committed to the activities they undertake.

2.2 Entrepreneurial Learning

Cosenz and Noto (2018) stated that entrepreneurship learning can be done with a start-up business so that students can learn via doing. The experiences gained during entrepreneurial learning can have a positive effect on determining students' entrepreneurial intentions and entrepreneurial mindset (Ahmed et al., 2020; Handayati et al., 2020).

Furthermore, the new curriculum in Indonesia has a mandate to teach an entrepreneurship subject from the elementary school level up to the level of higher education, including at VSS. The first change in the VSS curriculum was the number of teaching hours of an entrepreneurship subject, which increased to up to 524 hours. The second is that the entrepreneurship subject moves to become one of the subjects in the Productive Subjects group, so that it becomes one of the main subjects that support the skills of vocational school graduates. Thus entrepreneurial subjects in productive subject groups must carry out practical learning greater than theory. Students who study in vocational schools set a higher value on practical knowledge compared to theoretical knowledge (Ferm, 2021). The new curriculum ensures that the entrepreneurial subject is taught in a predominantly practice-oriented manner rather than as theoretical knowledge. Learning entrepreneurship by practice provides a lot of enriching experiences for students. Failure or success in attempting entrepreneurship is a valuable experience in itself; an important lesson for students (Liu et al., 2019).

Entrepreneurship education must be fully incorporated into the secondary school curriculum as a core course and not just as a crosscutting concept; the design has to be fully functional (Boehm, 2020; Charity et al., 2017). Thus, entrepreneurship education should effectively support students in becoming entrepreneurs, job creators, and independent individuals through proper training, including courses, seminars, and workshops.

The potential for improving the learning process can be enhanced by attractive, motivating, and effective media, which create favorable situations between students and teachers (Almeida, 2017). This design can generate problem-solving skills and stimulate reasoning that results in core learning competencies. In entrepreneurship, these elements are very relevant because they involve multidisciplinary, creative, explorative, and argumentative thinking skills, which provide a broad understanding of business dynamics, stimulate innovative ideas, and encourage and prepare students to be able to establish independent jobs as well as create new jobs. This is in line with findings in the extant literature that claim that entrepreneurial skills are related to the company creation process (Adeyemo, 2009; Kuratko, 2016; Levie et al., 2010; Liñán, 2008).

It takes students' hard and soft skills, mediated by their personalities, attitudes, and behaviors to be successful entrepreneurs (Ayuningtyas et al., 2015; Barnawi, 2012). Along with soft skills, students should be prepared with reliable entrepreneurial skills. Entrepreneurial skills develop and increase entrepreneurialism in students, while schools deliver graduates who have great concern for society, courage, and independence with the necessary ability and skills when entering employment. Based on this reasoning, VSS must pay quality attention to their students, not only providing knowledge and skills according to the student's talents but trusting them to get involved in real working experiences so that their potential evolves in synchrony as well.

2.3 Learning Evaluation

Stufflebeam and Coryn (2014, p. 14) say that evaluation is "the systematic process of delineating, obtaining, reporting, and applying descriptive and judgmental information about some object's merit, worth, probity, feasibility, safety, significance, and/or equity". Evaluation is a systematic process that describes, obtains, reports, and applies descriptive information and assessments that are useful as the basis of decision-making. Fitzpatrick et al. (2011) state that evaluation is the process of looking for something valuable, i.e., in the form of information about a particular program, production, or alternative procedure(s). They also mention that evaluation is not something new when one becomes an entrepreneur; it is common throughout life. In line with two experts, Bloom (1971) gives his opinion on evaluation; evaluation is the collection of facts that are systematically designed to determine whether there has been a change in the students or not, and to determine the scope of effect in the students' personalities. In general, evaluation aims at exploring the possibility to acquire improvements in a business and, in turn, to further advance the desired goals. In other words, the main purpose of an evaluation is to improve a program or action in the future.

The evaluation that is the focus of this study concerns results (outcome) and comprises two elements: Outcome and impact evaluation (Chen, 1996). Evaluation of problem-based

learning will be more meaningful if it is carried out using mixed techniques (quantitative and qualitative) on observations and questionnaires (Al-Kloub et al., 2014; Byers et al., 2018).

The scope of learning evaluation comprises three elements: Cognitive, affective, and psychomotor (Febriana, 2019). The cognitive feature comprises six levels of ability: Knowledge, understanding, application, analysis, synthesis, and evaluation. The affective element has four levels: Willingness to accept, willingness to respond, assessment, and organization. The psychomotor feature represents the students' ability to exert their bodies and their parts, starting from the simplest movements and advancing to the most difficult ones. There are several verbs to assess psychomotor learning, which are categorized into three groups: (1) Showing movement (muscular or motor skill); (2) repairing, compiling, cleaning, shifting, moving, and shaping (manipulating materials or objects), and (3) observing, applying, connecting (neuromuscular coordination). Entrepreneurial skills have all three elements of evaluation: Cognitive, affective, and psychomotor.

Widoyoko (2019) describes learning outcomes with a slightly different approach. The results of the learning process are divided into two kinds: Output and outcome. Learning output is a short-term learning outcome, which is further divided into two types: Hard skills and soft skills. Hard skills are in turn divided into academic skills and vocational skills. Soft skills are required to achieve a successful life in society. Therefore, soft skills are also divided into two elements: Personal skills and social skills. The variety of student skills as a result of this learning is presented in the following chart.

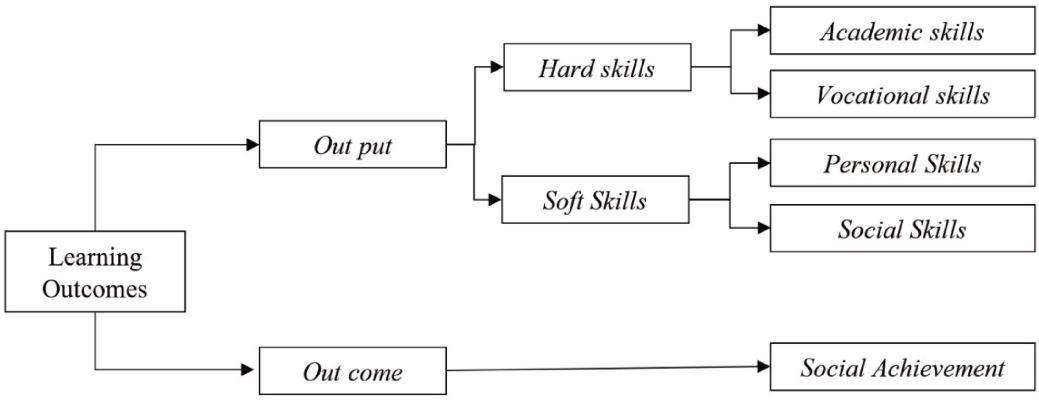

Figure 1: Learning Outcome Classification Chart (Widoyoko, 2019, p. 29)

2.4 Demographic Characteristics and Entrepreneurial Skills

Several factors affect the level of entrepreneurial skills, including financial conditions (Tan, 1999), motivation (Stahl et al., 2002), and the country's governmental policies (Denanyoh et al., 2015). Moreover, there is a group of different demographic characteristics that determine the level of entrepreneurial skills (Karimi et al., 2017; Ozyilmaz, 2011). According to Karimi et al. (2017), there are specific demographic characteristics that have been found to correlate with entrepreneurial intentions and skills. A group of studies shows that several demographic characteristics thought to be the best predictors of entrepreneurial skills and behavior include entrepreneurs' sex, age, origin, educational level, and previous work experience (Brockhaus & Horwitz, 1986; Talaş et al., 2013).

For instance, research conducted by DeTienne and Chandler (2007) pointed out that males and females possess specific elements of human capital that they use differentially to identify business opportunities. However, there was no change in the innovativeness of the opportunities they identified. Devine (1994) found that there were more female entrepreneurs than male ones recently, suggesting that entrepreneurship is no longer seen as an exclusively male-orientated field of work. Another study showed that women are more interested than men in voluntary work, while men are more motivated to open their own businesses (Krstic et al., 2017). Another study conducted by Blanchflower and Oswald (1990) highlighted that young individuals with a self-employed parent tend to establish a business for themselves. This study indicates that family background is highly correlated with entrepreneurial skills.

Soomro et al. (2019) investigated the demographic factors influencing the success of entrepreneurs of small and medium-sized enterprises (SMEs) in Pakistan and showed that there are positive and significant correlations between sex, education, working experience, and business success of entrepreneurs in Pakistan SMEs sector. This research indicates that demographic constructs play a positive and significant role in raising entrepreneurs. Finally, Singh and Singhal (2015) investigated the main association of demographic variables with entrepreneurial intention and skills among students in India. The results revealed that sex, family type, family background, and degree have a significant effect on entrepreneurial objectives.

3 Methods

This study used a quantitative approach. It included 1450 VSS students attending a business and management course in Central Java, which received the title of the Center of Excellence (CoE). A multistage sampling technique was used to reach the target population. In the initial stage, 15 VSS (public and private) were selected using a simple random sampling technique. Then, a list of class 11 and 12 students was collected from each school as the target sample size was drawn using a systematic random sampling technique. Thus, the study respondents

included 495 students from 15 VSS in Central Java, Indonesia. Informed consent from the respondents was obtained and the authors confirm that the relevant ethical approvals were fulfilled. The study was conducted in September and December 2021. The questionnaires were distributed to 495 students with 463 responses received (response rate: 93.5%). Then, instruments were measured by the value of the KMO and Bartlett's Test. The desired correlation between variables was h > 0.5 followed by a significance value < 0.05. The results of the instrument measurement are presented in Table 1.

Table 1: Output of KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.807
Bartlett's Test of Sphericity	Approx. Chi-Square	5376.223
	Df	1035
	Sig.	0.000

Table 1 shows that the results returned a KMO value of 0.807. The p-value associated with Bartlett's Test of Sphericity was 0.000.

Further, we present the correlations between the independent variables, in an Anti-Image Matrices table (Table 2). The value to be considered is the MSA (Measure of Sampling Adequacy); if the MSA value is > 0.5, the item can be predicted.

Table 2: Score of Measure of Sampling Adequacy (MSA)

Indicator	**MSA**
Leadership	0.754
Reflective communication	0.732
Risk-taking	0.745
Creatively innovative	0.733
Future orientation	0.773

Table 2 shows that all of the indicators have a value > 0.5. It can therefore be interpreted that the instrument meets the requirements to be able to predict indicators of leadership, reflective communication, risk-taking, creatively innovative, and future orientation in the sample to be measured.

Furthermore, to determine the influence of demographic characteristics on the level of entrepreneurial skills of VSS students, a linear regression analysis was employed to test the impact of demographic characteristics on the five levels of measured entrepreneurial skills: Leadership, reflective communication, risk taking, creative innovation, and future orientation. In this study, we used the following three demographic characteristics as explanatory variables: Sex, school status, and family background.

The data for sex, school status, and family background were drawn from the main instrument, which also collects these three demographic characteristics. Furthermore, all demographic characteristics were measured as dummy values. First, the dummy for sex was assigned a value of 1 if female, and 0 otherwise. Second, the dummy for school status was assigned a value of 1 if the respondent came from a public VSS, and 0 otherwise. Third, the dummy for family background was assigned a value of 1 if the respondent had an entrepreneurial background (self-employed) and 0 otherwise. Table 3 presents the operational definitions of these variables. Finally, the impact of the three demographic characteristics was tested on the five levels of measured entrepreneurial skills plus the overall score of entrepreneurial skills. Hence, the resulting six models present the impact of demographic characteristics on the level of entrepreneurial skills:

1. Model 1: The influence of demographic characteristics on the score of leadership.
2. Model 2: The influence of demographic characteristics on the score of reflective communication.
3. Model 3: The influence of demographic characteristics on risk-taking scores.
4. Model 4: The influence of demographic characteristics on the score of creatively innovative.
5. Model 5: The influence of demographic characteristics on the score of future orientation.
6. Model 6: The influence of demographic characteristics on the overall score of entrepreneurial skills.

Table 3: Definition of Variables

Dependent Variable	**Description of Variables**
Leadership	Level of leadership skills
Reflective communication	Level of reflective communication skills
Risk taking	Level of risk-taking skills
Creatively innovative	Level of creatively innovative skills
Future orientation	Level of future orientation skills
Overall score of entrepreneurial skills	Level of overall score for entrepreneurial skills
Explanatory Variable	**Description of Variables**
Sex	The dummy for sex is assigned as 1 if female and 0 otherwise.
Scholl status	The dummy for the school status is assigned as 1 if the respondent came from public VSS and 0 otherwise.
Family background	The family background is assigned as 1 if the respondent has an entrepreneur background (self-employed) and 0 otherwise.

4 Findings

This section presents the empirical findings of the study. In the first part, the five measurements of entrepreneurial skills levels of VSS students, namely Leadership, Reflective Communication, Risk-Taking, Creativity and Innovation, and Future Orientation, are reported. In the second part, the effects of demographic characteristics on entrepreneurial skills are discussed.

4.1 Entrepreneurial Skills Level of VSS Students

The data on the five variables comprising overall entrepreneurial skills have been processed and yielded the following results.

4.1.1 Leadership

The essence of leadership lies in how one can influence others to understand and agree on what needs to be done to achieve common goals. This makes leadership an important facet of being an entrepreneur. Leitch and Volery (2017) argue that on closer inspection, the entrepreneur is a leader *par excellence* who identifies opportunities from various stakeholders and takes advantage of said opportunities to create value. For this purpose, they created the visionary scenarios needed to select and mobilize supporting members of the group who enact the vision to achieve value creation. In this study, indicators of leadership included task orientation and relationship orientation. The scores for leadership are displayed in Table 4.

Table 4: Level of Leadership Skills

No	Criteria	Amount	%
1	Very high	4	0.86
2	High	102	22.03
3	Middle	270	58.32
4	Low	87	18.79
5	Very low	0	0
	Total	463	100

Table 4 shows that only 22.89% (comprises the very high and high criteria) of respondents capable of learning outcomes have entrepreneurial skills which are high and very high. While as many as 77.11% (comprising the middle and low criteria) are yet to achieve the expected learning outcomes.

4.1.2 Reflective Communication

An entrepreneur must be able to explain, discuss, and market goods or services through interactions. This can be understood as a form of communication. Several previous studies have demonstrated the importance of communication. Abbasi et al. (2011) state that the importance of communication skills precedes that of social skills because the former include important affective, cognitive, and behavioral aspects. In our study, the reflective communication indicators include (1) warmth in associating; (2) flexible/adaptive; (3) tolerant/cooperative; (4) ability to influence others; (5) willingness and ability to self-assess; (6) feeling free and safe; and (7) willingness to improve (receiving feedback).

Table 5: Level of Reflective Communication Skills

No	Criteria	Amount	%
1	Very high	1	0.22
2	High	44	9.50
3	Middle	249	53.78
4	Low	154	33.26
5	Very low	15	3.24
	Total	463	100

From Table 5, the achievement of a very high score is rare; only 0.22% reached this criterion. The high criterion load is 9.50%. Thus, only 9.72% of the total respondents have achieved the required learning outcomes. The number of respondents who have not reached the learning outcome account for 90.28% of all (comprising middle, low, and very low criteria).

4.1.3 Risk-Taking

Entrepreneurship requires taking risks to achieve goals. Entrepreneurs may vary in their approaches to, and considerations of, risk-taking. Some have a short-term and others a long-term orientation, which tends to affect their risk-taking decisions. Petrakis and Katsaiti (2014) distinguish four different combinations of time orientation and risk predisposition. They were short-term, low-risk behavior; long-term, low-risk behavior; short-term, high-risk behavior; long-term, high-risk behavior. Indicators of risk-taking in this study include (1) responsibility, (2) courage in making decisions, (3) willingness to try, and (4) tolerance of failure.

Table 6: Level of Risk-Taking Skills

No	Criteria	Amount	%
1	Very high	7	1.51
2	High	109	23.54
3	Middle	278	60.04
4	Low	68	14.69
5	Very low	1	0.22
	Total	463	100

Table 6 shows that only 1.51% achieved the very high criterion and 23.54% achieved the high criterion. Thus, those who achieved learning outcomes totaled 25.05%, while 74.95% (comprising the middle, low, and very low criteria) failed to achieve the outcomes.

4.1.4 Creatively Innovative

Creative innovation plays an important role in entrepreneurial success (Kabukcu, 2015). Entrepreneurship is often considered inseparable from creative innovation, which in turn is manifested in the act of starting and running a business (Baldacchino, 2009). Therefore, the value of creative innovation is in providing an opening for astute entrepreneurship and actively seeking opportunities to do new things in extraordinary ways (Okpara, 2007). In this study, creatively innovative indicators include (1) originality, (2) fluency, (3) elaboration, (4) flexibility, (5) appropriateness, and (6) innovation.

Table 7: Level of Creatively Innovative Skills

No	Criteria	Amount	%
1	Very high	0	0
2	High	23	4.97
3	Middle	175	37.80
4	Low	246	53.13
5	Very low	19	4.10%
	Total	463	100

From Table 7, there are no respondents who accomplish learning outcomes at a very high level, and only 4.97% achieve a high level. As many as 95.03% (comprising the middle, low, and very low criteria) of respondents have not accomplished learning outcomes. For this variable, the findings are quite surprising because the number of students with low and very low criteria of entrepreneurial skills is dominant (57.23%).

4.1.5 Future Orientation

Petrakis and Katsaiti (2014) stated that entrepreneurial activities which are oriented towards innovation are developed by individuals with high levels of the axis Distant-Future Orientation. Entrepreneurs must be directed toward the future so that they are more committed to the activities they undertake. Thus, Distant-Future Orientation is a very important attribute for entrepreneurs to have. In this study, the indicators of future orientation include (1) anticipatory (prospective), (2) strategic thinking and acting, (3) planning, programming, budgeting (programmed), and (4) a sense of time.

Table 8: Level of Future Orientation Skills

No	Criteria	Amount	%
1	Very high	16	3.46
2	High	113	24.41
3	Middle	237	51.19
4	Low	96	20.73
5	Very low	1	0.22
	Total	463	100

Table 8 shows that respondents who accomplish the learning outcome total 27.87% (comprising the very high and high criteria). Similar to the other sub-indicators, the number of respondents who have not achieved the learning outcome stands at 72.14% (comprising the middle, low, and very low criteria).

4.1.6 Level of Overall Score for Entrepreneurial Skills

All scores on the variables of leadership, reflective communication, risk-taking, creatively innovative, and future orientation are then processed to obtain an overall score for entrepreneurial skills. The level of overall score for entrepreneurial skills of VSS students in our study is presented in Table 9.

Table 9: Percentage Level of Overall Score for Entrepreneurial Skills

No	Criteria	%
1	Very high	1.20
2	High	16.88
3	Middle	52.22
4	Low	28.12
5	Very low	1.55
	Total	100

Table 9 shows that the highest score of the five criteria is the middle criterion at 52.2%, followed by the low and very low criteria at 29.67%. Eventually, based on the overall score of entrepreneurial skills, only 18.08% of respondents reached learning outcomes at high and very high levels.

4.2 Effects of Demographic Characteristic on Entrepreneurial Skills

This section reports the regression results of the impact of the VSS students' demographic characteristics on the five levels of measured entrepreneurial skills. First, we report the multicollinearity tests of the regression models. We employed a correlation test among the independent variables (sex, school status, and family background) to yield the correlation coefficient among the independent variables. The results of the correlation test show that the correlation coefficient between the independent variables in the model has no pair >0.5. Therefore, there is little possibility of multicollinearity among the independent variables in the model. Then, we examined the multicollinearity of variables in each regression model based on the acceptable variable threshold (tolerance) and the VIF coefficient. The results of the regression analysis show that the variance exaggeration factor VIF for each model is <2; thus, it is possible to reject the hypothesis that all models show multicollinearity.

Table 10: The Regression Results of the Impact of Demographic Characteristics on Entrepreneurial Skills

	Dependent variable					
	Leadership	Reflective communication	Risktaking	Creatively innovative	Future orientation	Overall score of entrepreneurial skills
Independent variable	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
Gender	-0.367	-0.060	-0.457	0.631	-0.071	-0.324
	(0.337)	(0.366)	(0.338)	(0.326)	(0.387)	(0.511)
School	0.207	-0.950***	-0.209	-0.312	0.911***	-0.352
	(0.223)	(0.243)	(0.224)	(0.216)	(0.256)	(0.339)
Family	0.930***	0.969***	0.674**	1.420***	1.552***	5.545***
	(0.215)	(0.233)	(0.216)	(0.208)	(0.246)	(0.326)
R-square	0.039	0.049	0.018	0.086	0.104	0.370
F stats (Prob)	0.000	0.001	0.000	0.002	0.000	0.000

*Note. Std. error in the parentheses. Significant code: 0 ***; 0.001;**; 0.01 *; 0.05 .*

Table 10 reports the regression results of the demographic characteristics, the score for each indicator of entrepreneurial skills, and the overall score for entrepreneurial skills. Based on the empirical results, gender has no significant effect on any of the dependent variables. The

results indicate that none of the dependent variables changes significantly with gender. Furthermore, the type of school has a negative significant effect on the reflective communication score (Model 2). This result indicates that private school tends to strengthen the level of reflective communication their students display. In Model 5, the type of school has a positive significant effect on future orientation. This reflects that private school tends to strengthen the level of future orientation of their students. The family background also has a positive significant impact on all dependent variables (Model 1-6). These results indicate that family background can increase the overall score for entrepreneurial skills and also for each sub-indicator of entrepreneurial skills.

5 Discussion and Conclusion

The findings of this study show that the entrepreneurial skills of VSS students can be divided into five indicators. The measurement of these sub-indicators of overall entrepreneurial skills is carried out after the completion of the mandated entrepreneurship courses. The results show that most students' entrepreneurial skills lie in the middle criterion. The learning outcomes of entrepreneurship have thus not been maximally accomplished; in each indicator, there are still several students achieving low and very low scores. This implies several possibilities, especially in the implementation of entrepreneurship learning in VSS. Further research is needed to ensure and improve the desired learning outcomes. In contrast to the other four indicators of entrepreneurship skills, the creatively innovative indicator was particularly low, with 246 people not achieving learning outcomes. Creativity and innovation are core elements of entrepreneurialism. The more entrepreneurs make breakthroughs, the more competitive their future businesses will be. To make breakthroughs, well-planned research is needed, for example, product or market research. Our results show that VSS students do not have these creative and innovative traits yet.

Based on the overall score for entrepreneurial skills of VSS students, most respondents were in the middle criterion, with 242 students. This is better than the results obtained in Sari (2013) where the level of entrepreneurial skills of vocational students was still low, at around 30%. This shows that education is not enough to improve students' entrepreneurial skills (Timmons, 2004); business practices must provide entrepreneurial experience for students. Based on this study, the schools only equip graduates with the knowledge and mentality to find work rather than encouraging creativity and entrepreneurial skills. This is contrary to Zimmerer et al.'s (2008) conclusions, who stated that entrepreneurial learning will instill an entrepreneurial spirit in students, which will then encourage them to create innovations or new businesses by taking risks and betting on uncertainties. Subsequently, it will enable them to achieve profitability and growth by identifying significant opportunities and pooling the required resources so that they can be capitalized appropriately. In addition, Robbins (2006)

said that entrepreneurship is a process where by a person pursues opportunities to fulfill their needs and desires through innovation, without paying attention to the resources they control.

Entrepreneurship education aims to provide soft skills, namely the ability to master entrepreneurial values, and hard skills, i.e., having entrepreneurial or business skills. At the secondary education level, the emphasis needs to be on how students gain attitude stabilization and are provisioned with basic entrepreneurial skills (Manimala & Thomas, 2017; Zeng & Honig, 2016). Entrepreneurship education is a crucial aspect of a nation's economic development and sustainability. Therefore, it is necessary to further investigate the problems in the implementation of entrepreneurship subjects at VSS and why the curriculum has not been able to help students attain these skills.

The level of entrepreneurial skills is proven to be influenced by demographic characteristics, that is, school and family. Private schools tend to strengthen the level of reflective communication and future orientation. The government has many school entrepreneurship development programs, including in VSS, for example, an entrepreneurial program for private school students (Barliana, 2019). In addition to entrepreneurship programs from the government, private schools have mentoring programs that are independently funded. Thus, providing more opportunities for students to be involved in it. Team activities provide many opportunities for students to improve their reflective communication skills. These interactions also open students' minds to having a better future target. In contrast to schools which only affect two subindicators of entrepreneurial skills, the family has a positive significant effect on all variables i.e., leadership, reflective communication, risk-taking, creatively innovative, and future orientation. It even has a significant effect on the overall score for entrepreneurial skills. Entrepreneurial parents provide many opportunities for students to have direct or indirect experiences in entrepreneurship activities (Rakieb, 2015). Entrepreneurial families will give their children an entrepreneurial atmosphere, in the form of experiences of failure and success, both of which have a positive influence on increasing students' entrepreneurial skills.

Based on our findings, we summarize that many variables exhibit intermediate standards. This shows that entrepreneurship in VSS has not been able to achieve the expected learning outcomes. Several factors need to be addressed, one of which is the need for an increase in the competence of vocational teachers, especially entrepreneurship teachers. Increased teacher competency is expected to improve the quality of learning (Antera, 2022). Demographic characteristics, especially type of school and family background, have been shown to influence students' entrepreneurial skills. For this reason, it is necessary to support schools and families to create an environment that helps students carry out various entrepreneurial activities.

In closing, further research is needed to identify problems in learning entrepreneurship in VSS. The identification results will be used to formulate alternative solutions to the extant problems. Analysis of entrepreneurship learning development can be done by observing the learning process and conducting in-depth interviews with entrepreneurship teachers at VSS.

Ethics Statement

Informed consent from the participants was obtained and the authors confirm that the relevant ethical approvals were fulfilled.

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References

Abbasi, M. H., Siddiqi, A., & Azim, R. U. A. (2011). Role of effective communications for enhancing leadership and entrepreneurial skills in university students. *International Journal of Business and Social Science*, *2*(10), 242–250. https://ijbssnet.com/journals/Vol.%202_No._10;_June_2011/25.pdf

Adeyemo, S. A. (2009). Understanding and acquisition of entrepreneurial skills: A pedagogical reorientation for classroom teacher in science education. *Journal of Turkish Science Education*, *6*(3), 57–65. http://www.tused.org/index.php/tused/article/view/125

Ahmed, T., Chandran, V. G. R., Klobas, J. E., Liñán, F., & Kokkalis, P. (2020). Entrepreneurship education programmes: How learning, inspiration and resources affect intentions for new venture creation in a developing economy. *International Journal of Management Education*, *18*(1), 100327. https://doi.org/10.1016/j.ijme.2019.100327

Al-Kloub, M. I., Salameh, T. N., & Froelicher, E. S. (2014). Nursing students evaluation of problem based learning and the impact of culture on the learning process and outcomes: A pilot project. *Nurse Education in Practice*, *14*(2), 142–147. https://doi.org/10.1016/j.nepr.2013.06.013

Almeida, F. (2017). Learning entrepreneurship with serious games - A classroom approach. *International Educational Applied Scientific Research Journal*, *2*(1), 4–7. https://doi.org/10.48550/arXiv.1710.04118

Antera, S. (2022). Being a vocational teacher in Sweden: Navigating the regime of competence for vocational teachers. *International Journal for Research in Vocational Education and Training (IJRVET)*, *9*(2), 269–293. https://doi.org/10.13152/IJRVET.9.2.6

Ayuningtyas, L. P., Djatmika, E. T., & Wardana, L. W. (2015). Hard and soft skills enhancement in entrepreunership learning for the twelfth grade students of SMK Kartika IV-1 Malang. *Journal of Education and Practice*, *6*(29), 188–194.

Badan Pusat Statistik. [BPS] (2020). *Februari 2020: Tingkat Pengangguran Terbuka (TPT) sebesar 4,99 persen*. https://www.bps.go.id/pressrelease/ 2020/05/05/1672/februari-2020--tingkat-pengangguran-terbuka--tpt--sebesar-4-99 persen.html

Badawi, S., Reyad, S., Khamis, R., Hamdan, A., & Alsartawi, A. M. (2019). Business education and entrepreneurial skills: Evidence from Arab universities. *Journal of Education for Business*, *94*(5), 314–323. https://doi.org/10.1080/08832323.2018.1534799

Baldacchino, L. (2009). Entrepreneurial creativity and innovation. *First International Conference on Strategic Innovation and Future Creation*, March, 1–15. https://www.researchgate.net/publication/200746590_Entrepreneurial_Creativity_and_Innovation_Management

Barliana, L. (2019). Vistra mewujudkan sekolah pencetak wirausaha negeri atas awan di SMK Negeri Blado. *Jurnal Penelitian dalam bidang Pendidikan dan Pengajaran*, *13*(2), 149–156. https://doi.org/10.26877/mpp.v13i2.5097

Barnawi, M. A. (2012). *School Preneurship* (2nd ed.). Ar-Ruzz Media.

Blanchflower, D., & Oswald, A. (1990). What makes a young entrepreneur? *Journal of Labor Economics*, *16*(1), 26–60. https://www.andrewoswald.com/docs/entrepre.pdf

Bloom, B. S. (1971). *Handbook of formative and summative evaluation of student learning*. McGraw-Hill.

Boehm, R. (2020). Aggies invent: How an intensive design experience teaches an entrepreneurial mindset. *Advances in Engineering Education*, *8*(1), 1–9.

Bongomin, G. O. C, Munene, J., Ntayi, J. M., & Malinga, C. A. (2018). Determinants of SMMEs growth in post-war communities in developing countries: Testing the interaction effect of government support. *World Journal of Entrepreneurship, Management and Sustainable Development*, *14*(1), 50–73. https://doi.org/10.1108/WJEMSD-06-2017-0026

Brockhaus, R. H., & Horwitz, P. S. (1986). *The psychology of the entrepreneur. Entrepreneurship*, In D. L. Sexton & R. W. Smilor (Eds.), The art and science of entrepreneurship. Ballinger.

Byers, T., Imms, W., & Hartnell-Young, E. (2018). Comparative analysis of the impact of traditional versus innovative learning environment on student attitudes and learning outcomes. *Studies in Educational Evaluation*, *58*, 167–177. https://doi.org/10.1016/j.stueduc.2018.07.003

Charity, D., Ozoji, B. E., Osasebor, F. O., & Ibn Umar, S. (2017). Effects of teaching gardening on science students' attitudes toward entrepreneurial skills acquisition in Jos South, Plateau State, Nigeria. *Science Education International*, *28*(2), 136–140.

Chen, H. (1996). Typology for program evaluation. *Evaluation Practice*, *17*(2), 121–130.

Cosenz, F., & Noto, G. (2018). Fostering entrepreneurial learning processes through dynamic start-up business model simulators. *International Journal of Management Education*, *16*(3), 468–482. https://doi.org/10.1016/j.ijme.2018.08.003

Denanyoh, R., Adjei, K., & Nyemekye, G. E. (2015). Factors that impact on entrepreneurial intention of tertiary students in Ghana. *International Journal of Business and Social Research*, *5*(3), 19–29.

DeTienne, D. R., & Chandler, G. N. (2007). The role of gender in opportunity identification. *Entrepreneurship Theory and Practice*, *31*(3), 365–386.

Devine, T. J. (1994). *Characteristics of self-employed women in the United States*. Monthly Lab. Rev, 117, 20–34. https://www.bls.gov/opub/mlr/1994/03/art3full.pdf

Directorate General of Early Years, Basic, and Secondary Educations. (2022). *Data pokok pendidikan*. https://dapo.kemdikbud.go.id

European Commission. (2008). *Entrepreneurship in higher education, especially within non- business studies*. European Commission.

Febriana, R. (2019). *Evaluasi pembelajaran* (1st ed.). Bumi Aksara.

Ferm, L. (2021). Vocational students' way of handling the academic/vocational devide. *International Journal for Research in Vocational Education and Training (IJRVET)*, *8*(1), 1–20. https://doi.org/10.13152/IJRVET.8.1.1

Fitzpatrick, J. L., Sanders, J. R., & Worthen, B. R. (2011). *Program evaluation: Alternative approaches and practical guidelines*. Pearson.

Global Entrepreneurship Index. [GEI] (2019). *Global Entrepreneurship Index 2018*. https://knoema.com/infographics/nyyasp/global-entrepreneurship-index-2018

Gontareva, I., Chorna, M., Pawliszczy, D., Barna, M., Dorokhov, O., & Osinska, O. (2018). Features of the entrepreneurship development in digital economy. *TEM Journal*, *7*(4), 813–822. https://doi.org/10.18421/TEM74-19

Hameed, I., & Irfan, Z. (2019). Entrepreneurship education: A review of challenges, characteristics and opportunities. *Entrepreneurship Education*, *2*(3–4), 135–148. https://doi.org/10.1007/s41959-019-00018-z

Handayati, P., Wulandari, D., Soetjipto, B. E., Wibowo, A., & Narmaditya, B. S. (2020). *Does entrepreneurship education promote vocational students' entrepreneurial mindset? Heliyon*, *6*(11), e05426. https://doi.org/10.1016/j.heliyon.2020.e05426

Hattab, H. W. (2014). Impact of entrepreneurship education on entrepreneurial intentions of university students in Egypt. *Journal of Entrepreneurship*, *23*(1), 1–18. https://doi.org/10.1177/0971355713513346

Hisrich, R. D. (2005). *Entrepreneurship* (4th Ed.). McGraw-Hill.

Ibrahim, N. A., & Lucky, E. O. I. (2014). Relationship between entrepreneurial orientation, entrepreneurial skills, environmental factor and entrepreneurial intention among Nigerian students in UUM. *Entrepreneurship and Innovation Management Journal*, *2*(4), 203–213.

Isidro, I. (2012, February 8). *Why be self-employed? 10 benefits of entrepreneurship*. https://www.powerhomebiz.com/starting-a-business/entrepreneurship/why-be-self-employed.htm

Johnson, C. D., & Stokes, G. S. (2002). The meaning, development, and career outcomes of breadth of vocational interests. *Journal of Vocational Behavior*, *61*(2), 327–347. https://doi.org/10.1006/jvbe.2001.1859

Kabukcu, E. (2015). Creativity process in innovation oriented entrepreneurship: The case of Vakko. *Procedia - Social and Behavioral Sciences*, *195*, 1321–1329. https://doi.org/10.1016/j.sbspro.2015.06.307

Karimi, S., Biemans, H. J., Naderi Mahdei, K., Lans, T., Chizari, M., & Mulder, M. (2017). Testing the relationship between personality characteristics, contextual factors and entre- preneurial intentions in a developing country. *International Journal of Psychology*, *52*(3), 227–240. https://doi.org/10.1002/ijop.12209

Kirkley, W. W. (2017). Cultivating entrepreneurial behaviour: Entrepreneurship education in secondary schools. *Asia Pacific Journal of Innovation and Entrepreneurship*, *11*(1), 17–37. https://doi.org/10.1108/apjie-04-2017-018

Krasniqi, B. (2018). Routledge handbook of entrepreneurship in developing economies. *International Journal of Entrepreneurial Behavior & Research*, *24*(2), 574–575. https://doi.org/10.1108/ijebr-03-2018-429

Kruger, S., & Steyn, A. A. (2021). A conceptual model of entrepreneurial competencies needed to utilise technologies of Industry 4.0. *International Journal of Entrepreneurship and Innovation*, *22*(1), 56–67. https://doi.org/10.1177/1465750320927359

Krstic, G., Miric, A. A., & Rakic, J. Z. (2017). Profile of social entrepreneur in Serbia: Motivation and socio, demographic characteristics. *Sociologija/Sociology: Journal of Sociology, Social Psychology & Social Anthropology*, *59*(1), 62–80.

Kuratko, D. F. (2016). *Entrepreneurship: Theory, process, practice*. Cengage Learning.

Leitch, C. M., & Volery, T. (2017). Entrepreneurial leadership: Insights and directions. *International Small Business Journal: Researching Entrepreneurship*, *35*(2), 147–156. https://doi.org/10.1177/0266242616681397

Levie, J. D., Hart, M., & Anyadyke-Danes, M. (2010). The effect of business or enterprise training on opportunity recognition and entrepreneurial skills of graduates and non-graduates in the UK. *Frontiers of Entrepreneurship Research*, *29*(23), 1–11. https://strathprints.strath.ac.uk/27904/

Liñán, F. (2008). Skill and value perceptions: How do they affect entrepreneurial intentions? *International Entrepreneurship and Management Journal*, *4*(3), 257–272. https://doi.org/10.1007/s11365-008-0093-0

Liu, Y., Li, Y., Hao, X., & Zhang, Y. (2019). Narcissism and learning from entrepreneurial failure. *Journal of Business Venturing*, *34*(3), 496–512. https://doi.org/10.1016/j.jbusvent.2019.01.003

Madgerova, R., & Kyurova, V. (2019). Specifics of entrepreneurship in the field of cultural and creative industries. *Entrepreneurship*, *7*(2), 103–123. http://ep.swu.bg/images/pdfarticles/2019/specifics_of_entrepreneurship_in_the_field_of_cultural_and_creative_industries.pdf

Manimala, M. J., & Thomas, P. (2017). *Entrepreneurship education*. Springer.

McClelland, D. C. (1976). *The achieving society* (with a new introduction). Irvington.

Momani, B. (2017). *Entrepreneurship: An engine for job creation and inclusive growth in the Arab world. Brookings Doha Center Policy Briefing*. https://www.brookings.edu/research/entrepreneurship-an-engine-for-job-creation-and-inclusive-growth-in-the-arab-world/

Mutaqin, M. K. A., Kuswana, W. S., & Sriyono, S. (2016). Studi eksplorasi keterserapan lulusan sekolah menengah kejuruan negeri di kota bandung pada industri otomotif. *Journal of Mechanical Engineering Education*, *2*(2), 247. https://doi.org/10.17509/jmee.v2i2.1486

Mwasalwiba, E. S. (2010). Entrepreneurship education: A review of its objectives, teaching methods, and impact indicators. *Education and Training*, *52*(1), 20–47. https://doi.org/10.1108/00400911011017663

Norberg, E. L. (2016). People and places in the global economy article information. *Journal of Enterprising Communities*, *10*(4), 29.

Okpara, F. (2007). The value of creativity and. *Journal of Asia Entrepreneurship and Sustainability*, *3*(2). http://www.asiaentrepreneurshipjournal.com/AJESIII2Okpara.pdf

Ozyilmaz, A. (2011). The effects of demographic characteristics on entrepreneurial intention in the pre-venture stage of entrepreneurship. *International Journal of Entrepreneurship and Small Business*, *14*(3), 406–424. https://doi.org/10.1504/IJESB.2011.042761

Petrakis, P., & Katsaiti, M. (2014). *Risk, future orientation and entrepreneurship*. http://elearn.elke.uoa.gr/ppetrakis/en/pdf/RiskFutureOrientationEntrepreneurship.pdf

Raine, A. L., & Pandya, M. (2019). Three keys to entrepreneurial success: Curiosity, creativity, and commitment. *Entrepreneurship Education*, *2*(3–4), 189–198. https://doi.org/10.1007/s41959-019-00019-y

Rakieb, M. (2015). Effect of industrial work practice and family environment on interest of entrepreneurship to students of vocational high school. *Journal of Education and Vocational Research*, *6*(4), 31–37. https://doi.org/10.22610/jevr.v6i4.205

Robbins, S. P. (2006). *Organizational behavior (10th Ed.)*. Prentice Hall College Div.

Sari, A. S. (2013). Kesiapan berwirausaha pada siswa SMK kompetensi keahlian jasa boga. *Jurnal Pendidikan Vokasi*, *2*(2), 154–168. https://doi.org/10.21831/jpv.v2i2.1025

Sanchez, P. L., Abad, P., Cabrero, C. F., & Calero, R. (2020). A university training programme for acquiring entrepreneurial and transversal employability skills, a students' assessment. *Journal of Sustainability (Switzerland)*, *12*(3), 1–17. https://doi.org/10.3390/su12030796

Schelfhout, W., Bruggeman, K., & De Mayer, S. (2016). Evaluation of entrepreneurial competence through scaled behavioural indicators: Validation of an instrument. *Studies in Educational Evaluation*, *51*, 29–41. https://doi.org/10.1016/j.stueduc.2016.09.001

Singh, S. P., & Singhal, H. (2015). Demographic variables predicts entrepreneurship development. *European Academic Research*, *2*(10), 13783–13796.

Soomro, M. A., Bahadur, R. A., & Abdelmegeed A. N. A., & Shah, N. (2019). The influence of demographic factors on the business success of entrepreneurs: An empirical study from the small and medium-sized enterprises context of Pakistan. *International Journal of Entrepreneurship*, *23*(2), 1939–4675.

Stahl, G. K., Miller, E. L., & Tung, R. L. (2002). Toward the boundaryless career: A closer look at the expatriate career concept and the perceived implications of an international assignment. *Journal of World Business*, *37*(3), 216–227. https://doi.org/10.1016/S1090-9516(02)00080-9

Stufflebeam, D. L., & Coryn, C. L. S. (2014). Evaluation theory, models, and applications. Jossey-Bass.

Tan, J. (1999). The growth of entrepreneurial firms in a Transition economy. The case of a Chinese entrepreneur. *Journal of Management Inquiry*, *8*(1), 83–89.

Talaş, E., Çelik, A. K., & Oral, İ. O. (2013). The influence of demographic factors on entrepreneurial intention among undergraduate students as a career choice: The case of a Turkish university. *American International Journal of Contemporary Research*, *3*(12), 22–31.

The Ministry of National Development Planning. [Bappenas] (2017). *Bonus demografi 2030-2040: Strategi Indonesia terkait ketenagakerjaan dan pendidikan*. https://www.bappenas.go.id/files/9215/0397/6050/Siaran_Pers_Peer_Learning_and_Knowledge_Sharing_Workshop.pdf

The United Nations Educational, Scientific, and Cultural Organization. [UNESCO] (2017). UNESCO moving forward the 2030 agenda for sustainable development. *United Nations Educ. Sci. Cult. Organ.*, 22.

Timmons, J., & Spinelli, S. (2004). *New venture creation: Entrepreneurship for the 21th century (9th edition)*. Irwin.

Trevelyan, R. (2009). Entrepreneurial attitudes and action in new venture development. *The International Journal of Entrepreneurship and Innovation*, *10*(1), 21–32. https://doi.org/10.5367/000000009787414271

Valliere, D., & Peterson, R. (2009). Entrepreneurship and economic growth: Evidence from emerging and developed countries. *Entrepreneurship and Regional Development*, *21*(5–6), 459–480. https://doi.org/10.1080/08985620802332723

Widoyoko, E. P. (2019). *Evaluasi program pembelajaran: Panduan praktis bagi pendidik dan calon pendidik* (9th ed.). Pustaka Pelajar.

Wiens, J., & Jackson, C. (2015, September 14). *The importance of young firms for economic growth*. http://www.kauffman.org/what-we-do/resources/entrepreneurship-policy-digest/the-importance-of-young-firms-for-economic-growth

Zeng, Z. E., & Honig, B. (2016). How should entrepreneurship be taught to students with diverse experience? A set of conceptual models of entrepreneurship education. *Advances in Entrepreneurship, Firm Emergence and Growth*, *18*, 237–282. https://doi.org/10.1108/S1074-754020160000018007

Zimmerer, T. W., Scarborough, N. M., & Wilson, D. (2008). Essentials of entrepreneurship and small business management. In Kwary, Deny Armos. *Kewirausahaan dan Manajemen Usaha Kecil edisi 5 Book 1 and 2*. Salemba Empat.

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Could Vocational Education Benefit From Augmented Reality and Hypervideo Technologies? An Exploratory Interview Study

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Abstract

Context: This study investigates the perspective of vocational educators on the possibility of adopting augmented reality (AR) and hypervideo (HV) technologies to support their teaching practice. Vocational education and training (VET) is particularly concerned with the learning of resources (knowledge, skills and attitudes) that are immediately transposable into conduct and procedures in the workplace. AR and HV can provide means to answer this requirement, but both technological solutions are still not so diffused in VET. The purpose of this study is to inquire into the perception of educators on the main advantages and disadvantages of using AR and HV to support teaching-and-learning.

Methods: A semi-structured interview protocol has been proposed to 73 teachers, inter-company trainers and in-company trainers in 10 professions (at least two per category within each profession). The interview was organized in two main steps: A need analysis, in which the most important and difficult operative skills are identified for the interviewee's profession; and a discussion of advantages and disadvantages of AR and HV. Content analysis was applied to the interview transcriptions.

Results: The results show that the main advantages reported in the literature for the two technologies – such as the ability to switch between 2D and 3D and carry out simulations –

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are also found in the VET context by educators. For HV the main technical advantages (such as the use of active points, and non-linear navigation of video content) were autonomously recognised, while the potential of the instrument to support reflection has not been clearly identified.

Conclusions: AR and HV are considered as tools able to support apprentices' procedural learning especially with regard to the operational skills which were judged by the educators to be most relevant for VET.

Keywords: Augmented Reality, Hypervideo, Dual VET, Semi-Structured Interview, Qualitative Analysis, VET, Vocational Education and Training

1 Introduction

Augmented reality (AR) is increasingly attracting the interest of educational researchers (Garzón et al., 2019; Sirakaya & Sirakaya, 2018, 2020), and one reason for this is because of its growing accessibility through mobile devices like smartphones and tablets (Akçayır & Akçayır, 2017). The distinctive characteristic of AR is that it allows users to see the real world as enriched by superimposed, additional layers of digital information (Azuma, 1997). Within AR technologies, additional distinctions can be done based on two main factors: Use mode and input mode.

As per the use mode, depending if the AR solution requires the user to hold a device – very often a smartphone or a tablet – or not, you can speak respectively about handheld and handfree use. In the latter case, having your hands free also comes with the possibility of seeing through a wearable device such as a Head Mounted Display. For this reason, handfree is often referred to as see-through use mode.

As per the input mode, the presence or absence of markers makes the difference. A marker, usually a QR code, is a trigger allowing the device to recognize the element of reality to which the "augmentation" is associated and to make the augmented elements visible. Beside these usual marker-based solutions, marker-less solutions exist as well. In this case, the device can directly recognize the shape of the object (or use non-visible data provided by GPS, eyetracking, handtracking) to activate the augmented elements. Marker-less solutions are currently still not widely used, for both economic and technical reasons. From the combination of use and input modes we can then identify four main categories: (1) Marker-based handheld; (2) marker-based handfree/see-through; (3) markerless handheld; and (4) markerless handfree/see-through.

The opportunity to receive precise instructions on the execution of a procedure and, consequently, to reduce both the number of errors and execution time has been one of the main features attracting the attention of both researchers and industry, for example, in manufacturing (Forest, 2021; Wang et al., 2016). Time and cost savings, a reduction of error rates and (possibly)

a decrease in cognitive load have also been the major benefits identified when it comes to using AR in general (Jetter et al., 2018; Radosavljevic et al., 2020; Sirakaya & Kilic Cakmak, 2018).

Hypervideo (HV, also known as interactive video) is a nonlinear video presenting (1) complex functions to control the navigation of the video stream, (2) hyperlinks giving access to additional information and materials through specific markers or hotspots and (3) annotation features allowing users to integrate their notes in the video and share and discuss them with others (Sauli et al., 2018). Both hyperlinks and annotations are considered additional layers of information that are placed over the video. For this reason, HV can be considered a technologically easier and less-expensive variant compared with AR, being able to integrate in an interactive way to overcome the risk of passivity that video sometimes entails. Moreover, where HV allows interactivity with content in a video, AR offers the same affordance directly in the real world. In other words, AR represents the synchronous and immersive version of HV.

Reduced costs and increased efficiency of AR have attracted the industrial sector. Numerous companies have introduced AR in their production processes (Li et al., 2018). However, few studies have tried to verify its effectiveness in initial VET. The use of HV to support VET has received more attention from the literature in the educational field (e.g., Cattaneo et al., 2016, 2018, 2019), but also in this case no study aimed at capturing the perspective of VET educators. For this reason, the current exploratory study presents the results from 73 semi-structured interviews conducted with teachers, branch course instructors and in-company trainers in the Swiss VET sector, with the aim of collecting the VET educators' perceptions of the advantages and disadvantages of each of the two technologies when applied to sustain learning in initial VET curricula. In doing so, we have attempted to answer the following two research questions:

1. What are the main advantages and disadvantages of using AR and HV as expected by VET educators?

2. What is the relationship between the perceived advantages and disadvantages of AR and HV and the operative skills to be acquired in VET curricula?

2 Theoretical Framework

Below, we present the main advantages and disadvantages of AR and HV as they emerge from the literature. The different states of advancement of the related research has made the presentation of the advantages different for the two cases: In discussing AR, we report as advantages the effects that the introduction of AR has had on the users. In the case of HV, we refer to its affordances. Indeed, AR is a technology that presents numerous modalities of use (e.g., marker-based handheld and see-through, markerless handheld and see-through), several of which still require further research to clearly identify its affordances.

2.1 Augmented Reality (AR) in Education

The literature has extensively investigated the effects of introducing AR in educational contexts. Conventionally, these can be divided into advantages and disadvantages, though the attribution to one of the two categories cannot always be done so neatly. Therefore, we present the advantages and disadvantages of AR as they have emerged from the literature.

2.1.1 AR Main Advantages

AR's main advantages have been widely underlined in the literature. Reviews in the educational field have reported advantages in terms of psychological variables—for example, motivation, engagement and cognitive load—and in terms of learning outcomes—for example, improved academic performances, spatial abilities development and better understanding of learning materials (Akçayır & Akçayır, 2017; Bacca et al., 2014; Chen et al., 2017; Radu, 2014; Sirakaya & Sirakaya, 2020).

Increased motivation and engagement have been widely reported in the literature, though some methodological limitations have reduced the reliability of these results. Indeed, there are still only a few longitudinal studies and research designs that have utilised control groups; moreover, the use of AR—especially in its immersive mode, which is less widespread among the general public—is often subject to the "novelty effect". This phenomenon refers to an increase in motivation or in the perceived usability of a technology because of its novelty (Koch et al., 2018) and has been highlighted by several authors (Hussein & Nätterdal, 2015; Jensen & Konradsen, 2018; Parmar, 2017); however, there are still few studies taking the novelty effect into explicit account in their research design (Huang et al., 2020).

The issue of cognitive load is also discussed in the literature. In most cases, the use of AR has been reported as benefitting the management and control of cognitive load (Avila-Garzon et al., 2021; Lee, 2020; Papakostas et al., 2021). That being said, in some other contexts, AR has been perceived as a source of cognitive overload: When creating a learning environment that is too rich in information, AR risks overloading students (Akçayır & Akçayır, 2017; Cheng & Tsai, 2013; Dunleavy et al., 2009).

Regarding learning outcomes, the literature seems be in agreement that AR can support learning processes and academic achievement. AR can indeed be used to perform simulations (Cuendet et al., 2013; Strada et al., 2019) or visualise normally invisible elements, such as electromagnetic fields (Villanueva et al., 2021). The fact that Sirakaya and Sirakaya (2020) identified an inverse proportionality between students' prior knowledge and the utility produced by AR does not contradict this general verification and is aligned with the famous expertise reversal effect in multimedia learning (Kalyuga, 2014) which states that instructional methods of multimedia instruction that are effective for less experienced

learners may not be effective for more experienced learners and vice versa. Hence, the effective introduction of technologies in education cannot be separated from the adoption of an adequate pedagogical design (Avila-Garzon et al., 2021).

In their review of education in the engineering field, Papakostas et al. (2021) explored the issue of spatial abilities. The authors reported that 25 out of the 32 studies found an improvement in spatial abilities following the use of AR. However, a previous review by Voronina et al. (2019) about geometry produced unclear results on the role of AR in supporting spatial abilities. For example, Gün and Atasoy (2017) studied the development of spatial abilities with the support of AR in the context of a geometry course aimed at learning the concept of volume. The research design was based on a pre–post-test measure with a control and an experimental group; the latter group exercised spatial abilities using both AR and real objects, while the control group only used real objects. The results showed significant improvements in spatial abilities and academic performance, but there were no significant differences at the post-test between the two groups. Additionally, the research design was not completely discriminant regarding the role of AR, so it is possible that the experimental group also obtained improvements by the use of real objects.

2.1.2 AR Main Disadvantages

The main disadvantages associated with AR can be categorised into three macro-categories: (1) High costs; (2) usability problems; and (3) technical limitations.

In almost all of the analysed studies, the applications used required an ad hoc development phase to respond to the specific needs of the context, thus significantly increasing the access cost to this type of experience (Bacca et al., 2014). Even though with the increased popularity of smartphones it is no longer essential to purchase expensive devices to deploy an AR solution (Akçayır & Akçayır, 2017), immersive technologies continue to come with high costs.

The macro-category of usability problems encompasses at least two separate aspects: First, it refers to the need to find the time to become familiar with the technology (Wüller et al., 2019) and, second, to the cybersickness phenomenon that makes immersive technologies completely inaccessible for some users (Moro et al., 2019, 2021).

Finally, the technical limitations are the most frequently mentioned, referring to (1) difficulties in maintaining the overlap between real and digital objects (Wang et al., 2016); (2) too high response times in overlaying digital objects, especially for markerless solutions; and (3) an almost total absence of applications able to support collaborative activities (Li et al., 2018).

In addition, many of the advantages of AR have yet to be definitively demonstrated; similarly, almost all the disadvantages of this technology seem likely to be resolved in the coming years (Akçayır & Akçayır, 2017; Papakostas et al., 2021).

AR Advantages and Disadvantages in VET: An Illustrative Example

Despite the paucity of studies stated above, most of the advantages and disadvantages of AR can also be seen when looking at applications within VET. We refer to the experience of Lee (2020) to provide an illustrative example. In the context of the vocational training of carpenters, one of the most complex and central of the professional skills to acquire is that of making wooden joints. Lee's (2020) research was organised on a pre–post-test design with control and experimental groups. In the pre-test, the spatial abilities of all the participants were measured. In the post-test, in addition to spatial abilities, the author also measured the levels of cognitive load while performing the splicing tasks, as well as the final results produced by the students. The splicing tasks to be performed were divided into three difficulty levels (easy, medium and difficult), which were classified in accordance with the teachers, here depending on the complexity of the splicing to be performed. The results showed that there was no significant difference in final performance when looking at both easy- and medium-level splices, while the difference was significant when looking at the 'difficult' splices, where the experimental group reported better results. Analysis of cognitive load is also interesting: When looking at the medium difficulty task, where students had obtained comparable performance in both groups, the cognitive load was found to be significantly higher for those in the control group; it would seem that AR put the students in a position to complete the task and do so while exerting less effort. Finally, from the comparison of spatial abilities in the pre-test and post-test it was found that whereas in the pre-test there were no significant differences between the experimental and control groups, these were observed in favour of the experimental group in the post-test. Despite these positive results, the authors reported a number of limitations related to the fact that difficulties were reported in performing some 3D animations; the participants would have needed more time to become familiar with AR technology; the study was aimed at novices, so it is not known whether it would produce similar results with more advanced participants; the study had a limited duration; and a longitudinal study would be needed to verify that AR can support the learning of this type of skill, which usually takes a long time to master.

2.1.3 HV Main Advantages

Although hypervideo (HV) has been much less investigated than AR, some studies and reviews have examined its use as a cognitive or sociocognitive tool (e.g., Cattaneo et al., 2019; Chambel et al., 2006; Evi-Colombo et al., 2020; Sauli et al., 2018; Zahn, 2017; Zahn et al., 2010). A recent meta-analysis shows that videos that include enhanced interaction features

are significantly more effective to foster learning than traditional videos (Ploetzner, 2022). This said, HV itself relies on video. Video-based demonstrations are well suited for sustaining procedural learning (Arguel & Jamet, 2009; Mohd Saiboon et al., 2014; van der Meij & van der Meij, 2016) because they can make both expert and novice behaviour visible and audible (Rosen et al., 2010). However, although such demonstrations are commonly used (Grossman et al., 2013), their effectiveness has been questioned, mainly because of the risk that learners will remain passive. In this respect, on top of the traditional affordances that a video can have, HV integrates interactive features that provide unique opportunities to increase the quality of demonstrations and secure more active engagement from learners. These features are as follows (Sauli et al., 2018): *Extended navigational control options, linkage options, automated feedback options and communication facilities.*

In addition to classic controls (stop, pause and rewind/forward), HV has advanced non-linear features, such as a table of contents or index (e.g., Meixner et al., 2016; Tiellet et al., 2010), allowing the user to pursue macro-level activities (Merkt et al., 2011). These features enable users to autonomously moderate the information intake against the risk of cognitive overload because of video complexity and transience (e.g., Schwan & Riempp, 2004), as well as to select nonlinear trajectories through the video material (e.g., Girgensohn et al., 2015; Meixner et al., 2016).

Additionally, HV makes it possible to integrate other existing content and media (text, audio, etc.) via hyperlinked markers, here by presenting a spatial and a temporal dimension. These markers can be placed anywhere in a video and have a double function: On the one hand, their spatial dimension allows them to be used as cueing tools (De Koning et al., 2007; van Gog, 2014) to focus the learners' attention on the significant detail of the image, hence playing an attention-directing role (e.g., Merkt & Sochatzy, 2015). On the other hand, they help the learner connect different sources of information (e.g., van der Meij & de Jong, 2006) through additional materials, making the relationship between concrete and abstract, practical and theoretical and particular and general issues explicit and more evident all while exploiting the benefit of using multiple representations.

Further, HV makes it possible to directly embed quizzes in the instructional video, along with automated feedback that can support learners and their self-regulatory mechanisms (e.g., Rice et al., 2019; van der Meij & Böckmann, 2021; Vural, 2013).

Finally, from a technical point of view, this feature could be considered not so different from the above-mentioned markers (e.g., Meixner et al., 2014; Sadallah et al., 2014), yet from a pedagogical point of view, it is possible to add newly created content in the form of textual overlays, creating a very powerful HV tool. We usually refer to this as 'video annotation'. Video annotation can be provided individually or collaboratively, directly by the learner, by peers or by tutors, and it has been shown to be a powerful tool to support reflection processes and self-regulated learning (e.g., Colasante, 2011; Evi-Colombo et al., 2020).

Apart from the advantages directly coming from HV's distinctive features, in previous use cases, HV has also shown some positive impact on learners' motivation (Cattaneo et al., 2018; Sauli et al., 2018), though more research is needed to definitively prove this point.

2.1.4 HV Main Disadvantages

With respect to AR, HV produces fewer disadvantages in terms of its usability because it presents no large differences with respect to traditional video interfaces, with which most users are already very familiar. The same can be said for technical problems because this kind of technology is much less complex than AR. In this respect, some existing problems could deal with the efficiency of IT infrastructure and capacity of the internet connection. That being said, the most important disadvantage of HV is likely in the costs teachers perceive in terms of time to be invested to become competent in the mastery of the pedagogical exploitation of the tool, particularly when HV must be designed from scratch as an instructional material (Cattaneo et al., 2016).

3 Methods

In this section, we outline the methods used for conducting this research. The discussion is divided into three subsections: Context and participants, procedures adopted, and finally, the approach used for data analysis.

3.1 Context

The current study took place in the context of Swiss vocational education and training, where activities are organised according to a dual (trial) model, one in which the learners (apprentices) alternate among three different training locations: (1) The school, where they have lessons with teachers and are exposed to the main theoretical notions useful for carrying out the profession; (2) the intercompany or branch courses, which is led by trainers, where apprentices have the opportunity to learn some professional procedures using machines similar to those they could encounter in the workplace; and (3) the workplace, where they work for most of the week as apprentices and where an in-company trainer follows and supervises their professional activity (for additional details on the Swiss VET model, see Bonoli et al., 2018; Strahm et al., 2016).

3.2 Participants

To bring together all the figures involved in the training process, we listened to the point of view of 73 participants (age range: 25–67; mean age = 42.9; SD = 10.4; female = 7), including 27 teachers (mean age = 43.3), 23 intercompany course trainers (mean age = 42.6) and 23 in-company trainers (mean age = 42.6) from 10 different professions and from two linguistic regions (see Table 1 for details). The choice of occupation was made in three stages: (1) Considering the entire VET/PET spectrum under Lucas et al.'s (2012) classification of VET professions; (2) narrowing the field by considering areas identified as promising in the literature; and (3) testing the availability and interest of trainers of the selected professions in the field.

Table 1: Participant Overview

Profession	Language	Teachers	Inter-company courses trainers	In-company trainers
Informatic	IT	2	0	0
Dental assistant	IT	2	1	1
Woodworker	IT	2	0	1
	DE	2	2	2
Carpenter	IT	1	1	1
	DE	2	2	2
Installer of refrigeration systems	IT	1	2	3
Installer of sanitary facilities	IT	2	3	1
	DE	1	2	2
Heating installer	IT	2	1	2
	DE	1	2	2
Mechatronic	DE	2	1	2
	IT	2	2	2
Gardener	DE	3	2	1
Logistic	DE	2	2	1
Total		**27**	**23**	**23**

3.3 Procedure

Each interview was organised following a protocol carried out in two phases: (1) A need analysis inspired by Hennessy (2011) and (2) a semi-structured interview, in which the main advantages and disadvantages of AR and HV were discussed consecutively.

3.3.1 Need Analysis

A need analysis, which has been inspired by the standardised tool by Hennessy (2011), was carried out starting with the training plan of the profession in which the interviewee is active. The training plan (Figure 1) shows the skills that apprentices are expected to acquire during their curriculum. The plan is usually structured into two sections: Operational skills fields (on the left side of the figure) and operational skills (on the right side of the figure), the latter constituting concrete operationalizations of the former. In other terms, each operational skill field includes two or more operational skills. At the beginning of the interview, each participant was shown her/his training plan and given the following instructions in sequence: (1) To identify the five operational skills that they consider the most important for the profession; (2) to identify the five operational skills that they consider the most difficult while also considering their experience in training; and (3) to identify a podium of the three operational skills that they consider both important and difficult to learn/teach.

The results of the need analysis were used to focus the interviews on the actual needs of the 10 professions considered.

3.3.2 Semi-Structured Interview

Immediately after completing need analysis, a one-minute clip was shown to the participants, in which six examples of see-through handless AR applications in VET contexts were shown. The applications showed different technological solutions of AR, from the use of digital twins to simple signaling, used in different professions like logistics, carpentry, mechanics, plumbing, and other. None of them showed AR applications for real-time support. We tried to include at least one example from each of the professions interviewed. If the participants were already familiar with AR technology, follow-up questions were formulated to check in which context they had been known. The interview protocol asked about the perceived advantages of a possible introduction of AR technology to support students' learning and about the perceived disadvantages as well; to investigate these advantages and disadvantages, a further focus was placed on the operational skills reported during the previous phase. A similar procedure was then followed regarding HV. After showing

the functionalities offered by one of the currently available tools for the creation of HVs, the main perceived advantages and disadvantages were investigated, here with particular reference to the operative skills the interviewee placed emphasis on.

3.4 Data Analysis

All interviews were transcribed verbatim and analysed using qualitative content analysis through NVivo software (released in March 2020). The materials have been coded by dividing the text into a unit of analysis, which can be defined as "an idea, argument chain or discussion topic" (Strijbos et al., 2006, pp. 28-46). A first version of the coding scheme was developed, here taking into consideration the AR and HV literature that had analysed the advantages and disadvantages of the two technologies. Complementarily, additional codes were integrated with further advantages and disadvantages mentioned directly by the interviewees. The final coding scheme is reported in Table 2. The coding process was carried out using a non-mutually exclusive approach, whereby each unit of analysis could also be assigned two or more codes. Whenever a code was not treated by educators in an unambiguously positive or negative manner, it was associated with the macro-category "neutral" to which a sentiment (positive or negative) was subsequently assigned, depending on the type of considerations reported. Units of analysis that did not fit into any of the identified codes were not coded. Two different coders used the coding scheme independently to code about 20% of the corpus (Cohen's K = 0.77; agreement 98%). Divergences were solved between the two coders or, if necessary, involving a third coder.

Table 2: Coding Scheme

	Code	Code description	Example	References
Advantages	Simulation	Interviewee describes a procedure in which AR or HV is used to simulate events	Using AR in simulating faults	Cuendet et al. (2013); Strada et al. (2019)
	From 2D to 3D	Interviewee describes situations in which AR or HV is used to display in 3D, 2D elements	Using AR to visualize a 2D project in 3D	Wulandari et al. (2019); Lee (2020) Papakostas et al. 2021
	See through things	Interviewee should be interested in using AR or HV to see through elements	Using AR to see an implant through a wall	
	See invisible elements	Interviewee should be interested in using AR or HV to see invisible elements	Using AR to see electromagnetic fields	Villanueva et al. (2021)
	Imagine future scenarios	Interviewee would use a technology to see future development of her/his project	Using AR to see a complete roof	

	Data recording	Interviewee would use AR or HV to record her/his learning	Using HV as workbook	
	Support in distance teaching	Interviewee should be interested in using AR or HV in distance teaching	Using HV to teach during pandemic	
	Support student motivation	Interviewee suggests that AR or HV could increase students' motivation		Akçayır & Akçayır (2017); Bacca et al. (2014); Chen et al. (2017); Radu, (2014); Sirakaya & Sirakaya (2020)
Disadvantages	Expensive	Interviewee reports that buying devices could be too much expensive	It is difficult to buy these devices for our school	Bacca et al. (2014)
	Hard to use in workplace	Interviewee reports difficulties in using these technologies in workplace	Using AR devices could be difficult with dirty hands	Wüller et al. (2019); Wang et al. (2016); Park et al. (2020); Li et al. (2018)
	Time consuming	Interviewee reports that completing a task using these technologies could require too much time	Using HV could require a lot of time in recording a video	Wüller et al. (2019)
	Deskilling	The interviewee fears that technological support may reduce the skills of operators when they cannot have them	Operators can not complete a task without technological support	
	Do not improve existent solutions	The interviewee describes a situation which the existent solutions offer the same service or better	Operators can already verify implant parameters using a laptop	
Neutral	Support in theory learning	Interviewee describes how AR or HV could support students in learning theory	Using AR to describe volume changes in wood	Akçayır & Akçayır (2017); Villanueva et al. (2021)
	Reflection	Interviewee reports that technologies could affect reflections.		
	Procedural learning support	Interviewee describes procedures in which could be supported by AR or HV	Using AR to assembly elements	Sirakaya & Kilic Cakmac (2018); Bacca et al. (2015); Radosavljvic et al. (2020); Radosavljvic et al. (2020); Wang et al. (2016)
	Attention	Interviewee reports that could affect on student attention	Using AR could be seen as a game	
	Workplace safety	Using AR or HV to Support workplace safety	Using AR to learn safety procedures	Li et al. (2018)
Operative skills	Planning	Interviewee describes an operative skill related to the planification	Drawing up plans, planning activities, designing	
	Assembly	Interviewee describes an operative skill related to the assembly	Assembly elements, Assemble components, mount devices	

	Repairs and Maintenance	Interviewee describes an operative skills related to the maintenance	Repair faults and carry out maintenance operations
	Optimization	Interviewee describes operative skills that requires optimization	Organize the spaces in a warehouse
Technologies	HV	Interviewee discusses about HV	
	AR	Interviewee discusses about AR	

NVivo software was then used to calculate the distribution of categories in the interviews, and the following indices were chosen: (1) Occurrences, that is, the number of times a code was assigned within the interviews, as presented in absolute value and (2) co-occurrences, that is, the number of times that two or more codes were used simultaneously for the same unit of analysis. The results are presented both in absolute value and using the c-coefficient n12/(n1+n2-n12). In the formula, we have the numerator 'n12', which represents the co-occurrences between the two codes (we could also have n12...n, depending on how many codes in the same unit of analysis are searched for). In the denominator, we have 'n1' and 'n2', which represent the number of occurrences for which the co-occurrence is being observed. However, the number of co-occurrences (n12) is subtracted from these two values to avoid adding up the intersection set of the two occurrences twice. As is evident from this formula, when operating with c-coefficient, both occurrences are taken into account at the denominator, thus ensuring the co-occurrence standardisation process. Comparing the co-occurrences in absolute value when there are substantial differences in the number of occurrences cannot provide reliable data about the result and could more easily lead to a misrepresentation of the obtained results, which the standardised c-coefficient should help avoid.

Before proceeding with the results, we give some indications about the interpretative method adopted for the indices used. In assessing the 'strength' of a co-occurrence, we took into account three distinct elements: (1) How much one of the codes co-occurred with the other regarding its own number of occurrences, here by relativising the result for two or more codes; (2) looking at the overall view offered by the c-coefficient (which we recall when integrating at the denominator the occurrences of two or more codes considered in the co-occurrence); and (3) integrating the figure with the percentage of the number of participants who reported that specific co-occurrence. To facilitate the reading of the results, we propose an example of the co-occurrence between the code 'From 2D to 3D' and 'AR'. As a first step, we verified that in 69 out of the 70 total occurrences of the code 'From 2D to 3D' (99%), this code co-occurred with that of AR; then, we carried out the same verification from the point of view of AR, where this represents about 11%. As a second step, we looked at the c-coefficient score (0.11) and, finally, at how many participants had found this advantage in using AR (42%). Here, although the c-coefficient is not very high, also because of the

disproportion of the occurrences of the two co-occurring codes— 'From 2D to 3D' (O=70) and 'AR' (O=599)—the possibility to switch from 2D to 3D is perceived as a very relevant advantage by the interviewed educators. When possible and functional to our aims, we also used queries that allow us to have triple or quadruple co-occurrences because these queries provide data that is easier to interpret.

4 Results

In this section, we present the main findings of our research. After describing the outcomes of the needs analysis, we illustrate the perceived advantages and disadvantages for both technologies.

4.1 Need Analysis

During the interviews, only 59 of the 72 participants completed need analysis according to the indications provided. During the interviews, this tool was used to guide the reflective process of the interviewees, and no finicky compilation was required. Among the 59 respondents, five did not identify a complete podium of important and difficult operational competences, which generated six missing values and a total corpus of 171 operational competences. As can be seen from Table 3, assembly procedures (48) have the highest number of occurrences, followed by 'Planning' tasks (38) and 'Repair and maintenance' (32). These are the most frequently discussed topics during the interviews and. Therefore. were included in the coding scheme. Other operational skills emerged, such as 'Diagnostics' (18) and the execution of 'safety protocols' (7). The category 'other' (18) was then used for the operational skills that could not be placed in any of the previously mentioned areas and were mentioned very few times within the analysed corpus; these include the following: 'Administrative tasks' (5), 'software development' (5), 'plant management' (3) and 'specific woodworking' (3).

Table 3: Need Analysis Occurrences

Assembly	Customer relations	Diag-nostics	Optimization	Other	Planning	Repair and mainte-nance	Security protocols
48	6	18	6	16	38	32	7

4.2 Occurrences in the Interviews' Body

As per the number of occurrences (see Table 4), the macro-categories that occurred the most, in decreasing order, are 'Technologies' (O = 870), within which the mainly occurring subcategory is 'AR' (O = 599); 'Neutral' (O = 543) and main subcategory 'Procedural learning support' (O = 289); 'Operative skills' (O = 404) and its main subcategory 'Assembly'; and finally the main categories 'Advantages' (O = 277) and 'Disadvantages' (0 = 220). The prevailing sentiment associated with the occurrences in the category 'Neutral' is 'Positive' (O = 362).

Table 4: Number of Occurrences and Related Participants per Macro-Category and Subcategories

	Codes	*Occurrences*	*Participants*
Advantages	From 2D to 3D	70	30
	Simulation	57	27
	See through things	33	18
	Support in distance teaching	30	15
	Support student motivation	29	19
	Imagine future scenarios	23	16
	Data recording	20	13
	See invisible elements	15	9
Disadvantages	Hard to use in workplace	68	34
	Do not improve existent solutions	40	24
	Deskilling	40	20
	Time consuming	34	19
	Learn how to use	22	16
	Expensive	16	12
Neutral	Procedural learning support	289	66
	Support in theory learning	152	52
	Workplace safety	60	32
	Attention	28	16
	Reflection	14	9
Operative skills	Assembly	171	39
	Repairs and Maintenance	134	28
	Planning	94	33
	Optimization	5	5
Sent Tech	AR	599	72
	HV	271	67
	Positive	362	68
	Negative	72	33

4.3 Perceived Advantages in AR and HV

We identified as perceived advantages both those coded directly in the 'Advantages' category and those in the 'Neutral' category before looking at those associated with a positive 'Sentiment'. In descending order, the most relevant occurrences and co-occurrences among the advantages are as follows: 'From 2D to 3D' and 'AR' (C = 69, c-coefficient = 0.11); 'Simulation' and 'AR' (C = 55, c-coefficient = 0.09); 'See-through things' and 'AR' (C = 32, c-coefficient = 0.05); and 'Support in distance teaching' and 'HV' (C = 13, c-coefficient = 0.05). In the neutral positive category, the categories 'Procedural learning support' stands out both in relation to 'AR' (C = 174, c-coefficient = 0.16) and 'HV' (C = 71, c-coefficient = 0.08) and 'Support in theory learning' in relation to 'AR' (C = 69, c-coefficient = 0.07) and 'HV' (C = 49, c-coefficient = 0.07). The full results can be seen in Tables 5 and 6.

To give voice to the numbers that emerged and understand how the different advantages and disadvantages looked to the participants, we supplemented the quantitative data with contextualised quotes. For example, we did this for a carpenter intercompany course trainer, who—especially considering the difficulties he encountered in his teaching experience—thinks that AR can become a tool to stimulate his students' three-dimensional visualisation. In this view, AR does not only offer a technological solution for solving a technical problem (visualising models in 3D), but it could also become a new tool in the teacher's toolbox:

> *So, for a student who needs to be able to interpret (the plans), it can sometimes be a stimulus to first visualise it in a three-dimensional version. With augmented reality, we can give them this three-dimensionality, even before they have the piece in their hands. One difficulty I have encountered in my years of teaching is the stimulation of three-dimensional vision (Interview 12, line 148).*

An example of the association with the simulation potential of AR is provided by an in-company trainer of heating installers, for whom AR could be useful to display (simulating it) the operation of a heating system. In this case, the in-company trainer would use AR not only to visualise, but also to support the understanding of the consequences of an action by using a simulation: 'What happens if I adjust my pump like this?' He explains that it is not always possible to observe the consequences of poor heat pump regulation in the short term and that AR could help him to do this by overcoming time constraints:

> *Right now, I'm thinking of a hydraulic circuit. If, for example, you set the regulator incorrectly and the pupil could then see, aha, that's not the reason. Or this is the reason, this is the reason. So as seen before, it's the wrong screw. You can actually deal with that. There are some really difficult things. If you can let it run virtually and say, what happens if I don't take it into account? Then that's certainly a good thing. Yes. So, as I said, I see it as another methodological possibility (Interview 47, Line 321).*

Examples of exploiting AR to support the execution of procedures requiring several steps are also reoccurring, as in this excerpt by an intercompany course trainer of sanitary facilities installers:

> *Maybe it's more like an instruction or a checklist. Like a building process. So that you know what you have to do or what you must not forget (Interview 70, Line 199).*

Especially when looking at the professional activity, correctly remembering the execution of a procedure can be a great advantage: From the point of view of the correctness of the execution of the procedure, the time taken and resulting costs for both the company and client. An in-company trainer of refrigeration installers notes the following:

> *So that's a very long procedure. In the end, to change a 10 CHF part a technician is there all day. Empty everything, replace, empty, recharge, try again if that's not the problem, he's gone, all day long. So that's a procedure that everyone dislikes. It doesn't even allow us if we've done something wrong (to be able to recover some of the work done), so we have to reopen the circuit. It means doing the whole procedure again (Interview 17, Line 310).*

Similarly, in case HV is used instead of AR:

> *This kind of video would certainly be useful. You can see how it's done, and then, you can call up the information you need. So, I would see it there. There would be possibilities for the manual part. I would also see that I could film the work processes and fill them with information (Interview 46, Line 300).*

Table 5: Co-Occurrences of the Perceived Advantages and Technologies

			AR		HV	
Perceived advantages	*Occurrences*	*Participants*	*Co-occ.*	*c-coefficient*	*Co-occ.*	*c-coefficient*
From 2D to 3D	70	30	69	0.11	2	0.01
Simulation	57	27	55	0.09	5	0.02
See through things	33	18	32	0.05	1	0.00
Imagine future scenarios	23	16	21	0.03	1	0.00
Support student motivation	29	19	10	0.02	19	0.07
Data recording	20	13	4	0.01	17	0.07
Support in distance teaching	30	15	16	0.03	13	0.05
See invisible elements	15	9	15	0.02	0	0.00

An in-company trainer of woodworkers refers to the importance of the 'workbook' for apprentices. In the first years of training, each student is told the functioning of the different machines, as well as the procedures to be followed for their correct use. Usually, the trainees take notes in their workbook, and years later when they encounter the same machine again,

they can use the workbook as a form of support for carrying out the procedure. The participant would gladly use the possibility of chapter navigation offered by HV, combined with the possibility of noting down the details of the individual work step:

> *You could use it as a workbook. (If I were to use it to write down the operation) of this circular machine, then (I would proceed like this) chapter 1: Power button, chapter 2 adjust wedge 0.5 more than blade, chapter 3: Start workpiece. And so on. In the third-year exam, all these notes, this workbook, can be kept, so what we were talking about earlier happens. When the guys arrive in the third year and they have to adjust that machine, they can retrieve their notes; then, it becomes convenient. You can actually travel there with the system you were showing (Interview 18, Line 433).*

Table 6: Triple Co-Occurrences Neutral/Positive and Technologies

Neutral/Positive	Co-Occurrences	c-coefficient	Participants
PLS/AR/Positive	174	0.16	57
PLS/HV/Positive	71	0.08	42
STL/AR/Positive	69	0.07	33
STL/HV/Positive	49	0.07	33
WPS/AR/Positive	21	0.02	16
WPS/HV/Positive	17	0.03	15

PLS= Procedural Learning Support; STL= Support in Theory Learning; WPS= Workplace Safety

4.4 Perceived Disadvantages in AR and HV

Similar to what we did for the advantages, also in the case of disadvantages, we include in the presentation of results both the codings of the category 'Disadvantages' and those of the category 'Neutral', which are associated with the sentiment 'Negative'. In descending order (see Tables 7 and 8), the main perceived disadvantages related to 'AR' are 'Hard to use in workplace' (C = 52, c-coefficient = 0.08), 'Deskilling' (C = 36, c-coefficient = 0.06) and 'Do not improve existing solutions' (C = 32, c-coefficient = 0.05). Regarding 'HV', only 'Time consuming' (C = 23, c-coefficient = 0.08) and 'Hard to use in workplace' (C = 15, c-coefficient = 0.05) stand out. When looking at co-occurrences with the two technologies in the 'Neutral' category with 'Sentiment' 'Negative', no relevant results appear.

Regarding the feasibility of using AR in the workplace, for example, an in-company trainer of refrigeration installers raises questions about the possibility of using these technologies in practice, especially for repairing tasks, which the interviewee considers too heterogeneous. In the interview, the participant reports that even the same model of a heat pump may have been produced by several manufacturers, and this may be enough to radically change the procedures to be followed: *"No, not in our training, not in our repair work, because it often happens that one is not the same as another" (Interview 15, Line 163).*

An intercompany course trainer of the carpenters expresses doubts about providing too much support to the students. His fear is that they would become lazy and that using AR would finally result in deskilling apprentices. To better understand the below quotation, it is important to contextualise the rough theory developed by the participant about the inclination of his students to use cognitive resources. Although not exactly in these terms, we could trace what is reported by the participant back to Kahneman's theory (2002): Humans will always prefer to use 'system 1' (instinctive, based on the use of heuristics and low cognitive expenditure) over 'system 2' (reflexive, basing decisions on exact calculations and the high expenditure of cognitive resources). Hence, a question arises: When AR offers students the opportunity to opt for 'system 1', will they stop using 'system 2' altogether?

> *The disadvantage is that by always having, as I said before, a ready-made meal there, you don't make the effort to try to recreate this thing, and you also slow down a bit. That's my fear: I have more than 10 years of teaching experience, and during these years, I have tried to change the way I provided materials for students to process. I noticed that by providing materials that I more or less preprocessed, the students changed their response: Those who were given a ready-made meal got lazy, while those who had to fend for themselves better learned how to proceed. I also think it is very important to define upstream in which context to introduce augmented reality: If you are having too much difficulty in imagining (the 3D development) a project and it is the only way to make you understand it, then it is fine, but if it has to become a way to avoid straining yourself, getting lazy and not imagining the three-dimensionality of objects, then it is not good (Interview 12 Line 157).*

Table 7: Co-Occurrences of the Perceived Disadvantages and Technologies

	AR		HV	
Disadvantages	**Co-occurrences**	**c-coefficient**	**Co-occurrences**	**c-coefficient**
Hard to use in workplace	52	0.08	15	0.05
Deskilling	36	0.06	3	0.01
Do not improve existent solutions	32	0.05	9	0.03
Time consuming	11	0.02	23	0.08
Learn how to use	14	0.02	7	0.02
Expensive	13	0.02	3	0.01

Table 8: Triple Co-Occurrences Neutral/Negative and Technologies

Neutral/Negative	Co-Occurrences	c-coefficient	Participants
PLS/AR/Negative	13	0.01	10
Attention/AR/Negative	11	0.02	9
WPS/AR/Negative	11	0.02	6
Attention/HV/Negative	7	0.02	5
Reflection/AR/Negative	6	0.01	4
SLT/HV/Negative	6	0.01	4
PLS/HV/Negative	5	0.01	4
SLT/AR/Negative	5	0.01	5
Reflection/HV/Negative	3	0.01	2
WPS/HV/Negative	0	0.00	0

4.5 Operative Skills, Advantages and Disadvantages

To verify whether there is a match between the advantages and disadvantages of AR and HV and the operational skills indicated as the most relevant by the trainers, we carried out co-occurrences analysis between 'operational skills' ('Assembly', repair and maintenance and planning) discussed during the interviews and the macro-categories of advantages and disadvantages (see Tables 9 and 10). As before, codes belonging to the neutral macro-category, here associated with a 'Positive' or 'Negative' sentiment, were included in the advantages and disadvantages, respectively. Looking at the results, AR seems to be able to support procedural work in all three operational skills analysed: 'Assembly' (C = 56), 'Repairs and maintenance' (C = 30) and 'Planning' (C = 6). However, AR is also negatively associated with 'Repairs and maintenance' (C = 5); 'From 2D to 3D' is of interest for both 'Planning' (C = 31) and 'Assembly' (C = 8); and 'Deskilling' is associated with 'Assembly' (C = 7). When it comes to HV, 'Assembly' is supported by 'Procedural learning support' (C = 6) and 'Support in theory learning' (C = 6). Finally, 'Procedural learning' for 'Repairs and maintenance' is supported by HV (C = 14). Particularly relevant is the result observed for 'Assembly', 'Procedural learning support' with a 'Positive' sentiment and the use of AR. In fact, this is a co-occurrence with four different codes that emerged on 56 occasions reported by 27 of the 72 educators. Therefore, the data sustain the idea that AR can support procedural learning, especially when looking at assembly procedures, which are the central themes for VET, which also emerged during need analysis. Less pronounced but just as relevant is the result regarding 'Planning' AR and 'From 2D to 3D'. From what the educators have reported, it seems that AR can support planning processes, especially when considering the transition from 2D to 3D. Planning processes are mentioned as crucial by the trainers, even if only informally: Being able to read and adequately create a work plan is the basis for many of the professions.

Table 9: Main Co-Occurrences Between Operative Skills, Advantages and Disadvantages in AR

AR	Co-occ.	Participants
Assembly/AR/Procedural learning support /Positive	56	27
Planning/AR/From 2D to 3D	31	19
Repairs and maintenance/AR/Procedural learning support /Positive	30	15
Assembly/AR/From 2D to 3D	10	8
Planning/AR/Imagine future scenarios	10	7
Repairs and maintenance/AR/See through things	8	5
Assembly/AR/Deskilling	7	6
Planning/AR/Procedural learning support /Positive	6	6
Planning/AR/Support in theory learning/Positive	6	4
Repairs and maintenance/AR/Deskilling	6	4
Repairs and maintenance/AR/Procedural learning support/Negative	5	4

Table 10: Main Co-Occurrences Between Operative Skills, Advantages and Disadvantages in HV

HV	Co-occ.	Participants
Repairs and maintenance/HV/Procedural learning support /Positive	14	10
Assembly/HV/Procedural learning support /Positive	6	5
Assembly/HV/Support in theory learning/Positive	6	4

5 Discussion

R1: What are the Main Advantages and Disadvantages of Using AR and HV as Perceived by VET Educators?

The results show that 89% of the participants perceive that the introduction of AR in VET can support procedural work, hence confirming what has been claimed in the literature (Li et al., 2018; Park et al., 2020; Wang et al., 2016). The ability to make three-dimensional designs (Lee, 2020; Papakostas et al., 2021; Wulandari et al., 2019), to simulate the consequences of a procedure in real time (Cuendet et al., 2013; Strada et al., 2019) and to be able to look through objects are the benefits most often mentioned by the interviewees.

The disadvantages reported by the interviewees, however, differ from what is reported in the literature: Although not having had the opportunity to experience the technologies first-hand is surely a limitation of the current research, which could have influenced the participants' perception of the advantages and disadvantages, in other respects, it is interesting to note that this has raised issues other than technical ones (Wang et al., 2016), specifically those issues connected to usability (Wüller et al., 2019). Except for the difficulty of use in

the workplace that has already been reported for construction safety by Li et al. (2018), the concern about deskilling constitutes a novel concept that opens up reflection about the role that these technologies can take on in supporting training. If AR, especially in the work environment, has a clear effectiveness in reducing the number of errors made and the efficiency in the execution of a procedure, from the perspective of some participants, it is not clear what its role could be in training and how much it could even interfere with learning. In part, this result is also reflected in the literature: It is not unequivocal that AR can ensure better learning outcomes, and even the sharper results obtained about motivation could still be flawed by the absence of longitudinal research that would avert the novelty effect. In other words, the role of AR, especially its wearable and markerless version, in supporting VET has yet to be clearly defined. The main prerogative reported by several interviewees, which seems to distinguish AR from VR and from the other technologies included in extended reality (XR), lies in the opportunity to directly handle the materials in the real world and acquire the muscle memory necessary for the correct execution of the procedure while at the same time being supported with additional information layered on top of what is seen in the real world. In thinking to AR, trainers might have identified the disadvantage of "deskilling" also due to the examples shown in the short clip. The short video emphasized activities in the workplace and not in teaching situations. This might have led the trainers to think, that the introduction of AR could be a tool to replace some of the activities currently carried out by the operators, rather than a learning support instrument. In other words, teachers were worried that the professionals of the future may become completely dependent on technology (or on synchronous remote support that AR technology could provide) and gain deep learning of fewer procedures as a result.

The main technical advantages offered by HV have been recognised by educators, such as the possibility of displaying content in a nonlinear way by using segmentation through chapters. In terms of teaching, several educators have reported the potential advantages in using it to support both theoretical and procedural learning. The possibility of annotating video materials is not reported by the trainers, while the literature reports it as an effective tool to foster reflective processes (Colasante, 2011; Evi-Colombo et al., 2020). In terms of the disadvantages, compared with AR, the users report few disadvantages because the user experience does not differ much from that of a traditional video, hence providing a much higher degree of familiarity. Among the few disadvantages reported are the time needed to design, record and subsequently produce an HV. However, these limitations are already known, and several platforms are upgrading to offer the possibility to more quickly make the video interactive.

Finally, it is worth noting that the main result of this research lies in the central role that both AR and HV have in supporting procedural learning: Both in terms of the number of co-occurrences and percentage of participants who reported this advantage, the two

technologies can be considered excellent allies for supporting procedural learning, which is a central element in VET programmes.

R2: What is the Relationship Between the Expected Advantages and Disadvantages of AR and HV and the Operative Skills to be Acquired in VET Curricula?

The results clearly report that according to our interviewees, AR can support procedural learning when referring to the operational skills of 'Assembly', 'Repair and maintenance' and 'Planning'. This finding is particularly relevant, especially in view of the results produced by need analysis showing that the two operational skills most supported by AR are also the most important and difficult for most trainers. This could give important hints for developing AR applications supporting these kinds of procedures. Planning could also be significantly supported by introducing AR, especially when looking at the transposition from 2D to 3D. HV is considered a tool capable of supporting procedural work in relation to 'Assembly' and repair and maintenance activities, though it cannot offer real-time support during the performance of procedures. On the other hand, no negative points could be identified from the use of this technology when it came to operational skills. Finally, it is worth mentioning that our data did not mention explicitly one of the possibilities we find in the literature when looking at how to use AR and HV for supporting learning, and namely the possibility to use them collaboratively. Consider, for example, the possibility of receiving AR-based remote assistance while a maintenance procedure is being performed (De Pace et al., 2019) or having the ability to simultaneously view the same augmented world in the planning phase (Nebeling et al., 2020). HV as well can be used collaboratively to support teaching, for example providing students with a raw video and asking them to transform it into a HV (Evi-Colombo et al., 2022) or using video annotation to augment it (Boldrini et al., 2021).

6 Conclusion

According to the interviews we conducted with 73 VET educators, the introduction of both AR and HV tools in VET would mainly produce advantages when applied as a way to support the teaching and learning processes, especially when applied to procedural learning. Procedural learning seems indeed to be the natural target audience for these technologies. The two technologies have aroused different impressions among the trainers: AR creates greater polarisation, raising great enthusiasm among its supporters and scepticism among its detractors, though the balance is strongly in favour of the former; HV, probably because it is not so disruptive regarding other already familiar technologies, is a more consolidated tool, whose benefits are somehow known to the trainers, who sometimes have used it themselves; the points against its use are largely circumscribed. The strong agreement found between the operational skills reported during the need analysis and the affordances found in the

two technologies is one of the main results produced by this study. According to educators' expectations, the use of AR and HV could lay the groundwork for teaching more effectively many operational skills considered relevant to the profession. In perspective, the adoption of these technologies could be a means by which to obtain better professionals.

Despite these results, the current research has several limitations. First, it is a pilot, descriptive study in which the participants were not given the opportunity to experience AR solutions directly. All participants were asked if they were already familiar with augmented reality, yet none of them had heard of it. On some occasions, we cannot say with certainty that the participants had a clear understanding of the differences between AR and virtual reality, and in a few cases, it was necessary to intervene to better clarify the differences and be sure about the interviewees' interpretation. Also, probably for the same reason (lack of direct experience), the educators often referred more willingly to professional applications than to educational ones, though these latter applications were the focus of our study. Additionally, although it was meant as an illustration of the possibilities AR provides, the visualisation of the examples within the explanatory video could have induced a priming effect in the participants. Moreover, there was a difference in the time spent discussing the two technologies during the interviews: AR is mentioned more than twice as many times as HV. This was a choice made in advance in view of the different notorieties of the two technologies; AR seems to have been more unfamiliar and partially unknown to almost all the participants, while HV was found to be known to most respondents. Interestingly, some trainers report fears about the possibility of deskilling in relation to AR by future professionals: It is possible that the absence of a pedagogical model that clearly indicates how the technology can be used to support vocational education and training, as also pointed out by Garzón et al. (2019), has raised doubts in some trainers who fear that these technologies may reduce students' problem-solving skills and force them to rely too much on technological support rather than reason with their own capacities. Future research could investigate what role AR can play in supporting VET by trying to clearly identify what advantage it may bring over other immersive technologies, as well as how AR and HV can be combined within a pedagogical model so that the maximum benefit can be derived from the opportunities offered by the two technologies. Furthermore, although the analogy between what happens in AR and HV is clear (in both cases, a layer of information is superimposed on reality), it needs to be clarified what relationship may persist between the two. The two technologies could fulfil each other's desires, and the specific affordances of each of the two could be pedagogically combined to full utilise the technology. This pedagogical empowerment should be investigated more, both at the theoretical and practical levels.

The present study—and in particular its need analysis—also have highlighted which operational skills need more support in VET today. Several educators underlined the usefulness of the first interview phase that allowed them to focus on those skills needing more support

than others. The needs reported by the interviewees might be helpful for other educators who want to benefit from the teaching experience reported in these interviews. Further studies are needed for developing applications that meet the needs expressed by the educators, as well as for the development of pedagogical models that maximise the use of the two technologies.

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Ethics Statement

This paper did not require approval by an ethics committee. All participants signed an informed consent and agreed to the processing of data for research purposes. Participants' names have been anonymized.

References

Akçayır, M., & Akçayır, G. (2017). Advantages and challenges associated with augmented reality for education: A systematic review of the literature. *Educational Research Review*, *20*, 1–11. https://doi.org/10.1016/j.edurev.2016.11.002

Arguel, A., & Jamet, E. (2009). Using video and static pictures to improve learning of procedural contents. *Computers in Human Behavior*, *25*(2), 354–359. https://doi.org/10.1016/j.chb.2008.12.014

Avila-Garzon, C., Bacca-Acosta, J., Kinshuk, ., Duarte, J., & Betancourt, J. (2021). Augmented reality in education: An overview of twenty-five years of research. *Contemporary Educational Technology*, *13*(3), ep302. https://doi.org/10.30935/cedtech/10865

Azuma, R. (1997). A survey of augmented reality. *Presence: Teleoperators & Virtual Environments*, *6*(4), 355–385. https://doi.org/10.1162/pres.1997.6.4.355

Bacca, J., Baldiris, S., Fabregat, R., Graf, S., & Kinshuk. (2014). Augmented reality trends in education: A systematic review of research and applications. *Educational Technology & Society*, *17*(4), 133–149. http://hdl.handle.net/10256/17763

Bacca, J., Baldiris, S., Fabregat, R., Kinshuk, & Graf, S. (2015). Mobile augmented reality in vocational education and training. *Procedia Computer Science*, *75*, 49–58. https://doi.org/10.1016/j.procs.2015.12.203

Boldrini, E., Cattaneo, A. S., & Evi-Colombo, A. (2021). Études exploratoire sur l'utilisation de l'annotation vidéo dans la formation des enseignant-e-s du secteur professionnel: Un outil d'aide à l'alternance ? *CERN European Organization for Nuclear Research*. https://doi.org/10.5281/zenodo.5751949

Bonoli, L., Berger, J., & Lamamra, N. (2018). *Enjeux de la formation professionnelle en Suisse: Le « modèle » suisse sous la loupe*. Seismo. https://doi.org/10.33058/seismo.20722

Cattaneo, A. A. P. (2016, January 1). Teaching and learning with hypervideo in vocational education and training. *Journal of Educational Multimedia and Hypermedia*, *25*(1), 5–35. https://www.learntechlib.org/primary/p/151120/

Cattaneo, A. S., Van Der Meij, H., & Sauli, F. (2018). An empirical test of three instructional scenarios for hypervideo use in a vocational education lesson. *Computers in the Schools*, *35*(4), 249–267. https://doi.org/10.1080/07380569.2018.1531597

Cattaneo, A. S., Van Der Meij, H., Aprea, C., Sauli, F., & Zahn, C. (2019). A model for designing hypervideo-based instructional scenarios. *Interactive Learning Environments*, *27*(4), 508–529. https://doi.org/10.1080/10494820.2018.1486860

Chambel, T., Zahn, C., & Finke, M. (2006). Hypervideo and cognition: Designing video-based hypermedia for individual learning and collaborative knowledge building. In E. Alkhalifa (Ed.), *Cognitively informed systems: Utilizing practical approaches to enrich information presentation and transfer* (pp. 26–49). IGI Global. https://doi.org/10.4018/978-1-59140-842-0.ch002

Chen, P., Lan, X., Cheng, W., & Huang, R. (2017). A review of using augmented reality in education from 2011 to 2016. In E. Popescu, Kinshuk, M. Koutheair Khribi, R. Huang, M. Jemni, N.-S. Chen, D. G. Sampson (Eds.), *Innovations in smart learning. Lecture notes in educational technology* (pp. 13–18). Springer. https://doi.org/10.1007/978-981-10-2419-1_2

Cheng, K., & Tsai, C. C. (2013). Affordances of augmented reality in science learning: Suggestions for future research. *Journal of Science Education and Technology*, *22*(4), 449–462. https://doi.org/10.1007/s10956-012-9405-9

Colasante, M. (2011). Using video annotation to reflect on and evaluate physical education pre-service teaching practice. *Australasian Journal of Educational Technology*, *27*(1). https://doi.org/10.14742/ajet.983

Cuendet, S., Bonnard, Q., Do-Lenh, S., & Dillenbourg, P. (2013). Designing augmented reality for the classroom. *Computers & Education*, *68*, 557–569. https://doi.org/10.1016/j.compedu.2013.02.015

De Koning, B. B., Tabbers, H. K., Rikers, R. M. J. P., & Paas, F. (2007). Attention cueing as a means to enhance learning from an animation. *Applied Cognitive Psychology*, *21*(6), 731–746. https://doi.org/10.1002/acp.1346

De Pace, F., Manuri, F., Sanna, A., & Zappia, D. (2019). A comparison between two different approaches for a collaborative mixed-virtual environment in industrial maintenance. Frontiers in Robotics and AI, 6(18). https://doi.org/10.3389/frobt.2019.00018

Dunleavy, M., Dede, C., & Mitchell, R. (2009). Affordances and limitations of immersive participatory augmented reality simulations for teaching and learning. *Journal of Science Education and Technology*, *18*(1), 7–22. https://doi.org/10.1007/s10956-008-9119-1

Evi-Colombo, A. (2020, July 1). Technical and pedagogical afordances of video annotation: A literature review. *Journal of Educational Multimedia and Hypermedia*, *29*(3), 193–226. https://www.learntechlib.org/primary/p/215718/

Evi-Colombo, A., Cattaneo, A. S., & Bétrancourt, M. (2022). Procedural knowledge acquisition in a second-year nursing course. Effectiveness of a digital video-based collaborative learning-by-design activity using hypervideo. *Journal of Computer Assisted Learning*, *39*(2), 501–516. https://doi.org/10.1111/jcal.12758

Forest, D. D. (2021). Training the next generation of operators: AFPM immersive learning. *Process Safety Progress*, *40*(4), 219–223. https://doi.org/10.1002/prs.12246

Garzón, J., & Acevedo, J. (2019). Meta-analysis of the impact of augmented reality on students' learning gains. *Educational Research Review*, *27*, 244–260. https://doi.org/10.1016/j.edurev.2019.04.001

Girgensohn, A., Marlow, J., Shipman, F. M., & Wilcox, L. D. (2015). HyperMeeting: Supporting asynchronous meetings with hypervideo. *ACM Multimedia*. https://doi.org/10.1145/2733373.2806258

Grossman, R., Salas, E., Pavlas, D., & Rosen, M. J. (2013). Using instructional features to enhance demonstration-based training in management education. *Academy of Management Learning and Education*, *12*(2), 219–243. https://doi.org/10.5465/amle.2011.0527

Gün, E. T., & Atasoy, B. (2017). The effects of eugmented reality on elementary school students' spatial ability and academic achievement. *Education & Science / Egitim ve Bilim*, *42*(191), 31–51. https://doi.org/10.15390/EB.2017.7140

Hennessy, D. A. (2011). Hennessy-Hicks training needs analysis questionnaire and manual: Training assessment tool. *University of Birmingham, UK-Licensed to WHO for on-line use*. http://epapers.bham.ac.uk/3453/

Huang, W. C., Roscoe, R. D., Johnson-Glenberg, M. C., & Craig, S. D. (2021). Motivation, engagement, and performance across multiple virtual reality sessions and levels of immersion. *Journal of Computer Assisted Learning*, *37*(3), 745–758. https://doi.org/10.1111/jcal.12520

Hussein, M., & Nätterdal, C. (2015). The benefits of virtual reality in education - A comparision Study. Bachelor Thesis, University of Gothenburg. https://gupea.ub.gu.se/handle/2077/39977

Jensen, L., & Konradsen, F. (2018). A review of the use of virtual reality head-mounted displays in education and training. *Education and Information Technologies*, *23*(4), 1515–1529. https://doi.org/10.1007/s10639-017-9676-0

Jetter, J., Eimecke, J., & Rese, A. (2018). Augmented reality tools for industrial applications: What are potential key performance indicators and who benefits? *Computers in Human Behavior*, *87*, 18–33. https://doi.org/10.1016/j.chb.2018.04.054

Kalyuga, S. (2014). The expertise reversal principle in multimedial – experiences and lessons-learned for evaluating prototypes. In R. E. Mayer (Ed.), *The cambridge handbook of multimedia learning* (2nd ed., pp. 576–597). Cambridge University Press. https://doi.org/10.1017/cbo9781139547369.028

Koch, M., van Luck, K., Schwarzer, J., & Draheim, S. (2018). *The novelty effect in large display deployments – experiences and lessons-learned for evaluating prototypes*. European Society for Socially Embedded Technologies (EUSSET). https://dl.eusset.eu/handle/20.500.12015/3115

Lee, I. (2020). Using augmented reality to train students to visualize three-dimensional drawings of mortise–tenon joints in furniture carpentry. *Interactive Learning Environments*, *28*(7), 930–944. https://doi.org/10.1080/10494820.2019.1572629

Li, X., Yi, W., Du Lin, H., Wang, X., & Chan, A. S. C. (2018). A critical review of virtual and augmented reality (VR/AR) applications in construction safety. *Automation in Construction*, *86*, 150–162. https://doi.org/10.1016/j.autcon.2017.11.003

Meixner, B., & Gold, M. (2016). Second-layer navigation in mobile hypervideo for medical training. In Q. Tian, N. Sebe, G.-J. Qi, B. Huet, R. Hong & X. Liu (Eds.), *MultiMedia Modeling, Lecture Notes in Computer Science 9516*. https://doi.org/10.1007/978-3-319-27671-7_32

Merkt, M., & Sochatzy, F. (2015). Becoming aware of cinematic techniques in propaganda: Instructional support by cueing and training. *Learning and Instruction*, *39*, 55–71. https://doi.org/10.1016/j.learninstruc.2015.05.006

Merkt, M., Weigand, S., Heier, A., & Schwan, S. (2011). Learning with videos vs. learning with print: The role of interactive features. *Learning and Instruction*, *21*(6), 687–704. https://doi.org/10.1016/j.learninstruc.2011.03.004

Moro, C., Phelps, C., Redmond, P., & Stromberga, Z. (2021). HoloLens and mobile augmented reality in medical and health science education: A randomised controlled trial. *British Journal of Educational Technology*, *52*(2), 680–694. https://doi.org/10.1111/bjet.13049

Moro, S., Rita, P., & Esmerado, J. (2019). Analysing recent augmented and virtual reality developments in tourism. *Journal of Hospitality and Tourism Technology*, *10*(4), 571–586. https://doi.org/10.1108/jhtt-07-2018-0059

Nebeling, M., Lewis, K., Chang, Y., Zhu, L., Chung, M., Wang, P., & Nebeling, J. (2020). XRDirector: A role-based collaborative immersive authoring system. Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems, Association for Computing Machinery. https://doi.org/10.1145/3313831.3376637

Papakostas, C., Troussas, C., Krouska, A., & Sgouropoulou, C. (2021). Exploration of augmented reality in spatial abilities training: A systematic literature review for the last decade. *Informatics in Education*, *20*(1), 107–130. https://doi.org/10.15388/infedu.2021.06

Park, K., Kim, M., Choi, S. H., & Lee, J. S. (2020). Deep learning-based smart task assistance in wearable augmented reality. *Robotics and Computer-integrated Manufacturing*, *63*, 101887. https://doi.org/10.1016/j.rcim.2019.101887

Parmar, D. (2017). Evaluating the effects of immersive embodied interaction on cognition in virtual reality [*Doctoral dissertation, Clemson University*]. ProQuest

Ploetzner, R. (2022). The effectiveness of enhanced interaction features in educational videos: A meta-analysis. *Interactive Learning Environments*, 1–16. https://doi.org/10.1080/10494820.2022.2123002

Radosavljevic, S., Radosavljevic, V., & Grgurovic, B. (2020). The potential of implementing augmented reality into vocational higher education through mobile learning. *Interactive Learning Environments*, *28*(4), 404–418. https://doi.org/10.1080/10494820.2018.1528286

Radu, I. (2014). Augmented reality in education: A meta-review and cross-media analysis. *Personal and Ubiquitous Computing*, *18*(6), 1533–1543. https://doi.org/10.1007/s00779-013-0747-y

Rice, P., Beeson, P., & Blackmore-Wright, J. (2019). Evaluating the impact of a quiz question within an educational video. *TechTrends*, *63*(5), 522–532. https://doi.org/10.1007/s11528-019-00374-6

Sadallah, M., Aubert, O., & Prié, Y. (2014). CHM: An annotation- and component-based hypervideo model for the Web. *Multimedia Tools and Applications*, *70*(2), 869–903. https://doi.org/10.1007/s11042-012-1177-y

Saiboon, I. M., Jaafar, M. S., Ahmad, N. N., Nasarudin, N. M. A., Mohamad, N., Ahmad, M. S., & Gilbert, J. (2014). Emergency skills learning on video (ESLOV): A single-blinded randomized control trial of teaching common emergency skills using self-instruction video (SIV) versus traditional face-to-face (FTF) methods. *Medical Teacher*, *36*(3), 245–250. https://doi.org/10.3109/0142159x.2013.857013

Sauli, F., Cattaneo, A. S., & Van Der Meij, H. (2017). Hypervideo for educational purposes: A literature review on a multifaceted technological tool. *Technology, Pedagogy and Education*, *27*(1), 115–134. https://doi.org/10.1080/1475939x.2017.1407357

Schwan, S., & Riempp, R. (2004). The cognitive benefits of interactive videos: Learning to tie nautical knots. *Learning and Instruction*, *14*(3), 293–305. https://doi.org/10.1016/j.learninstruc.2004.06.005

Sirakaya, M., & Çakmak, E. K. (2018). Effects of augmented reality on student achievement and self-efficacy in vocational education and training. *International Journal for Research in Vocational Education and Training*, *5*(1), 1–18. https://doi.org/10.13152/ijrvet.5.1.1

Sirakaya, M., & Sirakaya, D. A. (2018). Trends in educational augmented reality studies: A systematic review. *Malaysian Online Journal of Educational Technology*, *6*(2), 60–74. https://doi.org/10.17220/mojet.2018.02.005

Sirakaya, M., & Sirakaya, D. A. (2020). Augmented reality in STEM education: A systematic review. *Interactive Learning Environments*, *30*(8), 1556–1569. https://doi.org/10.1080/10494820.2020.1722713

Strada, F., Bottino, A., Lamberti, F., Mormando, G., & Ingrassia, P. L. (2019). Holo-BLSD–A holographic tool for self-training and self-evaluation of emergency response skills. *IEEE Transactions on Emerging Topics in Computing*, *9*(3), 1581–1595. https://doi.org/10.1109/TETC.2019.2925777

Strahm, R. H., Geiger, B. H., Oertle, C., & Swars, E. (2016). Vocational and professional education and training in Switzerland. Success factors and challenges for sustainable implementation abroad. https://edudoc.ch/record/122648

Strijbos, J. W., Martens, R. L., Prins, F. J., & Jochems, W. M. (2006). Content analysis: What are they talking about? *Computers & education*, *46*(1), 29–48. https://doi.org/10.1016/j.compedu.2005.04.002

Tiellet, C. A., Pereira, A. G., Reategui, E. B., Lima, J. V., & Chambel, T. (2010, June). Design and evaluation of a hypervideo environment to support veterinary surgery learning. In *Proceedings of the 21st ACM Conference on Hypertext and Hypermedia* (pp. 213–222). https://doi.org/10.1145/1810617.1810656

van der Meij, H., & Böckmann, L. (2021). Effects of embedded questions in recorded lectures. *Journal of computing in higher education*, *33*(1), 235–254. https://doi.org/10.1007/s12528-020-09263-x

van der Meij, H., & van der Meij, J. (2016). based training (DBT) in the design of a video tutorial for software training. *Instructional Science*, *44*(6), 527–542. https://doi.org/10.1007/s11251-016-9394-9

van der Meij, J., & de Jong, T. (2006). Supporting students' learning with multiple representations in a dynamic simulation-based learning environment. *Learning and Instruction*, *16*(3), 199–212. https://doi.org/10.1016/j.learninstruc.2006.03.007

Van Gog, T. (2014). 11 - The signaling (or cueing) principle in multimedia learning. In R. Mayer (Ed.), *The cambridge handbook of multimedia learning* (pp. 263-278). Cambridge University Press. https://doi.org/10.1017/CBO9781139547369.014

Villanueva, A. M., Liu, Z., Kitaguchi, Y., Zhu, Z., Peppler, K., Redick, T. S., & Ramani, K. (2021). Towards modeling of human skilling for electrical circuitry using augmented reality applications. *International Journal of Educational Technology in Higher Education*, *18*(1). https://doi.org/10.1186/s41239-021-00268-9

Voronina, M. V., Tretyakova, Z. O., Krivonozhkina, E. G., Buslaev, S. I., & Sidorenko, G. G. (2019). Augmented reality in teaching descriptive geometry, engineering and computer graphics – systematic review and results of the russian teachers' experience. *Eurasia Journal of Mathematics, Science and Technology Education*, *15*(12). https://doi.org/10.29333/ejmste/113503

Vural, Ö. F. (2013). The Impact of a question-embedded video-based learning tool on E-learning*. *Kuram Ve Uygulamada Egitim Bilimleri*, *13*(2), 1315–1323. https://files.eric.ed.gov/fulltext/EJ1017292.pdf

Wang, X. F., Ong, S., & Nee, A. Y. C. (2016). A comprehensive survey of augmented reality assembly research. *Advances in Manufacturing*, *4*(1), 1–22. https://doi.org/10.1007/s40436-015-0131-4

Wulandari, B., Pratama, G. N. I. P., Hasanah, N., & Yuniarti, N. (2019). Augmented reality as android based learning media for wood field laboratory work. *Journal of Physics: Conference Series 1413*. https://doi.org/10.1088/1742-6596/1413/1/012035

Wüller, H., Behrens, J., Garthaus, M., Marquard, S., & Remmers, H. (2019). A scoping review of augmented reality in nursing. *BMC Nursing*, *18*(1). https://doi.org/10.1186/s12912-019-0342-2

Zahn, C. (2017). *Digital design and learning: Cognitive-constructivist perspectives*. Springer eBooks, 147–170. https://doi.org/10.1007/978-3-319-49077-9_8

Zahn, C., Krauskopf, K., Hesse, F. W., & Pea, R. (2010). *Digital video tools in the classroom: How to support meaningful collaboration and critical advanced thinking of students?* Springer. https://doi.org/10.1007/978-1-4419-5716-0_25

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From TPACK to N-TPACK Framework for Vocational Education and Training With a Focus on Nutritional Science and Home Economics

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Abstract

Context: In Germany, vocational education and training (VET) plays a key role in the transition from school to working life. Due to its proximity to the labour market and an increasingly digitised, connected world, the professional knowledge requirements of VET teachers are changing and an adjustment of competence frameworks for vocational teachers is needed.

Approach: Since its introduction, the TPACK (Technological Pedagogical And Content Knowledge) framework of Shulman and Mishra and Koehler has been repeatedly used in the international research discourse as a framework for capturing teachers' professional knowledge. Given the infrequent reference to TPACK in the field of vocational education and training (VET), this theoretical article aims to adapt the TPACK framework for VET teachers. A literature review revealed the importance of developing an adapted TPACK framework that takes into account the peculiarities of the German vocational school system as well as the non technical personal service sector. Based on this research gap, an appropriately adapted TPACK framework was developed. The focus of this article lies on VET of nutritional science and home economics.

Findings: After considering and analysing the requirements of the VET system in Germany in the context of digitalisation, it is suggested to adapt and enlarge the existing TPACK

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framework, thus creating an N-TPACK framework, taking into account "Networking and Collaborative Knowledge (NK)" as an aspect of essential VET teachers' professional knowledge.

Conclusion: The present theoretical article considers the research desideratum of extending the TPACK framework by developing a theoretical N-TPACK framework as well as examining and discussing the various knowledge areas. Building on this theoretical article, a survey of the current status quo of these professional knowledge areas among (prospective) VET teachers in the subject area of nutrition and home economics is necessary, in order to provide orientation and to be able to derive recommended actions for an up-to-date and forward looking teacher education and training.

Keywords: Vocational Education and Training, VET, Digitalisation, Vocational Teachers, Skills and Knowledge

1 Introduction

This section focuses on teachers' professional knowledge in the context of digital transformation and the relevance of the TPACK framework for VET schools.

1.1 Teachers' Professional Knowledge

The skills, knowledge and competencies required by teachers to fulfil their mandate is an area that has been under investigation for some years. Even though the concept of (teacher) competencies is used heterogeneously and there are various proposals for modelling teachers' professional competencies (cf. e.g., Baumert & Kunter, 2006; Shulman, 1986), some basic assumptions find broad agreement. The professional competencies of teachers are usually understood as a combination of professional knowledge as well as teacher's beliefs, values, motivational orientations and self regulatory skills (cf. e.g., Baumert & Kunter, 2006; Bromme, 1997; Shulman, 1986). To be able to offer high quality instructions, a core area of teachers' professional competencies represents their professional knowledge, which unfolds in the facets of Content Knowledge (CK), Pedagogical Knowledge (PK), Pedagogical Content Knowledge (PCK) as well as Organisational and Advisory Knowledge (Baumert & Kunter, 2006; Shulman, 1986).

The increasing digitalisation in all areas of life has entailed new challenges for schools and especially new requirements for teachers (Vilppola et al., 2022), in order to be able to integrate digital media in lessons in a way that promotes learning, as well as to prepare learners for a life in a digitised, connected world. Thus, various theoretical models and approaches

have emerged in the national and international context, with regard to the knowledge that teachers need in order to be able to act professionally in the context of digitalisation and to be capable of designing teaching and guiding proper learning processes.

One model that is repeatedly used as a framework for empirical research and can provide guidance for teacher education and training is the TPACK framework, which originated from Shulman's (1986) concept of Pedagogical Content Knowledge (PCK) and extends the original concept by including a technological component in the teaching context. The extended model of Mishra and Koehler (2006) combines the facets CK, PK and PCK known from Shulman with the technological component TK, from which new intersections emerge that have their focus on digital technologies in the context of content knowledge, pedagogical and pedagogical content knowledge. The facet of Technological Pedagogical And Content Knowledge (TPACK) is particularly interesting for VET teachers, because, in addition to the knowledge of how to incorporate digital tools into the classroom, also knowledge about a digital World of Work 4.0 is becoming increasingly important for VET, due to its proximity to the labour market as subject-specific knowledge (TCK), and future-oriented technologies are already frequently used in in-company training, which should be reflected on with prospective teachers with regard to their implications for the working world. Although the TPACK model can be seen as a flexible framework regarding a variety of technological tools and pedagogical approaches (Celik, 2023; Mishra et al., 2011; Valtonen et al., 2017), the authors of this article expect that the TPACK framework will prove to be a robust framework when aligned with the peculiarities and needs of the German VET system, for a better understanding of the necessary teacher knowledge for vocational education in a World of Work 4.0.

1.2 Significance of the TPACK Framework for Vocational Education and Training

The TPACK model had and still has a considerable impact. The importance of the framework has been widely recognized, not only in the US but internationally (Chai et al., 2013; Hew et al., 2019; Tiede, 2020; Voogt et al., 2013). In the course of the diverse and extensive scientific reception of the TPACK framework, many survey instruments were developed. Moreover, numerous further developments of the TPACK model with adaptations to specific contexts or subject areas and accordingly adapted measurement instruments were produced (Tiede, 2020). However, the published articles with reference to the TPACK framework mostly refer to (prospective) teachers of science, mathematics and technology (Arifin et al., 2020a; Chua & Jamil, 2012; Nurhadi et al., 2019), whereas articles on VET related to the TPACK model are still comparatively few and far between, especially in the non-technical and personal and service sectors.

Through a literature review, the authors of this article aimed to determine the importance of the TPACK framework for vocational school teachers. The following research questions formed the basis for the literature review:

1. Does the TPACK framework adequately map the required knowledge of vocational school teachers?

2. Do international studies regarding the TPACK framework in the context of vocational schools exist?

A literature review was conducted (search date: August 31, 2021) with the following keywords: Initially only "TPACK", then "TPACK AND vocational school" as well as "TPACK AND VET" on literature databases such as Literaturdatenbank Berufliche Bildung (LDBB) and Web of Science (WoS) including SSCI indexed journals. This review has shown that studies in the field of VET with reference to the TPACK framework have so far been limited mainly to Asian countries (Arifin et al., 2020a; Arifin et al., 2020b; Arifin et al., 2020c; Nurhadi et al., 2019) or can be located in the field of industrial-technical education (see Figure 1). However, taking into account the peculiarities of the German VET system, such as the "dual" system (which is called "dual" because the VET takes place at two learning venues - in a company and at a vocational school), the authors of this article believe that these international findings are not sufficiently transferable to the VET system in Germany.

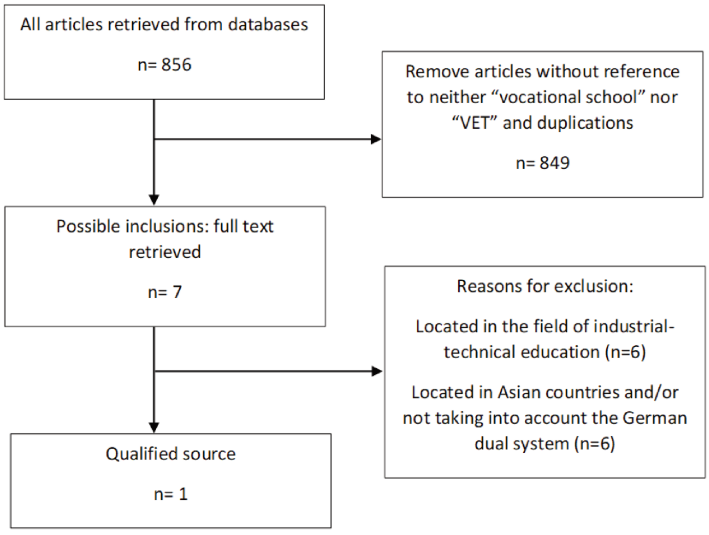

Figure 1: Flow Diagram of Literature Review Process for Articles on TPACK With Reference to Vocational Schools

The literature review was the starting point for developing a new, robust framework that takes into account the specific requirements of the German VET school system, with focus on the non-technical and the personal and service sectors.

Therefore, the key contribution of this theoretical article is to discuss selected peculiarities of the VET system in Germany and the various facets of a VET teacher's professional knowledge, focusing primarily on the non-technical subject area of nutrition and home economics (NaH). The article aims to develop a conceptual framework for the professional knowledge of vocational school teachers of NaH, in the context of the digital transformation, based on the TPACK model by Mishra and Koehler (2006). Considering the peculiarities of the VET system in Germany and the requirements in the context of digitalisation, the authors propose to enlarge the original framework to an N-TPACK framework, taking into account "Networking and Collaborative Knowledge" (NK) as an essential aspect of a VET teacher's professional knowledge in Germany. As a future research proposal, the status quo of the various N-TPACK components among (prospective) VET teachers should be measured. Furthermore, offers which prepare (prospective) VET teachers for the challenges of a World of Work 4.0 and which promote their Networking and Collaborative Knowledge should be implemented.

1.3 Why Networking and Collaborative Knowledge (NK) Matters in Vocational Education and Training?

Prospective digital technologies (e.g., Smart Devices, Cloud Computing, Social Media, Internet of Things, Big Data Analytics, Robotics and Artificial Intelligence) are progressively changing work and business processes, but also the way we inform ourselves, how we learn (e.g., m learning), how we communicate and how we consume - with massive consequences for technological and economic processes, but also for social interactions (Euler & Severing, 2019; Hossain et al., 2021; Hossain et al., 2019). The digital transformation has long since taken hold of sectors and areas that were long considered "digital laggards", such as the personal services sector, that so far had a minor potential for digitisation due to the importance of social interaction (Daum, 2017). Networked, intelligent, automated technologies are increasingly finding their way into our society. The term Industry 4.0 refers specifically to developments in industry, but often also serves as a collective term for the intelligent networking and collaboration of people, machines and objects by means of information and communication systems, and their targeted application in new forms of work and manufacturing processes (Berufsgenossenschaft Nahrungsmittel und Gastgewerbe [BGN], 2020). In the context of this Fourth Industrial Revolution, there is an increasing interconnection of information technology (IT) and software components with mechanical and electronic parts, that communicate via a data infrastructure, such as the internet. Due to the fusion of the physical and digital world and their connection via the internet, it is often called the Internet of Things

(IoT). In addition to new manufacturing processes, forms of work and assistance systems, the merging of processes from the virtual and the real world, as well as their automation, are core elements of the World of Work 4.0 (BGN, 2020). Networked systems make it possible to exchange data and information as well as to react intelligently to each other. Thus, networking and collaboration are central elements of the World of Work 4.0.

As work situations, technologies, forms of work and (customer) interaction forms change, the competence requirements for employees and thus, the demands on VET change too (Euler & Severing, 2019). Due to the proximity to the employment sector, Networking and Collaborative Knowledge (NK) plays progressively an important role for VET, and as a separate VET teacher's professional knowledge facet. On the one hand, this can be understood as knowledge regarding an increasingly digitally networked World of Work with more and more networked systems, and on the other hand, as the ability to network and collaborate with the various actors involved in the VET system in Germany, in order to prepare trainees as far as possible for a World of Work 4.0.

The apprenticeship system in the German-speaking area is known as a "dual system", since it consists of two learning venues, i.e. the vocational (part-time) school and the company. The Federal Government regulates in-company and inter-company training by means of Vocational Training Regulations, whereas the Standing Conference of Ministers of Education and Cultural Affairs of the *Länder (Kultusministerkonferenz [KMK])* develops the corresponding Framework Curricula for the (part-time) vocational school training (Bundesinstitut für Berufsbildung [BIBB], 2011). Along with the German state, both on the federal (*Bund*) and the federal state (*Länder*) level, chambers and companies as well as trade unions represent major actors and players in shaping the VET system beyond government regulation, e.g., when it comes to the on-going modernization of training courses (BIBB, 2011; Deissinger & Gonon, 2016).

A prerequisite for a successful VET is the cooperation and networking between the learning venues. The importance of a "learning venue cooperation" (*Lernortkooperation*) is explicitly emphasised in the original Vocational Training Act (*Berufsbildungsgesetz [BBiG]*) under § 2 subsection 2, however, the act does not make any statements on the nature and extent of this cooperation (Hackel et al., 2017) . Studies show a varying degree of development of learning location cooperation (BIBB, 2018).

Another pedagogical concept that is guiding and established nationwide for the (part-time) vocational school is the "learning field concept" (*Lernfeldkonzept*), which was introduced by the *Kultusministerkonferenz (KMK)* in 1996. The learning field concept is open to development and based on action-orientation. It requires the traditional "division of labour" between the two learning venues (vocational school and company) to be discussed and negotiated, and to that extent an increased cooperation between the two learning venues (Pätzold, 2002). At the same time, lessons structured according to learning fields require much more

consultation and cooperation between the teaching colleagues for planning and organising lessons, since the learning field principle wants to promote interdisciplinary teaching in a didactic sense, while abolishing pure subject-based teaching (Pätzold, 2002). The orientation towards concrete vocational tasks and courses of action is intended to convey key competences that are typical for the corresponding occupational field as well as cross-occupational competences, in order to ultimately enable the trainees to acquire a "vocational action competence" (KMK, 2021; Pätzold, 2002). The learning field concept requires a school and lesson development that enables holistic action-oriented teaching and learning and thus necessitates, in addition to a growing learning venue cooperation, an increased cooperation within teacher teams - the individual teacher is no longer an expert for a specific subject, but a team member as a subject expert (KMK, 2021).

Cooperation of teachers can be a key to successful professional work, in order to successfully cope with new situational demands and complex instructional and pedagogical activities combined with the aforementioned technological innovations (Fussangel, 2008; Gräsel et al., 2006); it is especially a characteristic of school quality (Holtappels, 2020). Studies show that teacher cooperation is also related to better students' performances. Gräsel et al. (2006) distinguish three forms of cooperation: Exchange, cooperation based on division of labour, and co-construction. While exchange as a low-cost method has a low target claim to equalize knowledge levels without a loss of teachers' autonomy, cooperation based on division of labour already aims at increasing efficiency with distributed task fulfilment and shared objectives. Furthermore, joint planning and reliability are required. Co-construction, as the most intensive form of cooperation, uses individual expertise for joint knowledge generation; goals are coordinated and (teaching) actions are professionally planned; pronounced trust and a high level of commitment are required while at the same time restricting the teachers' autonomy. However, the quality and benefits of these activities are high for both team members and the organization. Looking at school organisation, Holtappels (2020) systematizes forms of cooperation into the following categories of increasing intensity and systemic embeddedness from occasional cooperation to professional teamwork: (1) Structured cooperation (committees, conferences); (2) Occasion-induced temporary cooperation (informal and occasional exchange between fixed cooperation partners); (3) Temporary development groups (working groups, development circles); (4) Institutionalized team forms (class teams, year teams, subject teams, steering groups); (5) Professional learning communities (PLC - teamwork focusing on teaching effectiveness and student learning as exchange, division of labour, and co construction). Accordingly, the extension of the TPACK framework by including the networking and collaborative component will be illustrated in section 3, as a basis for further empirical research in this area.

1.4 Digitalisation of the Occupational Field of Nutrition and Home Economics 4.0

The degree of digitalisation of individual professions within the occupational field of nutrition and home economics (NaH) varies greatly and depends on the developments of a single company. However, the current German Digitalisation Index (Bundesministerium für Wirtschaft und Klimaschutz [BMWK], 2022) shows that the manufacturing industry (including food production) as well as the tourism industry are still below average in terms of digitalisation and that small companies have the highest potential for digitalisation. The future of the professional world will be characterised by a "coexistence of highly digitalised and conventional working environments" (Katzer et al., 2017; Zinke, 2019, p. 39). On the one hand, the competency requirements for apprentices remain specific to the occupational field, but cross-occupational competency requirements such as process and system understanding are gaining in importance (Zinke, 2019). The occupational field of NaH is characterised by a broad spectrum of work areas in personal services, crafts and technological manufacturing. The approximately 30 apprenticeship occupations range from hotel specialist, housekeeper, chef, baker to wine technologist and brewer and maltster (Terrasi-Haufe & Miesera, 2018). These fields of work are characterised by interfaces with health and care, commercial occupations and food technology. Cross-occupational knowledge and understanding of related occupations are necessary to meet the demands of the changing world of work. Teachers and trainers within the dual vocational education and training system need to take these requirements into account through cooperation. So far, occupations focused on personal services, such as gastronomy, home economics and food retailing, have been almost unaffected by system-altering technological changes (Brutzer et al., 2018; Kastrup & Brutzer, 2021). The increasing digitalisation of these areas requires an expansion of the professional competencies of employees as well as of teachers and trainers. More and more digitalised processes find their way into the workflows of personal services (Friese, 2021). Digital work processes are increasingly taking place asynchronously and at separate locations from the workplace, and systemic considerations of work processes are becoming more significant (Zinke, 2019). New forms of ordering and payment in the gastronomy sector, smart home facilities in home economics and both digitalised customer contacts and digitalised production in food retailing and production can be found. Previous VET and teacher training has not taken these areas into account (Brutzer et al., 2018). On the one hand, technological knowledge specific to the occupational field is necessary to meet the requirements of everyday working life (Miesera et al., 2021). On the other hand, digitalisation is more than the transformation of manual activities into digitalised processes; rather, digitalisation in the occupational field is characterised by increased networking and interfaces. The interfaces concern both other occupational fields as well as competency areas in dealing with technologies in the commercial occupational field, manufacturing field and the field of personal services. The networking

includes work processes e.g., from ordering to payment and (individualised) production, cooperation with other occupational groups such as suppliers, dealers, IT specialists as well as the loyalty to customers e.g., through customer cards, mailings.

2 Adaptation of the TPACK Framework for VET – With a Focus on Vocational Education of Nutritional Science and Home Economics

Since the existing framework by Mishra and Koehler (2006) has already been adapted for (prospective) VET teachers in Germany in a previous contribution (see Miesera et al., 2021), the authors deliberately refrain from illuminating in detail the individual framework components. This section deals with the technology-related knowledge of vocational school teachers of NaH in the context of the digital transformation. Furthermore, the focus of this article lays on the Networking and Collaborative Knowledge (NK) of VET teachers (see section 3).

2.1 Technological (TK), Pedagogical Technological (TPK) and Technological Content Knowledge (TCK)

With regard to the profound changes that modern, digital technologies entail for forms of work and business processes in companies, but also for social coexistence (Dormann et al., 2016; Gerholz & Dormann, 2017), the term digitalisation falls short. Therefore, the term digital transformation is more appropriate. In the course of a transformed World of Work, the competence requirements for employees are changing and thus the requirements for VET and VET teachers (Euler & Severing, 2019; Funk & Webe, 2017). This is accompanied by changes in the requirements for the to-be-taught learning content as well as for the didactic design of teaching and learning processes. The digital transformation has taken hold of sectors and areas that so far had less potential for digitisation due to the importance of social interaction, such as the personal services sector (Daum, 2017). In the light of the immense technological possibilities, an ever-increasing flood of data and a globally networked society, according to Wittmann and Weyland (2020), topics such as autonomy, security and trust, as well as the tension between these categories, are becoming increasingly relevant for a successful digital transformation in occupation, working life and society. In order to fulfil its educational mandate, VET and especially a VET teacher needs to impart an understanding for these issues, as well as for data protection and security, with the purpose of promoting a sustainable development of the working and living environment as well as the sovereignty, maturity and a self-determined participation in society of all those involved (Blossfeld et al., 2018; KMK, 2021; Seufert et al., 2018; Wittmann & Weyland, 2020). An increasingly digital

World of Work requires VET teachers to have specific technological and methodological skills, e.g., knowledge in dealing with Big Data applications, as well as to know how to impart understanding for the (critical) use of digital media and technologies (Blossfeld et al., 2018). In order to qualify learners for the requirements of a World of Work 4.0, a VET teacher needs to be able to convey complex content on the topic of digitalisation as well as to know how to combine traditional and digital forms of learning in a suitable way (Blossfeld et al., 2018). The role of a VET teacher is changing. A VET teacher increasingly has the task of promoting the learners' ability for self directed learning and enabling them to actively shape their individual learning processes - the VET teacher increasingly and consciously takes a back seat (Blossfeld et al., 2018; KMK, 2021).

A World of Work 4.0 requires VET teachers to have occupational field-specific knowledge of up-to-date digital technologies and tools (e.g., Augmented Reality [AR], Virtual Reality [VR], Artificial Intelligence [AI], Cloud Computing etc.) and, above all, knowledge of their significance for the various training occupations in the corresponding occupational field. For example, a VET teacher of NaH needs to be familiar with subject specific media and technologies, such as evaluation portals, enterprise resource planning (ERP) systems, electronic assistance systems, point-of-sale systems and apps (for ordering and reservation processes, as collection of recipes, for ingredients, regarding food hygiene/safety, waste disposal, etc.) (Arenskötter et al., 2019; Brutzer et al., 2018). Furthermore, he/she should be able to assess how these technologies are affecting and changing the professional discipline. The survey of occupational field-specific knowledge with an adapted TPACK survey instrument shows a lower mean value for the TCK subscale than for the TK and TPACK subscales among prospective VET teachers in the field of NaH (Miesera et al., 2021). The low self-assessment of items such as "knowledge about the significance and importance of innovative media and technologies (e.g., cloud-based software programmes, artificial intelligence, etc.) for the field of personal services (e.g., home economics, gastronomy, dietary assistance)" indicates a need for targeted training offers (Miesera et al., 2021, p. 12).

2.2 Technological Pedagogical and Content Knowledge (TPACK)

For a VET teacher of NaH, it is important to know how digitalisation will change structures and processes in the various training occupations of the occupational field, in order to be able to re-describe the current and future vocational action competence and to adapt the learning content and action-oriented learning situations accordingly (Lund, 2018). According to Bruhn & Hadwich, 2017), the service sector will change significantly as a result of digitalisation; the integration of technologies and intelligent services within value-creating networks will increase. At the same time, the service sector has a profoundly human side and it is up to the VET teacher to keep an eye on what is originally human that needs to be

preserved, what competences the learners need to find their way around a World of Work 4.0 and how, correspondingly, future-oriented learning situations can be designed (Lund, 2018). Furthermore, a VET teacher of NaH must identify subject-specific digital media and technologies with vocational reference and integrate them into the teaching-learning scenarios in a competency-oriented manner by connecting them to the matching vocational field or training contents of the various occupations (Grundmann et al., 2019).

3 Extension of the TPACK Framework to N-TPACK Taking Into Account Networking and Collaborative Knowledge (NK)

As already pointed out in section 1.3, as a result of its proximity to the employment sector, Networking and Collaborative Knowledge (NK) plays an important role for vocational education and training, even more within the context of the digitalisation. To that extent, according to the authors of this article, Networking and Collaborative Knowledge (NK) can be seen as a separate VET teacher's professional knowledge facet. However, a VET teacher needs to be competent not only in terms of the four types of knowledge per se – Networking and Collaborative (NK), Pedagogical (PK), Content (CK) and Technological Knowledge (TK) - but especially regarding their intersection, interplay and combination (see Figure 2).

The proposed N-TPACK framework provides various network related components of a VET teacher's professional knowledge (see Figure 2). In the following, these components of the N-TPACK framework are formulated in concrete terms, principally regarding VET teachers of NaH.

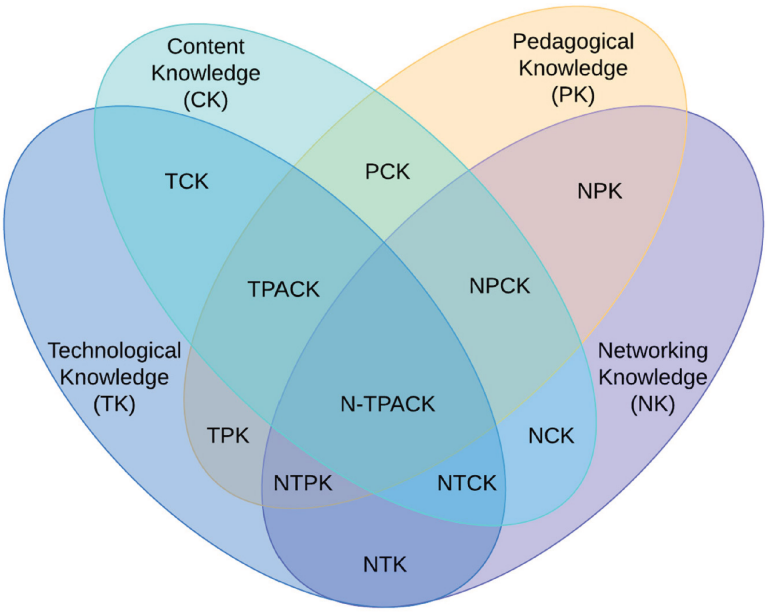

Figure 2: Conceptual Framework N-TPACK for VET (own representation based on the TPACK Framework by Mishra and Koehler, 2006)

3.1 Networking and Collaborative Knowledge (NK) as Well as Networking and Collaborative Technological Knowledge (NTK)

Networking and Collaborative Knowledge (NK) of a VET teacher can be considered as knowledge regarding the networking and collaboration with the various actors involved in the VET system, such as other VET teachers, companies, chambers, trade unions, other educational institutions etc., with the aim of preparing learners adequately for cooperation in a World of Work 4.0, whereas NTK can be understood as a VET teacher's knowledge related to the potential and usage of digital technologies and media to achieve the same goals (e.g., knowledge about data sharing, knowledge about cooperation tools such as Teams, Zoom, Adobe Connect, Padlet, Miro etc.). Furthermore, NTK implies knowledge related to the potentials as well as the risks that intelligently networked machines and processes, characterising a World of Work 4.0, can entail.

3.2 Networking and Collaborative Pedagogical Knowledge (NPK) as Well as Networking and Collaborative Technological Pedagogical Knowledge (NTPK)

VET trainees have always had diverse backgrounds. However, (social) heterogeneity in VET in Germany has increased over the last decade, among others, for the following reasons: The strong influx of refugees (especially in 2015/2016) has reached VET so that many trainees come from immigrant families; the signing of the UN Convention on the Rights of Persons with Disabilities (2009) has led to the inclusion of persons with disabilities within the mainstream school system; the proportion of university drop-outs has grown (Euler & Severing, 2020). The increasing heterogeneity in VET requires a constructive approach to this diversity and the individual support of all learners. Teachers need to know how to get support and how to cooperate within internal and external school networks (e.g., with other teachers, school social workers, accompanying social services, professionals from the therapeutic, socio-pedagogical and medical fields, with other educational institutions etc.) in order to enable successful work as multi-professional teams and to ensure inclusive school development (cf. Fischer & Heger, 2011; Heimlich, 2003; Heimlich & Jacobs, 2001; Verband Bildung und Erziehung [VBE], 2017).

Furthermore, NPK includes knowledge about the importance of a "learning venue cooperation" *(Lernortkooperation)*, a central pedagogical concept of the German VET system emphasised in the original Vocational Training Act *(Berufsbildungsgesetz [BBiG])*. VET teachers should be in constant contact with the instructors in the companies, and show willingness to cooperate with them on an organisational but also didactic level (Helm et al., 2017; KMK, 2021).

As already mentioned in section 1.2, elaborated forms of collaboration are found in PLCs. These have a long history for cooperative school and classroom development in general education schools and originated in the United States in the late 1980s (Bonsen & Rolff, 2006). PLGs are mainly characterized by five features (cf. Warwas & Schadt, 2020): (1) They develop common action guiding objectives with a view to instructional design; (2) they have a clear focus on learning with a supportive help and error culture (Bonsen & Rolff, 2006); (3) they engage a continuous, reflective dialogue about the instructional actions of the community members, e.g., by testing/evaluating new instructional approaches; (4) they de-privatize their teaching by having their members share knowledge and professional experiences and direct their activities toward the goal of promoting and improving student learning; (5) they collaboratively construct new knowledge and instructional approaches. Another characteristic of this approach is that members of the learning community can quickly assess success and effectiveness through the feedback of a scientific formative evaluation in parallel with the process, and benefit from these findings as they continue to develop the innovation (Gräsel, 2010; Gräsel & Parchmann, 2004). The importance of cooperation and collaboration as

a condition for success in incorporating innovations into the classroom is emphasized by several studies (Borko, 2004; Fussangel, 2008; Krebs, 2008). Therefore, it is a desirable goal to initiate a professional cooperation of teachers in vocational education for the implementation of technological and didactical innovations beyond teacher training and to systematically involve further stakeholders in the development of school and teaching, e.g., school management, educational administration, school functionaries with expertise related to the innovation (e.g., the person responsible for IT), in order to meet the changing and increased requirements in the vocational education system.

If there is a large physical distance between members of a PLC, the usage of digital media can be a solution (Kansteiner, 2019). Individual sessions can be organised as online-only, but also as hybrid sessions. A VET teacher needs to have knowledge about suitable collaboration tools, thus needs to have Networking and Collaborative Technological Pedagogical Knowledge (NTPK). Digital technologies and media can also support and improve (time and location independent) cooperation within and between the learning venues (Euler & Severing, 2019), as well as with other relevant actors for the VET system (e.g., social services, universities, etc.). Digital labour and learning platforms can offer the possibility of improved coordination and exchange of experience as well as work resources, documents, materials and data (Euler & Severing, 2019). A VET teacher needs to know how to use them to best connect and engage networking as well as collaboration with the various actors.

If necessary, a teacher in Germany can seek support from the school's media education consultants *(medienpädagogische Berater:innen digitaler Bildung, mBdB)* or information technology (IT) consultants *(informationstechnische Berater:innen digitaler Bildung [iBdB])*, who represent an important link between the various school and non-school stakeholders. They support teachers in shaping the digital transformation as well as in relation to media education and IT issues. Media education consultants focus on the challenges of the modern media world and digitalisation as a whole and give support in the development of schools and teaching regarding questions of school media education. However, media education consultants have also specific expertise as trainers within learning communities/collaboration.

3.3 Networking and Collaborative Content Knowledge (NCK) and Networking and Collaborative Technological Content Knowledge (NTCK)

One of the most important characteristics of the subject area of nutrition and home economics is its considerable range of training occupations, as it includes 29 different occupations with an industrial-technical or craft character (e.g., occupations in food production), with an economic administrative or commercial character (e.g., occupations in food retailing), as well as with a person-related service character (e.g., occupation in hospitality and home

economics) (Brutzer & Küster, 2015; Kastrup & Brutzer, 2019; Kettschau, 2013; Terrasi-Haufe & Miesera, 2018). Furthermore, some are designed as dual training occupations and others as full-time school-based vocational training programmes (Kastrup & Brutzer, 2019). The heterogeneity of the subject area makes the importance and necessity of networking and cooperation with the various actors of the VET system as well as within the school's subject group *(Fachgruppe)* all the more obvious. A vocational school teacher for NaH should place special emphasis on close cooperation within the subject group by regularly making more precise arrangements regarding the specifications of the curricula and the content knowledge to be taught. Whenever networking and cooperation with the various actors of the VET system as well as within the subject group for this purpose takes place successfully with help of digital cooperation tools (such as Zoom, Teams, Adobe Connect, Padlet etc.) or digital working and learning platforms (such as Moodle, SharePoint etc.), we speak of Networking and Collaborative Technological Content Knowledge (NTCK).

3.4 Networking and Collaborative Pedagogical Content Knowledge (NPCK)

The in section 3.2 mentioned learning venue cooperation can take place by involving companies in the design of learning situations, by exchanging information on the implementation of the learning field concept or by planning training courses together. Moreover, a VET teacher for NaH could carry out a practical training or a visit within a company, in order to align learning situations as closely as possible to real work and business processes of the occupational field. Learning venue cooperation ultimately pursues the mutual goal of enabling the trainees to achieve a vocational action competence (Helm et al., 2017; KMK, 2021).

As a VET teacher for NaH or as a member of a team that collaborates with the university, it is also of great importance to be in close exchange with the subject didactic of NaH located at the university. This way, an optimal networking of study and vocational school, of theory and practice, can be achieved. Furthermore, this way of networking supports a future-oriented VET. Networking and collaboration with federal working groups *(Bundesarbeitsgemeinschaften)* related to the vocational field *(e.g., Bundesarbeitsgemeinschaft für Berufsbildung in der Fachrichtung Ernährung und Hauswirtschaft [BAG E&H])* promotes this interlock of research and practice as well, and thus innovation in VET.

Furthermore, the learning field concept (introduced in 1996) has caused a didactic paradigm shift at vocational schools, requiring the cooperation between teachers. With the introduction of the learning field concept, separate school subjects were largely abolished. Instead, learning fields with an extensive time volume are now to be implemented; there is a dissolution and reorganisation of the planning and organisational structures, related to times, rooms and teachers - a learning field is not exclusively assigned to one teacher anymore, but entails the cooperation of several teachers (Kremer & Sloane, 2000; Tenberg, 2017). In order

to ensure the highest possible quality of vocational education within the learning field plans, a VET teacher needs to have the ability to optimally integrate his/her strengths within a team of teachers and to compensate for his/her weaknesses as much as possible (Tenberg, 2017).

3.5 Networking and Collaborative Technological Pedagogical and Content Knowledge (N-TPACK)

N-TPACK refers to knowledge that goes beyond the individual components of professional knowledge. It can be interpreted as knowledge and understanding related to the complex and required interaction of the different components. Supported by cooperation within networks (especially with the learning venue company), a VET teacher needs to know how to teach and convey subject content using appropriate subject didactic and pedagogical reflection as well as technologies. Based on learning field-related teaching, a VET teacher has the responsibility to identify relevant, vocational tasks and problems and prepare these didactically as action oriented learning situations. Considering the ongoing digitalisation characterising the World of Work 4.0 and the immediacy to the labour market, a VET teacher needs to recognize technologies and digital media with relevance for the corresponding occupational field and integrate them into the teaching-learning scenarios in a competency-oriented manner (Grundmann et al., 2019). According to the authors of this article, through networking and cooperation between the two learning venues as well as with other stakeholders of the VET system, company needs and on-going digital developments within the occupational field can be included in the best possible way in vocational school teaching (e.g., as learning situations based on current and future-oriented professional actions), and thus offering up to date teaching.

Furthermore, digital media and technologies, such as mobile devices and cloud-based learning management systems, offer new opportunities for the cooperative knowledge construction between the learning venues, e.g., for linking work and learning processes (Schmid et al., 2016)

In summary, a central prerequisite for the development and implementation of innovative training concepts is that a vocational school teacher has the necessary competencies to qualify trainees for the requirements of a World of Work 4.0. In addition to a VET teacher's technical know-how, up-to-date, practice-relevant knowledge on digitalisation, Industry 4.0 and the networking of operational processes is necessary (Blossfeld et al., 2018). In this respect, a vocational school teacher needs to be able to convey complex content regarding the subject of digitalisation and Industry 4.0 and, on the other hand, to combine traditional and digital forms of learning in a suitable manner (Blossfeld et al., 2018).

Because of changing requirements for VET and considering the demanded implementation of complex, future-oriented learning situations, according to the authors of this article,

besides learning venue cooperation, also cooperation and networking between teachers becomes more and more advantageous, if not necessary, with the final goal of ensuring school development as well as the improvement of the learners' professional action competence.

4 Discussion and Conclusion

The analysis and understanding of learning and interaction processes and their contextual adaptations are the prerequisite for the design of future VET. The impact of the digital transformation on learning and professional development needs to be taken into account by teacher education programs, teaching and learning processes as well as by inter-professional cooperation.

The specificity of the VET system and VET teachers' education in Germany, requires an adaptation of existing frameworks defining teachers' professional knowledge. The TPACK framework was used in several studies to define and capture teachers' professional knowledge, however primarily in the field of general school education. The TPACK framework captures the technology-related knowledge components of a teacher, which in this article refers primarily to technological knowledge in the context of a World of Work 4.0. Technological changes and an increasingly networked, digitalised world require an expansion of the professional understanding of teachers and thus a revision of existing competency frameworks - e.g., of the TPACK model. This article takes into account this desideratum by extending the TPACK to an N-TPACK framework, by including Networking and Collaborative Knowledge (NK) as a further knowledge facet. As an example, in this article this is done for teachers of the vocational subject area of nutrition and home economics. With regard to the learning venue cooperation in VET, there is a lack of research that systematically examines the influence on school and teaching development as well as the influence on students' learning outcomes in VET.

With a view to a future-oriented VET and VET teachers' training, there is a need for research that records the status quo of the various N-TPACK components among (prospective) VET teachers on the one hand, while on the other hand, it is necessary to enable and carry out corresponding offers further on - e.g., in the form of digital and networked Teaching and Learning Labs - that prepare (prospective) VET teachers for the challenges of a World of Work 4.0 and through which the implementation of their network related knowledge is promoted. Thus, it is essential to move from the level of knowledge to the level of practice, design and application.

Ethics Statement

The submitted article is a theoretical article for which no empirical data collection was carried out, thus no research ethics committee was consulted. The ethical principles in accordance with the IJRVET Ethics Statement were implemented.

References

Arifin, Z., Nurtanto, M., Kholifish, N., Nurhaji, S., & Warju, W. (2020b). The technology andragogy work content knowledge model framework on technical and vocational education and training. *Journal of Education and Learning (EduLearn)*, *14*(3), 442–448. https://doi.org/10.11591/edulearn.v14i3.15946

Arifin, Z., Nurtanto, M., Priatna, A., Kholifah, N., & Fawaid, M. (2020a). Technology andragogy work content knowledge model as a new framework in vocational education: Revised technology pedagogy content knowledge model. *TEM Journal*, 9(2), 786–791. https://doi.org/10.18421/TEM92-48

Arifin, Z., Nurtanto, M., Warju, W., Rabiman, R., & Kholifah, N. (2020c). The TAWOCK conceptual model at content knowledge for professional teaching in vocational education. *International Journal of Evaluation and Research in Education (IJERE)*, *9*(3), 697–703. https://doi.org/10.11591/ijere.v9i3.20561

Baumert, J., & Kunter, M. (2006). Stichwort: Professionelle Kompetenz von Lehrkräften. *Zeitschrift Für Erziehungswissenschaft*, *9*(4), 469–520. https://doi.org/10.1007/s11618-006-0165-2

Berufsgenossenschaft Nahrungsmittel und Gastgewerbe. (BGN) (2020). *Arbeitswelt 4.0 - Was ist das eigentlich?* Berufsgenossenschaft Nahrungsmittel und Gastgewerbe - BGN. https://www.bgn.de/praevention-arbeitshilfen/sicher-und-gesund/themenseite-arbeitswelt-40/arbeitswelt-40-was-ist-das-eigentlich

Bundesinstitut für Berufsbildung. (BIBB) (2011). V*ocational training regulations and the process behind them*. Federal Institute for Vocational Education and Training (Bundesinstitut für Berufsbildung). https://www.bibb.de/dienst/publikationen/en/2062

Bundesinstitut für Berufsbildung. (BIBB) (2018). *Lernorte und Lernortkooperation in der beruflichen Bildung*. https://docplayer.org/212510737-Lernorte-und-lernortkooperation-in-der-beruflichen-bildung.html

Blossfeld, H.-P., Bos, W., Daniel, H.-D., Hannover, B., Köller, O., Lenzen, D., McElvany, N., Roßbach, H.-G., Seidel, T., Tippelt, R., & Wößmann, L. (2018). *Digitale Souveränität und Bildung: Gutachten*. Waxmann.

Bundesministerium für Wirtschaft und Klimaschutz. (BMWK) (2022). *Digitalisation of the economy in Germany: Digitalisation index 2021*. https://www.de.digital/DIGITAL/Redaktion/DE/Digitalisierungsindex/Publikationen/publikation-download-zusammenfassung-ergebnisse-digitalisierungsindex-2021-english.pdf?__blob=publicationFile&v=5

Bonsen, M., & Rolff, H.-G. (2006). Professionelle Lerngemeinschaften von Lehrerinnen und Lehrern. *Zeitschrift für Pädagogik*, *52*(2), 167–184. https://doi.org/10.25656/01:4451

Borko, H. (2004). Professional development and teacher learning: Mapping the terrain. *Educational Researcher*, *33*(8), 3–15. https://doi.org/10.3102/0013189X033008003

Bromme, R. (1997). Kompetenzen, Funktionen und unterrichtliches Handeln des Lehrers. In F. E. Weinert (Ed.), *Psychologie des Unterrichts und der Schule* (pp. 177–212). Hogrefe.

Bruhn, M., & Hadwich, K. (2017). *Dienstleistungen 4.0: Konzepte – Methoden – Instrumente. Band 1. Forum Dienstleistungsmanagement*. Springer Gabler. https://doi.org/10.1007/978-3-658-17550-4

Brutzer, A., Kastrup, J., & Kettschau, I. (2018). Impulse zur Novellierung der Ausbildung. *Be&B Agrar, 71*(4), 13–15.

Brutzer, A., & Küster, C. (2015). Lernbereich "Alltagskultur" im Berufsfeld Ernährung und Hauswirtschaft – Skizze für einen Orientierungsrahmen. *Haushalt in Bildung & Forschung*, *4*(1), 97–107. https://doi.org/10.3224/hibifo.v4i1.18198

Celik, I. (2023). Towards Intelligent-TPACK: An empirical study on teachers' professional knowledge to ethically integrate artificial intelligence (AI)-based tools into education. *Computers in Human Behavior*, *138*, 107468. https://doi.org/10.1016/j.chb.2022.107468

Chai, C., Koh, J., & Tsai, C.-C. (2013). A review of technological pedagogical content knowledge. *Educational Technology & Society*, *16*(2), 31–51.

Chua, J. H., & Jamil, H. (2012). Factors influencing the technological pedagogical content knowledge (TPACK) among TVET instructors in Malaysian TVET institution. P*rocedia - Social and Behavioral Sciences*, *69*, 1539–1547. https://doi.org/10.1016/j.sbspro.2012.12.096

Daum, M. (2017). *Digitalisierung und Technisierung der Pflege in Deutschland: Aktuelle Trends und ihre Folgewirkungen auf Arbeitsorganisation, Beschäftigung und Qualifizierung*. DAA-Stiftung Bildung und Beruf. https://www.daa-stiftung.de/fileadmin/user_upload/digitalisierung_und_technisierung_der_pflege_2.pdf

Deissinger, T., & Gonon, P. (2016). Stakeholders in the German and Swiss vocational educational and training system. *Education + Training*, *58*(6), 568–577. https://doi.org/10.1108/ET-02-2016-0034

Dormann, M., Gerholz, K.-H., & Schmieden, A. (2016). 21st Century skills für die Ausbildung 4.0. *Wir AUSBILDER* (Sonderausgabe 2/2016), 17–19.

Euler, D., & Severing, E. (2019). *Berufsbildung für eine digitale Arbeitswelt: Fakten, Gestaltungsfelder, offene Fragen*. Bertelsmann Stiftung. https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/GrauePublikationen/LL_Digitalisierung_Berufsbildung.pdf

Euler, D., & Severing, E. (2020). *Heterogenität in der Berufsbildung – Vielfalt gestalten*. Bertelsmann Stiftung. https://www.bertelsmann-stiftung.de/fileadmin/files/user_upload/Heterogenitaet_Berufsbildg.pdf https://doi.org/10.11586/2020016

Fischer, E., & Heger, M. (2011). B*erufliche Teilhabe und Integration von Menschen mit geistiger Behinderung: Abschlussbericht der wissenschaftlichen Begleitung zum Projekt "Übergang Förderschule-Beruf". Schriften zur Pädagogik bei Geistiger Behinderung: Band 3*. Athena-Verlag.

Friese, M. (Ed.). (2021). *Berufsbildung, Arbeit und Innovation: Band 58. Care Work 4.0: Digitalisierung in der beruflichen und akademischen Bildung für personenbezogene Dienstleistungsberufe*. wbv. https://library.oapen.org/bitstream/handle/20.500.12657/47797/1/external_content.pdf

Funk, T., & Webe, C. (2017). *Digitalisierung in der Ausbildung: Upgrade mit Strategie*. k.o.s GmbH. https://www.kos-qualitaet.de/wp-content/uploads/2021/08/baq_Heft_Ausbilden_Nr2_Digitalisierung.pdf

Fussangel, K. (2008). *Subjektive Theorien von Lehrkräften zur Kooperation* [Doctoral dissertation, Bergische Universität Wuppertal]. Deutsche Nationalbibliothek.

Gerholz, K.-H., & Dormann, M. (2017). Ausbildung 4.0: Didaktische Gestaltung der betrieblich-beruflichen Ausbildung in Zeiten der digitalen Transformation. *Bwp@ Berufs- Und Wirtschaftspädagogik - Online*, *32*, 1–22. http://www.bwpat.de/ausgabe32/gerholz_dormann_bwpat32.pdf

Gräsel, C. (2010). Stichwort: Transfer und Transferforschung im Bildungsbereich. *Zeitschrift Für Erziehungswissenschaft*, *13*(1), 7–20. https://doi.org/10.1007/s11618-010-0109-8

Gräsel, C., Fußangel, K., & Pröbstel, C. (2006). Lehrkräfte zur Kooperation anregen - eine Aufgabe für Sisyphos? *Zeitschrift für Pädagogik*, *52*(2), 205–219. https://doi.org/10.25656/01:4453

Gräsel, C., & Parchmann, I. (2004). Implementationsforschung - oder: Der steinige Weg, Unterricht zu verändern. *Unterrichtswissenschaft*, *32*(3), 196–214. https://doi.org/10.25656/01:5813

Grundmann, S., Stilz, M., & Becker, B. (2019). Digitale Welten – Unterricht 4.0 in der beruflichen Fachrichtung Ernährung und Hauswirtschaft. *Haushalt in Bildung & Forschung*, *8*(3), 26–41. https://doi.org/10.3224/hibifo.v8i3.03

Hackel, M., Junggeburth, C., Milolaza, A., Reymers, M., Zöller, M., & Schaal, T. (2017). *Berufsschule im dualen System - Daten, Strukturen, Konzepte. Wissenschaftliche Diskussionspapiere: Heft 185*. Bundesinstitut für Berufsbildung. http://nbn-resolving.de/urn:nbn:de:0035-0656-6

Heimlich, U. (2003). *Integrative Pädagogik: Eine Einführung. Kohlhammer-Urban-Taschenbücher*. Kohlhammer.

Heimlich, U., & Jacobs, S. (2001). *Integrative Schulentwicklung im Sekundarbereich: Das Beispiel der IGS Halle/Saale*. Klinkhardt.

Helm, C., & Holtsch, D. (2017). Pädagogisch-psychologisches Wissen aus Sicht der Berufs- und Wirtschaftspädagogik: Bestandsaufnahme und Überlegungen zur Weiterentwicklung des Konstrukts. *Zeitschrift Für Bildungsforschung (ZBF)*, *7*, 273–290. https://doi.org/10.1007/s35834-017-0194-3

Hew, K. F., Lan, M., Tang, Y., Jia, C., & Lo, C. K. (2019). Where is the "theory" within the field of educational technology research? *British Journal of Educational Technology*, *50*(3), 956–971. https://doi.org/10.1111/bjet.12770

Holtappels, H. G. (2020). Professionelle Lerngemeinschaften - Systematisierung und Forschungsbefunde zu Merkmalen und Wirkungen von Teamhandeln. In K. Kansteiner, C. Stamann, C. Buhren & P. Theurl (Eds.), P*rofessionelle Lerngemeinschaften als Entwicklungsinstrument im Bildungswesen* (pp. 64–83). Beltz Juventa.

Hossain, S. F. A., Nurunnabi, M., & Hussain, K. (2021). Continuous mobile devices usage tendency in the TPACK-based classroom and academic performance of university students. *Technology, Pedagogy and Education*, *30*(4), 589–607. https://doi.org/10.1080/1475939X.2021.1933160

Hossain, S. F. A., Shan, X., & Nurunnabi, M. (2019). Is M-Learning a challenge? *International Journal of E-Collaboration*, *15*(1), 21–37. https://doi.org/10.4018/IJeC.2019010102

Kansteiner, K., Louca, L., Landström, P., Sanchidrián, C., Theurl, P., Emstad, A. B., Stamann, C., Barrios, E., Skoulia, T., Meidell, M., Stjärne, C., Krogstad Strand, M., Knutsen, B., Zumtobel, M. (2019). *Professionelle Lerngemeinschaften für Schulleitungen: Führungskräfteentwicklung trifft Schulentwicklung*. Weingarte. https://ec.europa.eu/programmes/erasmus-plus/project-result-content/5bd3ec76-a197-4c24-bc8e-8bf9fa521681/HeadsUP_PLC_Manual_german.pdf

Kastrup, J., & Brutzer, A. (2019). Wechselwirkungen der Fachdidaktik, Fachwissenschaft und Berufspädagogik in der beruflichen Fachrichtung Ernährung und Hauswirtschaft. *Bwp@ Berufs- Und Wirtschaftspädagogik - Online, 37*, 1–20. http://www.bwpat.de/ausgabe37/brutzer_kastrup_bwpat37.pdf

Kastrup, J., & Brutzer, A. (2021). Digitalisierung im Berufsfeld Ernährung und Hauswirtschaft - eine Analyse aktueller Diskurse. In M. Friese (Ed.), *Berufsbildung, Arbeit und Innovation: Band 58. Care Work 4.0: Digitalisierung in der beruflichen und akademischen Bildung für personenbezogene Dienstleistungsberufe* (pp. 199–214). wbv.

Katzer, O., Kreher, S., & Zinke, G. (2017). Ausbildungsgestaltung in der digitalisierten Arbeitswelt: Beispiel: Produktionsunterstützende Fachkräfte in der Automobilindustrie. *BWP – Berufsbildung in Wissenschaft Und Praxis*, *46*(2), 24–27. https://www.bwp-zeitschrift.de/dienst/publikationen/de/8292

Kettschau, I. (2013). Berufsfeld Ernährung und Hauswirtschaft: Heterogenität als Merkmal - Gemeinsamkeit als Chance. *Haushalt in Bildung & Forschung*, *2*(1), 3–15. https://www.pedocs.de/volltexte/2020/20947/pdf/HiBiFo_2013_1_Kettschau_Berufsfeld_Ernaehrung.pdf

Kultusministerkonferenz (KMK) (2021). *Handreichung für die Erarbeitung von Rahmenlehrplänen der Kultusministerkonferenz für den berufsbezogenen Unterricht in der Berufsschule und ihre Abstimmung mit Ausbildungsordnungen des Bundes für anerkannte Ausbildungsberufe*. https://www.kmk.org/fileadmin/veroeffentlichungen_beschluesse/2021/2021_06_17-GEP-Handreichung.pdf

Krebs, I. (2008). Wie gelingt die Verbreitung eines Unterrichtsentwicklungsprogramms? Das Beispiel SINUS-Transfer. In E. M. Lankes (Ed.), *Pädagogische Professionalität als Gegenstand empirischer Forschung* (pp. 219–231). Waxmann.

Kremer, H.-H., & Sloane, P. F. E. (2000). Lernfeldkonzept - Erste Umsetzungserfahrungen und Konsequenzen für die Implementation. In R. Bader & P. F. E. Sloane (Eds.), *Lernen in Lernfeldern - Theoretische Analysen und Gestaltungsansätze zum Lernfeldkonzept* (pp. 71–84). Markt Schwaben.

Lund, D. (2018). Einfluss der Digitalisierung auf schulisches Lehren und Lernen in Lernfeldern - Brauchen wir eine neue fachdidaktische Perspektive? *Haushalt in Bildung & Forschung*, *7*(1), 22–37. https://doi.org/10.3224/hibifo.v7i1.02

Miesera, S., Torggler, C., & Nerdel, C. (2021). Erfassung des Professionswissens angehender Berufsschullehrkräfte im Berufsfeld Ernährung und Hauswirtschaft - Adaption des TPACK-Modells. *HiBiFo – Haushalt in Bildung & Forschung*, *10*(3), 81–96. https://doi.org/10.3224/hibifo.v10i3.06

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, *108*(6), 1017–1054.

Mishra, P., Koehler, M. J., & Henriksen, D. (2011). The seven trans-disciplinary habits of mind: Extending the TPACK framework towards 21st century learning. *Educational Technology*, *51*(2), 22–28. http://www.jstor.org/stable/44429913

Nurhadi, D., Purwaningsih, E., Masjkur, K., & Nyan-Myau, L. (2019). Using TPACK to map teaching and learning skills for vocational high school teacher candidates in Indonesia. In *Proceedings of the 5th UPI International Conference on Technical and Vocational Education and Training (ICTVET 2018)*. Atlantis Press. https://doi.org/10.2991/ictvet-18.2019.9

Pätzold, G. (2002). *Lernfelder - Lernortkooperation: Neugestaltung beruflicher Bildung. Dortmunder Beiträge zur Pädagogik*. Projekt-Verl.

Schmid, U., Goertz, L., & Behrens, J. (2016). *Monitor Digitale Bildung: Berufliche Ausbildung im digitalen Zeitalter*. Bertelsmann Stiftung. https://www.bertelsmann-stiftung.de/fileadmin/files/BSt/Publikationen/GrauePublikationen/Studie_Monitor-Digitale-Bildung_Berufliche-Ausbildung-im-digitalen-Zeitalter_IFT_2016.pdf https://doi.org/10.11586/2016001

Seufert, S., Guggemos, J., & Tarantini, E. (2018). Digitale Transformation in Schulen: Kompetenzanforderungen an Lehrpersonen. *Beiträge Zur Lehrerinnen - Und Lehrerbildung*, *36*(2), 175–193. https://www.pedocs.de/volltexte/2019/17096/pdf/BzL_182_175-193Seufert.pdf

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, *15*(2), 4–14. https://doi.org/10.3102/0013189X015002004

Tenberg, R. (2017). Zum Stand der Lehrpersonenkooperation an berufsbildenden Schulen. *Zeitschrift Für Berufs- Und Wirtschaftspädagogik*, *113*(2), 179–201. https://www.td.tu-darmstadt.de/media/arbeitsbereich_tenberg/dateien_1/aktuelles_3/ZBW_2017_2_179-201_Editorial_Tenberg.pdf

Terrasi-Haufe, E., & Miesera, S. (2018). Fach- und Berufssprachenvermittlung im Berufsfeld "Ernährung und Hauswirtschaft". In J. Roche & S. Drumm (Eds.), *Kompendium DaF/DaZ: Vol. 8. Berufs-, Fach- und Wissenschaftssprachen: Didaktische Grundlagen* (1st ed., pp. 271–285). Narr Francke Attempto.

Tiede, J. (2020). Media-related educational competencies of German and US peservice teachers: A comparative analysis of competency models, measurements and practices of advancement. *MedienPädagogik - Zeitschrift Für Theorie Und Praxis Der Medienbildung*, 1–239. https://d-nb.info/1213247578/34

Valtonen, T., Sointu, E., Kukkonen, J., Kontkanen, S., Lambert, M. C., & Mäkitalo-Siegl, K. (2017). TPACK updated to measure pre-service teachers' twenty-first century skills. *Australasian Journal of Educational Technology*, *33*(3), 15–31. https://doi.org/10.14742/ajet.3518

Verband Bildung und Erziehung. [VBE] (2017). *Multiprofessionelle Teams in der Schule*. https://www.vbe.de/fileadmin/user_upload/VBE/Themen/Positionen/2017_11_17_Position_Multiprofessionelle-Teams.pdf

Vilppola, J., Lämsä, J., Vähäsantanen, K., & Hämäläinen, R. (2022). Teacher trainees' experiences of the components of ICT competencies and key factors in ICT competence development in work-based vocational teacher training in Finland. *International Journal for Research in Vocational Education and Training*, *9*(2), 146–166. https://doi.org/10.13152/IJRVET.9.2.1

Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., & van Braak, J. (2013). Technological pedagogical content knowledge - a review of the literature. *Journal of Computer Assisted Learning*, *29*(2), 109–121. https://doi.org/10.1111/j.1365-2729.2012.00487.x

Warwas, J., & Schadt, C. (2020). Zur Modellierung Professioneller Lerngemeinschaften. In K. Kansteiner, C. Stamann, C. Buhren & P. Theurl (Eds.), *Professionelle Lerngemeinschaften als Entwicklungsinstrument im Bildungswesen* (pp. 37–48). Beltz Juventa.

Wittmann, E., & Weyland, U. (2020). Berufliche Bildung im Kontext der digitalen Transformation. *Zeitschrift Für Berufs- Und Wirtschaftspädagogik*, *116*(2), 269–291. https://doi.org/10.25162/zbw-2020-0012

Zinke, G. (2019). *Berufsbildung 4.0 – Fachkräftequalifikationen und Kompetenzen für die digitalisierte Arbeit von morgen: Branchen- und Berufescreening*. Bundesinstitut für Berufsbildung (BIBB). https://www.bibb.de/dienst/publikationen/de/10371

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An Empirical Case of Education Policy Implementation in Serbian VET

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Abstract

Purpose: Education policy implementation is as important as policy design. This study applies a literature-based, multi-dimensional framework for success factors and barriers to vocational education and training (VET) reform implementation in the case of a new dual VET law in Serbia. We use the framework to assess factors related to implementation, then relate these factors to actual implementation progress to determine how factors relate to progress. In this application of the framework, we examine whether implementation success requires high scores in every dimension.

Methods: This is a mixed methods study. We conduct document analysis of key resources related to the structure and intention of the reform. We also statistically analyze a dataset of two rounds of interviews conducted during the pre- and early-implementation phases. These interviews include key stakeholders from the public and private sectors, and from national, regional, and local-level actors. We examine how the framework's dimensions and determinants relate to implementation progress.

Results: The implementation of the law is moving forward in Serbia, making this a successful case of progress in policy implementation. Despite this progress, the factors for implementation are not all strong. We find that the content dimension of the framework is a

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barrier, capacity is unclear, and context, commitment, and clients—actors' engagement—drive implementation progress. Thus, although the implementation process is imperfect in its determinants, it is successfully progressing and already forming the new system.

Conclusions: Based on our results we argue that—even if the framework describes factors that affect VET reform implementation—not all elements are necessary for VET reform implementation to progress. Policymakers can start without perfect implementation conditions and may benefit from striving for "good enough" across dimensions rather than perfect in any one dimension. We discuss potential mechanisms and identify pathways for future research, including moving in the direction of causal research.

Keywords: Education and Training Reform, Law, Change Management, Policy Formation, Case Study, VET, Vocational Education and Training

1 Introduction

The science describing the best policies and practices in vocational education and training (VET) has moved forward dramatically in recent years, to the point that policymakers can make evidence-based choices about wide-ranging topics from learning styles in VET (e.g., Jossberger et al., 2010; Morris, 2018) to the connection between learning and work (e.g., Bolli et al., 2018; Rintala & Nokelainen, 2020) or VET for international development (e.g., Li & Pilz, 2021; McGrath et al., 2020). Research continues to demonstrate the value of innovative programs and strategies, and impact-oriented politicians are converting findings into policy (e.g., Gulikers et al., 2018; Zancajo & Valiente, 2019). One of the next challenges for VET research is providing evidence to support the implementation of new policies.

Currently, many jurisdictions are engaged in implementing new or changed VET policies. Although VET is a special case of education policy, it is the majority program at the upper-secondary level in numerous countries[1]. Evidence-based implementation is particularly challenging in this field given the limited research on VET reform implementation (Caves et al., 2021; Fluitman, 1999; Holmes, 2009) compared to the more extensive evidence supporting reform and policy design (e.g., Ceric et al., 2020; Dumbrell & Smith, 2013; Gillis, 2020). Therefore, this study sets out to investigate whether key factors from the literature related to VET reform implementation apply in practice. Our aim is to begin applying a quantitative lens on the implementation process so we can make comparisons and derive lessons that apply across contexts. This strand of research should eventually help policymakers avoid costly implementation pitfalls and failures.

[1] See, e.g., from OECD the Education at a Glance statistics: https://stats.oecd.org/

We focus on the implementation process of a new dual VET[2] law in Serbia. This case is useful because various actors are involved in the implementation process, including representation from the education and employment systems (Bolli et al., 2018). Furthermore, the president of Serbia is invested in the implementation process because he is convinced by evidence that dual VET has important advantages over school-based VET. This high-level interest and the choice to start the reform by drafting and passing a law makes the Serbian case an example of a top-down implementation case, making the implementation process more easily observable and traceable.

To analyze the implementation of the new Law on Dual Education (LDE) in Serbia, we use a dataset of stakeholder interviews and combine it with field study notes. We specifically investigate whether each dimension of the VET implementation framework supported the implementation of the law, then evaluate whether all dimensions were necessary for implementation progress. We find that the key determinants in three of the framework's five dimensions are drivers of implementation progress, determinants in one dimension are unclear, and the final dimension appears to be a barrier to implementation progress. Despite this, we observe implementation progress over the period of study. From this, we argue that it is not necessary for all key determinants in all dimensions to be drivers of implementation progress for the implementation process to proceed.

2 Theory

The evolution of policy implementation research is typically described in three generations (Goggin et al., 1990; Pülzl & Treib, 2017). First, in the 1970s, came case studies of specific policy implementation processes that identified individual variables like hierarchical complexity (Pressman & Wildavsky, 1973) or conflict among implementers (Jeffrey, 1978). Second, through the 1980s, came a wave of discourse on top-down compared to bottom-up implementation, as well as the first analytical frameworks for implementation (i.e., Mazmanian & Sabatier, 1983). The third and ongoing generation of implementation research has focused on developing theoretical frameworks that can be operationalized, tested, and applied across policy fields (Nilsen, 2015).

In VET specifically, implementation research tends to take the form of standalone case studies. These studies examine the implementation of new programs (e.g., Brodie et al., 1995; Schmees, 2020), practices (e.g., Runhaar & Sanders, 2013; Tudor, 1991), or policies (e.g., Dalby & Noyes, 2018; Zancajo & Valiente, 2019). These case studies typically describe individual VET implementation processes and draw conclusions about why they succeed or fail (e.g., Marhuenda-Fluixá et al., 2019). However, it is difficult to aggregate the results of many case studies into a consistent set of findings—an issue in VET research even outside the sub-field

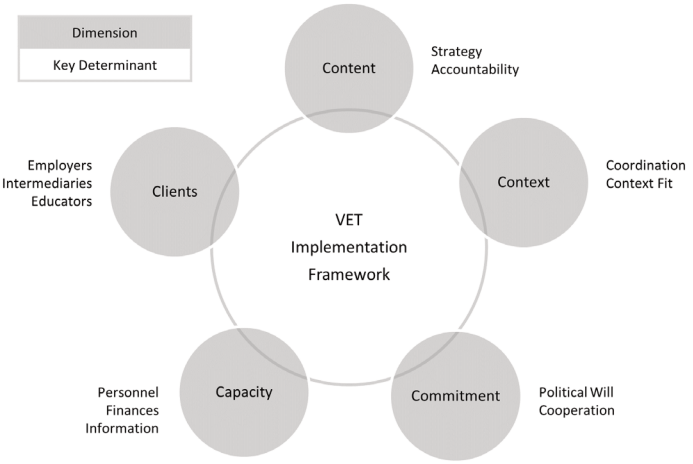
[2] Dual VET in Serbia is generally referred to as "dual education". We use the international term here to prevent confusion.

of implementation (e.g., Gessler & Siemer, 2020; Scheuchet al., 2021). Without frameworks or efforts to place individual case findings in a broader context, the literature demonstrates very little development over time and fails to coalesce around any shared findings or key ideas (Caves et al., 2021).

Caves et al. (2021) review the available literature on VET policy implementation and attempt to capture and organize the lessons of the many available case studies. They code the success factors and barriers reported in each study into a framework based on Najam's (1995) 5C Protocol. These factors are the determinants—independent variables that are barriers or drivers to implementation—that comprise the determinant framework (Nilsen, 2015). The framework's key determinants are the most important implementation drivers, which come up frequently and are consistently important for implementation success. We focus on the key determinants in each dimension with the most supporting evidence in the existing literature according to Caves et al. (2021).

The framework has been applied in other VET implementation case studies. Bolli et al. (2020) operationalize the framework to predict reform up-scaling in Nepal, finding in their pre-implementation analysis that the planned reform scores highly in all dimensions. Vieira et al. (2021) apply the framework to a VET program for in-service teachers in Albania, arguing that the in-service training approach is sustainable because it meets the criteria in all five dimensions and especially prioritizes context fit, commitment from the Ministry of Education, and the inclusion of universities as key actors. Although the framework has been applied to indicate why policy implementation should succeed, it needs further testing to determine if it captures the right factors and to examine how key determinants and dimensions interact to affect implementation progress.

To examine how the framework relates to implementation progress, we develop detailed hypotheses for each dimension based on its key determinants. Figure 1 shows the key determinants in the framework by dimension.



Note: This figure shows the theoretical framework of policy implementation—adapted to VET reform implementation—consisting of five dimensions with its two to three key determinants.

Figure 1: VET Implementation Framework (adapted from Caves et al., 2021)

In the *Content* dimension, the key determinants are strategy and accountability. Najam (1995) defines this dimension as "the Content of the policy itself—What it sets out to do (i.e., goals); how it problematizes the issue (i.e., causal theory); how it aims to solve the perceived problem (i.e., methods)" (Najam, 1995, p. 4). Strategy is a broad determinant, covering whether there is a sense of clarity, strategy or vision in the reform as opposed to confusion, short-termism, or a feeling that things are unclear. Accountability is the presence of quality assurance measures, regulations, and accountability as opposed to the lack thereof.

> *Hypothesis 1 (H1): The* Content *dimension—represented by the determinants strategy and accountability—is necessary for implementation to proceed.*

The *Context* dimension covers "The nature of the institutional Context—The corridor (often structured as standard operating procedures) through which policy must travel, and by whose boundaries it is limited, in the process of implementation" (Najam, 1995, p. 4). Its key determinants are coordination and context fit. Coordination is the orderly organization of activities from multiple actors toward the reform's goals, efficiency, and good management as opposed to bureaucracy. Context fit is the appropriateness of the project and process for the institutions, culture, and other context factors of the target area, as opposed to a mismatch or bad fit.

Hypothesis 2 (H2): The Context *dimension—represented by the determinants coordination and context fit—is necessary for implementation to proceed.*

The third dimension, *Commitment*, entails "The Commitment of those entrusted with carrying out the implementation at various levels to the goals, causal theory, and methods of the policy" (Najam, 1995, p. 4). Its key determinants are political will and cooperation. Political will is general demand for the reform among stakeholders like political leaders, teachers, students, and parents. This is opposed to supply-side reform that may be met with disinterest and opposition from the public and leaders. Cooperation is willingness to work together both within and across institutions, as opposed to conflict.

Hypothesis 3 (H3): The Commitment *dimension—represented by the determinants political will and cooperation—is necessary for implementation to proceed.*

Capacity is "The administrative Capacity of implementers to carry out the changes desired of them" (Najam, 1995, p. 4). Its key determinants are personnel, finances, and research. Personnel is the people needed to carry out the work of implementation, both quantitatively in terms of their availability and numbers and qualitatively in terms of their specific skills and knowledge. Financial resources are money to hire new people, make new materials, develop new processes, and communicate information. Finally, information covers research evidence informing policymaking, general information on best practices, and reform evaluation.

Hypothesis 4 (H4): The Capacity *dimension—represented by the determinants personnel, finances, and information—is necessary for implementation to proceed.*

The last dimension, *Clients*, includes "The support of Clients and Coalitions whose interests are enhanced or threatened by the policy, and the strategies they employ in strengthening or deflecting its implementation" (Najam, 1995, p. 4). Caves et al. (2021) focus on the engagement of individual actor levels and types to differentiate this dimension from the others, which focus on the different kinds of engagement by interest groups and institutions. The key determinants in this dimension are employers, intermediaries, and educators. Employers reflect engagement with actors from the employment system for VET design, delivery, and updating. Intermediaries are industry associations, trade unions, and other facilitating bodies. Educators are actors from the education system including education governance, school leaders, and teachers (as well as teachers' unions).

Hypothesis 5 (H5): The Clients *dimension—represented by the determinants employers, intermediaries, and educators—is necessary for implementation to proceed.*

Finally, all of the above hypotheses imply that all dimensions are necessary for implementation progress. Therefore, we develop a hypothesis to that effect to test whether all dimensions are in fact required for the implementation process to continue.

> *H6: Every dimension*—Content, Context, Commitment, Capacity*, and* Clients—*is necessary for implementation to proceed, as is every key determinant.*

These are the specific hypotheses we test using empirical data from the Serbian case. The next section describes that case in detail.

3 Serbian Case

The reform in question is the implementation of a VET law in Serbia called the Law on Dual Education. VET is the majority upper-secondary program in Serbia, serving 75% of students in each cohort (ETH Zürich, 2017). VET in Serbia is provided through upper-secondary VET schools where students spend a total of three or four years (depending on their occupational profile). Before the new law was introduced, upper-secondary VET in Serbia comprised only VET schools delivering school-based VET. After the law's introduction, VET schools could deliver school-based VET under the previous law and/or dual VET under the new law, the latter regulating work-based learning.

In the school-based model that existed before the new law, students learned general education content (30–40%) and vocational content (55–65%) comprising both vocational theory and vocational practice. The curriculum also included some elective subjects (5%). Practical skills were delivered almost entirely through "professional practice" in school-based workshops with only very little (infrequent and inconsistent) work-based learning, so VET in Serbia was a school-based program. This program was defined primarily by the Law on Secondary Education and its associated bylaws and rulebooks.

The Law on Dual Education was introduced in 2017 to add a dual VET program to Serbia's upper-secondary landscape[3]. Education governance in Serbia is highly centralized and both the drafting and implementation of the law were top-down processes with limited consultation. Unlike school-based VET, dual VET is the specific type of VET where students spend at least 25% of total program time in work-based learning as opposed to school-based learning (Organisation for Economic Co-operation and Development [OECD], 2017).

The overall goal of the new law was to increase VET quality and relevance to eventually improve major national issues with very high youth unemployment and high rates of young people not in employment, education, or training (NEET), especially among young people

[3] For more information see "Dual education: New knowledge for the new age" by the Government of the Republic of Serbia. https://www.srbija.gov.rs/tekst/en/129780/dual-education.php

with upper-secondary qualifications[4]. Although the law was added in the context of Serbia's efforts to enter the European Union, the political dialogue we observed focused on dual VET as a measure to improve VET's perceived low quality. Other education-system measures like the development of a National Qualifications Framework were more directly tied to EU entry.

3.1 Content of the Law on Dual Education

The new law formalized and nationally regulated dual VET at the upper secondary level, as opposed to the existing program where VET schools and companies could collaborate on an ad hoc basis without specific regulation. Although the previous law governing school-based VET allowed for work-based learning, it was uncommon and usually in very small amounts. Overall, work-based learning experiences in the existing school-based program were extremely inconsistent, there were no skill- or competency-related outcomes assigned to the work-based learning experience, and there was no formal oversight for student safety or quality assurance while at work. Moreover, students were not protected by contracts or a requirement to have trainers or supervisors or compensated if they made productive contributions to their training companies.

The law on dual VET set out to address those issues, implementing a new apprentice-company matching process and regulations covering how much time should be spent on workplace learning, students' remuneration and non-monetary compensation, companies' participation in career guidance and counseling, training certification for companies, instructor licensing for in-company trainers, and contracts for both the student-company and school-company relationships (Serbian Government, 2017).

3.2 Implementation of the Law

The Ministry of Education[5] was charged with overseeing implementation along with the Chamber of Commerce[6], which represents companies. The Ministry of Education's regional offices, called Regional School Administrations, were required to support the Ministry of Education in implementation. Similarly, the Chamber of Commerce used its own regional offices to provide ground-level support. The Chamber of Commerce is responsible for certifying companies and for training and licensing in-company instructors. Each school and company must follow the new processes and regulations when implementing dual VET, although both could choose whether (and for how many occupations and students) to implement dual VET or stick with the existing school-based program.

4 See, e.g., the Serbian Labor Force Survey: https://data.stat.gov.rs/?caller=2400&languageCode=en-US.

5 Referred to in Serbia as the "Ministry of Education, Science, and Technological Development" (MoESTD).

6 Referred to in Serbia as the "Chamber of Commerce and Industry Serbia" (CCIS).

Serbia promulgated the new law in 2017, and full-scale implementation began in the 2019–2020 school year. Some international donor organization-led pilots had been underway since 2013 through organizations like development agencies from Germany and Austria. In the first year, schools could continue offering VET under the old regulations with no changes. Because the old regulations allowed for unregulated work-based learning, this created competition between VET programs during the 2019–2020 school year, resulting in low uptake (Renold et al., 2020a). Essentially, schools could still collaborate with companies to offer small amounts of work-based learning without contracts, company certification, licensed instructors, curricula, or—most importantly—compensation for students. This made the old school-based program not only much easier but also much cheaper for companies (Bolli et al., 2021), who were unwilling to switch to a regulated and paid model when they were not required to do so. Schools were unwilling to switch because they would lose full control in the new more cooperative model and because they perceived increased workplace learning as a threat to teachers' importance (Renold et al., 2020b). Therefore, 2020 amendments to the Law on Dual Education and the Law on Secondary Education drastically reduced and limited the work-based learning allowed under school-based VET. This helped drive increased participation in dual VET in the 2020–2021 school year (Renold et al., 2021).

Thus far, implementation has led to significant changes in the key processes outlined by the law. The number of classes of dual VET in the Ministry of Education's enrollment plans have steadily increased, and nearly every key tenet of the law began to translate from goals to action (Renold et al., 2020a; Renold et al., 2021). 33 occupational profiles were available in the 2018–2019 school year, and 54 were available by the 2021–2022 school year. However, implementation is not perfect: Requirements like company accreditation, instructor licensing, student remuneration, and training contracts are all near 70% in the second year of implementation. However, in schools and occupational profiles that are still using school-based VET, those indicators are typically less than 10%, ranging between 0% and 44% (for school-company contracts, which were already common although not previously required; Renold et al., 2020a). Therefore, we treat this implementation case as one that is making progress.

4 Materials and Methods

Our goal is to categorize each dimension as driving implementation progress or acting as a barrier based on the data related to the determinants in each dimension. To do so, we revise documents and field notes and evaluate interview data. In the following, we will describe the data sources and the methods to classify the dimensions.

4.1 Documents and Field Notes

Relevant documents for our analysis are reform documents such as the law itself, its bylaws, and research on the reform (Renold & Oswald-Egg, 2017). The content and set up of these documents contain valuable information for our study. Additionally, we review field notes made during four visits to Serbia over a period of 1.5 years plus virtual visits and meetings for another 1.5 years. These include our individual field notes taken during the visits and an internal summary document written immediately after each visit. The field notes capture our observations in meetings and discussions with leaders and stakeholders in Serbia's VET sector.

4.2 Interview Dataset

We use a dataset of stakeholder interviews carried out in late 2018 and early 2019 (referred to as 2019 wave) and in early 2020 (referred to as 2020 wave). The data was collected for a series of policy reports on implementation progress (Renold et al., 2019, 2020a, 2020b, 2021). Our involvement during data collection for the reports was in the interview design[7], data cleaning, and data analysis. We did not carry out the interviews, that was done in Serbian by a local think tank in Serbia. Interviews were in person or over the phone. However, for evaluation of the answers, the interviews were translated into English and this is the version we got for our analysis in this study. For this study we apply that existing dataset to the task of testing the implementation framework.

The interview data captures the overall attitude of deeply involved stakeholders toward implementation and their specific concerns, challenges, and opportunities with the law overall and with specific issues. The interview questions were structured for stakeholders though there were some differences in questions among the different stakeholder groups. For this study, we draw a specific set of questions from the interview dataset to address our hypotheses. Table 1 summarizes the interview questions we used for each hypothesis.

[7] Interviews were designed with the VET reform implementation framework in mind (Caves et al., 2021) and the project team's experiences with VET reform implementation. The purpose of those interviews was not to test the framework but to assess factors related to implementation progress. Only this study is interested in testing the framework.

Table 1: Interview Data by Dimension

Dimension	Determinant	Interview Question(s)
Content	Strategy	n/a
	Accountability	n/a
Context	Coordination	Right now, are all of the relevant actors and institutions coordinated to implement dual VET?
	Context Fit	Do you think dual VET fits with the needs of Serbian students and companies?
Commitment	Political Will	How willing do you think your institution is to implement dual VET?
	Cooperation	Is your organization prepared to cooperate with other actors on implementing dual VET?
Capacity	Personnel Financial Research	Does your organization have enough *[personnel, financial, information]* resources to implement dual VET?
Clients	Employers Intermediaries Educators	How *willing* do you think *[actor]* is to implement dual VET? Employers includes Companies Intermediaries includes Chamber of Commerce (national and regional), International Donors *Educators* includes Ministry of Education, Regional School Administrations, Schools

Note: This table gives an overview on the interview questions posed to survey respondents to collect data for each key determinant of the five dimensions.

Responses to each interview question include quantitative data in yes or no answers and a five-point Likert scale, depending on the type of information needed. It also includes optional qualitative open responses. We primarily use the quantitative responses, and include qualitative responses to support and deepen our discussion of results. We draw 212 interviews based on the items we need to test our hypotheses. Table 2 summarizes the interviewed subjects we use by stakeholder group.

Subjects in the school and company categories are representatives, sampled to balance geographic representation. Five schools began piloting dual VET in 2013, 84 implemented it in 2017–2018 (one year before full implementation), and 247 schools were not participating at that time according to the Serbian Ministry of Education. The 2019 sample includes principals and program coordinators from three pilot schools (six interviews total), as well as those that started offering dual VET upon implementation. The data also includes interviews with the principals of 19 schools that did not participate in dual VET in its first year. In the 2020 sample, the data includes 26 schools in dual VET and 12 schools not in dual VET. Of the 600 companies currently involved in education, 18 companies appear in the 2019 dataset along with eight non-participating companies. In 2020, the dataset includes 11 companies in dual VET and seven not involved.

For the government and chamber of commerce, the sample of interviewed subjects represents the full population of dual-VET-related actors, who were interviewed in both 2019 and 2020. Despite them being the same subjects in both years, we count them as independent observations because they were asked a year apart. We do the same with the three respondents from trade unions and five respondents from international donor groups in both sample years. To reduce social desirability bias, interviewers were external to the project and the government and we ensure respondents' anonymity.

Table 2: Sample

Stakeholder group	Department/Subset/Group	N in 2019	N in 2020
Government	Ministry of Education and other relevant national bodies	7	4
	Regional School Administrations	14	11
VET Schools	Participating schools	24	16
	Non-participating schools	19	12
Companies	Participating companies	18	11
	Non-participating companies	8	7
Chamber of Commerce	National Chamber of Commerce Office	3	3
	Regional Chamber of Commerce Units	15	14
International Donors	International education community and donors	5	5
Organized Labor	Trade unions	3	3
Total		116	96

Note: This table lists the survey respondents by stakeholder group and subgroup. Some individuals were interviewed in both years because interviews captured all involved stakeholders in groups except for companies and schools.

4.3 Analytical Methods

To examine H1, which classifies the *Content* dimension according to its key determinants strategy and accountability, we examine reform documents (e.g., rulebooks, bylaws, communications) and our own field notes from a series of visits to Serbia before and during the implementation period. We apply directed content analysis (Hsieh & Shannon, 2005) to analyze this dimension, using existing research or theory to form our expectations for coding. Our codes specifically search for the key determinants relevant for H1 in the *Content* dimension—strategy and accountability. Therefore, we examine the notes and documents looking for evidence of procedures and guidance for reform implementers (strategy) and evaluation procedures about the implementation of the new law (accountability). Our analysis is straightforward: If the documents contain information specifying procedures for both strategy and accountability, this dimension is a driver for implementation. If one key

determinant is not covered, the Content dimension is unclear. If both key determinants are not covered, this dimension is a barrier.

To examine H2–H5, which cover the dimensions *Context, Commitment, Capacity* and *Clients*, we apply the existing stakeholder interview dataset. We still use some directed content analysis to provide illustrative quotations from the interviews, but we rely more heavily on the quantitative element of the data. The statistical analyses are simple, mainly relying on descriptive statistics and inferential analysis (analysis of variance) to test whether differences among stakeholder groups are statistically significant. Three key determinants (coordination and context fit in the Content dimension, cooperation in the Context dimension) feature questions where participants were asked whether they agree with a statement about that determinant. In these cases, we use the percentage agreement and identify the determinants as drivers or barriers depending on how many interviewees agreed that the determinant was present.

For other key determinants, we have five-point Likert scale data. In every case, five points is the maximum desirable score (adequate resources, strong political will, etc.) and one point is the minimum undesirable score. We examine overall averages and each individual actor group's score to determine whether scores are significantly different from the maximum and minimum. Specifically, we use the standard deviation to calculate a >95% confidence interval (two standard deviations each way from the mean), and if the maximum five-point score falls within that range it is not different from the maximum. If the minimum five-point score falls within the range it is not different from the minimum. If these distributions on average and for all actor groups include the maximum and not the minimum, we code the determinant as a driver. If the distributions include both or neither of the maximum and minimum, we code the determinant as unclear. We also code determinants as unclear if we observe variation across actor groups. If actor groups are generally significantly different from the maximum but not the minimum, the determinant is a barrier.

For H6, we assess our findings from all dimensions together. We find support for H6 if all dimensions are classified as drivers based on their key determinants. If some of the dimensions are unclear or are barriers, we reject H6.

5 Results

We present results by dimension, addressing each hypothesis in turn. We start with the content dimension followed by the context dimension, the commitment dimension, the capacity dimension and the client's dimension. We conclude by considering our findings overall in terms of the framework.

5.1 Content

The determinants under *Content* are strategy and accountability. The strategy determinant covers the clarity and quality of the plan for implementation. The law and its bylaws describe a series of interdependent critical moments throughout the implementation process. For example, companies need to be certified by the Chamber of Commerce and must have trained, licensed instructors before they can host students, which means the Chamber of Commerce had to develop certification and licensing processes in addition to implementing them and training every interested company and instructor. Other processes are similarly complex, requiring multiple steps and a variety of actors. For example, schools match students with companies according to a new process requiring every company in a given occupation to interview every student in that occupation—with their parents—before both sides submit priorities and the school program coordinator allocates students.

Although the end goal is relatively clear, the implementation strategy is not fully articulated, and is made more difficult because the project is complex, large-scale, and rapid. According to our field notes, VET leaders in the Ministry of Education and Chamber of Commerce have engaged quickly and deeply with the project, but have very large workloads of process development, process implementation, new partner engagement, and legal interpretation. Many of the key processes required to make dual VET work are not articulated in the law and must be created as needed. We found that stress levels were very high despite a strong, shared desire to make everything work. The strategy determinant in this case captures the large challenges associated with making major changes and innovating under pressure. Therefore, although the law and its bylaws outline a clear goal and stakeholders' effort is very high, the implementation strategy is a barrier in this case.

Accountability is the second determinant in the *Content* dimension, and is mainly addressed by the bylaw on the evaluation of institutions. This defines evaluation procedures and indicators, mainly focused on school performance. The accountability measures internal to dual VET are adequate, but they are undermined because the program itself is optional—existing workplace learning under the school-based VET programs could continue, despite being less regulated and not requiring remuneration. Because implementers can choose whether or not they wish to follow the law in delivering dual VET, the accountability of the law is weak. Therefore, the accountability determinant is also a barrier to implementation.

The two determinants under the *Content* dimension are strategy and accountability, and both are barriers in this case. Therefore, we categorize the Content dimension as a barrier to implementation in this case. H1 states that Content is a necessary condition for implementation progress, but implementation is progressing even though Content is not a success factor. Therefore, we reject H1.

5.2 Context

This is the first dimension we address using interview data directly related to its determinants—coordination and context fit. Table 3 summarizes data on these determinants by respondents' actor group.

Overall, 75% of respondents agreed that all the relevant actors and institutions were coordinated for implementation. Non-participating companies, non-participating schools, and Trade Unions drove the negative responses, while the Ministry and National Bodies, Regional Chamber of Commerce, and both participating companies and VET schools were all optimistic.

Table 3: Context Dimension Results

Category	Subset	Coordination	Fits Context
Government	Ministry and National Bodies	82%	100%
	Regional School Administrations	64%	83%
VET Schools	Participating	80%	90%
	Non-participating	47%	79%
Companies	Participating	96%	90%
	Non-participating	43%	79%
Chambers of Commerce	National Chamber	67%	83%
	Regional Chambers	86%	93%
International/Donors	All	60%	100%
Organized Labor	Trade unions	50%	67%
Mean		75%	85%

Note: This table displays the agreement percentage for the two key determinants in the dimension "Context" by respondent category. All answers are on a yes/no scale, where 100% indicates having only yes-answers and 0% having only no-answers.

Most respondents (85%) affirmed that the law fit with the needs of Serbian students and companies, addressing context fit. The trade unions, non-participating schools, and non-participating companies are least—though still mostly—convinced. The qualitative data shows interesting disagreement on who dual VET works for, with comments like *"It totally fits with the needs of students, but companies aren't satisfied, sometimes they don't see the benefits from dual VET" (interview wave 1, respondent 81, answer 27)* contrasting with *"The initiative for the adoption of the law…came from companies" (interview wave 1, respondent 87, answer 27).* These two positions are not necessarily polar opposites, but they do illustrate the variation in the way interviewees perceive the way the law fit into Serbia's context. Overall, however, the consensus appears to be that the law is a good fit for Serbia.

The two determinants under this dimension are both strong. Interview respondents generally agree that the law is a good fit for the Serbian context, also reporting that coordination among institutions for dual VET is generally sufficient. However, it is important to note the variation within these apparently strong numbers: Even though most interviewees believed the law fit the Serbian context and coordination was sufficient, there was a non-negligible sample of voices—especially among non-participating schools and companies—that disagreed. Overall, though, it appears that the Context dimension's determinants represented a success factor for implementation. Therefore, we find support for H2.

5.3 Commitment

Two questions in the interview dataset directly address political will and cooperation. Table 4 shows institutions' willingness to implement by actor group. On a five-point Likert scale, the average response was a 4.5. The highest scores came from the Ministry and National Bodies, the national Chamber of Commerce, regional Chamber of Commerce offices, and the schools and companies that already participate in dual VET. The lowest came from trade unions and non-participating schools and companies, but none were below the three-point neutral threshold. With a standard deviation of 0.9, the lowest score within two standard deviations would still be a relatively neutral 2.7. Non-participating schools and companies had some of the lowest scores and relatively large standard deviations, meaning that responses within the insignificant range span nearly the full one-to-five-point distribution. However, no score distribution included the lowest score without also including the highest score and all distributions included the highest possible score. Participating stakeholders showed strong commitment, like this participating school interviewee who said, *"We are prepared to cooperate with everybody who recognizes the importance of dual VET and who wants to improve it" (interview wave 1, respondent 164, answer 51)*.

The question for cooperation asked whether respondents believed their organizations were willing to cooperate with other organizations for implementation. The response to this question was overwhelming, with 99% of respondents saying yes (see Table 4 Cooperation). The only actor groups that had any "no" answers at all—and even then, a small minority—were Regional School Administrations and non-participating companies. In their comments, many respondents noted that they were already cooperating or beginning to cooperate with external partners. Some saw their own roles as very important, including a regional Chamber of Commerce respondent who states that the organization *"educates, informs and motivates all the participants" (interview wave 1, respondent 175, answer 51)*.

Both determinants in this dimension are very strong. Willingness to implement is high among affected stakeholders, and nearly all actors report that their institution would cooperate with others for implementation. We categorize the Commitment dimension as a driver dimension for implementation in this case. Therefore, we find support for H3.

Table 4: Commitment Dimension Results

Category	Subset	Political Will*	Cooperation**
Government	Ministry and National Bodies	5.0 (0.0)	100%
	Regional School Administrations	4.3 (0.9)	96%
VET Schools	Participating	4.8 (0.5)	100%
	Non-participating	3.7 (1.1)	88%
Companies	Participating	4.8 (0.5)	100%
	Non-participating	3.5 (1.1)	88%
Chambers of Commerce	National Chamber	4.8 (0.4)	100%
	Regional Chambers	5.0 (0.2)	100%
International/Donors	All	4.8 (0.4)	100%
Organized Labor	Trade unions	3.3 (1.4)	-
Mean		4.5 (0.9)	99%

Note: This table displays the average values (political will) or the agreement percentage (cooperation) for the two key determinants in the dimension "Commitment" by respondent category.
**All answers are scored on a five-point Likert scale where one means "not at all" and five means "very much." The numbers in brackets are the corresponding standard deviations.*
***All answers are on a yes/no scale, whereby 100% indicates having only yes-answers and 0% having only noanswers.*

5.4 Capacity

The interviews asked specifically about each of the three key resource types in the Capacity dimension: Personnel, finances, and information. Table 5 shows results by resource type and actor. Overall, interviewees reported that they had most of the resources they needed to implement, with personnel at 4.2 on a five-point Likert scale, finances at 3.6, and information at 4.3. Based on two standard deviations, no resource score was significantly different from fully adequate (five points) and all are significantly different from completely inadequate (one point).

Under personnel, regional Chamber of Commerce offices and the participating schools and companies were better resourced than most, and the Ministry and National Bodies reported a lack of personnel along with the Regional School Administrations. Finances scored the lowest overall, with the Regional School Administrations and non-participating schools feeling the least financially prepared. Participating companies reported the highest financial resources. Finally, there was a top-down trend in information and research resources, with the government and the national Chamber of Commerce reporting having more adequate evidence and

information than Regional School Administrations and non-participating companies. The exceptions were participating schools and regional Chamber of Commerce, who reported higher-than-average information resources. Based on two standard deviations, no actor's situation for personnel or information was significantly different from five and all were significantly different from one—all actors were roughly adequate for these two capacity dimensions. For finances, the situation was the same except for Regional School Administrations whose two-standard-deviation range fell below the maximum at the top and below the minimum at the bottom. This actor was significantly different from adequate financial resources, but it was the only such deviation among all actor groups and all three resource types.

Table 5: Capacity Dimension Results

Category	Subset	Personnel	Finances	Information
Government	Ministry and National Bodies	3.2 (1.3)	3.4 (1.2)	4.5 (0.8)
	Regional School Administrations	3.2 (1.2)	2.2 (1.5)	3.6 (1.0)
VET Schools	Participating	4.7 (0.6)	3.9 (1.1)	4.6 (0.8)
	Non-participating	3.9 (1.0)	3.6 (1.1)	3.5 (1.2)
Companies	Participating	4.6 (0.7)	4.5 (0.6)	4.3 (0.9)
	Non-participating	3.9 (1.0)	3.6 (1.1)	3.5 (1.2)
International/Donors	All	-	-	-
Organized Labor	Trade unions	-	-	-
Mean	4.2 (1.0)	3.6 (1.3)	4.3 (0.9)	

Note: This table displays the average values for the three key determinants in the dimension "Capacity" by respondent category. All answers are scored on a five-point Likert scale where one means "not at all sufficient" and five means "we have enough". The numbers in brackets are the corresponding standard deviations.

Some qualitative responses indicated more complexity. Although resources were generally adequate in the government, one respondent stated that *"We don't have enough employees so we are overloaded by tasks" (interview wave 1, respondent 84, answer 43)*. Regional School Administrations, who had the lowest scores, reported planning to hire a new person for implementation, stating *"We have a lot of other duties" (interview wave 1, respondent 72, answer 43)*. More specifically, one Regional School Administration stated that *"We have information but we don't have materials" (interview wave 1, respondent 66, answer 47)*.

Qualitatively—although not quantitatively—different regional branches of the Chamber of Commerce stated very different resource levels. While one region stated, *"[National Chamber of Commerce] staff provides all necessary information and materials" (interview wave 1, respondent 169, answer 47)*, another contradicted, *"Training through work is a new system so there is not enough distribution of material, but constant work, information exchange, and promotion of the dual VET system" (interview wave 1, respondent 175, answer 47)*. The Cham-

ber of Commerce was a very important actor and was new to the system, so their having sufficient resources was important.

Participating schools, participating companies and regional Chambers of Commerce had the highest overall capacity. However, even among these more prepared actors there was still some demand for further resources. One school leader stated that personnel was adequate, saying, *"On particular profiles yes, but on some profiles existing teaching staff need more support" (interview wave 1, respondent 12, answer 41)*. However, schools that already participated in dual VET were generally confident, like the respondent who simply asserts, *"We have qualified and motivated human resources" (interview wave 1, respondent 106, answer 41)*.

The quantitative data indicates that capacity is generally close to sufficient in all three determinants of personnel, finances, and information for stakeholders participating in the new law. Only Regional School Administrations lack capacity, and even then, only in the financial-resource category. However, the qualitative responses uncover some concerns and potential weak points. It is unclear whether the Capacity dimension is a barrier or support to implementation progress in this case. Out of an abundance of caution, we can neither reject nor find support for H4.

5.5 Clients

The key determinants in the Clients dimension are employers, intermediaries, and educators. The interview data includes questions for each actor group on their own motivation to participate—covered under commitment—as well as a question asking each actor to report whether the others are willing to implement the law. We aggregate actor groups into the three determinant categories. Educators are represented by schools (both participating and not), the government, and Regional School Administrations. Participating and non-participating companies go into the "employers" category. Finally, the Chamber of Commerce, regional Chamber of Commerce offices, and international donors are intermediaries. We leave out trade unions because they fall under their own minor determinant in the original framework. Table 6 shows self-reported and peer-reported engagement by aggregated group.

Table 6: Clients Dimension Results

Aggregated Group	Self-Reported Engagement	Peer-Reported Engagement
Educators *(Government, Regional School Administrations, VET Schools)*	4.4 (0.9)	4.5 (0.7)
Employers (Companies)	4.3 (1.0)	3.6 (1.0)
Intermediaries *(National Chamber of Commerce, Regional Chamber of Commerce; International Donors)**	4.9 (0.3)	4.5 (0.8)
Mean	4.5 (0.8)	4.3 (0.7)

*Note: This table displays the average values for the two key determinants in the dimension "Clients" by respondent category. All answers are scored on a five-point Likert scale where one means "not at all willing" and five means "very willing." The numbers in brackets are the corresponding standard deviations. *International donors are not included in the peer-reported engagement scores, and trade unions are not included because they have a (non-key) dimension.*

In self-reported engagement, the overall average was 4.5 out of a five-point Likert scale, indicating strong engagement. Intermediaries have the highest self-reported engagement, at 4.9. No group's score was significantly different from five points and all were significantly different from one. Government and intermediary respondents explained their high engagement by stating that they were required to enact the new law, with comments like *"[we participate] because it is in the scope of our work" (interview wave 2, respondent 26, answer 52)*. Employers were not similarly required, and their motivations were more diverse (e.g., *"We need the competent employees" (interview wave 2, respondent 85, answer 52)*, *"to support the local community" (interview wave 2, respondent 81, answer 52)*, *"to influence the development of young people")*.

Peer-reported engagement was also strong, at 4.3 points. Employers had lower peer-reported engagement (3.6), but were significantly different from one point and not different from five. The other two groups were considered highly engaged by their peers (4.5 for both) and were also not significantly different from five points and significantly different from one point. One comment highlights these public-private differences: *"The state/government is willing to support dual education and this is positive, but the way decisions are made…causes resentment among other actors, especially teachers and unions" (interview wave 2, respondent 37, answer 90)*. Even if all scores and two-standard-deviation ranges were high enough to indicate general commitment, the differences in level may create friction.

Because the average score and all component scores were not significantly different from maximum engagement and were significantly different from minimal engagement, we categorize the Clients dimension as a driver dimension for implementation in this case. This indicates support for H5.

5.6 All Dimensions

Figure 2 summarizes the results, with black used to show barrier dimensions and white for driver dimensions. Grey dimensions are unclear. We find that *Content* is a barrier, *Context*, *Commitment*, and *Clients* are driver dimensions, and *Capacity* is unclear. With this information, we turn to our sixth hypothesis and examine how configurations of determinants and dimensions may explain implementation progress.

Given that implementation is progressing in this case while *Content* is a barrier dimension and *Capacity* is unclear, it is not necessary for all five dimensions to be driver dimensions or even neutral. It is also not necessary for all 12 key determinants to be supportive of implementation—strategy, accountability, and finances are either unclear or barrier determinants. This indicates that some individual dimension or determinant, or some combination or configuration thereof, is a sufficient condition for implementation.

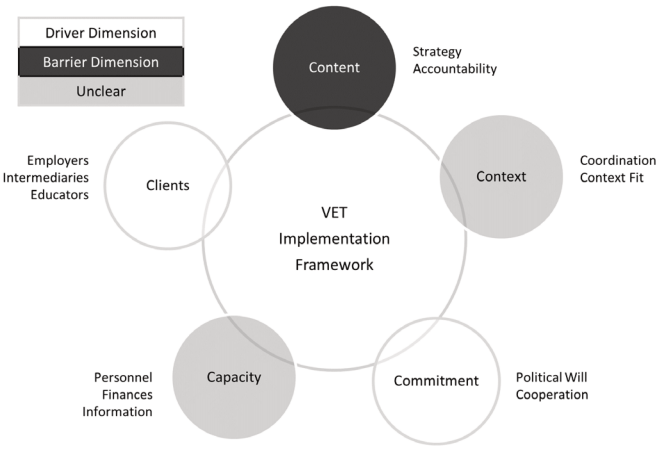


Figure 2: Summary of Results

Note: This figure summarizes our main results, where in the case of Serbia we find the dimensions in white to be drivers, the one in black to be a barrier, and the one in grey to be unclear for implementation of the new VET law.

It is impossible given a single case study to be specific, but these results point to a set of possibilities for how dimensions and determinants could relate to implementation progress. Based on these results, it is possible that Clients, Context, Commitment, or some combination thereof is a sufficient condition for reform. Similarly, at the determinant level it may be possible that the key is some individual or combination of context fit, political will, coordination, cooperation, personnel, information, employers, intermediaries, and educators. Finally,

it may be that instead of some specific factor being necessary or sufficient, implementation progress requires some threshold quantity of dimensions or determinants. The evidence presented here could show that implementation can proceed if only one dimension is a barrier, as long as two or more are drivers, or as long as the median dimension is at least neutral.

Despite that fact that not all dimensions are success factors, implementation is progressing in this case. Therefore, we find that all dimensions are not necessary for implementation progress, nor are all determinants. As a result, we reject H6.

The discussion section turns from the specific hypotheses to the overarching question of why some implementation efforts in VET succeed and others do not, and whether this framework helps answer that question.

6 Discussion

The ultimate goal of this research agenda is to understand why some efforts at education policy implementation progress while others do not. Other research is focused on the nature of implementation and what it means to successfully implement a policy, but we do not take up those issues. Instead, we focus on the factors related to progress or lack thereof. In this discussion, we consider how case-specific features may play a role in implementation progress, identify some of the ways dimensions and determinants might relate to one another, and relate our findings to the broader context and literature of education policy implementation.

A single empirical case is limited by definition, and some condition of this case may be part of the sufficient conditions for its implementation progress. The reform discussed here is a top-down formal process that started with a law. We observe the impact of this in the interview data, when respondents state things like *"We have to – it is in our job description to implement MoESTD decisions" (interview wave 1, respondent 69, answer 51)*. Therefore, it may be that the implementation drivers in this case are commitment, clients, and a top-down reform, and a bottom-up reform would have a completely different configuration like requiring every dimension or sufficiency from just one unrelated to commitment and clients.

Even if commitment and clients are indeed sufficient for implementation progress across cases, the implications of that finding vary significantly by case. For example, a bottom-up reform cannot use legal obligation to proceed, so would need to develop relationships with specific actors and engender commitment through different—and probably more time-consuming—means. A case implementing VET for the first time may lack the intermediaries that play a key role in the *Clients* dimension, so that project may have to build intermediaries first and then engage with them.

That challenge raises the as-yet-unanswered question of how determinants and dimensions relate to each other. The ideal endpoint of research like this would be a weighted framework of dimensions and key determinants that can serve as a guide for improving the chan-

ces of implementation progress. At this point, however, it is not clear how items interact. There may be a weighting scheme that can show which items are more and less important, but the solution may also be a configurational approach that provides implementers with a few possible ways to combine items and reach their goals. This study takes a more configurational approach—focusing on sufficiency and necessity—but the real mechanism could be more additive.

Empirical research in the broader field of education policy implementation has already highlighted similar determinants to the ones we use here. For example, Morris and Scott (2003) identify inertia, cynicism, lack of coordination, and low capacity as barriers in Hong Kong. In the Philippines, communication gaps, a convoluted network of linkages, weak coordination, and low accountability lead to corruption and failed implementation (Reyes, 2009). Time pressure, top-down reform, lack of financial and human resources, and poor management have all been barriers in the UK (Baird & Lee-Kelley, 2009)

Other implementation factors are more complex, or even positive. Little (2011) characterizes political will as a double-edged sword following her analysis of a reform in Sri Lanka. Reeves and Drew (2012) point out the dynamic nature of policy implementation, highlighting successive recontextualizations from political will to policy plan, then plan to practical action, and finally from action to dissemination. In a relatively rare example of a case study recounting successful policy implementation in education, Salazar-Morales (2018) credits the improvement of Peru's Ministry of Education to successful long-term planning and political consensus, among other factors. Bolli et al. (2020), applying the same framework for the upscaling of a dual VET program in Nepal, find that the dimensions Commitment, Capacity, Clients and Context are all drivers whereas Content is a barrier. These studies indicate that we can interpret our findings broadly across both contexts and education policy subfields.

Overall, our findings reinforce that VET implementation is not necessarily a linear or clean process. Even in a case where progress is being made in a measurable way, there have been hurdles, disagreements, and amendments along the way. Despite that, though, implementation of the new program continues. Our challenge as researchers is to find a framework or theory that can lift the key elements of this implementation process out of its context, disentangling what is context- or project-specific from the consistent patterns that might apply generally. By focusing on how the progress of this project's implementation fits into an empirical framework, we do lose some of the rich detail on what makes this process special. However, we do that to gain broader insight into the features that might make this project common.

7 Conclusion

In our policy implementation case, we find that this project's content is a barrier to implementation, its capacity is unclear, and context, commitment, and clients are driver dimensions. Given that implementation is progressing as of this writing, this indicates that not all dimensions are necessary for implementation progress, and that some or some combination of dimensions or determinants is sufficient. The case further develops intriguing possibilities that dimensions and determinants vary in their importance for implementation progress, that some threshold proportion of enabling factors is sufficient, and that context-specific factors may also be part of the configuration driving implementation.

Implementing policy changes is a crucial step on the progression from evidence-based policy design to improved outcomes. Existing frameworks and checklists are largely untested, limiting their utility for both theory and practice. This study tests one framework of key implementation determinants. Although the determinants we analyze are VET-specific and our determinant-level findings apply mainly to VET, the dimensions we investigate apply to policy implementation in general. Therefore, our findings and method are applicable in all types of education policy implementation.

This study makes three main contributions to the literature. First, we find that we can begin to quantify a reform's implementation factors, and this process shows great promise for cross-case comparison and possibly even operationalization into a measurement tool. Second, we find initial evidence for the success of even imperfect implementation processes—implementation can proceed even if some determinants or dimensions are not success factors. In this case, most of the key determinants are success factors, but we cannot draw any conclusions about the threshold. Finally, we develop some potential explanations—to be further examined in future research—for how the determinants of education policy implementation may interact, combine, or configure to drive implementation progress.

The main limitations of this study are its simplified application of the framework, its non-causal nature, and its single-case scope. We begin testing the framework at the dimension level using only the key determinants. The framework includes other, less-important determinants that we do not assess, and further studies designed to examine those would make important contributions. Another interesting avenue for further research is the relative weighting of key determinants and dimensions, which we do not address. The analyses we present use a relatively large interview dataset with both qualitative and quantitative data, but they are descriptive, not causal. If there is social desirability bias it would overestimate the dimensions' contribution to implementation, meaning that even less is required for the implementation to progress. Finally, we report results by stakeholder group, treating every group equally and every interviewee within the group equally, but this gives more weight to individuals in smaller groups (e.g., the government) and less to those in larger groups (e.g.,

firms). The sample represents each group, and in doing so requires more responses from larger and more diverse groups.

Like all case study research, we describe only one case. While this case is a useful starting point, further work replicating this approach should investigate implementation processes with different structures, but the Serbian case is a very useful starting point. Further research and additional cases of both ongoing and historical reforms can fill in the gaps and begin to establish patterns. The value of this study lies in replication and we look to future research to determine whether individual determinants or dimensions are necessary, sufficient, or correlated with implementation progress. We will continue to follow this case to determine whether eventual implementation outcomes follow a similar pattern to progress during the implementation phase.

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Ethics Statement

The authors assure that it is their own original work, which has not yet been published nor currently handed in at another journal. The study reflects the authors' own research and analysis in a truthful and complete manner and puts the results appropriately in context of existing research. All sources are properly cited. Thus, we comply with the IJRVET ethics statement.

References

Baird, J. A., & Lee-Kelley, L. (2009). The dearth of managerialism in implementation of national examinations policy. Journal of Education Policy, *24*(1), 55–81. https://doi.org/10.1080/02680930802382938

Bolli, T., Caves, K. M., Pusterla, F., & Renold, U. (2021). New dual education program in Serbia. Do benefits exceed costs for participating companies? *CES Studies, 9*. ETH Zürich. https://doi.org/10.3929/ethz-b-000477795

Bolli, T., Caves, K. M., Renold, U., & Buergi, J. (2018). Beyond employer engagement: Measuring education-employment linkage in vocational education and training programmes. *Journal of Vocational Education and Training, 70*(4), 524–563. https://doi.org/10.1080/13636820.2018.1451911

Bolli, T., Kemper, J. M., Parajuli, M. N., Renold, U., & Thapa, B. K. (2020). Drivers and barriers of scaling-up the dual VET-Apprenticeship programme in Nepal. *KOF Studies, 144*. ETH Zürich. https://doi.org/10.3929/ethz-b-000455767

Brodie, I., Reeve, F., & Whittaker, R. (1995). Delivering the DEAL: Implementation of a work-based learning programme at degree level. *The Vocational Aspect of Education, 47*(4), 365–385. https://doi.org/10.1080/0305787950470403

Caves, K. M., Baumann, S., & Renold, U. (2021). Getting there from here: A literature review on vocational education and training reform implementation. *Journal of Vocational Education and Training, 73*(1), 95–126. https://doi.org/10.1080/13636820.2019.1698643

Ceric, A., Small, F., & Morrison, M. (2020). What Indigenous employees value in a business training programme: Implications for training design and government policies. *Journal of Vocational Education and Training, 74*(2), 1–21. https://doi.org/10.1080/13636820.2020.1754886

Dalby, D., & Noyes, A. (2018). Mathematics education policy enactment in England's further education colleges. *Journal of Vocational Education and Training, 70*(4), 564–580. https://doi.org/10.1080/13636820.2018.1462245

Dumbrell, T., & Smith, E. (2013). Pre-apprenticeships in Australia: Differing orientations and their policy implications. *Journal of Vocational Education and Training, 65*(2), 161–176. https://doi.org/10.1080/13636820.2012.738428

ETH Zürich (2017). *KOF education system factbook Serbia*. KOF Swiss Economic Institute. https://ethz.ch/content/dam/ethz/special-interest/mtec/edusys-dam/documents/KOF_Factbook_Serbia.pdf

Fluitman, F. (1999). The roots and nature of reforms in vocational education and training: An analytical framework and some examples. *Prospects, 29*(1), 55–65. https://doi.org/10.1007/BF02736825

Gessler, M., & Siemer, C. (2020). Umbrella review: Methodological review of reviews published in peer-reviewed journals with a substantial focus on vocational education and training research. *International Journal for Research in Vocational Education and Training, 7*(1), 91–125. https://doi.org/10.13152/IJRVET.7.1.5

Gillis, S. (2020). Ensuring comparability of qualifications through moderation: Implications for Australia's VET sector. *Journal of Vocational Education and Training, 75*(2), 1–23. https://doi.org/10.1080/13636820.2020.1860116

Goggin, M. L., Bowman, A. O., Lester, J. P., & O'Toole, L. (1990). *Implementation theory and practice: Toward a third generation*. Longman Higher Education.

Gulikers, J. T., Runhaar, P., & Mulder, M. (2018). An assessment innovation as flywheel for changing teaching and learning. *Journal of Vocational Education and Training, 70*(2), 212–231. https://doi.org/10.1080/13636820.2017.1394353

Holmes, K. (2009). The reform and governance of public TVET institutions: Comparative experiences. In R. Maclean & D. Wilson (Eds.), *International handbook of education for the changing world of work* (pp. 905–919). Springer. https://doi.org/10.1007/978-1-4020-5281-1_61

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. Qualitative Health Research, 15(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Jeffrey, J. R. (1978). *Education for children of the poor. A study of the origins and implementation of the elementary and secondary education act of 1965* [Doctoral dissertation, Rice University]. RICE Digital Scholarship Archive. https://hdl.handle.net/1911/14856

Jossberger, H., Brand-Gruwel, S., Boshuizen, H., & Van de Wiel, M. (2010). The challenge of self-directed and self-regulated learning in vocational education: A theoretical analysis and synthesis of requirements. *Journal of Vocational Education and Training, 62*(4), 415–440. https://doi.org/10.1080/13636820.2010.523479

Serbian Government. (2017). *Law on dual Education*. https://www.ilo.org/dyn/natlex/natlex4.detail?p_isn=113419&p_lang=en

Li, J., & Pilz, M. (2021). International transfer of vocational education and training: A literature review. *Journal of Vocational Education and Training, 75*(2), 1–34. https://doi.org/10.1080/13636820.2020.1847566

Little, A. W. (2011). Education policy reform in Sri Lanka: The double-edged sword of political will. *Journal of Education Policy, 26*(4), 499–512. https://doi.org/10.1080/02680939.2011.555005

Marhuenda-Fluixá, F., Chisvert-Tarazona, M. J., & Palomares-Montero, D. (2019). The Implementation of dual VET in Spain: An empirical analysis. In F. Marhuenda-Fluixá (Eds.), *The school-based vocational education and training system in Spain* (pp. 205–221). Springer. https://doi.org/10.1007/978-981-13-8475-2_11

Mazmanian, D. A., & Sabatier, P. A. (1983). *Implementation and public policy*. Scott, Foresman.

McGrath, S., Ramsarup, P., Zeelen, J., Wedekind, V., Allais, S., Lotz-Sisitka, H., Monk, D., Openjuru, G., & Russon, J.-A. (2020). Vocational education and training for African development: A literature review. *Journal of Vocational Education and Training, 72*(4), 465–487. https://doi.org/10.1080/13636820.2019.1679969

Morris, P., & Scott, I. (2003). Educational reform and policy implementation in Hong Kong. *Journal of Education Policy, 18*(1), 71–84. https://doi.org/10.1080/0268093032000042218

Morris, T. H. (2018). Vocational education of young adults in England: A systemic analysis of teaching–learning transactions that facilitate self-directed learning. *Journal of Vocational Education and Training, 70*(4), 619–643. https://doi.org/10.1080/13636820.2018.1463280

Najam, A. (1995, July). *Learning from the literature on policy implementation: A synthesis perspective*. IIASA Working Papers No. WP-95-061. https://pure.iiasa.ac.at/id/eprint/4532/1/WP-95-061.pdf

Nilsen, P. (2015). Making sense of implementation theories, models and frameworks. *Implementation Science, 10*(1), 53–65. https://doi.org/10.1186/s13012-015-0242-0

Organisation for Economic Co-operation and Development. (OECD) (2017). *OECD handbook for internationally comparative education statistics: Concepts, standards, definitions and classifications*. OECD. https://doi.org/10.1787/9789264279889-en

Pressman, J. L., & Wildavsky, A. B. (1973). *Implementation: How great expectations in Washington are dashed in Oakland*. University of California Press.

Pülzl, H., & Treib, O. (2017). Implementing public policy. In F. Fischer, G. J. Miller & M. S. Sidney (Eds.), *Handbook of public policy analysis* (pp. 115–134). Routledge. https://doi.org/10.4324/9781315093192

Reeves, J., & Drew, V. (2012). Relays and relations: Tracking a policy initiative for improving teacher professionalism. *Journal of Education Policy, 27*(6), 711–730. https://doi.org/10.1080/02680939.2011.652194

Renold, U., Caves, K., Maldonado-Mariscal, K., Oswald-Egg, M. E., Markovic, J., Veselinovic, Z., Stankovic, D., Ceneric, I., & Todorovic, M. (2019). *Implementation of the Serbian law on dual education: First report on drivers and barriers in the pre-implementation phase*. KOF Studies, 129. ETH Zürich. https://doi.org/10.3929/ethz-b-000337794

Renold, U., Caves, K. M., & Oswald-Egg, M. E. (2021). *Implementation of the Serbian law on dual education: Fourth report on drivers and barriers in the implementation phase*. CES Studies, 14. ETH Zürich. https://doi.org/10.3929/ethz-b-000476567

Renold, U., Caves, K. M., Oswald-Egg, M. E., Maldonado-Mariscal, K., Markovic, J., Veselinovic, Z., & Todorovic, M. (2020a). *Implementation of the Serbian law on dual education: Second report on barriers and drivers in the implementation phase*. CES Studies, 4. ETH Zürich. https://doi.org/10.3929/ethz-b-000441561

Renold, U., Caves, K. M., Oswald-Egg, M. E., Markovic, J., Veselinovic, Z., & Todorovic, M. (2020b). *Implementation of the Serbian law on dual education: Third report on drivers and barriers in the implementation phase*. CES Studies, 8. ETH Zürich. https://doi.org/10.3929/ethz-b-000449663

Renold, U., & Oswald-Egg, M. E. (2017). *Analysis of challenges to strengthening the Serbian dual VET system*, KOF Studies, 103. ETH Zürich. https://doi.org/10.3929/ethz-b-000214127

Reyes, V. C. (2009). Case study of implementation amidst corruption linkages: The national textbook delivery program (TDP) of the Philippine Department of Education. *Journal of Education Policy, 24*(4), 515–535. https://doi.org/10.1080/02680930902823021

Rintala, H., & Nokelainen, P. (2020). Standing and attractiveness of vocational education and training in Finland: Focus on learning environments. *Journal of Vocational Education and Training, 72*(2), 250–269. https://doi.org/10.1080/13636820.2020.1744696

Runhaar, P., & Sanders, K. (2013). Implementing human resources management (HRM) within Dutch VET institutions: Examining the fostering and hindering factors. *Journal of Vocational Education and Training, 65*(2), 236–255. https://doi.org/10.1080/13636820.2013.783612

Salazar-Morales, D. A. (2018). Sermons, carrots or sticks? Explaining successful policy implementation in a low performance institution. *Journal of Education Policy, 33*(4), 457–487. https://doi.org/10.1080/02680939.2017.1378823

Scheuch, I., Bohlinger, S., Bieß, A., & Nguyen, H. L. (2021). Mapping research on European VET policy with a systematic literature review method: A pilot study. *International Journal for Research in Vocational Education and Training, 8*(4), 113–137. https://doi.org/10.13152/IJRVET.8.4.6

Schmees, J. K. (2020). The implementation of Bachelor's and Master's degrees in teacher training in the German states between 1999 and 2013. *Journal of Vocational Education and Training, 72*(4), 621–621. https://doi.org/10.1080/13636820.2020.1771103

Tudor, A. (1991). The accreditation of prior experiential learning (APEL) in Great Britain—Some implementation issues in vocational education. *The Vocational Aspect of Education, 43*(2), 191–204. https://doi.org/10.1080/10408347308003691

Vieira, M. J., Ferreira, C., Rodríguez-Esteban, A., & Vidal, J. (2021). Towards sustainable development in education: Implementing a VET System for in-service teachers in Albania. *Sustainability, 13*(16), 8739. https://doi.org/10.3390/su13168739

Zancajo, A., & Valiente, O. (2019). TVET policy reforms in Chile 2006–2018: Between human capital and the right to education. *Journal of Vocational Education and Training, 71*(4), 579–599. https://doi.org/10.1080/13636820.2018.1548500

Biographical Notes

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New Higher Education Model? Degree Apprenticeships as a Strategy to Modernize Apprenticeships: Rationale, Current Development in the U.S., and a Conceptual Framework

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Abstract

Purpose: To better prepare young people for the increasingly complex world of work in the global knowledge economy, apprenticeships are receiving renewed attention in countries without a strong history of vocational education. One of the strategies to promote and modernize apprenticeships in these countries is to offer apprenticeships integrated into degree programs, known as degree apprenticeships at the tertiary level. However, little research has been done to explore this new degree pathway. The purpose of this study is to explore the rationales and recent development of degree apprenticeships in the U.S. and to present a conceptual framework for designing and delivering such programs.

Approach: Through an extensive literature review, this study examines the underlying justifications for the integration of apprenticeships into degree programs. Subsequently, it delves into the current progress of degree apprenticeships in the U.S., substantiating the rationales. Finally, it explores multiple facets of degree apprenticeships, offering a conceptual framework for higher education institutions to consider when implementing such programs.

Findings: This study discusses two rationales for degree apprenticeships. First, they enable permeability of vocational education credentials, one of the features of a robust apprenticeship system. Second, they also equip higher education institutions to effectively

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prepare young people for work in response to globalization. For these reasons, recently, community colleges, the primary vocational education providers in the U.S., have actively been implementing apprenticeships within degree programs. This study also outlines four interconnected dimensions of apprenticeships - occupational, pedagogical, relational, and aligned – as a conceptual framework for implementing degree apprenticeships.

Conclusion: By providing a useful context and framework for degree apprenticeships, this study contributes to the growing body of research on apprenticeships and provides a foundation for on-going research to advance the theory and practice concerning degree apprenticeships. Future studies can explore the process of implementing degree apprenticeships using the suggested framework and develop strategies to further modernize apprenticeships based upon this study.

Keywords: Vocational Education and Training, VET, VET Modernization, Degree Apprenticeships, Community Colleges, Permeability, Globalization

1 Introduction

Driven by the forces of globalization and technology innovation, the 21st-century workplace has become much more complex (CEDEFOP, 2018). To better equip young people in transition from school to work, apprenticeships, after relative neglect in many countries, are receiving renewed interest as an effective way of preparing young people for work and serving the economy (Browning & Nickoli, 2017; Organisation for Economic Co-operation and Development [OECD], 2018). In the U.S., the Departments of Labor, Commerce and Education signed a Joint Declaration of Intent with the Swiss Federal Department of Economic Affairs, Education, and Research in 2015 to collaborate on the development of modern apprenticeships. The Intent supported exchange of information and practices regarding organizing education and training systems (State Secretariat for Education, Research and Innovation [SERI], n.d.) as well as collaboration with the business sector, facilitating the creation of apprenticeships in the U.S. by Swiss companies (U.S. Mission Switzerland, 2015 July). Due to these recent efforts, the number of new apprentices has grown by 64% in 2021 compared to 2012, and more than 14,700 new apprenticeship programs were created in the last five years. These new programs are increasingly designed for modern occupations (U.S. Department of Labor, 2021). While apprentices in the U.S. currently make up only about 0.2% of the labor force, which is 10 times less than the rates of about 2.5 – 3.0% in countries with strong apprenticeship, such as Switzerland and Germany (Lerman, 2019), the recent legislative support and growth of apprenticeships clearly demonstrate both public and private interest in further establishing apprenticeships.

While traditionally apprenticeships provided training for a narrow set of technical skills, often in manual or low-skilled occupations, countries with strong apprenticeship tradition have expanded apprenticeships to accommodate the needs of the modern economy, offering them in a broader range of occupational categories (Klor De Alva & Schneider, 2018). In these countries, such as Germany and Switzerland, a dual apprenticeship that combines learning in the workplace and in the school (Berhard & Graf, 2022) is an essential part of the overall education system, supporting youth employment and the strong economy (Hoffman, 2015). However, a robust dual system cannot be simply transferred from one context to another (Barabasch et al., 2009; Euler, 2013; Gonon, 2014; Stockmann, 2014). Apprenticeships involve various stakeholders, such as the state, employers, labor market institutions, and training organizations. To establish apprenticeships as a recognized vocational education pathway, all stakeholders' needs should be met in dynamic social, cultural, and economic contexts (Fuller & Unwin, 2012), which requires complex institutional arrangements. For these reasons, apprenticeship models vary in different contexts, and each country should identify an approach that is appealing to both employers and learners (Valiente & Scandurra, 2017) based on the understanding of a strong dual system.

One of the common strategies to promote and modernize apprenticeships in countries without a rich culture of vocational education is by creating them within modern occupations and integrating them into higher education by offering *degree* apprenticeships (DAs). For example, in the U.S., a growing number of community colleges have been integrating apprenticeships into their degree programs. These two-year institutions are a unique part of U.S. postsecondary education system, offering associate degrees and short-term vocational programs. As of 2022, there are 1,043 community colleges across the U.S., providing broad access to higher education (American Association of Community Colleges, 2022). Over the past three years, more than one hundred community colleges have joined the Expanding Community College Apprenticeships (ECCA) initiative to offer apprenticeships in both modern and traditional occupations, such as construction, advanced manufacturing, healthcare, information technology, finance and business, and energy (American Association of Community Colleges, 2021). Some 4-year universities also offer degree apprenticeships leading to a bachelor's or even a master's degree (Alabama A&M University, 2021 September). Besides the U.S., the U.K. government launched Degree and Higher Level Apprenticeships (D&HLAs) in 2014 to revive and modernize apprenticeships as a means of improving the country's skill. Since then, DAs have been growing quickly. 26% apprenticeship programs that started in 2019/20 in the U.K. were degree apprenticeships, an increase of 7% compared to 2018/19 (Hubble & Bolton, 2019). South Korea, a country extremely focused on academics with the highest rate of college enrollment in the world (McNeill, 2011), has also been strategically implementing various forms of DAs since 2014 to better prepare college students for the world of work (Ahn, 2019).

While more countries are adopting DAs, little research has been done to explore DAs as a strategy for modernizing and institutionalizing apprenticeships, especially in countries without a strong apprenticeship history. This study explores the rationales, current development in the U.S., and a conceptual framework for designing and delivering such programs. The aim is to raise awareness among scholars and policymakers about the recent movement to design strong career pathways through apprenticeships and lay down a foundation for future research. Based on a thorough narrative literature review (Gessler & Siemer, 2020), I first discuss rationales for DAs, followed by current development in the U.S. Then, a conceptual framework is presented for implementing DAs at higher education institutions. Finally, I conclude the study with recommendations for future research.

2 The Rationales: Why Degree Apprenticeships?

This section presents two rationales for why DAs can serve as an effective strategy to modernize apprenticeships. First, DAs enable the *permeability* of vocational education in the predominant education systems (Eichhorst et al., 2012; Renold & Caves, 2017). Second, DAs can equip higher education to effectively prepare young people for work in response to globalization and technology innovation. These two rationales are further elaborated below.

2.1 Enabling Permeability of Vocational Education

To establish an effective VET system, scholars (Renold & Caves, 2017; Renold, et al., 2018; Woessmann, 2008) suggest several crucial features need to be in place, such as a high level of linkage between education and employment sectors, good multilevel governance to coordinate among various stakeholders, and quality vocational programs that meet national standards. In addition, quality VET programs should be integrated into the overall education system to enable permeability, which means that VET credentials are transferable vertically across different levels of education, including tertiary education, and horizontally between the general education systems (Hamilton, 1994; Renold & Caves, 2017). In today's knowledge-based economy, higher education is regarded as a primary driver in advancing knowledge (Olssen & Peters, 2005). Therefore, permeability between VET and higher education is particularly crucial so that apprenticeships do not appear to be dead ends (Hamilton, 2020). Degree apprenticeships enable permeability in their design, strategically establishing apprenticeships without hindering the pursuit of higher education.

According to Bernhard (2019), the concept of institutional permeability is categorized into four dimensions: (1) Access, (2) recognition and validation, (3) organizational linkages, and (4) institutional support structures to meet the diverse needs of learners. Access to education is the first dimension that most people think of when considering permeability. Access

could be granted without limitation for a maximum level of permeability or based upon predetermined conditions. Recognition and validation of prior learning, as the second dimension, is under the premise that diverse educational paths can lead to similar competencies. The third dimension, organizational linkages, indicates connection between vocational and academic education at the organization level. It also implies that different types of education are integrated into one educational program or institution, as is the case with degree apprenticeships. The fourth dimension pertains to the provision of institutional support structures that facilitate successful learning experience in permeable educational pathways.

Overall, institutional permeability encompasses multiple dimensions, and various countries have implemented various measures to promote permeability in VET and higher education, including German-speaking countries with a strong apprenticeship culture. For example, when apprenticeships in Switzerland were increasingly perceived as a less ideal option since VET diplomas did not grant access to higher education, Universities of Applied Sciences (UAS) were established in 1990s. This created a path for VET diploma holders to pursue a professional baccalaureate (Meyer, 2009). In Germany, dual study programs emerged in the 1970s to combine university studies and work-based learning, and have become a prominent educational choice in the past fifteen years, blurring the boundaries between vocational and higher education (Ertl, 2020). In addition, some dual VET programs at the secondary level integrate the Abitur, a general higher education entrance qualification, offering double qualifications (Bernhard & Graf, 2022).

In the U.S., apprenticeships traditionally existed within a limited set of occupations, such as construction trades, primarily recruiting adult workers with very little linkage to secondary schools and colleges, which made apprenticeships invisible to policymakers (Lerman, 2013). For these reasons, the lack of permeability in U.S. apprenticeships has been pointed to as one of the culprits for the less than desirable status of such programs (Hamilton, 2020; Lerman, 2013). From this perspective, the current apprenticeship movement among community colleges has a higher chance of success due to its intentionality to include higher education institutions as apprenticeship providers (Hamilton, 2020). Recent federal grants, such as *Scaling Apprenticeship through Sector-Based Strategies* (U.S. Department of Labor, 2018) and *Apprenticeships: Closing the Skills Gap* (U.S. Department of Labor, 2019), also encourage higher education institutions to offer apprenticeships within their degree programs.

2.2 Degree Apprenticeships in Response to Globalization and Technology Innovation

Another rationale for DAs is that this nontraditional pathway can equip higher education institutions to effectively prepare young people for the globalized, knowledge economy. Globalization and the rapid development of technology have profoundly changed how we live,

causing increasing complexity in the world of work for young people to navigate (Jensen & Arnett, 2012; Larson, 2011; OECD, 2017). The global economy is now marked by the closely related trends of automation, digitalization, and robotification (CEDEFOP, 2018), which requires more skills and education to be successful in the workplace. To equip young people for the world of work, it is essential to provide right type of skills that enable them to successfully navigate an ever-evolving, technology-driven work environment (OECD, 2017).

While the role of education in response to globalization is a critical area of debate, in the global neoliberal era, employability is emphasized as one of the most important goals of education to equip individuals with economic productivity (Davies & Bansel, 2007; Hastings, 2019). For that, higher education is regarded as the primary player to advance the knowledge economy. As a result, the expansion of higher education has been in the interest of both developing and developed countries, and higher education has shifted from an elite to a mass system, especially in developed countries (Olssen & Peters, 2005), with an increasing emphasis on vocationalism and professionalism (Cheng et al., 2022; Department for Business, Innovation, and Skills, 2016; Sin & Neave, 2016).

For example, the Obama administration set the goal of leading the world in college completion by raising the U.S. college graduation rate among 25- to 34-year-olds to 60% by 2020 (Kelderman, 2020 January). Along with that, the administration pushed states to raise graduation standards in high schools by adopting Common Core academic standards, a curriculum initiative to increase the rigor of high school courses to prepare students for college and career. As a result, schools' performances are often judged by academic test results and whether or not students enroll in college (Lerman, 2013).

However, a mere expansion of higher education does not lead to career preparedness. According to recent surveys (Hart Research Associates, 2015; Society for Human Resource Management [SHRM], 2019), U.S. employers generally find it difficult to hire suitable candidates with the right soft and technical skills. Written and oral communication, teamwork, ethical decision-making, critical thinking, and the ability to apply knowledge in real-world settings are the most highly valued skills when hiring recent college graduates. While employers who participated in the survey rated the recent graduates' readiness with these skills as low, interestingly college students rated themselves notably higher in these areas, indicating a discrepancy between students' and employers' perspectives. Employers also highly valued applied learning experiences to improve job readiness and believed that it was important for higher education institutions to ensure such experiences through internships and community-based projects with people from diverse backgrounds. However, only 14% of the employers thought college graduates were equipped with such experiences (Hart Research Associates, 2015). Overall, employers felt that higher education has done little to help address the skills shortage (SHRM, 2019), which is disheartening considering the all-out efforts in the U.S. to expand higher education and the rising amount of student debt that has resulted.

DAs can effectively address the lack of job preparedness among recent college graduates. This learn-and-earn degree pathway enables student apprentices to acquire valuable real-world work experience and receive at least an apprentice's minimum income while pursuing the aspiration for college education (Mulkeen et al., 2019; Universities UK, 2016). DAs especially appeal to nontraditional students, such as job changers and those from underrepresented populations, allowing them to reach social mobility goals (Universities UK, 2017). For higher education institutions (HEIs), DAs facilitate collaborations with employers, strengthening existing relationships with them. Implementing DAs can also provide a new income stream for HEIs since such programs are often supported by national funding (Universities UK, 2016; Voeller, 2022).

Given these rationales discussed so far, countries without a strong apprenticeship history are strategically implementing various forms of DAs to better equip young people for the world of work. The following section highlights recent development of DAs in the U.S.

3 Past Challenges and Recent Development of Degree Apprenticeships in the U.S.

Apprenticeships were formally established in the U.S. with the passage of the National Apprenticeship Act in 1937 (Klor De Alva & Schneider, 2018). This act formulated a set of standards for registered apprenticeships regulated by the Department of Labor (U.S. Department of Labor, n.d.-a). However, this registered apprenticeship system, with little linkage to the formal education system, has never been fully established as a viable educational path (Lerman, 2013). Rather, apprenticeship programs have been dominated by construction trades and unions, held in low esteem as secondary options for low-performing high school students.

In the late 1980s and early 1990s, new initiatives were implemented to sponsor a variety of work-based learning programs at schools (Hamilton, 2020). These efforts developed amidst dissatisfaction with the nation's education system and a call for a radical change to improve school-to-work preparation to better compete with emerging economic powers, such as Germany and Japan. This movement culminated in the passage of the School-to-Work Opportunities Act (STWOA) by the Clinton administration in 1994. At that time, *youth* apprenticeships implemented at the secondary level received special attention as the most intensive form of work-based learning. However, unions generally opposed youth apprenticeships in fear of losing control over registered apprenticeship programs. Some were concerned about forcing youth to start careers too early (Lerman, 2013).

In addition, strong opposition was generated by apprenticeships presented as a non-college alternative for those who did not thrive at school (Hamilton, 2020). During the last several decades, there has been a strong emphasis on restoring U.S. leadership in college

completion, which has, in turn, raised the rigor of high school courses to prepare students for college (Lerman, 2013). Several scholars (Hamilton, 2020; Hoffman, 2011; Lerman, 2013) point to this "college-for-all" mentality in the U.S. as one of the key barriers that shifted attention away from the school-to-work transition. Youth apprenticeships were perceived as less prestigious compared to pursuing higher education, and the school-to-work movement faded.

However, recently, apprenticeships have re-emerged as an effective learning pathway, particularly for middle-skilled jobs in the U.S., receiving widespread bipartisan support (Browning & Nickoli, 2017; Klor De Alva & Schneider, 2018). Especially, community colleges are actively leading in the move to implement apprenticeships within degree programs (Browning & Nickoli, 2017). Community colleges, traditionally known as junior or technical colleges, are a unique and important part of the U.S. postsecondary education system. With their open admissions policies, these two-year institutions provide broad access to higher education and fulfill various missions. They prepare students for four-year universities, offer remedial/development education for underrepresented populations, and serve as the primary career and technical education (CTE) providers in the U.S. by providing short- and long-term, mainly school-based, vocational programs (Baime & Baum, 2016; Baker III, 1994).

Given their established role as the vocational education provider in the U.S., community colleges are natural partners in advancing apprenticeships (Browning & Nickoli, 2017; Hamilton, 2020). Consequently, there has been a surge in the number of community colleges implementing registered apprenticeships in both traditional and modern occupations (American Association of Community Colleges, n.d). One notable example is Apprenticeship Carolina, a division of the South Carolina Technical College System that offers statewide apprenticeship programs. Launched in 2007 by the state, Apprenticeship Carolina sought to expand apprenticeships as part of the state's workforce development efforts. To do so, it recognized the importance of including continued educational opportunities through apprenticeships, and for that reason, the SC Technical College System was recommended as the best central organization for promoting apprenticeships in the state. One of the main strategies for this initiative was to enhance the capacity of the state's 16 technical colleges to become providers for in-class instruction for registered apprenticeships (Stieritz, 2009). These efforts also resulted in the approval of an employer tax credit worth $1,000 per apprentice. Although not a decisive factor for employers, it has served as a helpful incentive for them to consider sponsoring apprenticeships (Lerman, 2013). Due to the state-wide efforts, apprenticeship opportunities increased significantly in South Carolina from 415 registered in 2006 to 2,946 in 2016 (Kuehn, 2017).

Apprenticeships at community colleges offer a pathway to earning a two-year associate degree, which can be transferred towards a bachelor's degrees. When an apprenticeship leads to a degree, the "conflict with the college-for-all ethos dissipates. College is not just a future

prospect for apprentices; they are enrolled now" (Hamilton, 2020, p. 119). The current development of DAs in the U.S. demonstrates that it is possible for countries without a strong recent history of apprenticeships to grow apprenticeships through strong government support, national funding, and development efforts, and DAs have been one of the key strategies to do so.

4 Design and Delivery of DAs: Work-Based Learning as a Conceptual Framework

So far, this study has examined the rationales for DAs and substantiated them by presenting their recent development in the U.S. While DAs offer unique opportunities for learners to learn and earn while pursuing a degree, implementing DAs can be challenging since this requires institutional changes and a high-level of coordination among various stakeholders, especially employers, to enable this nontraditional degree pathway. DAs require higher education institutions (HEIs) to be flexible with program design and delivery to accommodate the needs of companies and working students (Martin et al., 2020). This final section discusses various aspects of DAs to provide a conceptual framework for HEIs to consider when designing and delivering such programs.

The primary pedagogical premise of apprenticeships is based on a social model of learning. According to Lave and Wenger (1991), learning is a situated activity in which new members participate in communities of practice where old members pass down identities, knowledge, and skills. Apprenticeships situate young people in a community of practitioners which enables apprentices to learn through direct involvement in various work activities and guidance from their mentors. Later, Fuller and Unwin (1999) built on the original claim of the social model of learning and defined the following four interconnected dimensions as a broader context for apprenticeships: (1) Pedagogical (i.e., how learning is organized and delivered at the workplace and during in-class instruction), (2) occupational (i.e., how apprentices are initiated and plugged into a specific or broader occupational community), (3) locational (i.e., how employers' relationships with the community in which they are located enable apprentices to become part of the wider community), and (4) social (i.e., how the perceived success of the employer affects the community's perception of apprenticeships and how the local community regards apprenticeships as an important means for the school-to-work transition for young people).

While this framework situates apprentices in a broad sociocultural context, this study is more concerned with a conceptual framework that can be applied to the *design and delivery* of apprenticeships. For this, I synthesize Fuller and Unwin's (1999) framework with primary features of work-based learning (WBL) to present a conceptual framework for DA design and delivery. Broadly defined, WBL refers to learning and knowledge acquired in a work-

place (Basit et al., 2015). This definition includes work-like activities, such as field trips to workplaces, job shadowing, and service learning. This study, however, chooses a narrower definition – WBL "occurs in places where the principal activity is producing goods and services" (Hamilton, 2020, p. 61); requires direct and systematic input from employers and/or community (Darche et al., 2009); and involves a tripartite relationship between the education institution, the employer, and the learner (Basit et al., 2015). Based on this definition, apprenticeship is the most formal, intensive, and, indeed, ambitious form of work-based learning (Bailey et al., 2004; Hamilton, 2020). To ensure a quality learning experience, apprenticeships should include the following four interconnected features, distilled from the work of several scholars (Bailey et al., 2004; Darche et al., 2009; Fuller & Unwin, 1999; Hamilton, 1990) – occupational, pedagogical, relational, and aligned.

4.1 Occupational Dimension

The first dimension is *occupational*. Apprentices must engage in the workplace (Darche et al., 2009; RTI International, n.d.) and they should be given meaningful responsibilities and be initiated into a specific or broader occupational community of shared knowledge, skills, values, customs, and habits, often leading to certification(s) (Bailey et al., 2004; Fuller & Unwin, 1999; Hamilton, 1990).

Apprenticeships do not exist without employers who want to hire apprentices. However, company recruitment is a common and constant challenge in offering apprenticeships, especially in countries without a strong apprenticeship history. A typical hiring strategy for companies in these countries is to select a candidate already equipped with the necessary skills, or in the case of companies with more resources, conduct their own short-term on-the-job training. However, apprenticeships require a paradigm shift in which companies become directly involved in long-term training to develop a talent to meet their human resource needs (Choi & Hong, 2014).

To support engagement of employers in the U.S., various *intermediary* organizations have emerged. Nonprofits, private training companies, and industry organizations are among those facilitating connections between stakeholders to create and operate apprenticeship programs (Katz & Elliott, 2020). Community colleges frequently serve as intermediaries as well, by combining degree programs with apprenticeships. They convince employers to join apprenticeships, manage the relevant paperwork to make it easy for them to hire apprentices, match companies with apprentices, and deliver the classroom component of an apprenticeship (Bewick & Craig, n.d.; U.S. Department of Labor, n.d.-b; Voeller, 2022). Indeed, intermediaries are significant contributors to the growth of apprenticeships, especially in countries without a strong history of such programs to connect various stakeholders with different interests (Bewick & Craig, n.d.).

4.2 Pedagogical Dimension

The second dimension is *pedagogical*. Learning should be planned and delivered to impart vocational knowledge and skills (Fuller & Unwin, 1999). Common instructional strategies for WBL include learning by practice, feedback, discussions, modeling, hands-on projects, and direct teaching (Lucas et al., 2012). WBL also includes assessments that facilitate critical reflection and evaluate vocational proficiency. Critical reflection provides an opportunity for students to step back and connect what they are experiencing at the workplace with in-class instruction (Hamilton, 2020). It enables students to "justify and validate their claims for learning, by using a variety of evidence sources" (Brodie & Irving, 2007, p.15). Also, given the primary purpose of WBL as promoting the application of new knowledge and skills, assessment should demonstrate vocational proficiency. Examples of WBL assessment may include feedback from the employer, artifacts produced as part of learning, a reflective journal/essay, or a combination of these items. Assessment needs to be clearly linked to the learning outcomes and designed in an affordable, realistic way (Woolf & Yorke, 2010).

In DAs, learning occurs both at the workplace and during in-class instruction. However, while schools function around pre-designed learning objectives and course schedules, the primary purpose of a workplace is to produce goods or services. For this reason, thoughtfully designed workplace learning to train apprentices cannot be taken for granted from employers with demanding day-to-day work activities. In a case study of implementing degree apprenticeships at a community college (Voeller, 2022), the college exuded confidence in their ability to provide relevant technical instruction, but participant companies varied in their readiness to offer on-the-job training based on their resources and learning culture. To assist employers in delivering effective workplace learning, targeted training for apprentice supervisors, supported through public policy or employer organizations, can be helpful, especially when they first offer apprenticeships in partnership with universities (OECD, 2018).

4.3 Relational Dimension

Third, relationships between young people and adults should be fostered through mentoring. Hamilton and Hamilton (2002) argue that workplaces are "especially appropriate and powerful settings for mentoring" (p. 79). Mentors not only help apprentices apply their technical skills in the workplace, but also coach them in how to effectively communicate and work with others in a professional work environment (Hamilton, 1990; Hamilton & Hamilton, 1997; Helper et al., 2016). Additionally, mentors provide general career and education guidance, personal and professional growth, and a caring, emotional connection (RTI International, n.d.).

Guidance from mentors is achieved through demonstration, instruction, asking reflective questions, providing constructive feedback, and engaging with their apprentices in joint problem solving throughout the program (Hamilton et al, 2021). Apprentices are sometimes assigned to a single mentor for their entire apprenticeship while some might rotate through multiple departments, thereby working with multiple mentors. Over an extended period of time, the mentor and the apprentice often form a special bond coming from their mutual commitment (Hamilton & Hamilton, 2002), which may last well beyond the apprenticeship.

Despite the significance of workplace mentoring, it cannot be assumed that employers have the necessary skills to effectively mentor apprentices in partnership with higher education institutions (HEIs) (OECD, 2018), especially in countries without a strong tradition of apprenticeships. To address this, some more experienced HEIs have created short workshops and manuals to assist employers, particularly those who are new to apprenticeships. Additionally, some HEIs provide their own coaching/mentoring within the school to supplement any potential gaps in workplace learning. This is because apprentices are likely to have varying workplace mentoring experiences, depending on the readiness and resources of the employer (Rowe et al., 2017). Some community colleges are also taking steps to provide additional assistance, including workshops for employers and extra coaching for apprentices within the school to ensure successful mentoring experiences in DAs (Voeller, 2022).

4.4 Aligned Dimension

Lastly, but certainly not least, classroom teaching should be connected to workplace learning so that learning activities at these two locations complement and reinforce each other (Haimson & Bellotti, 2001; Hamilton & Hamilton, 1997). Achieving this alignment requires ongoing, substantial commitment from schools and employers, and for that, a joint management system between the schools and employers should be established (Darche et al., 2009).

School-work connectivity is a multidimensional, multilevel process (Aprea & Sappa, 2015). Literature suggests that alignment should be established in three stages: (1) The first stage is to identify in explicit terms what is supposed to be learned, such as the major duties, tasks, and task components of the occupation and align them with academic standards; (2) the next stage is to develop learning plans – the learning objectives, expectations, and time commitment for various activities – on which both the educational institution and the employer agree; (3) the last stage is to reinforce the alignment through joint management between the educational institution and the employer (Darche et al., 2009).

To achieve aligned learning experiences and facilitate joint management in DAs, it is crucial for the higher education institution and the company to determine what level of alignment to achieve, and establish ongoing communication channels and a set of practices

accordingly. This involves regular touchpoints, such as curriculum meetings, onsite visits, and annual reviews, as well as ongoing communications as needed (Voeller, 2022).

These four dimensions interconnect to create an optimal apprenticeship experience. For example, the alignment (*aligned*) of learning at school and at the workplace is achieved through well-designed VET curriculum (*pedagogical*) and ongoing mentoring (*relational*). Learning at school (*pedagogical*) is reinforced through real-world applications at work (*occupational*). Figure 1 depicts these four interconnected dimensions of apprenticeships.

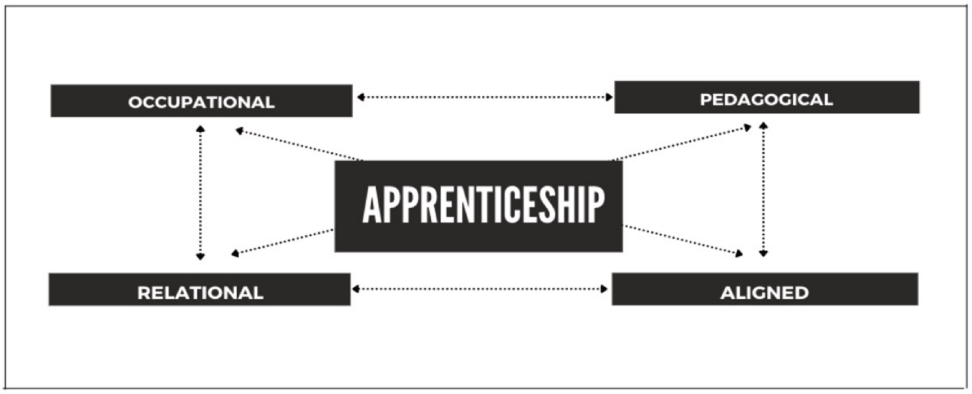

Figure 1: Four Dimensions of Apprenticeships

5 Conclusion, Limitation, and Recommendations for Future Research

There has been a growing interest in re-establishing and modernizing apprenticeships to better support young people in transition from school to work in the globalized knowledge economy. Implementing degree apprenticeships has been one of the strategies to do so, especially in countries without a rich culture of vocational education. This study explores this new degree pathway by discussing their rationales, substantiating them with recent development of DAs among community colleges in the U.S. A conceptual framework is also presented, distilled from the work of several scholars, that can be considered for designing and delivering degree apprenticeships.

By providing a helpful context and framework for understanding DAs, this study contributes to the growing body of research on apprenticeships, providing a foundation for future research that can advance the theory and support the practice for implementing DAs. However, due to the limited literature on this topic, this study lacks more in-depth discourse

about best practices and challenges of implementing DAs. A future study can build upon this study to explore implementation of DAs in depth. In addition, it can also focus on how to strengthen an ecosystem to support DAs at the policy level. For example, this study highlights permeability as one of the features of a strong VET system. Future research can focus on other features, such as how to enhance collaboration between education and employment sectors and how to establish multilevel governance to create an integrated environment for DAs. More research and attention from the scholastic community will further advance the current growing movement for adopting apprenticeships in the U.S. and beyond through DAs, ultimately better supporting the transition of young people from school to work.

Ethics Statement

This study does not involve any human participants and the author has no conflict of interest to declare.

References

Ahn, S. (2019). 학위연계형 일학습병행제: 한국과 독일형 모델의 비교연구 [A comparative analysis of degree apprenticeship models in Korea and Germany]. *Koreanisch-Deutsche Gesellschaft für Wirtschaftswissenschaften* [KDGW], *37*(2), 1–24. https://doi.org/10.18237/KDGW.2019.37.2.001

Alabama A&M University. (2021 September). *A&M social work supports profession in new way*. https://www.aamu.edu/about/inside-aamu/news/social-work-opioid-support.html

American Association of Community Colleges. (2021). *DataPoints: Apprenticeship goals*. https://www.aacc.nche.edu/2021/11/18/datapoints-apprenticeship-goals/

American Association of Community Colleges. (2022). *Fast facts 2022*. http://www.aacc.nche.edu/wp-content/uploads/2022/05/AACC_2022_Fact_Sheet-Rev-5-11-22.pdf

American Association of Community Colleges. (n.d.). *Expanding community college apprenticeships*. https://www.aacc.nche.edu/programs/workforce-economic-development/expanding-community-college-apprenticeships/

Aprea, C., & Sappa, V. (2015). School-workplace connectivity: An instrument for the analysis, evaluation, and design of educational plans in vocational education and training. *Berufsbildung in Wissenschaft und Praxis BWP*, 1, 27–31.

Bailey, T. R., Hughes, K. L., & Moore, D. T. (2004). *Working knowledge: Work-based learning and education reform*. Psychology Press.

Baime, D., & Baum, S. (2016). *Community colleges: Multiple missions, diverse student bodies, and a range of policy solutions*. Urban Institute. https://files.eric.ed.gov/fulltext/ED570475.pdf

Baker III, G. A. (1994). *A handbook on the community college in America: Its history, mission, and management*. Greenwood Press.

Barabasch, A., Huang, S., & Lawson, R. (2009). Planned policy transfer: The impact of the German model on Chinese vocational education. *Compare*, *39*(1), 5–20. https://doi.org/10.1080/03057920802265566

Basit, T. N., Eardley, A., Borup, R., Shah, H., Slack, K., & Hughes, A. (2015). Higher education institutions and work-based learning in the UK: Employer engagement within a tripartite relationship. *Higher Education*, *70*(6), 1003–1015. https://doi.org/10.1007/s10734-015-9877-7

Bernhard, N. (2019). Supporting the needs of vocationally qualified students – changes towards institutional permeability in Germany? *Formation Emploi*, *146*(2), 129–147. https://doi.org/10.4000/formationemploi.7255

Bernhard, N., & Graf, L. (2022). Enhancing permeability through cooperation: The case of vocational and academic worlds of learning in the knowledge economy. In G. Bonoli & P. Emenegger (Eds.), *Collective Skill Formation in the Knowledge Economy* (pp. 281–307). Oxford University Press.

Bewick, T., & Craig, R. (n.d.). *Making apprenticeships work: Five policy recommendations*. University Ventures. https://universityventures.com/images/Making_Apprenticeships_Work_-_UV_Whitepaper.pdf

Brodie, P., & Irving, K. (2007). Assessment in work-based learning: Investigating a pedagogical approach to enhance student learning. *Assessment & Evaluation in Higher Education*, *32*(1), 11–19. https://doi.org/10.1080/02602930600848218

Browning, B., & Nickoli, R. (2017). *Supporting community college delivery of apprenticeships*. Jobs for the Future. https://jfforg-prod-new.s3.amazonaws.com/media/documents/CCSurveyReport091917.pdf

CEDEFOP. (2018). *Globalization opportunities for VET: how European and international initiatives help in renewing vocational education and training in European countries*. Publications Office of the European Union. https://files.eric.ed.gov/fulltext/ED592614.pdf

Cheng, M., Adekola, O., Albia, J., & Cai, S. (2022). Employability in higher education: A review of key stakeholders' perspectives. *Higher Education Evaluation and Development*, *16*(1), 16–31. https://doi.org/10.1108/HEED-03-2021-0025

Choi, J., & Hong, S. (2014). 대학 관점에서의 일·학습병행제의 현안과 정착·발전을 위한 [Recommendations to establish degree apprenticeships: From higher education's perspective]. *The HRD Review*.

Darche, S., Nayar, N., & Bracco, K. R. (2009). *Work-based learning in California: Opportunities and models for expansion*. James Irvine Foundation. https://www.wested.org/online_pubs/workbasedlearning.pdf

Davies, B., & Bansel, P. (2007). Neoliberalism and education. *International Journal of Qualitative Studies in Education*, *20*(3), 247–259. https://doi.org/10.1080/09518390701281751

Department for Business, Innovation & Skills. (2016). *Success as a knowledge economy: Teaching, learning and assessment in UK higher education*. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/523546/bis-16-265-success-as-a-knowledge-economy-web.pdf

Eichhorst, W., Rodríguez-Planas, N., Schmidl, R., & Zimmermann, K. F. (2012). *A roadmap to vocational education and training systems around the world (Research Report No. 7110)*. IZA. http://repec.iza.org/dp7110.pdf

Ertl, H. (2020). Dual study programmes in Germany: Blurring the boundaries between higher education and vocational training? *Oxford Review of Education*, *46*(1), 79–95. https://doi.org/10.1080/03054985.2019.1687438

Euler, D. (2013). *Germany's dual vocational training system: A model for other countries?* Bertelsmann Stiftung.

Fuller, A., & Unwin, L. (1999). A sense of belonging: The relationship between community and apprenticeship. In P. Ainley & H. Rainbird (Eds.), *Apprenticeship: Towards a new paradigm of learning* (pp. 150–162). Kogan Page Limited.

Fuller, A. & Unwin, L. (2012). *Contemporary apprenticeship*. Taylor and Francis.

Gessler, M., & Siemer, C. (2020). Umbrella review: Methodological review of reviews published in peer-reviewed journals with a substantial focus on vocational education and training research. *International Journal for Research in Vocational Education and Training*, *7*(1), 91–125. https://doi.org/10.13152/IJRVET.7.1.5

Gonon, P. (2014). Development cooperation in the field of vocational education and training: The dual system as a global role model. In M. Maurer & P. Gonon (Eds.), T*he challenges of policy transfer in vocational skills development: National Qualifications frameworks and the dual model of vocational education in international cooperation*. Peter Lang.

Haimson, J., & Bellotti, J. (2001). *Schooling in the workplace: Increasing the scale and quality of work-based learning. Mathematica Policy Research*. https://www.mathematica.org/publications/schooling-in-the-workplace-increasing-the-scale-and-quality-of-workbased-learning

Hamilton, S. F. (1990). *Apprenticeship for adulthood*. Free Press.

Hamilton, S. F. (1994). Employment prospects as motivation for school achievement: Links and gaps between school and work in seven countries. In R. K. Silbereisen & E. Todt (Eds.), *Adolescence in context: The interplay of family, school, peers, and work in adjustment* (pp. 267–283). Springer.

Hamilton, S. F. (2020). *Career pathways for all youth: Lessons from the school-to-work Movement*. Harvard Education Press.

Hamilton, S. F., & Hamilton, M. A. (1997). *Learning well at work: Choices for quality*. Cornell University. https://files.eric.ed.gov/fulltext/ED411390.pdf

Hamilton, M. A., & Hamilton, S. F. (2002). Why mentoring in the workplace works. *New Directions for Youth Development*, *2002*(93), 59–89. https://doi.org/10.1002/yd.23320029306

Hamilton, S.F., Boren, Z., Arabandi, B., & Jacoby, T. (2021). *Mentor guide for youth registered apprenticeship programs*. Urban Institute. https://www.urban.org/sites/default/files/publication/104456/mentor-guide-for-youth-registered-apprenticeship-programs_0.pdf

Hart Research Associates. (2015). Falling short? College learning and career success. *Association of American Colleges and Universities*. https://www.aacu.org/sites/default/files/files/LEAP/2015employerstudentsurvey.pdf

Hastings, M. (2019). Neoliberalism and education. *Oxford Research Encyclopedia of Education*. https://doi.org/10.1093/acrefore/9780190264093.013.404

Helper, S., Noonan, R., Nicholson, J. R., & Langdon, D. (2016). *The benefits and costs of apprenticeships: A business perspective*. U.S. Department of Commerce.

Hoffman, N. (2011). *Schooling in the workplace: How six of the world's best vocational education systems prepare young people for jobs and life*. Harvard Education Press.

Hoffman, N. (2015). High school in Switzerland blends work with learning. *Phi Delta Kappan*, *97*(3), 29–33. https://doi.org/10.1177/0031721715614825

Hubble, S., & Bolton, P. (2019). *Degree apprenticeships. House of Commons Library*. https://researchbriefings.files.parliament.uk/documents/CBP-8741/CBP-8741.pdf

Jensen, L. A., & Arnett, J. J. (2012). Going global: New pathways for adolescents and emerging adults in a changing world. *Journal of Social Issues, 68*(3), 473–492.

Katz, B., & Elliott, D. (2020). *CareerWise: Case study of a youth apprenticeship intermediary*. Urban Institute. https://www.urban.org/sites/default/files/publication/102373/careerwise-case-study-of-a-youth-apprenticeship-intermediary_0.pdf

Kelderman, E. (2020 Jauary). *Happy new year, higher education: You've missed your completion goal*. The Chronicle of Higher Education. https://www.chronicle.com/article/happy-new-year-higher-ed-youve-missed-your-completion-goal/

Klor De Alva, J., & Schneider, M. (2018). *Apprenticeships and community colleges: Do they have a future together?* American Enterprise Institution. https://files.eric.ed.gov/fulltext/ED585878.pdf

Kuehn, D. P. (2017). *Diversity and inclusion in apprenticeship expansion*. Urban Institute. https://www.urban.org/sites/default/files/publication/93831/diversity-and-inclusion-in-apprenticeship-expansion.pdf

Larson, R. W. (2011). Positive development in a disorderly world. *Journal of Research on Adolescence*, *21*(2), 317–334.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press.

Lerman, R. I. (2013). Expanding apprenticeship in the United States: Barriers and opportunities. In A. Fuller & L. Unwin (Eds.), *Contemporary apprenticeship: International perspectives on an evolving model of learning* (pp. 105–24). Routledge.

Lerman, R. I. (2019). *Scaling apprenticeship to increase human capital. Aspen Institute*. https://www.aspeninstitute.org/wp-content/uploads/2019/01/1.3-Pgs-56-74-Scaling-Apprenticeship-to-Increase-Human-Capital.pdf

Lucas, B., Spencer, E., & Claxton, G. (2012). *How to teach vocational education: A theory of vocational pedagogy*. City & Guilds Centre for Skills Development. https://www.educationinnovations.org/sites/default/files/How-to-teach-vocational-education.pdf

Martin, L., Lord, G., & Warren-Smith, I. (2020). Juggling hats: Academic roles, identity work, and new degree apprenticeships. *Studies in Higher Education*, *45*(3), 524–537. https://doi.org/10.1080/03075079.2018.1550478

McNeill, D. (2011, November 27). *After decades of building colleges, South Korea faces a lack of students*. The Chronicle of Higher Education. https://www.chronicle.com/article/after-decades-of-building-colleges-south-korea-faces-a-lack-of-students/

Meyer, T. (2009). Can "Vocationalisation" of education go too far? The case of Switzerland. *European Journal of Vocational Training*, *46*(1), 28–40.

Mulkeen, J., Abdou, H. A., Leigh, J., & Ward, P. (2019). Degree and higher level apprenticeships: An empirical investigation of stakeholder perceptions of challenges and opportunities. *Studies in Higher Education*, *44*(2), 333–346. https://doi.org/10.1080/03075079.2017.1365357

Organisation for Economic Co-operation and Development. [OECD] (2017). *Future of work and skills*. https://www.oecd.org/els/emp/wcms_556984.pdf

Organisation for Economic Co-operation and Development. [OECD] (2018). *Seven questions about apprenticeships: Answers from international experience*. OECD Publishing. https://doi.org/10.1787/9789264306486-en

Olssen*, M., & Peters, M. A. (2005). Neoliberalism, higher education and the knowledge economy: From the free market to knowledge capitalism. *Journal of Education Policy*, *20*(3), 313–345. https://doi.org/10.1080/02680930500108718

Renold, U., & Caves, K. (2017). *Constitutional reform and its impact on TVET governance in Nepal: A report in support of developing understanding and finding the way forward for federalizing the TVET sector in Nepal*. KOF Swiss Economic Institute. https://doi.org/10.3929/ethz-a-010857985

Renold, U., Caves, K., Burgi, J., Egg, M., Kemper, J., & Rageth, L. (2018). *Comparing international vocational education and training programs: The KOF education-employment linkage index*. National Center on Education and the Economy. https://files.eric.ed.gov/fulltext/ED589125.pdf

Rowe, L., Moss, D., Moore, N., & Perrin, D. (2017). The challenges of managing degree apprentices in the workplace: A manager's perspective. *Journal of Work-Applied Management*, *9*(2), 185–199. https://doi.org/10.1108/JWAM-07-2017-0021

RTI International. (n.d.). *Work-based learning toolkit*. https://cte.ed.gov/wbltoolkit/index.html

Society for Human Resource Management. [SHRM] (2019). *The global skills shortage: Bridging the talent gap with education training and sourcing*. SHRM. https://www.shrm.org/hr-today/trends-and-forecasting/research-and-surveys/Documents/SHRM%20Skills%20Gap%202019.pdf

Sin, C., & Neave, G. (2016). Employability deconstructed: Perceptions of Bologna stakeholders. *Studies in higher education*, *41*(8), 1447–1462. https://doi.org/10.1080/03075079.2014.977859

State Secretariat for Education, Research and Innovation [SERI]. (n.d.). *Swiss-US cooperation in VET*. SERI. https://www.sbfi.admin.ch/sbfi/en/home/education/international-cooperation-in-education/staerkung-der-schweizer-berufsbildung-im-internationalen-kontext/berufsbildungskooperation-schweiz-usa.html

Stieritz, A. M. (2009). Apprenticeship Carolina™: Building a 21st century workforce through statewide collaboration. *Community College Journal of Research and Practice*, *33*(11), 980–982. https://doi.org/10.1080/10668920903153485

Stockmann, R. (2014). The transfer of dual vocational training: Experiences from German development cooperation. In M. Maurer & P. Gonon (Eds), *The challenges of policy transfer in vocational skills development: National Qualifications frameworks and the dual model of vocational education in international cooperation*. Peter Lang.

Universities, U.K. (2016). *The future growth of degree apprenticeships*. https://dera.ioe.ac.uk/id/eprint/26180/1/FutureGrowthDegreeApprenticeships.pdf

Universities, U. K. (2017). *Degree apprenticeships: Realising opportunities.* https://dera.ioe.ac.uk/id/eprint/28772/1/degree-apprenticeships-realising-opportunities.pdf

U.S. Department of Labor. (n.d.-a). *History and Fitzgerald Act*. https://www.dol.gov/agencies/eta/apprenticeship/policy/national-apprenticeship-act

U.S. Department of Labor. (n.d.-b). *Apprenticeship USA*. https://www.apprenticeship.gov/

U.S. Department of Labor. (2018). *H-1B scaling apprenticeship through sector-based strategy*. https://www.dol.gov/sites/dolgov/files/ETA/grants/pdfs/FOA-ETA-18-08_FAQ1.pdf

U.S. Department of Labor. (2019). *U.S. Department of Labor announces record-high number of apprentices for fiscal year 2019*. https://www.dol.gov/newsroom/releases/eta/eta20191122

U.S. Department of Labor. (2021). *Data and statistics*. https://www.dol.gov/agencies/eta/apprenticeship/about/statistics/2020

U.S. Mission Switzerland. (2015 July). *Swiss companies bring apprenticeship programs that work to the U.S.* U.S. Embassy in Switzerland and Liechtenstein. https://ch.usembassy.gov/swiss-companies-bring-apprenticeship-programs-work-u-s/

Valiente, O., & Scandurra, R. (2017). Challenges to the implementation of dual apprenticeships in OECD countries: A literature review. In M. Pilz (Ed.), *Vocational education and training in times of economic crisis* (pp. 41–57). Springer, Cham.

Voeller, J. (2022). Exploring the opportunities, challenges, and strategies for implementing degree apprenticeships: Perceptions of stakeholders at a community college. *Career and Technical Education Research*, *47*(1), 39–54.

Woessmann, L. (2008). Efficiency and equity of European education and training policies. *International Tax and Public Finance*, *15*(2), 199–230.

Woolf, H., & Yorke, M. (2010). *Guidance for the assessment of work-based learning in Foundation degrees. Foundation Degree Forward.*

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Enhancing Critical Thinking Skills and Media Literacy in Initial VET Students: A Mixed Methods Study on a Cross-Country Training Program

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Abstract

Context: In the last few decades, the constant and exponential changes in the society's consumption of information have increased the awareness of practitioners from the education and training field, on the need for training programs for the enhancement of critical thinking skills and media literacy among students from Initial Vocational Education and Training (IVET) who are less exposed to intellectual trainings than their peers in traditional education pathways.

Approach: With this impetus, the present paper reports the results of a mixed methods study evaluating a training program for such competences. Based on a cognitive psychology theoretical framework, the training program consisted in three main techniques through which trainers can work with students in the classroom. *N*= 35 trainers from five different countries (i.e., Greece, Italy, Spain, Portugal, and the Netherlands) were instructed about the training techniques and implemented them in their training centres. Then, a total of *N*= 288 students among these countries were involved in the testing of the training, which took place on a duration average of 5 months. Mixed methods approach was used to evaluate the effectiveness and quality of the training. Notably, prospective statistical analysis

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evaluated the training's impact of the participating students and compared with a control group. Qualitative interviews examined the training's lived experience with a group of students and trainers.

Findings: The quantitative and qualitative analysis of pre/post- measures of critical thinking skills and media literacy of the experimental group, and the comparison with the control group, indicate an increase in these competences and confirm the efficacy of the training intervention.

Conclusion: These results inform about the usefulness of the training program cross-culturally and the feasibility of training strategies based on cognitive psychology. Moreover, the paper offers a methodological contribution thanks to the proposition of the mixed methods approach for training programs assessment.

Keywords: Critical Thinking Skills, Social Media, Educational Program, Qualitative Research, Quantitative Research, VET, Vocational Education and Training

1 Introduction

Given the constant and exponential changes of information and technology, scholars and practitioners have highlighted the imperative for finding practices devoted to the promotion of critical thinking skills and media literacy in the context of Initial Vocational Education and Training (IVET) (Bolaños & Salinas, 2021; Candido et al., 2023; Fraillon et al., 2014; Hague & Payton 2011). This emphasis stands in the context of IVET since intellectual disciplines and educational opportunities for critical engagement are less prominent (European Commission, 2020; Perini et al., 2022; Riesmeyer et al., 2016; Tommasi et al., 2022). The core part of the IVET is the focus on the application of technical and practical modules to prepare students for the labour market which reduces the occasion to foster intellectual opportunities (European Commission, 2020; Perini et al., 2022; Riesmeyer et al., 2016; Sartori et al., 2022; Tommasi et al., 2023). IVET teachers and trainers operate in the absence of formal ways of approaching such skills with unclear expectations about appropriate programs.

Recent reviews of the scientific literature presented the lack of a consensus on the definition of critical thinking skills and media literacy and how to address these dimensions in the context of IVET (see Tommasi et al., 2023). The absence of shared approaches and institutional guides leaves to the own responsibility of trainers, teachers, and Vocational Education and Training (VET) centres the promotion of such skills. Ultimately, the question on how IVET teachers and trainers can find a guide for educational actions to foster critical thinking skills and media literacy remains unanswered (European Commission, 2020; Riesmeyer et al., 2016; Sartori et al., 2022; Tommasi et al., 2023).

The overreaching aim of the present study is to take into account this gap on how to promote critical thinking skills and media literacy in the context of IVET. To pursue this aim, the study used a mixed methods approach to evaluate and examine a novel designed program of training for enhancing critical thinking skills and media literacy in IVET students. The designed program focused on training for supporting IVET students in behaving critically followed recent advance in cognitive psychology. It has been realized by the NERDVET project (Think smart! Enhancing critical thinking skills and media literacy in VET, n.d.), an Erasmus+ KA3 project co-funded by the European Commission, a cross-country project involving allied VET centres from Greece, Italy, Portugal, Spain, and The Netherlands. This project had the proposition of developing a novel educational program to support VET teaching staff in increasing critical thinking skills and media literacy of their students.

In more details, the NERDVET educational program bases on different training techniques and follows the cognitive psychology notion of self-nudging as a theoretical framework. Applying a cognitive psychology approach, teachers and trainers implemented techniques focused on (a) fostering the use of reliable sources, (b) reducing irrational beliefs and cognitive biases, and (c) proactive behaviours (Hertwig & Grüne-Yanoff, 2017; Kenyon, 2014; Noorani et al., 2019; Soll et al., 2014). According to the notion of self-nudging, teachers and trainers are active actors in fostering students' capacity to create a set of specific personal strategies to reach a target or to tailor their behaviour for a proactive purpose (Thaler & Sunstein, 2008; Torma et al., 2018), e.g., using reliable sources, reducing the reference to irrational beliefs, and being proactive in behaving critically in their daily life. Training programs based on self-nudging are meant to foster proactive commitment of individuals in the processing of information, supporting the creation of specific individuals' strategies to critically evaluate information and adopt a specific behaviour (Sartori et al., 2022).

In the present paper, we begin presenting the designed actions of the NERDVET partnership and the training program. Five groups of teachers and trainers from five different countries participating to the NERDVET project (Greece, Italy, Spain, Portugal, and The Netherlands) worked together to test a set of techniques and practical exercises for enhancing critical thinking skills and media literacy. Second, we continue reporting the number of participants involved in the training program, i.e., teachers and trainers, and students of each involved country of the project. Here, we present the mixed methods approach, i.e., quantitative and qualitative approaches, used for examining the quality the programs. Third, we report the results of our examinations. Prospective statistical analysis offers evidence of the efficacy of the training in promoting the critical thinking skills and media literacy. Prospective analysis of interviews offers indications of the experiences and perceptions of the training. We conclude discussing our results offering indications for theory and practice.

2 Method

In the present study, we evaluated a training program for supporting IVET students in behaving critically. The training program followed recent advance in cognitive psychology, and it has been realized by the NERDVET project. For the assessment of the effectiveness of the training, we used a mixed methods approach

2.1 Training Program

The training program refers to a shared definition of critical thinking skills and media literacy resulting from a cognitive psychology framework. That is, critical thinking skills include:

> *"metacognitive competence concerning abilities of reflection, analysis and questioning of information resulting in proactive behaviour and citizenship. [...] media literacy as the equivalent of media information literacy, where the alphabet and language used are media content. Media literacy encompasses the knowledge and skills to think critically about media information through an understanding of media representations, structures and implications." (Tommasi et al., 2023; p. 16).*

Thus, approaching critical thinking and media literacy from a cognitive psychology perspective, focusing on how individuals analyse and understand information and concepts, including those coming from digital media, implies helping them creating connections between concepts, break down information and rebuild it with logical connections, as – in doing so – their understanding of that information/concept will increase. By transferring these concepts to the educational context, a range of training objectives are ultimately defined: 1) Supporting the use of procedures to detect misinformation; 2) Enhancing the awareness of cognitive biases; 3) Enhancing the individuals' ability to develop personal strategies and procedures to process information objectively and behaving critically in a digital environment (Hertwig & Grüne-Yanoff, 2017; Kenyon, 2014; Noorani et al., 2019; Soll et al., 2014). By coupling these cognitive aspects with the previously mentioned factors related to the development of critical thinking in IVET, the following three educational techniques have been at the core of the training program tested: (a) Debunking misinformation by using reliable sources; (b) Raising awareness on biases, irrational beliefs and heuristics; (c) Self-nudging (Sartori et al., 2022; Thaler & Sunstein, 2008; Torma et al., 2018).

The training program began with a train the trainer session with a training meant to teach the three techniques above presented to teachers and trainers. This occurred in different online sessions during which Francesco Tommasi and Andrea Ceschi taught teachers and trainers in an interactive modality. Then, participants of the train the trainer session developed a series of training strategies and then trained themselves in their use and application. In parallel to the rules set as common ground, trainers were still granted a degree of freedom to

decide how to transfer the contents of the training program to their students. Furthermore, the proposed exercises and strategies were adapted for the training program in each country, especially in terms of simplification or the use of classroom content in a customised form. Some group of teachers and trainers have additionally found ways to thematically modify them to integrate them in the topics of the lessons. Moreover, other cases of teachers creating their own exercises, taking inspiration from the training techniques, or translating them in their national languages to foster efficacy were registered. In addition, five video animations were available for teachers' use. These video tutorials unanimously proved to be useful tools to expose topics and ideas for discussion, present visual stimuli to accompany the exercises, as well as to allow brainstorming and debate.

Then, the training programs for each country took place in a timeframe that ranged from three to seven months, average duration of five. Vocational education and training providers have been able to arrange their training phases by frequency and length of the training, according to the needs of their students and to the trainers' work programmes. With respect to the participation of teachers and trainers, they volunteered to take part and to involve their students. 35 trainers (age range 24 to 50 years old) volunteered to take part in the training program and included $N = 288$ students (age range 15 to 31 years old) which were randomly identified in each VET centre. Simultaneously, each vocational education and training provider established one control group, for a total of $N = 173$ learners, with the aim to compare the impact of the training on the experimental group (see Table 1).

With respect to the duration, the training program followed different time frames according to differences in terms of a) duration of the educational programs, b) national and regional holidays, and c) duration of the school year. Specifically, The Netherlands IVET centre took three months (February – April 2022), in Greece took three months (March – May 2022), in Spain four months (March – June 2022), in Italy five months (February – June 2022), and in Portugal seven months.

Table 1: Descriptive Data of the Study Participants per Each Country

Country	Trainers	Students	Control Studens
Greece	8	30	10
Italy	8	105	39
Portugal	6	82	73
Spain	6	30	7
The Netherlands	7	33	23

2.2 Assessment of the Training Program: Mixed Methods Approach

We used a mixed methods approach for purposes of (a) expansion (extending breadth and scope) to allow exploration of multiple levels of influence and (b) triangulation to assess the extent to which qualitative and quantitative findings corroborate each other (Caves & Oswald-Egg, 2023; Morse, 2016; Shorten & Smith, 2017). We used a quantitatively and qualitatively driven approach meant to supplement each other. Quantitative part was theoretical drive and so deductive. In this case, self-report measures (described below) have been used to assess pre/post- training program the level of critical thinking skills and media literacy. Data collected are then analysed in order to find evidence of significant differences between two time points (time 1, pre-training *vs* time 2, post-training), and two groups (1 control group without training and 1 experimental group of people who participated in the program. Qualitative part was inductive as meant to examine the experiences and perceptions of teachers and trainers, and students who participated in the training program. Data collected are then analysed to explore the lived experience and find indications for the improvement of the training, as well as to expand the knowledge on the factors contributing to the enhancement of critical thinking skills and media literacy. Quantitative and qualitative data were collected concurrently, analysed independently, then merged and integrated to create the research narrative (Morse & Neihaus, 2009).

Before data collection, participants were informed about the aim of the study who then provided their consent to the use of the data collected. The study has been approved by the ethical committee of the University of Verona (n. 2022-45b) according to the declaration of Helsinki.

2.2.1 Quantitative Assessment

We constructed an online survey protocol comprising two scales and demographics. Using the online survey software LimeSurvey, students of the VET centres were invited to participate via teachers and trainers before and after the training involving both participants of the training and a control group of students of the same age and classes. The survey took between five and seven minutes for them filling in it. Analyses have been conducted using SPSS (version 22). We used a self-evaluation tool to allow teachers and trainers to verify which is their level of critical thinking skills and media literacy, whether there is room for improvement and whether the learning activities carried out during the training were effective. Results can then be easily interpreted by looking at the range of the answers. Particularly, we used the California Critical Thinking Scale developed by Facione, and Giancarlo in 1998, and adapted to Dutch, Greek, Italian, Spanish and Portuguese. It contests in 27 items on a five-point Likert-type scale (1 = Strongly Disagree to 5 = Strong Agree) and the internal consistency coefficient of the scale was 0.88.

The other assessment tool employed was the Self-Nudging Scale, which has been developed for the present study. It is a seven-point Likert scale consisting of nine different but connected behavioural-cognitive dimensions for 27 items related to self-nudging for behaving critical, namely a) managing information (3 items), b) simplifying information, c) reframing alternative information (3 items), d) behaving critical explicitly (3 items), e) social influence (3 items), d) using alternative strategies, f) managing data (3 items), g) using self-incentives (3 items), h) emotional affections (3 items), and i) using self-reminders (3 items) (reliability of each scale ranged from .80 to 91).

After the first data collection, we operated on time fatigue and efforts of students, and the scale was reduced from 64 items to 54 by cutting the number of items of the California Critical Thinking Scale (n = 7 items) and the Self-nudging scale (eliminating the scale "using self-incentives").

Then, we conducted a Confirmatory factor analysis (CFA) to examine the factor structure of the Self-Nudging Scale as a means to verify the reliability of the measure. To do so, we tested the scale with separate factors which led to a good model fit ($\chi 2$ (224) = 492, $p < 0.001$, SRMR = 0.06, RMSEA = 0.062, CFI = 0.95) and in line with recommended cut-off scores (CFI ≥ 0.95; SRMR ≤ 0.06; RMSEA ≤ 0.08, e.g., Hu & Bentler, 1999). No error terms were allowed to correlate.

2.2.2 Qualitative Assessment

We devised a field study by involving a mix of qualitative data collection and analysis methods; coupling semi-structured interviews with the grounded theory approach (Charmaz, 2008; Glaser et al., 1968). On the one hand, qualitative data collection has been considered to conduct an exploratory investigation from the standpoint of the experiences and views of the participants. On the other hand, the grounded theory approach allowed us to generate new knowledge by valuing the experiences and narratives of participants. This method has been used in similar research contexts (Tacconi, 2011; Tacconi & Morbioli, 2019) since it also helps considering unexpected elements that may occur in qualitative data.

We collected data via semi-structured interviews to keep the focus on the research object, without a strict structure of questions. As such, this method helped to let participants tell and present their opinions and link episodes and situations that may be relevant for them. Following the principles of grounded theory, the starting reference track, was fixed after each interview with the aim of better investigating the perspectives and experiences reported by the subjects involved (Charmaz, 2008). For students, the semi-structured interview involved open questions meant to foster engagement in the participation to the interview. For example, we started with questions on their experience and perception of the training "How was the training?" "Have you learnt anything?". Then, we continued following participants

answers and focused on aspects of the training and their experience, an example of our questions is "Do you have a particular experience that you would like to share?", "Did you find any difficulties in following the activities of the trainers?". In this, we also asked participants to talk about their acquired knowledge and how they evaluated the training in qualitative terms "Have you applied what you learnt out of the school?", "Did you find the activities useful for you?". In closing, we asked whether they wanted to advance suggestions about the training program.

For teachers and trainers, we used a similar semi-structured interview. We began with open questions on their experience of the training, i.e., "How was the training? Did you enjoy it?". We continued talking about their experience in the classroom, asking the participants about particular meaningful and/or negative stories of their training implementation. In closing, we left teachers and trainers to talk about their perception of the value of the training by asking "Is there anything you would like to add to this interview?", "Do you have additional comments about the training?". In these terms, we tried to make the participants to feel free as much as possible to share their comments and views of the training.

Participants were invited via email, i.e., brief description of the study accompanied the invitation. A total amount of 14 students and trainers were involved in the study. The interviews were conducted electronically via Zoom according to the interview's possibilities (average interview time, M = 35 minutes, standard deviation 10.23).

2.2.3 Data Analytic Plan

Interviews were audio-recorded and then transcribed at the end of the data collection. For anonymity concerns and analysis purposes, a progressive code to each conversational turn of the word has been assigned to make each extract traceable. Quantitative data were analysed with independent *t*-test and paired-sample *t*-test in order to verify the alternative-hypothesis of significant differences in pre/post training and for the comparison between the control and experimental group.

For anonymity concerns and analysis purposes, a progressive code to each conversational turn of the word has been assigned to make each extract traceable. For example, the code [INT004/03] indicates the interviewee number INT04 in the/03 turn of the interview. In the end, data were analysed according to the guidelines of grounded theory. Sets of information were grouped into categories and sub-categories to systematize the interviewees' contributions to the research focus. The use of codes allowed a continuous analysis and re-categorization of the original interview texts and providing the sketching of a model anchored to the data on which it was built. Such a procedure has been administered manually.

3 Results

Analysis of quantitative and qualitative data revealed interesting results about the training program. For clarity and convenience, we report them in separate sections (i.e., 3.1 and 3.2) and we narratively combine them in the discussion.

3.1 Quantitative Part

With respect to the quantitative part of the assessment, we firstly run descriptive statistics of the involved groups. Table 2 reports the descriptive statistics for each country at time 1 and time 2 of data collection.

Table 2: Samples Descriptions at Time 1 and Time 2 of Data Collection

	Time 1					Time 2				
	Group		Gender		Age	Group		Gender		Age
	Exp.	Control	Male	Female		Exp.	Control	Male	Female	
Greece	12	/	12	/	21	48	9	29	28	20
Italy	114	17	113	18	17.2	114	17	113	16	17.2
Portugal	37	39	26	50	17.3	71	58	33	96	28.5
Spain	15	11	26	/	18.3	15	11	26	/	18
The Netherlands	50	16	56	9	18.2	50	16	23	3	18.2

We firstly tested the hypothesis assuming significant higher levels of critical thinking skills and media literacy within the experimental group of students at the end of the training, i.e., pre-post comparison, using paired-sample *t*-tests. Secondly, we tested the comparison between the experimental group and the control group for each country via independent-sample *t*-test. We made pre/post- and experimental *vs* control group comparisons for the variable California Critical Thinking Scale and the Self-nudging dimensions ($N = 8$).

In respect to the first group of hypotheses, first, students from Greece reported an improvement for the general level of critical thinking ($t(11) = 4.58$, $p = .001$), plus improvements for the dimensions of self-nudging linked with the behavioural strategies and the management of information in a critical modality. Particularly, students reported higher levels of reframing alternative information ($t(10) = 2.34$, $p = .042$), behaving critical explicitly ($t(10) = 2.89$, $p = .02$), social influence ($t(10) = 3.49$, $p = .01$) and managing information ($t(10) = 2.3$, $p = .04$). Second, students from The Netherlands showed higher levels for all the dimensions of critical thinking and self-nudging scale except for the dimension of reframing alternative with a p-value slightly higher than the cut-off of $p < .05$. Third, students from Italy reported improvements as well. Participants of the training program resulted to have

higher levels of critical thinking ($t(98) = 2.85$, $p = .001$), and the self-nudging dimension of simplifying information ($t(95) = 1.95$, $p = .03$), b) social influence ($t(94) = 2.34$, $p = .01$), managing data ($t(94) = 2.96$, $p = .002$), and emotional affections ($t(94) = 2.86$, $p = .003$). Fourth, students from Portugal reported to have similar results with higher levels of critical thinking ($t(36) = .43$, $p = .001$), and self-nudging dimensions of simplifying information ($t(30) = 3.19$, $p = .003$), social influence ($t(29) = 1.97$, $p = .05$), using alternative strategies ($t(29) = 5.05$, $p = .001$), managing data ($t(29) = 2.56$, $p = .02$) and emotional affections ($t(29) = 2.23$, $p = .03$). Lastly, students from Spain showed improvements in critical thinking ($t(14) = 1.75$, $p = .004$), and managing information ($t(13) = 1.77$, $p = .05$), simplifying information ($t(13) = 1.35$, $p = .03$), and reframing alternative information ($t(13) = 1.03$, $p = .02$) for self-nudging.

Such improvements are related to the fact that students attended the training, because the comparison with control group reveals that participants of the training program had higher levels of critical thinking and media literacy when compared to participants of the control group, i.e., second group of hypotheses. This appears for each country with no exceptions. Although not all the control groups had a sufficient number of participants to be compared with the pilot training group, the independent t-test revealed small (i.e., $p = .05$) to higher (i.e., $p = .001$) significant differences with improvements of critical thinking and self-nudging dimensions.

Students from Greece reported a significant difference for the improvement in critical thinking ($t(67) = 3.48$, $p = .001$), in managing information ($t(67) = 1.78$, $p = .04$), and in using alternative strategies ($t(67) = 2.18$, $p = .016$). In The Netherlands students the differences of improvement were significative in critical thinking ($t(40) = 1.14$, $p = .04$), in managing information ($t(40) = 1.54$, $p = .05$), and in using alternative strategies ($t(40) = 2.27$, $p = .014$). In Italian students, all the dimensions examined reported significant differences with the control group: critical thinking ($t(98) = 2.91$, $p = .001$); managing information ($t(95) = 2.28$, $p = .001$); simplifying information ($t(94) = 1.95$, $p = .026$); reframing alternative ($t(93) = 2.03$, $p = .002$); behaving critical explicitly ($t(95) = 2.45$, $p = .001$); social influence ($t(94) = 2.34$, $p = .011$); using alternative strategies ($t(95) = 2.05$, p = .002); managing data ($t(93) = 2.96$, $p = .003$); emotional affections ($t(95) = 2.86$, $p = .002$). Significant differences among the groups of Portugal students were found in critical thinking ($t(139) = 1.64$, $p = .03$), managing information ($t(127) = 1.49$, $p = .006$), behaving critical explicitly ($t(127) = 1.86$, $p = .04$), social influence ($t(127) = 1.11$, $p = .004$) and emotional affections ($t(127) = 1.53$, $p = .05$). In Spanish students, all the dimensions examined reported significant differences with the control group: critical thinking ($t(24) = 2.56$, $p = .009$); managing information ($t(24) = 3.08$, $p = .003$); simplifying information ($t(24) = 3.14$, $p = .002$); reframing alternative ($t(24) = 3.27$, $p = .002$); behaving critical explicitly ($t(24) = 3.29$, $p = .002$); social influence ($t(24) = 2.54$, $p = .009$); using alternative strategies ($t(23) = 3.23$, $p = .002$); managing data ($t(23) = 3.28$, $p = .002$); emotional affections ($t(23) = 2.79$, $p = .005$).

3.2 Qualitative Part

Regarding the qualitative part of the assessment, four main aspects resulted from the analysis, namely: (a) Quality of the training program, (b) effectiveness of the training program, (c) contents of the training program, and (d) integration of the training program within VET curricula (see Table 3).

Table 3: Qualitative Results: Categories and Examples of Extracts From the Interviewees

Categories	Examples of Interview Extracts
(a) Quality of the training program	"Well, we [students] have been able to learn at our own pace, collaborate with teachers and trainers, it was good." (INT010/02)
	"Thanks to the training, we [teachers] have also learnt more and maybe we have also shown higher level of critical thinking and media literacy to our students." (INT007/02)
(b) Effectiveness of the training program	"I wasn't expecting such a huge presence of cognitive biases. I think that … at least, I am aware know. And it is more than nothing." (INT005/03)
	"I had this meaningful experience when I noted that students were devising personal tips to solve problems. This was very satisfactory during the training program." (INT004/07)
(c) Contents of the training program	"… sometimes… I think that sometimes teachers had problems in enhancing critical thinking and media literacy. This is because they were engaged with too specific training practices. But in that case, we identified the problem and perhaps we were critical. Maybe, it was the task, I don't know." (INT001/08)
	"The more we [teachers] have contents, the more we have opportunities to engage students in different activities for improving their critical thinking skills and media literacy. I think this is a good point." (INT012/10)
(d) Integration of the training program within IVET curricula	"Considering my experience, I think that we [students] should have more opportunities in the future. It is good to reflect on these aspects and also to practice." (INT001/10)
	"Our ambition [teachers] is to add these competences in our curricula. Then, we would like to have a sort of a reference point to build our own activities… but you know, there are some institutional/regional barriers that we [teachers/trainers] cannot address." (INT013/09)

3.2.1 Quality of the Training Program

Participants' opinions on the kind of societal changes and labour transformation will lead to, stressed the crucial role of having a critical thinking mindset and, consequent behaviour, in daily life. Among the views of the interviewees there is a certain degree of consensus over the positive experience with the training program, linked with a positive perception of it. Some participants reported their moral and pragmatic concerns with regards to the information-driven society, highlighting and stressing the importance of being aware of one's own

irrational beliefs and cognitive biases, and the crucial importance of using reliable sources. Some participants (both students and trainers) emphasized the relevance of the opportunities offered using the Training program in the classroom, as the consequences of living in an information-driven society affect not only public environments, (e.g., school, work, etc.) but also the private sphere. In more detail, participants evaluated the training program as qualitatively good and relevant. However, there were some specific concerns coming from trainers on how to translate the teaching strategies in practical activities in their classes. Accordingly, some teachers reported how they had to adjust the training's exercises and practices according to their students' needs and level of school advancement. By means of example, since the training program's exercise were developed by a group of trainers from different country organisations, it was easier for teachers and trainers to use the strategies developed by their own organisation, rather than employing those from other countries. Despite this, the trainers used similar practices or re-adapted the already existing ones, which indicates that this issue has not compromised the quality of the pilot action.

3.2.2 Effectiveness of the Training Program

Participants gave relatively high and positive judgments on the use of the training program. Moreover, they showed a shared view of training activities realised by the teachers and trainers and addressing the students. Particularly, students and teachers indicated how the skills developed were not limited to the classroom activities as they a) proposed a general definition of critical thinking and b) students reported how they applied some of the techniques in their daily life, out of their classrooms. First of all, teachers and trainers of all the organisations agreed on the importance and the linguistic meaning of having a critical thinking mindset and good levels of media literacy. They defined it as "the set of skills of an individual which allow them to deal with the information driven society without incurring in flawed and erroneous choices" leading to "avoiding getting lost". Such a result, although it partially echoes the definition of the academic literature, is particularly crucial for evaluating the effectiveness of the training, as trainers have been able to foster the students' capacity to offer a personal perspective on the content of the training. Secondly, this results in the long-term application of the techniques developed outside the classroom. Accordingly, students reported how they have applied this way of thinking and behaving in their daily life (e.g., when debating with peers or looking for information).

3.2.3 Contents of the Training Program

Teachers reported that debating in the classroom and raising awareness of cognitive biases and prejudice is very interesting and stimulating. Indeed, the debating activity has been the

one most frequently used by teachers to sharpen students' critical thinking skills and media literacy. Some teachers and trainers, for example, created two groups with the task of confronting around a specific topic where two different positions can be sustained. During these activities, students made arguments concerning possible irrational beliefs, cognitive biases and the use of reliable sources. As such, the debates were more based on the students' ability of debunking arguments of others rather than on the use of good rhetorical way of presenting arguments. Despite these positive results, students as well as teachers and trainers reported some ways in understanding the notion of self-nudging, asking for a clearer description of the training technique and the related exercises.

3.2.4 Integration of the Training Program Within IVET Curricula

One of the most interesting aspects reported by teachers, trainers and students was the fact that all agree on the importance of integrating the training program into IVET curricula, and more broadly into vocational education and training. They actually reported how useful it was for them to have the possibility to debate and think about the different ways through which they could make incorrect choices and assumptions due their own irrational beliefs, biases or when trusting unreliable sources. For most of them, it was quite surprising to understand how easy can be to make poor decisions. Accordingly, they suggested that IVET programs should entail at least 1-2 hours per week to develop and continue their critical thinking training. This is for improving students' skills and also to make them feel engaged and active, as well as fostering their sense of participation in civic life.

4 Discussion

The study reported the results of the testing of a training program for the enhancement of critical thinking skills and media literacy in IVET students. Accordingly, the aim of the study was to shed light onto the effectiveness, gather knowledge on its usefulness and impact and identify implications for future initiatives. As noted before, the IVET context is a fragmented context which has no proper identification and specific guidelines at the international level concerning the provision of training on critical thinking and media literacy competences. The only main aspect characterizing IVET is that most of the time for education and training is devoted to the development of practical skills (European Union Communication, 2020). In the view of the information driven society with information creation, innovation, storage, and distribution being the modern currency of contemporary society (Bolaños & Salinas, 2021; Fraillon et al., 2014; Hague & Payton, 2011), owning skills and competences that support critical thinking skills and media literacy becomes crucial (Sartori et al., 2022; Tommasi et al., 2023). Coupling these moral and pragmatic issues, we found impetus for the realization

of a training program meant to foster critical thinking skills and media literacy in IVET students. Such an effort was realized thanks to the collaboration in the NERDVET project partnership comprising scholars and practitioners from six different countries.

4.1 Narrative Discussion

The training program was offered in an average duration of five months by trained trainers, while an assessment of its effectiveness has been carried out based on a mixed methods approach (Morse, 2016; Shorten & Smith, 2017). This mixed methods approach used for the evaluation of the training program involved both quantitative and qualitative methods. As previously mentioned, for the quantitative component of the assessment, IVET students who participated at the training program reported small to large significant differences for most of the investigated dimensions, with post-training dimensions having significant higher levels than those of the pre-training. Such improvements can be read as a consequence of the training program, as the comparison between control and experimental groups for the post-training dimensions revealed significant differences too. That is, provided that the experimental and control groups of each country have completed the same questionnaire and at the same time, the control groups showed significant lower levels in the dimensions considered when compared to the training group. This also indicates an improvement in the students of the training group, which appears as a positive effect of the training. In particular, the improvements observed indicate that students have reached higher levels for the dimensions considered, i.e., (a) debunking misinformation by using reliable sources, (b) raising awareness on biases, irrational beliefs and heuristics, (c) self-nudging (Sartori et al., 2022; Thaler & Sunstein, 2008; Torma et al., 2018).

Quantitative results echo in the qualitative part of the assessment, with indications about what worked well and why. Particularly, teachers, trainers and students who participated in the interviews showed a certain level of satisfaction with the activities of the training. Intriguingly, these results are in line with those of the pre and post comparison and the control vs experimental group analysis, according to which most of the students demonstrated higher levels of critical thinking and self-nudging dimensions of behaving critically and the management of complex information. Students expressed in different terms the quality and relevance of the training: For the most part, they reported how they were implementing training activities in their daily life after the training. This means that, indirectly, the students were not only focused on the activities at school, but also that teachers and trainers have been able to foster their capacity to behave critically even in private situations. Accordingly, this reminds to the background of the training, i.e., self-nudging notion. Students have shown to have improved their use of reliable sources while reducing irrational beliefs and cognitive biases, and, in particular, have shown proactive behaviours (Hertwig & Grüne-Yanoff, 2017;

Kenyon, 2014; Noorani et al., 2019; Soll et al., 2014). Lastly, teachers and trainers found the training activity itself interesting and relevant, also in the possibility that the Training program gives to support students in their critical thinking beyond the testing that was carried out within the NERDVET project.

As it has been argued throughout this paper, the participants' opinions gathered both by means of the standard training program monitoring, as well through the formal assessment system, are clear and uniform in reporting positive judgements on the training program experience. As a matter of fact, expressing it in different ways, all actors (teachers/trainers, students, supporting and project staff) directly involved in the training have stated that the training program should be systemically integrated in the curricula of their training centres and, furthermore, be taken up by any other interested vocational education and training or traditional education provider. More than that, offering such a training should not be left to the individual drive of teachers/trainers or VET providers, but the necessary political framework should be provided through a top-down process (European Commission, 2020; Riesmeyer et al., 2016; Tommasi et al., 2023; Perini et al., 2022).

Ultimately, our results offer a broader depiction of the quality of the training program while they also inform about the prospects of the implementation of such specific training programs in the context of IVET. Thanks to mixed methods approach comprising both quantitative and qualitative methods, our results provide empirical evidence which can serve future the interdisciplinary and international research in the context of IVET (Gessler et al., 2021).

5 Conclusion

To conclude, the use of both quantitative and qualitative methods helped to find evidence of the effectiveness of the training program while simultaneously evaluate the quality of the program. However, the study cannot give indications on the long-term effects of the training program as both the quantitative and qualitative parts were limited to the evaluation of the post-training effects and experience. Post-training quantitative assessment and qualitative data were prospective and recorded only once whereas the training was approaching to the end. Also, there might possible effects due to individual differences, as well as effects due to the duration of the program. However, we decided to not consider such aspects in our assessment since we opted for a specific focus on the broader value of the training program. Although it is possible that individual characteristics (e.g., gender) might affect the quality of training, these aspects do not limit our results but rather inform subsequent studies using the assessment approach as a baseline for the development of future exploration of the training program developed.

Nevertheless, this study makes two important implications for theory-building and research-conducting in the field of critical thinking skills and media literacy in the context of IVET. This study suggests that the use of a cognitive psychology framework applied in the context of education may offer interesting and useful tips for the realization of training program. Indeed, our training program finds its basis on a large and well-established research program in cognitive psychology, i.e., research on reasoning and rationality (Sartori et al., 2022; Ceschi & Fioretti, 2021). To take into account these calls for efforts in the education programs for the promotion of critical thinking can be supported by following lines of theoretical and applied research in psychology. In this context, seminal contributions have launched several training programs for helping individuals in reducing cognitive errors, and to not incur in irrational beliefs (e.g., Kahneman & Tversky, 1984; Tommasi et al., 2021).

Ethics Statement

The study reported involves human participants and has been approved by the ethical committee of the University of Verona, Department of Human Sciences.

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References

Bolaños, F., & Salinas, Á. (2021). Secondary vocational education students' expressed experiences of and approaches to information interaction activities within digital environments: A Phenomenographic study. *Education and Information Technologies, 26*(2), 1955–1975. https://doi.org/10.1007/s10639-020-10322-0.

Candido, V., Raemy, P., Amenduni, F., & Cattaneo, A. (2023). Could vocational education benefit from augmented reality and hypervideo technologies? An exploratory interview Study. *International Journal for Research in Vocational Education and Training, 10*(2), 138–167. https://doi.org/10.13152/IJRVET.10.2.1

Caves, K. M. & Oswald-Egg, M. E. (2023). An empirical case of education policy Implementation in Serbian VET. *International Journal for Research in Vocational Education and Training, 10*(2), 191–219. https://doi.org/10.13152/IJRVET.10.2.3.

Ceschi, A., & Fioretti, G. (2021). From bounded rationality to collective behavior. Nonlinear Dynamics, *Psychology, and Life Sciences, 25*(4), 385–394.

Charmaz, K. (2008). Grounded theory as an emergent method. In S. N. Hesse-Biber & P. Leavy (Eds.), *Handbook of emergent methods* (pp. 155–172). The Guilford Press.

European Union Communication. (2020). Communication from the commission to the European parliament, the council, the European economic and social committee and the committee of the regions. European skills agenda for sustainable competitiveness, social fairness and resilience. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020DC0274& from=EN

Facione, N. C., & Giancarlo, C. A. (1998). Narratives of breast symptom discovery and cancer diagnosis: Psychologic risk for advanced cancer at diagnosis. *Cancer Nursing, 21*(6), 430–440. https://doi.org/10.1097/00002820-199812000-00007

Fraillon, J., Ainley, J., Schulz, W., Friedman, T., & Gebhardt, E. (2014). Preparing for life in a digital age: *The IEA International Computer and Information Literacy Study international report*. Springer Nature. https://doi.org/10.1007/978-3-319-14222-7

Gessler, M., Bohlinger, S., & Zlatkin-Troitschanskaia, O. (2021). International vocational education and training research: An introduction to the special issue. *International Journal for Research in Vocational Education and Training (IJRVET), 8*(4), 1–15. https://doi.org/10.13152/IJRVET.8.4.1

Glaser, B. G., Strauss, A. L., & Strutzel, E. (1968). The discovery of grounded theory; strategies for qualitative research. *Nursing research, 17*(4), 364.

Hague, C., & Payton, S. (2011). Digital literacy across the curriculum. Curriculum Leadership, 9(10).

Hertwig, R., & Grüne-Yanoff, T. (2017). Nudging and boosting: Steering or empowering good decisions. *Perspectives in Psychological Science, 12*(6), 973–986. https://doi.org/10.1177/1745691617702496

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modeling: A multidisciplinary journal, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118.

Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. *American psychologist, 39*(4), 341–350. https://doi.org/10.1037/0003-066X.39.4.341.

Kenyon, T. (2014). False polarization: Debiasing as applied social epistemology. *Synthese*, 191, 2529–2547. https://doi.org/10.1007/s11229-014-0438-x.

Morse, J. M. (2016). *Mixed method design: Principles and procedures*. Routledge.

Morse, J., & Neihaus, L. (2009). Mixed method design: Who needs it? In J. Morse (Ed.), *Mixed methods design: principles and procedures* (pp. 1–10). Routhledge. https://doi.org/10.4324/9781315424538

NERDVET. (n.d.). Think smart! Enhancing critical thinking skills and media literacy in VET. https://nerdvet.eu/

Noorani, S., Baïdak, N., Krém o, A., & Riiheläinen, J. (2019). Integrating students from migrant backgrounds into schools in Europe: National policies and measures. Eurydice Brief. Education, Audiovisual and Culture Executive Agency, European Commission. EU Bookshop.

Perini, M., Tommasi, F., & Sartori, R. (2022). Quali competenze e quali strategie formative per l'industria 4.0? Lo stato dell'arte. *Qwerty-Open and Interdisciplinary Journal of Technology, Culture and Education, 17*(1), 65–85. https://doi.org/10.30557/QW000039.

Riesmeyer, C., Pfaff-Rüdiger, S., & Kümpel, A. (2016). Wenn Wissen zu Handeln wird: Medienkompetenz aus motivationaler Perspektive. *M&K Medien & Kommunikationswissenschaft, 64*(1), 36–55. https://doi.org/10.5771/1615-634X-2016-1-36.

Sartori, R., Tommasi, F., Ceschi, A., Falser, M., Genero, S., & Belotto, S. (2022). Enhancing critical thinking skills & media literacy in initial vocational education and training via self-nudging: The contribution of NERDVET project. *Frontiers in Psychology*, 44–49. https://doi.org/10.3389/fpsyg.2022.935673.

Shorten, A., & Smith, J. (2017). Mixed methods research: Expanding the evidence base. *Evidence-based nursing, 20*(3), 74–75. https://doi.org/10.1136/eb-2017-102699.

Soll, J. B., Milkman, K. L., & Payne, J. W. (2014). A user's guide to debiasing. In K. Gideon & W. George (Eds.), *The Wiley Blackwell handbook of judgement and decision making, II* (pp. 924– 952). John Wiley and Sons, Ltd. https://doi.org/10.1002/9781118468333.ch33.

Tacconi, G. (2011). *La didattica al lavoro: analisi delle pratiche educative nell'istruzione e formazione professionale* (Vol. 6). FrancoAngeli.

Tacconi, G., & Morbioli, N. (2019). *Reinventare la scuola: la sfida dell'istruzione degli adulti in Italia*. Centro studi Erickson. University & Research.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.

Tommasi, F., Ceschi, A., Sartori, R., Gostimir, M., Passaia, G., Genero, S., & Belotto, S. (2023). Enhancing critical thinking and media literacy in the context of IVET: A systematic scoping review. *European Journal of Training and Development, 47*(1/2), 85–104. https://doi.org/10.1108/EJTD-06-2021-0074.

Tommasi, F., Perini, M., & Sartori, R. (2022). Multilevel comprehension for labor market inclusion: A qualitative study on experts' perspectives on Industry 4.0 competences. *Education+ Training, 64*(2), 177–189. https://doi.org/10.1108/ET-04-2021-0146.

Tommasi, F., Ceschi, A., Weller, J., Costantini, A., Passaia, G., Gostimir, M., & Sartori, R. (2021). An empirical evaluation of tech interventions to improve financial decision-making. *European Journal of Training and Development, 45*(6/7), 633–649. https://doi.org/10.1108/EJTD-11-2020-0169.

Torma, G., Aschemann-Witzel, J., & Thøøgersen, J. (2018). I nudge myself: Exploring 'self-nudging' strategies to drive sustainable consumption behaviour. *International Journal on Consumer Studies, 42*(1), 141–154. https://doi.org/10.1111/ijcs.12404.

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Scoping Review of Positive Mental Health Research for Students in Vocational Education and Training

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Abstract

Context: In this scoping review, we examine the knowledge base concerning positive mental health studies for students in vocational education and training (VET). The VET student population embraces approximately 30-52% of secondary school students in the Nordic countries, and 40% of the global student population. The risk of early school leaving (ESL) is substantially higher in VET than in general education and mental health may be a relevant factor in this matter. Yet, an overview of mental health studies in VET is lacking and therefore, this article aims to map empirical research studies that have explored positive mental health in VET students. The positive mental health framework, with its origin in Antonovsky's (2002) salutogenesis and positive psychology, focuses on factors that promote mental health and wellbeing rather than taking on a pathological perspective.

Methods: For our scoping review, we searched four databases, and 19 articles were found eligible for inclusion. These articles were systematically screened by means of a coding scheme to identify the following information: Country of origin of the study, its aim, research design, measures, conceptualization of mental health, and main findings.

Results: The evidence suggests that positive mental health is understood as a multifaceted concept, and wellbeing is the dimension that is explored most often, followed by resilience and quality of life. The majority of the included studies used a validated questionnaire to

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assess various aspects of positive mental health, and most of them sought to explore correlations between different dimensions of positive mental health. Main findings of the studies suggest that a supportive school environment, physical activity, and a strong vocational identity may contribute to positive mental health for students in VET. Furthermore, correlations have also been identified between environmental factors and positive mental health. Finally, findings from the review illustrate how even small-scale interventions may have far-reaching effects, due to the interrelatedness of the different dimensions within the positive mental health construct.

Conclusion: Findings from this review illustrate that numerous factors may affect the well-being of students in VET. In particular, a strong vocational identity, a supportive school environment, and physical activity may contribute to positive mental health. These findings suggest that VET teachers may promote the wellbeing of their students by providing a supportive psychosocial learning environment at school.

Keywords: VET in Schools, VET, Vocational Education and Training, Wellbeing, School Leavers, Positive Mental Health

1 Introduction

Positive mental health in adolescence is a foundation for learning and development, and for coping with life stressors. Adolescent mental and subjective health has become a public health concern worldwide, as it affects both the individual and the productivity of students and the workforce (Allison et al., 2019). Mental health challenges are also associated with early school leaving (ESL) (Esch et al., 2014; Gubbels et al., 2019). Though there exists research on mental health as a factor associated with ESL in secondary school in general, less is known about mental health amongst youth in VET specifically. Approximately 40% of students in upper secondary school are enrolled in a VET program across the Organisation for Economic Co-operation and Development (OECD) countries (OECD, 2023). Considering that ESL is greater in VET than in general studies programs (Statistics Norway, 2022), it may be particularly useful to consider the research on mental health in VET.

Mental health is a multidimensional construct, and this review has examined mental health from a salutogenetic perspective, i.e., a perspective that focuses on factors that promote wellbeing rather than taking a pathological perspective. One important reason for taking this stance is the preventive focus that lies inherently in the positive mental health tradition, which focuses explicitly on salutary factors (Antonovsky, 2002). Additionally, salutary factors seem generally less addressed in research compared to risk factors, and this indicates the need for researchers to address these factors to a greater extent.

An overview of the existing knowledge base may inform schools and support systems about the potential for prevention and intervention work within the context of VET. This argument is also substantiated by the paucity of support to teachers who encounter students that deal with mental health challenges. For example, a Norwegian small-scale study indicated a lack of systemic support for teachers who work with students with mental health issues (Refsnes & Danielsen, 2018).

In this scoping review, we therefore investigate the research conducted on positive mental health for students in VET. We explore the characteristics of research that has been conducted on positive mental health for students in VET, and we highlight potential implications for further research and practice.

2 Theoretical Background: Conceptualizing Positive Mental Health

Mental health is a complex, multidimensional construct. Cambridge Dictionary (n.d., para. 1) defines mental health as "the condition of someone's mind and whether or not they are suffering from any mental illness". Yet, the absence of mental illness does not automatically result in positive mental health, and there is accumulating evidence for a dual-factor model of mental health, which implies that mental illness and positive mental health function along two different continua that are only moderately interrelated (Trompetter et al., 2017). On the one hand, there is the continuum of positive mental health, which refers to the presence of optimal wellbeing, i.e., feeling well and functioning well. On the other hand, there is the continuum of psychopathology and mental ill-health. For instance, an adolescent may not meet the diagnostic criteria for depression (i.e., a low score on the psychopathological continuum), but she may nonetheless lack positive feelings of joy, happiness and a sense of resilience (i.e., a low score on the continuum of positive mental health). Despite the absence of mental illness, the adolescent's mental health could be described as poor. Hence, positive mental health is not merely the absence of disease or infirmity, but instead, it requires a surplus of positive feelings. The salutogenic approach to health, which aims to explain why people remain healthy rather than develop health problems (Antonovsky, 2002), is relevant in this regard. The salutogenic model was developed by Antonovsky in the 1970s, with an aim to focus on the origins of health, as opposed to the origins of disease (Mittelmark & Bauer, 2022). According to Antonovsky's (2002) theory of salutogenesis, improved health can be obtained by enhancing salutory factors (resources) rather than by decreasing risk factors (stressors), thereby challenging the dominant pathogenic paradigm. Antonovsky (2002) believed that stressors are always present in the human environment, whether microbiological, social, personal, or other, and he preoccupied himself with the question of how individuals cope with these stressors and how they use available resources to successfully balance the impact of stressors. Thus, salutogenesis is a stress and coping model, which focuses on processes that engage

available resources within the individual and the community in order to promote individual and collective health. Despite its potential to enhance human functioning, the salutogenic model has not yet been thoroughly embedded in the social sciences.

While Antonovsky developed his concept of salutogenesis primarily as a reaction to the pathogenic dominance within the field of medicine, a similar movement developed some decennia later within the field of psychology, with psychologists Martin Seligman, Christopher Peterson, and Mihaly Csikszentmihalyi in the forefront. Within the positive psychology movement, psychology's sole focus on pathogenic functioning was challenged, and character strengths, talents, abilities and what makes for a happy and healthy life became the center of attention. This does not imply a disregard for the facts of mental ill-health, but instead, positive psychology aims to identify and promote what works well, so as to enhance quality of life and joy (Seligman & Csikszentmihalyi, 2000). Positive psychology suggests that a one-sided focus on solving mental health challenges is insufficient to result in positive mental health (Peterson, 2009). Instead, this discipline encourages us to seek out and identify the positive sides of human experience and strengthen what gives joy in life. Thus, a focus on positive mental health may provide more information about the way in which people's lives may be improved, than a pathological approach that focuses on mental ill-health alone.

Considering our emphasis on positive mental health and salutogenic factors, we find the following definition of mental health provided by the World Health Organization (WHO, 2022, para. 5) useful: "A state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community". This definition describes mental health as a state, suggesting that it is a temporary condition that is context-dependent, rather than a dispositional trait or personal characteristic. Hence, WHO's (2022) definition emphasizes the relational aspect of positive mental health; it is not something that exists independently in a vacuum, but instead, it is the result of a successful interaction between the individual and its environment. Furthermore, this definition highlights the importance of self-realization for positive mental health, and this is again seen in relation to the opportunities that are available in society.

Mental health is an evolving concept and positive mental health may be understood in various ways (see e.g., Fusar-Poli et al., 2020; Peterson & Seligman, 2004; Vaillant, 2012). The understanding of positive mental health as more than the absence of mental disorder is anchored in the hedonic and eudemonic dimensions of the concept, where the hedonic dimension refers to feeling good, i.e., experiencing positive emotions and life satisfaction, and the eudemonic dimension refers to functioning well, i.e., managing everyday challenges, sensing meaning in life, and having close personal relationships (Stewart-Brown, 2013). Within positive psychology, various related concepts are used when discussing positive mental health, such as well-being, resilience, self-esteem, and quality of life (Peterson & Seligman, 2004). In

research studies, the term well-being is often used synonymously or interchangeably when describing positive mental health. Subjective well-being (SWB) reflects an overall evaluation of the quality of a person's life from the person's own perspective (Diener et al., 2018). There is no gold standard to assess subjective well-being, but several researchers measure well-being simply as overall life-satisfaction (Vaillant, 2012).

Another way of understanding positive mental health is resilience or the presence of various coping mechanisms to deal with adversity and the challenges of everyday life. Mature coping mechanisms such as altruism and humor are important for positive mental health (Vaillant, 2012). Thus, positive mental health encompasses a person's resilience to handle the stresses of everyday life and to experience positive emotions while doing so. Mental health is also closely associated with quality of life, which is both a means to an end and a product of mental health in general. Quality of life usually refers to a person's experience of overall life circumstances, including environmental, social, societal, and material aspects of life that affect how desirable and positive the person's life is (Diener et al., 2018).

Self-esteem is another aspect that is frequently highlighted within research on positive mental health (see e.g., Mruk, 2008). The term self-esteem refers to people's overall feelings of acceptance and respect, and it includes the dimensions of self-worth, self-efficacy, and authenticity (Stets & Burke, 2014). High self-esteem makes people feel worthwhile and accepted, and it creates a sense of meaning and coherence in one's life. People who experience self-esteem and self-worth feel good about themselves; they experience a positive self-view and show self-respect (Stets & Burke, 2014).

Considering positive mental health within a school context, Exner-Cortens et al. (2022, p. 3) offer a more practical understanding of mental health, as they define school mental health as "the comprehensive continuum of mental health promotion and intervention programs, policies, and services offered in school settings that are designed to promote emotional, social, and/or behavioral well-being". Hence, mental health is here linked explicitly to an environmental aspect, namely the school's attention to students' well-being and school's efforts to promote mental health. As such, this definition is in line with the relational understanding of positive mental health as suggested by WHO (2022), as it defines students' mental health not merely as an individual matter, but as deeply rooted in and dependent on contextual factors. Within such a contextual or relational understanding, what happens in school may play a pivotal role for students' wellbeing, opening for the implementation of interventions in this area.

2.1 Mental Health and Vocational Education and Training

It has been argued that achieving above average mental or physical health is not the province of medicine, but of education (Vaillant, 2012). This is especially valid, given that health and resilience develop in a manner closely linked to the social context such as family, peers, and school (Wiklund et al., 2012). Positive psychologists have tried to apply their way of thinking about mental health to the field of education, and Seligman and Csikszentmihalyi (2000) identified schools as institutions that may enable positive experiences and support positive characteristics. However, Hart and Sasso (2011) suggest in their literature review that the research interest in schools as positive institutions has been sparse. Mental health programs and interventions in a school context are often associated with measures to prevent mental health problems and to identify students at risk, rather than with targeting positive mental health, strengthening students' quality of life or enhancing students' experience of mastery.

As previously argued, mental health may be associated with ESL. Though there are many explanations as to why ESL occurs, such as a lack of basic skills in subjects, gradual lack of school engagement, socio-economic factors, as well as the social and pedagogical environment within school (Frostad & Mjaavatn, 2018; Gubbels et al., 2019; Haugan et al., 2019; Magen-Nagar & Shachar, 2017; von Simson et al., 2022), the decision to leave school or education early may also be associated with mental health related factors (Brekke, 2015; Hjorth et al., 2016). For example, Esch et al. (2014) found that mood and anxiety disorders, substance use, and disruptive behavior disorders are associated with ESL, particularly when these disorders originate early in life, substantiating the preventive focus of the present paper. With a dearth of research studies that explore positive mental health and schools as positive institutions, the need for further investigation of what is known about positive mental health for VET students emerges.

In sum, this brief overview of the literature substantiates the need for a review of the research on mental health in VET, particularly from a positive mental health perspective.

3 Aim of the Study

Our scoping review was guided by an overarching aim to systematically map positive mental health research related to students in VET. The following research questions guided our review:

1. How is positive mental health conceptualized in the studies?
2. How is positive mental health assessed in the studies?
3. What is the aim of the included studies?
4. What are the main findings of the studies?

4 Method

This study uses a scoping review to describe the knowledge base on positive mental health for students in VET. Scoping reviews form an ideal tool to explore the coverage of a given research topic, and they provide a clear overview of the size and scope of studies that have been conducted in the field (Gessler & Siemer, 2020; Tricco et al., 2016). Scoping reviews are generally broader in scope than systematic reviews (Munn et al., 2018), as reflected in our relatively generic research questions. Especially in emerging research areas, scoping reviews are useful to map existing evidence and to identify new research questions for further study. Moreover, a scoping review may also be used to clarify key concepts in the research literature (Munn et al., 2018). In order to secure a transparent research process, we used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) Checklist (Tricco et al., 2018). See appendix 1 for the complete checklist.

4.1 Search Strategy

For our search of the existing knowledge base, we consulted the following four databases that are known for making available multidisciplinary research studies: ERIC, PsycInfo, Web of Science, and PubMed. The search was conducted in September 2022, and we narrowed our search to articles that were published during the past ten years, i.e., from 2013 to 2022. Table 1 lists the search terms that we used in our search of titles and abstracts. Table 2 provides an example of the full electronic search strategy in PsycInfo. The search terms were determined based on the overarching aim of this review, as well as by consulting research literature on the conceptualization of positive mental health.

Table 1: Search Terms

Setting terms	Age-related terms	Topic terms
Vocational education	Student*	Mental health
Vocational training	Pupil*	Quality of life
Vocational school	Learner*	Self-esteem or self-concept
	Apprentice	or self-worth
	Adolescen*	Resilience
	Youth	Wellbeing or well-being
	Teen*	Coping
	Young adult*	

Table 2: Search String From PsychInfo

Search string 1	Vocational education OR vocational training OR vocational school
Search string 2	Student* OR pupil* OR learner* OR adolescen* OR youth* OR teen* OR young adult*
Search string 3	Mental health OR quality of life OR self-esteem OR self-concept OR self-worth OR resilience OR well-being OR wellbeing OR well being OR coping
Search string 4	1 AND 2 AND 3

This search produced a total of 516 articles, which were then transported to Endnote X9, in order to remove duplicates. This left us with a total of 479 articles (see figure 1), which were then exported to Rayyan QCRI, a free software application for literature reviews (Ouzzani et al., 2016), for further screening. The title and abstract of each of the articles were screened by two authors, based on the following inclusion criteria:

- Research article published in English in peer-reviewed journals;
- Study includes adolescents aged 16-21 in upper secondary VET;
- Focus on one or more aspects of positive mental health;
- Empirical research design.

Exclusion criteria were the following:

- Policy articles, conceptual articles, validation studies, reviews, brief reports;
- Focus on mental ill-health;
- Higher vocational education (i.e., post-secondary education);
- Student age group < 16 years old or > 21 years old;
- Data on VET students cannot be retrieved from a larger sample;
- Articles directly related to Covid-19;
- Articles written in other languages than English.

Inter-rater reliability for inclusion/exclusion was calculated to be 92.5%. All three authors discussed the articles that presented a conflict, until 100% agreement was reached. After the initial title and abstract screening, a total of 35 articles was deemed relevant for further investigation. After this initial study selection process, the articles' full texts were screened, and 16 were removed because they either did not meet the inclusion criteria for the scoping review (N = 13), or because the same study was represented in more than one article (N = 3). Multiple reports from the same study may introduce bias in review studies due to double reporting (Higgins et al., 2020), and we therefore retained only the original article from those studies and excluded later publications. This left us with 19 articles that were found eligible for inclusion in our scoping review. These articles are marked with asterisk in the reference list.

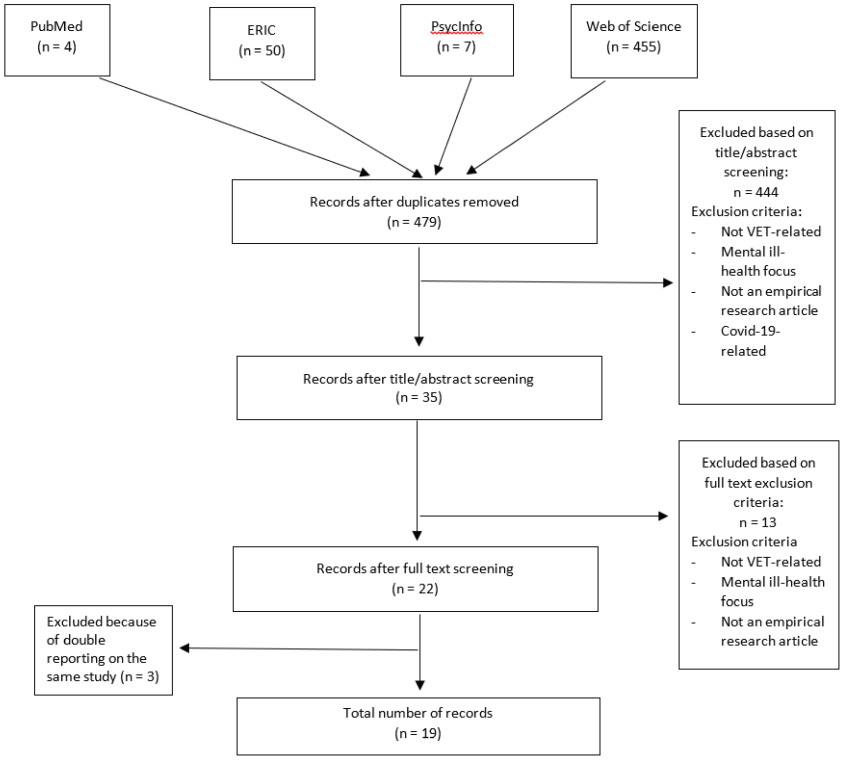

Figure 1: Flow Chart

4.2 Coding Procedure

The 19 articles that met the inclusion criteria for our scoping review were systematically analyzed, based on a coding scheme developed especially for this study (see table 3). The coding scheme mapped country of origin of the included studies, their aims, sample, research design and measures used to assess mental health, conceptualization of mental health, and main findings. First, all three authors coded the first five articles independently, and then we compared our analyses in order to check for reliability and to calibrate our coding. Next, each of the remaining articles was coded by two authors.

Table 3: Coding Scheme

Author + country	*Purpose of the study*	*Participants*	*Research design and mental health measures*	*Conceptualization of mental health*	*Main findings*
Andersen et al., 2016 Denmark	To assess the effectiveness of an intervention ("Shaping the Social") that targets the socio-environmental setting at vocational schools on student wellbeing and smoking.	5794 students in VET (mean age 21; 81% male).	Non-randomized controlled trial. *Measures*: - 0 – 10 Cantril Ladder Scale for life satisfaction. - A 13-item questionnaire for student wellbeing, based on the Health Behavior in School-Aged Children (HBSC) survey.	*Wellbeing*: Not specifically defined, but related to positive student-to-student and student-to-teacher relationships, the development of a professional identity, and structure in school life.	There were no statistically significant differences between the intervention and control groups on student support, teacher relatedness and valuing the profession. Students in the intervention group showed increased school connectedness compared to the control group.
Ataei & Chorami, 2021 Iran	To predict academic emotions based on spiritual well-being and life satisfaction in students of a technical and vocational school.	210 students.	Cross-sectional study with quantitative survey. *Measures*: - Pakran Academic Emotions Questionnaire. - Spiritual well-being questionnaire. - Satisfaction With Life Scale.	*Positive academic emotions* such as enjoyment, hope, pride. *Spiritual well-being*: "A state of health reflecting the positive feelings, behaviors, and cognitions of relationships with oneself, others, the transcendent and nature, which in turn provide a person with a sense of identity,	Spiritual well-being could predict academic emotions (pride). Life satisfaction could predict feelings of enjoyment but not pride.

				wholeness, satisfaction, enjoyment, contentment, beauty, love, respect, positive attitudes, inner peace, harmony, purpose and direction of life". *Life satisfaction*: "A person's feeling about performance and living conditions. It is a cognitive process of judgment based on a comparison of one's perceived life circumstance with a self-imposed standard or set of standards. Life satisfaction involves the positive attitude toward one's life and is in fact the feeling of happiness."	
Chen et al., 2021 China	To assess the association between disadvantaged characteristics and resilience and the role of mindfulness among Chinese vocational school students.	875 senior students from a vocational school.	Cross-sectional study with quantitative survey *Measures*: - 14–item Resilience Scale instrument (RS-14). - 14-item Mindful Attention Awareness Scale for Adolescents.	*Resilience*: "The ability to successfully adapt to internal and external stress". *Mindfulness*: "A state of consciousness that incorporates purposeful awareness and attention and non-judgmental reaction to the present moment."	Disadvantaged characteristics were negatively associated with mindfulness, and the lowered mindfulness was related to low resilience.

Gashi & Mojsoska-Blazevski, 2016 Kosovo and Macedonia	To investigate factors that affect the well-being of pupils in secondary vocational schools in Kosovo and Macedonia.	608 students in VET (mean age 16.3; 50% females).	Comparative cross-sectional study with quantitative survey. *Measure*: - Researcher-designed questionnaire.	*Well-being* as an outcome of quality of life; well-being in school as related to the quality of the school and experience in the school; "happiness at school" was used as the dependent variable and as a proxy for the underlying variable "well-being".	Findings suggest that the well-being of students is influenced more by environmental and socialization factors and variables measuring the satisfaction of students in school than by socio-demographic factors. Students' age has a statistically significant influence on happiness at school, with older students being less happy than younger students. The school environment and quality of learning were key factors that impacted students' well-being. Welcoming teachers, friendly peers and learning that improves future job opportunities all support students' well-being.
Gavala-Gonzalez et al., 2022 Spain	To examine the relationship between physical activity levels and perceived quality of life.	86 students in VET (mean age = 18.5).	Cross-sectional study with quantitative survey. *Measures*: - International Physical Activity Questionnaire – short version (IPAQ-SF). - The SF-36 questionnaire on perceived health status.	Self-perceived *quality of life* (not further specified).	A direct relationship was shown between participation in physical activity and perceived health. Students who are more physically active experience fewer emotional problems in daily activities.

Gerber et al., 2013 Switzerland	To examine whether mental toughness operates as a resilience resource using general perceived stress as an indicator of risk, and depressive symptoms and life satisfaction as indicators of adaptation.	865 students from two VET schools (369 females, 496 males).	Longitudinal study with two waves with quantitative surveys. *Measures*: - 18-item short form of the MTQ48 (a measurement of total mental toughness). - Satisfaction with Life Scale (SWLS).	*Mental toughness* as associated with stress resilience in young populations; the ability to cope successfully with the pressures and demands of life. Four dimensions of mental toughness: Control; feeling influential in daily life experiences. Commitment; involving oneself rather than experiencing alienation from daily encounters. Challenge; believing that change is normal and that coping with change offers opportunities for individual growth. Confidence; feeling competent in overcoming general and interpersonal problems.	Mental toughness operates as a stress resilience resource. Four clusters emerged characterizing students with well-adjusted, maladjusted, deteriorated, and resilient profiles. The latter two clusters reported similar levels of mental toughness at baseline, but resilient adolescents scored significantly higher on mental toughness at follow-up.
Güngör & Perdu, 2017 Belgium	To test the hypothesis that communal (e.g., school) and individual resources (e.g., autonomy) that highlight mainstream culture and values of independence are also conducive to the well-being of immigrant youth, especially when these youths are high on mainstream culture adoption.	296 students in upper-secondary vocational schools (64% male; 166 native Belgians, 130 of non-Western origin; mean age 19.7).	Cross-sectional study with quantitative survey *Measures*: - Positive emotions measure (1-item 5-point frequency measure). - Adapted version of The Child and Youth Resilience Measure (CYRM).	*Resilience*: "Positive adaptation in the context of significant risk or adversity"; "the ability to 'bounce back' from stressful experiences quickly by using positive emotions, such as optimism and gratefulness, and finding positive meaning in these experiences". *Well-being*: Low levels of stress and high levels of positive emotions are considered as proxies of well-being.	Resilience resources that are beneficial for monocultural youths seem to work for immigrant youths who have acculturated to the mainstream culture.

Jensen et al., 2022 Denmark	To examine the association between mental health and physical activity among Danish students in VET.	5277 VET students (mean age 24.3).	Cross-sectional study with an electronic quantitative survey. *Measures*: - A 1-item 5-point self-esteem measure. - A simplified version of the 0 – 10 Cantril Ladder for life satisfaction. - A 1-item 5-point self-efficacy measure. - A short version of the Warwick-Edinburgh mental well-being scale.	*Mental health* as a multidimensional construct as defined by WHO: "A state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and is able to make a contribution to his or her community". Mental health is more than the absence of mental disorders, and it consists of both hedonic and eudaimonic dimensions.	Higher levels of positive mental health were associated with better odds of achieving WHO physical activity guidelines.
Keijzer et al., 2021 The Netherlands	To explore whether differences in at-risk students' individual characteristics moderate the relationship between their resilience and vocational identity.	996 students in senior secondary vocational education (mean age 21.7; 44% female).	Cross-sectional study with quantitative survey *Measure*: - A paper-and-pencil questionnaire for personal and social resilience. This measure was developed especially for the study in collaboration with practitioners and based on validated questionnaires.	*Resilience*: "The dynamic process of positive adaptation, despite experiencing adversity"; being able to function in adversity. *Personal resilience* includes internal qualities and refers to independence and self-sufficient decision-making in main domains of life, such as education, friends, and work, presuming a sense of self-efficacy, perceived control, and the capacity to regulate one's own life. *Social resilience* is externally oriented and refers to having supportive social networks, and the ability and willingness to utilize them.	Resilient students often have strong vocational identities compared to less resilient students. Yet, the strength of the relationships varied depending on individual characteristics., such as gender, age and motivation.

Kirschner et al., 2021 The Netherlands	To explore the association between physical activity and student mental wellbeing in VET.	85 VET students (mean age 18.8; 70.6% female).	Cross-sectional observational study with quantitative questionnaire *Measures*: Rosenberg self-esteem scale (RSE).	*Student mental wellbeing* (SMW): The absence of depressive symptoms and the presence of self-esteem.	Data analysis shows a significant positive association between physical activity and self-esteem. High levels of sedentary behavior were significantly associated with low self-esteem. Increasing light physical behavior could contribute to improve student mental wellbeing.
Krawczynska & Zawierucha, 2018 Poland	To assess health-related quality of life in adolescents to determine the existence of relationships between subjective assessments of health and selected environmental factors, such as place of residence and type of school.	155 students in basic trade schools (offering the following courses: automotive technician, iron-worker/ locksmith, waiter, and barber/ hairdresser) (age range 16.6 – 18) (part of a larger sample).	Cross-sectional study with quantitative survey. *Measure:* - Polish version of the KIDSCREEN 52, HR-QOL Screening Instrument.	*Quality of life*: The objective assessment of functional performance and a subjective sense of well-being in correlation with physical and psychological health. A holistic view of health that requires a three-dimensional perspective, from biological, psychological, and social standpoints.	Students who attended a basic trade school reported significantly better mental well-being compared to general-education students.
Lang et al., 2016 Switzerland	To develop, implement and evaluate a physical education based coping training (EPHECT) for VET students.	131 VET students (mean age =16.22, 35% females).	Cluster randomized controlled trial. *Measure*: - Coping Questionnaire for Children and Adolescents (SVF. KJ).	*Mental health*: No clear definition provided, but the authors mention resilience, coping, and "the ability to calmly process a situation or maintain a positive outlook".	A complete and accurate implementation of a PE-based coping training can make a positive contribution to the development of adaptive coping skills among adolescents attending vocational schools.

Ouyang et al., 2021 China	To examine the mediating role of depression and the moderating role of perceived social support in the association between female adolescents' stressful life events and subjective well-being.	1,096 female VET students (mean age = 15.5).	Cross-sectional study with quantitative survey. *Measures*: - General Well-Being Schedule (GWB). - Multidimensional Scale of Perceived Social Support.	*Subjective well-being* (SWB) is defined as individuals' cognitive and affective evaluations of their life.	Female adolescents high in perceived social support displayed higher levels of subjective well-being and lower levels of depression when facing stressful life events than those low in perceived social support.
Sakiz & Aftab, 2019 Turkey	To investigate the relationships among achievement, psychological resilience, and sociodemographic factors.	341 students in VET (part of a larger sample).	Cross-sectional study with quantitative survey and collection of school records. *Measures*: - Child and Youth Resilience Measure (CYRM)-12.	*Psychological resilience*: The capacity to recover from or adapt to difficult and challenging life circumstances; the ability to succeed despite multiple risk factors.	The psychological resilience levels of students going to vocational schools and those with low income levels was lower than those going to nonvocational schools and those with higher income levels.
Siembab & Stawarz, 2019 Germany	To analyze how life satisfaction changes when adolescents enter the German vocational and educational training (VET) system (i.e., enter an apprenticeship or a vocational preparation).	13.717 VET students.	Longitudinal study with six waves. *Measures*: - A single-item 11-point scale for general life satisfaction; - A ten-item 5-point scale for self-esteem.	*Life satisfaction*: The cognitive-evaluative component of subjective well-being. *Self-esteem*: A positive or negative attitude towards oneself; self-esteem is considered as one of the strongest predictors of life satisfaction.	Leaving school and entering the VET system is associated with increased life satisfaction for the vast majority of adolescents.
Stheneur et al., 2019 France	To assess the association between sleep duration, quality of life and depression in adolescents.	167 VET students (14-19 years); part of a larger sample.	Cross-sectional study with quantitative survey. *Measures*: - A 32-item self-questionnaire (OK-ados) for quality of life, assessing four areas (recreation and relationships with others; school; family and adult life; and esteem and self-image).	*Quality of life*: No definition provided.	Students studying vocational subjects reported significantly more sleep than students studying technological subjects. QoL did not appear to be affected by sleep duration, but adolescent sleep duration is on average lower than recommended.

van den Bogerd et al., 2020 The Netherlands	To examine whether indoor nature (e.g., potted plants, green walls) has beneficial effects on attention, health, and well-being, when students attend a single lecture in a classroom with indoor nature.	161 VET students (part of a larger sample).	Experimental design study. *Measures*: - Assessment of four emotions (joy, happiness, fatigue, relaxed) on a 5-point Likert scale.	*Well-being*: No definition provided.	Attending only one lecture in a classroom with indoor nature does not seem to provide immediate effects on health and well-being. There were no straightforward intervention effects on well-being and health complaints.
van den Toren et al., 2019 The Netherlands	To examine the association between school absenteeism, health-related quality of life (HRQOL) and happiness among young adults attending vocational education.	676 VET students (age range 16–26; mean age 18.5; 26.1% males).	Cross-sectional study with quantitative survey. *Measures*: - General happiness assessed on a 1-item 11-point scale. - 12-item Short Form Health Survey.	*Health-related quality of life* is a subjective and multidimensional measure of physical functioning and well-being related to health, incorporating satisfaction with physical, social and occupational functioning, as well as vitality and psychological state of mind. Happiness is conceptualized as both pleasure and satisfaction and the avoidance of suffering, as well as having purpose in life.	Young adults with ≥ 5 sick days or ≥ 6 days of truancy reported lower mental HRQOL. No associations were observed between school absence and happiness.
Warne et al., 2013 Sweden	To explore factors that promote health and learning from the perspective of vocational and low-achieving high school students in Sweden.	23 VET students (age range 16 - 20).	Qualitative study with interviews and photovoice.	*Well-being* (not further defined). Antonovsky's theory of *salutogenesis*: Movement on the continuum toward total health can be influenced by enhancing salutary factors rather than by decreasing risk factors.	Students identified factors that promoted their own sense of health and well-being: i) Longing to be seen by teachers; ii) longing for support; and iii) longing for recuperation. They wanted to be treated fairly and with positive expectations, and they needed more social, environmental, and educational support.

4.3 Description of the Included Articles

The articles in this scoping review represent research from the following 13 countries: The Netherlands (4 studies), Switzerland (2), Denmark (2), China (2), Iran (1), Kosovo and Macedonia (1), Spain (1), Belgium (1), Poland (1), Turkey (1), Germany (1), France (1), and Sweden (1). Thirteen of the articles were published between 2018 and 2022, and six articles were published between 2013 and 2017. Eighteen studies used a quantitative method, and one study used a qualitative method. None of the studies used a mixed method design. Thirteen studies used a cross-sectional survey design, two studies used a longitudinal survey design, three studies used an experimental design, and one study used qualitative interviews and photovoice.

5 Results

In the following, we present the results according to the research questions; 1) How is mental health conceptualized in the studies? 2) How is mental health assessed in the studies? 3) What is the aim of the included studies? and 4) What are the main findings of the studies?

5.1 RQ 1) How is Positive Mental Health Conceptualized in the Studies?

The multifaceted nature of positive mental health was clearly visible in the articles that were included in this scoping review. Five articles combined several aspects of positive mental health in their studies (e.g., Ataei & Chorami [2021] explored positive academic emotions, spiritual well-being, and life satisfaction), and 14 articles investigated one dimension only. Wellbeing (including student, mental, spiritual, and subjective wellbeing) was the dimension that was explored most often (eight articles), followed by resilience (five articles), quality of life (four articles), and life satisfaction (two articles). Other dimensions that were explored in some of the studies included mindfulness, mental toughness, and happiness.

Most articles (13) provided a definition of the dimension of positive mental health that they investigated. One of these articles referred to the World Health Organization's holistic definitions of health and quality of life, while most studies gave definitions that could be traced back to positive psychology i.e., they conceptualized mental health as the presence of multiple strengths, such as having positive emotions and attitudes, and experiencing positive feelings such as satisfaction, enjoyment, wholeness, contentment, and happiness. In six of the articles, the researchers did not provide a specific definition of the dimensions that they explored. Figure 2 illustrates the different dimensions of positive mental health that were present in the included studies.

Figure 2: Dimensions of Positive Mental Health Included in the Studies

5.2 RQ 2) How is Positive Mental Health Assessed in the Studies?

Across the quantitative studies in our scoping review, 27 different questionnaires were used to assess various aspects of positive mental health. Fifteen of the included studies used validated questionnaires, such as the Child and Youth Resilience Measure (CYRM)-12 (Güngör & Perdu, 2017; Sakiz & Aftab, 2019), the Mindful Attention Awareness Scale (Chen et al., 2021), or the Cantril Ladder for general life satisfaction (Andersen et al., 2016; Jensen et al., 2022). Several studies also used single-item measures with Likert scales to assess positive emotions, self-esteem, and general life satisfaction. Three studies (Gashi & Mojsoska-Blazevski, 2016; Keijzer et al., 2021; van den Bogerd et al., 2020) used researcher-designed questionnaires to assess emotions (joy, happiness, fatigue, relaxed), social resilience, and well-being. An overview of the different measures that were used in each of the studies can be found in Table 3.

5.3 RQ 3) What is the Aim of the Studies?

Fifteen of the included studies aimed to explore correlations between different dimensions of positive mental health, or between dimensions of positive mental health and other factors in students' lives. Four of these studies explored the relationship between aspects of positive mental health and sociodemographic variables (Chen et al., 2021; Gashi & Mojsoska-Blazevski,

2016; Güngör & Perdu, 2017; Sakiz & Aftab, 2019). Three of the studies investigated the relationship between aspects of positive mental health and school environment (Gashi & Mojsoska-Blazevski, 2016; Krawczynska & Zawierucha, 2018; Warne et al., 2013). Three studies explored the relationship between aspects of positive mental health and physical activity (Gavala-Gonzalez et al., 2022; Jensen et al., 2022; Kirschner et al., 2021). One study explored the relationship between quality of life and sleep duration (Stheneur et al., 2019).

The three experimental studies aimed to assess the effect of the use of indoor nature on students' wellbeing (van den Bogerd et al., 2020), the effect of a physical education-based coping training on students' resilience (Lang et al., 2016), and the effect of a social intervention on students' wellbeing (Andersen et al., 2016). The qualitative study in this scoping review aimed to explore school-related factors that promote students' well-being (Warne et al., 2013). More detailed descriptions of the aims of the studies can be found in Table 3.

5.4 RQ 4) What are the Main Findings of the Studies?

The main findings of the studies included in this scoping review may be categorized into four themes: i) Vocational identity tends to correlate positively with different domains of positive mental health; ii) Positive correlations exist between different dimensions of positive mental health; iii) Physical activity is associated with positive mental health; and iv) A supportive school environment may predict student wellbeing.

5.4.1 Vocational Identity Tends to Correlate Positively With Different Domains of Positive Health

Four of the studies in this scoping review investigated the correlation between positive mental health and vocational identity or attending a vocational school. Three of these studies found a positive association between having a strong vocational identity or attending a vocational school and positive mental health (Keijzer et al., 2021; Krawczynskav & Zawierucha, 2018; Siembab & Stawarz, 2019). Positive mental health in these studies was conceptualized as resilience, "better mental health", and life satisfaction. One study (Sakiz & Aftab, 2019) found that students in vocational schools reported lower psychological resilience than students in nonvocational schools.

5.4.2 Positive Correlations Exist Between Different Dimensions of Positive Mental Health

Three of the included studies explored associations between several domains of positive mental health in VET students. Ataei and Chorami (2021) found that life satisfaction could

predict feelings of enjoyment, and that spiritual wellbeing could predict positive academic emotions. Findings from the study by Chen et al. (2021) suggest a positive correlation between students' mindfulness and their resilience. Furthermore, Gerber et al. (2013) found that mental toughness operates as a stress resilience resource.

5.4.3 Physical Activity is Positively Associated With Positive Mental Health

Four studies looked into the relationship between physical activity and positive mental health in VET students. Kirschner et al. (2021) found a significant positive association between physical activity and self-esteem. Similarly, the study by Gavala-Gonzalez et al. (2022) suggests an inverse relationship between participation in physical activity and emotional problems. Jensen et al. (2022) also highlighted the positive relationship between positive mental health and the likelihood of meeting the recommended standard for physical activity. In their intervention study, Lang et al. (2016) discovered a positive effect of a physical education training program on students' coping skills.

5.4.4 A Supportive School Environment May Predict Student Wellbeing

Three studies in this scoping review explored the relationship between school environment and student wellbeing. The qualitative study by Warne et al. (2018) illustrates how VET students consider support and acknowledgement from teachers as important factors for their own wellbeing. Ouyang et al. (2021) found that female VET students cope better with adversity when they perceive high levels of social support, and that they report higher subjective wellbeing. Furthermore, findings from Gashi and Mojsoska-Blazevski's (2016) study highlight the importance of a positive school environment, welcoming teachers, and friendly peers for students' wellbeing.

6 Discussion

This overview of the past decade's research on positive mental health amongst young people in VET indicates that a number of factors may affect students' positive mental health. In our scoping review, we found evidence to suggest that a supportive school environment, physical activity, and a strong vocational identity may contribute to positive mental health for students in VET. Moreover, doing well within one domain of positive mental health may lead to more positive outcomes in other domains. A particularly interesting finding is that having a strong vocational identity and attending a vocational school seems to be associated with positive mental health (Keijzer et al., 2021; Krawczynskav & Zawierucha, 2018; Siembab & Stawarz, 2019). Vocational or occupational identity refers to how students define themselves

in a career context (Skorikov & Vondracek, 2012). According to Keijzer et al. (2020) vocational identity consists of three components, namely i) vocational self-image, i.e., self-perceived interests and capabilities, ii) vocational future image, i.e., ambitions for future outcomes, and iii) vocational self-efficacy, i.e., expectations for success in working life. As such, the development of vocational identity may be associated with positive feelings, quality of life, and positive mental health. Due to the nature of the included studies (cross-sectional studies), findings from this scoping review do not allow us to draw inferences about causality or the direction of the correlation between vocational identity and positive mental health. Hence, it is not possible to determine whether having a strong vocational identity, functions as a protective factor for mental health, or whether positive mental health may lead to a stronger vocational identity. Yet, findings from Krawczynskav and Zawierucha (2018) do indicate that VET students have better mental health than those attending general education, and Siembab and Stawarz (2019) suggest that entering VET may lead to increased life satisfaction. Thus, it is plausible to assume that choosing VET may be beneficial to students' positive mental health.

One possible explanation for this correlation between a strong vocational identity and positive mental health is that students who function well mentally, experience a sense of control in their life (cf. Antonovsky, 2002); they act purposefully and believe in themselves and what they can become (Stets & Burke, 2014). Positive mental health also suggests optimism and faith in finding one's way in life, so that a "future self" can be imagined (Uribe et al., 2022). Thus, students who experience positive mental health may more readily picture themselves in a particular job and have a sense of occupational calling and vocational identity. Another explanation for the correlation between positive mental health and a strong vocational identity may be that VET provides students with the prerequisites to do well, possibly more so than general studies programs. VET offers a wide variety of choices in subjects related to a broad range of careers, which may increase the likelihood that the education matches students' interests and talents. Moreover, VET is characterized by creativity, with a focus on practical skills, and this may positively affect student motivation, especially for students who struggle with theoretical learning. Students can also learn while they are at work as an apprentice, which may provide an immediate sense of relevance for future employment (Directorate-General for Employment, Social Affairs and Inclusion, 2018). Hence, VET may be a more effective way of stimulating students' vocational self-efficacy than a general studies program, and this may have a positive impact on their mental health.

Another important finding concerns the identified correlations between environmental factors and positive mental health. Several studies in this scoping review suggest that supportive relationships between teachers and students play a crucial role in the wellbeing of VET students. These findings are not exclusive to students in VET, and research has previously indicated that student perceptions of teacher support and school connectedness are associated

with better emotional health (see e.g., Kidger et al., 2012; Oberle et al., 2018). However, what makes these findings of interest for students in VET, is the fact that VET-teachers report that they often feel uncertain of their role and responsibilities in matters that concern students' mental health (Refsnes & Danielsen, 2018). In the study by Refsnes and Danielsen (2018), VET-teachers express the need for more systematic support and collaboration with mental health institutions within and outside of the school. While such systematic support and collaboration may indeed be necessary for some students, findings from this scoping review indicate that taking preventive action for students' mental health is well within teachers' mandate. Teachers can take specific measures to support students, strengthen their relationships with them, and acknowledge students as individuals. These relatively simple actions may be beneficial to students' mental health and do not require collaboration with mental health institutions. This is in line with findings from a study by Schmid et al. (2021), that highlights the importance of the school's social organization and teachers' active support and positive expectations on students' sense of belonging and thriving at school. Students in VET are at a greater risk of ESL, and this has also been associated with mental health (Brekke, 2015; Esch et al., 2014; Hjorth et al., 2016). Since the decision to leave school early may be related to school environmental factors (Gubbels et al., 2019; Haugan et al., 2019; Magen-Nagar & Shachar, 2017; von Simson et al., 2022), it may be particularly important for VET teachers to focus on school conditions that may affect students' positive mental health and to identify salutogenic factors within the school environment. Thus, a practical implication from this review is the need for VET teacher education to focus more extensively on the importance of the psychosocial learning climate at school, and on VET teachers' role in developing a learning environment that promotes students' mental health through building positive and supportive relationships with them. When VET teachers understand how their everyday actions can contribute to students' positive mental health, this may lead to improved school quality of life, school mental health, and lower dropout rates for students in VET.

Finally, findings from this scoping review illustrate how even small-scale interventions may have far-reaching effects, due to the interrelatedness of the different dimensions within the positive mental health construct (see e.g., Ataei & Chorami, 2021; Chen et al., 2021; Gerber et al., 2013). For educators in school as well as for researchers, implementing interventions to promote positive mental health may seem daunting and overwhelming because of the complex nature of the mental health construct. Yet, several studies in this scoping review illustrate how interventions that limit themselves to a single dimension of positive mental health may positively affect other dimensions, thereby generating positive side effects. Hence, "thinking small" in school interventions may still lead to improvements in students' overall positive mental health, and potentially contribute to reducing ESL rates in VET.

6.1 Implications for Future Research

Based on the findings in this scoping review, some implications for future research are worthwhile discussing. Firstly, this scoping review confirms that positive mental health is understood by researchers as a multifaceted concept that can be assessed in a variety of ways. In order to enhance the quality of future research studies, consensus about a common language and terminology for positive mental health is recommended, as this may allow for an improved common understanding (cf. Mei et al., 2020). Next, previous research has shown that a large number of assessment tools are available to assess positive mental health, and this makes it pivotal for researchers to be cautious about their choice of measure (Parkinson, 2008). Studies in this scoping review have used a diversity of assessment tools, ranging from single-item scales to short forms to lengthier scales, and each of these tools comes with benefits and disadvantages. While there are few general recommendations about which assessment tool to choose, it is important for researchers to consider the psychometric properties of the scales that they use, particularly the face and content validity of the instruments (Parkinson, 2008). Furthermore, researchers need to ensure that the scale is appropriate for the chosen population and that it does not cause undue stress to vulnerable respondents (Parkinson, 2008). The development of an internationally standardized toolkit of assessment and outcome measures for youth mental health is recommended (Mei et al., 2020).

Finally, most of the studies included in this review are cross-sectional studies, and there is a paucity of studies that explore the positive mental health of VET students through longitudinal, qualitative and/or intervention studies. Longitudinal studies have previously been identified as a prioritized area for future research on youth mental health (Mei et al., 2020). Moreover, it is important for researchers to actively involve research participants throughout the research process. In the studies included in this scoping review, VET students functioned generally as "informants" rather than as "participants" in the research that concerned their own mental health. Thus, there is room for an increased focus on inclusive and participatory research in the field of positive mental health for VET students. Given the subjective nature of positive mental health and wellbeing, qualitative studies may be particularly useful to explore VET students' personal experiences of what enhances their mental health. In this way, future research studies are likely to remain relevant for those concerned.

6.2 Limitations of the Study and Conclusions

While the authors of this study tried to conduct the literature search for this study with as much rigor and transparency as possible, it is possible that certain relevant studies were left out. We limited ourselves to a literature search of four databases only, which means that some studies may have gone under the radar for our search. Moreover, given the somewhat vague nature of the concept of positive mental health, it was not always straightforward to decide

which studies to include or exclude. However, by following the PRISMA guidelines for scoping reviews, we tried to provide as much clarity as possible about how we conducted the literature search. Moreover, we made sure that all hits in our literature search were screened by at least two researchers, in order to guarantee the reliability of our results.

This scoping review has mapped the available research on positive mental health for students in VET that has been conducted over the past decade. Now that the prevalence of mental health issues amongst youth is increasing, the salutogenetic focus that characterizes this review may be especially useful from a preventive perspective. Findings from this review illustrate that a number of factors may affect the wellbeing of students in VET. In particular, a strong vocational identity, a supportive school environment, and physical activity may contribute to positive mental health. These findings suggest that VET teachers may promote the wellbeing of their students by providing a supportive psychosocial learning environment at school. Moreover, VET may enhance students' positive mental health by providing ample opportunity for developing a strong vocational identity. Future research may explore how these findings can be used to prevent early school leaving and how policy makers and VET teachers may contribute to students' thriving at school.

Ethics Statement

While ethical considerations are not typically discussed explicitly in a scoping review, we would nonetheless like to mention our efforts to safeguard research ethics in this study. Firstly, we applied a rigid sampling plan for the sources that we used in this scoping review, so that all relevant literature could be identified, regardless of the viewpoints and perspectives of the authors. Secondly, we aimed for audience-appropriate transparency in the reporting of our review, so that the entire research process is available to the reader. The PRISMA guidelines supported us in our efforts to conduct an ethically sound scoping review.

References[1]

Allison, M. A., Attisha, E., Council On School, H., Lerner, M., De Pinto, C. D., Beers, N. S., Gibson, E. J., Gorski, P., Kjolhede, C., O'Leary, S. C., Schumacher, H., & Weiss-Harrison, A. (2019). The link between school attendance and good health. *Pediatrics*, *143*(2), e20183648. https://doi.org/10.1542/peds.2018-3648

*Andersen, S., Rod, M. H., Ersbøll, A. K., Stock, C., Johansen, C., Holmberg, T., Zinckernagel, L., Ingholt, L., Sørensen, B. B., & Tolstrup, J. S. (2016). Effects of a settings-based intervention to promote student wellbeing and reduce smoking in vocational schools: A non-randomized controlled study. *Social Science & Medicine*, *161*, 195–203. https://doi.org/10.1016/j.socscimed.2016.06.012

1 The articles marked with asterisks were included in the review.

Antonovsky, A. (2002). Unraveling the mystery of health: How people manage stress and stay well. In D. Marks (Ed.), *The health psychology reader* (pp. 127–139). SAGE Publications Ltd.

*Ataei, Z., & Chorami, M. (2021). Predicting academic emotions based on spiritual well-being and life satisfaction in students of Shahrekord Girls' Technical and Vocational School. *Propositos Y Representaciones*, *9*(SPE3), e1250. https://doi.org/10.20511/pyr2021.v9nSPE3.1250

Brekke, I. (2015). Health and educational success in adolescents: A longitudinal study. *BMC Public Health*, *15*(1), 619. https://doi.org/10.1186/s12889-015-1966-0

Cambridge Dictionary. (n.d.). Mental health. In Cambridge Dictionary. Retrieved February 24th, 2023, from https://dictionary.cambridge.org/dictionary/english/mental-health

*Chen, Y. F., Xie, X. X., & Huang, C. C. (2021). Resilience of vocational students with disadvantaged characteristics in China: The role of mindfulness. *Children and Youth Services Review*, *122*, 105917. https://doi.org/10.1016/j.childyouth.2020.105917

Diener, E., Oishi, S., & Tay, L. (2018). Advances in subjective well-being research. Nature Human *Behaviour*, *2*(4), 253–260. https://doi.org/10.1038/s41562-018-0307-6

Directorate-General for Employment, Social Affairs and Inclusion. (2018). *What is vocational education? European Commission*. https://vocational-skills.ec.europa.eu/news/what-vocational-education-2018-09-25_en

Esch, P., Bocquet, V., Pull, C., Couffignal, S., Lehnert, T., Graas, M., Fond-Harmant, L., & Ansseau, M. (2014). The downward spiral of mental disorders and educational attainment: A systematic review on early school leaving. *BMC Psychiatry*, *14*, 237. https://doi.org/10.1186/s12888-014-0237-4

Exner-Cortens, D., Gaias, L., Splett, J. W., Jones, J., & Walker, W. (2022). Embedding equity into school mental health theory, research, and practice: An introduction to the special issue series. *Psychology in the Schools*, *59*(10), 1941–1947. https://doi.org/10.1002/pits.22679

Frostad, P., & Mjaavatn, P. E. (2018). Fra ungdomsskolen til videregående skole. Faktorer som predikerer elevers intensjon om å slutte [From lower secondary school to upper secondary school. Factors predicting students' intention of leaving]. *Psykologi i kommunen*, *2*, 27–40. https://ntnuopen.ntnu.no/ntnu-xmlui/bitstream/handle/11250/2596284/Frostad-Mjaavatn.pdf?sequence=7&isAllowed=y

Fusar-Poli, P., Salazar de Pablo, G., De Micheli, A., Nieman, D. H., Correll, C. U., Kessing, L. V., Pfennig, A., Bechdolf, A., Borgwardt, S., Arango, C., & van Amelsvoort, T. (2020). What is good mental health? A scoping review. *European Neuropsychopharmacology*, *31*, 33–46. https://doi.org/10.1016/j.euroneuro.2019.12.105

*Gashi, A., & Mojsoska-Blazevski, N. (2016). The determinants of students' well-being in secondary vocational schools in Kosovo and Macedonia. *European Journal of Education*, *51*(3), 333–344. https://doi.org/10.1111/ejed.12181

*Gavala-Gonzalez, J., Torres-Perez, A., Galvez-Fernandez, I., & Fernandez-Garcia, J. C. (2022). Lifestyle and self-perceived quality of life in sports students: A case study. *International Journal of Environmental Research and Public Health*, *19*(3), 1598. https://doi.org/10.3390/ijerph19031598

*Gerber, M., Brand, S., Feldmeth, A. K., Lang, C., Elliot, C., Holsboer-Trachsler, E., & Puhse, U. (2013). Adolescents with high mental toughness adapt better to perceived stress: A longitudinal study with Swiss vocational students. *Personality and Individual Differences*, *54*(7), 808–814. https://doi.org/10.1016/j.paid.2012.12.003

Gessler, M., & Siemer, C. (2020). Umbrella review: Methodological review of reviews published in peer-reviewed journals with a substantial focus on vocational education and training re-

search. *International Journal for Research in Vocational Education and Training*, *7*(1), 91–125. https://doi.org/10.13152/IJRVET.7.1.5

Gubbels, J., van der Put, C. E., & Assink, M. (2019). Risk factors for school absenteeism and dropout: A meta-analytic review. *Journal of Youth and Adolescence*, *48*(9), 1637–1667. https://doi.org/10.1007/s10964-019-01072-5

*Güngör, D., & Perdu, N. (2017). Resilience and acculturative pathways underlying psychological well-being of immigrant youth. *International Journal of Intercultural Relations*, *56*, 1–12. https://doi.org/10.1016/j.ijintrel.2016.10.005

Hart, K. E., & Sasso, T. (2011). Mapping the contours of contemporary positive psychology. *Canadian Psychology / Psychologie canadienne*, *52*(2), 82–92. https://doi.org/10.1037/a0023118

Haugan, J. A., Frostad, P., & Mjaavatn, P. E. (2019). A longitudinal study of factors predicting students' intentions to leave upper secondary school in Norway. *Social Psychology of Education*, *22*(5), 1259–1279. https://doi.org/10.1007/s11218-019-09527-0

Higgins, J. P. T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M. J., & Welch, V. A. (2020). *Cochrane handbook for systematic reviews of interventions version 6.1* (updated September 2020). Cochrane. www.training.cochrane.org/handbook

Hjorth, C. F., Bilgrav, L., Frandsen, L. S., Overgaard, C., Torp-Pedersen, C., Nielsen, B., & Bøggild, H. (2016). Mental health and school dropout across educational levels and genders: A 4.8-year follow-up study. *BMC Public Health*, *16*, 976. https://doi.org/10.1186/s12889-016-3622-8

*Jensen, C. T., Heinze, C., Andersen, P. K., Bauman, A., & Klinker, C. D. (2022). Mental health and physical activity in vocational education and training schools students: A population-based survey. *European Journal of Public Health*, *32*(2), 233–238. https://doi.org/10.1093/eurpub/ckab202

Keijzer, R., Admiraal, W., Van der Rijst, R., & Van Schooten, E. (2020). Vocational identity of at-risk emerging adults and its relationship with individual characteristics. *International Journal of Educational and Vocational Guidance*, *20*, 375–410. https://doi.org/10.1007/s10775-019-09409-z

*Keijzer, R., van der Rijst, R., van Schooten, E., & Admiraal, W. (2021). Individual differences among at-risk students changing the relationship between resilience and vocational identity. *International Journal of Educational Research*, *110*, 101893. https://doi.org/10.1016/j.ijer.2021.101893

Kidger, J., Araya, R., Donovan, J., & Gunnell, D. (2012). The effect of the school environment on the emotional health of adolescents: A systematic review. *Pediatrics*, *129*(5), 925–949. https://doi.org/10.1542/peds.2011-2248

*Kirschner, M., Golsteijn, R. H. J., Sijben, S. M., Singh, A. S., Savelberg, H., & de Groot, R. H. M. (2021). A qualitative study of the feasibility and acceptability of implementing 'Sit-To-Stand' desks in vocational education and training. *International Journal of Environmental Research and Public Health*, *18*(3), 849. https://doi.org/10.3390/ijerph18030849

*Krawczynska, J., & Zawierucha, E. (2018). Subjective assessment of health in secondary school adolescents. *Medical Studies-Studia Medyczne*, *34*(4), 296–303. https://doi.org/10.5114/ms.2018.80945

*Lang, C., Feldmeth, A. K., Brand, S., Holsboer-Trachsler, E., Puhse, U., & Gerber, M. (2016). Stress management in physical education class: An experiential approach to improve coping skills and reduce stress perceptions in adolescents. *Journal of Teaching in Physical Education*, *35*(2), 149–158. https://doi.org/10.1123/jtpe.2015-0079

Magen-Nagar, N., & Shachar, H. (2017). Quality of teaching and dropout risk: A multi-level analysis. *Journal of Education for Students Placed at Risk (JESPAR)*, *22*(1), 9–24. https://doi.org/10.1080/10824669.2016.1242069

Mei, C., Fitzsimons, J., Allen, N., Alvarez-Jimenez, M., Amminger, G. P., Browne, V., Cannon, M., Davis, M., Dooley, B., Hickie, I. B., Iyer, S., Killackey, E., Malla, A., Manion, I., Mathias, S., Pennell, K., Purcell, R., Rickwood, D., Singh, S. P., Wood, S. J., Yung, A., & McGorry, P. D. (2020). Global research priorities for youth mental health. *Early Intervention in Psychiatry*, *14*(1), 3–13. https://doi.org/10.1111/eip.12878

Mittelmark, M. B., & Bauer, G. F. (2022). Salutogenesis as a theory, as an orientation and as the Sense of Coherence. In M. B. Mittelmark, G. F. Bauer, L. Vaandrager, J. M. Pelikan, S. Sagy, M. Eriksson, B. Lindström & C. M. Magistretti (Eds.), *The handbook of salutogenesis*. Springer, Cham. Ch.3. https://doi.org/10.1007/978-3-030-79515-3_3

Mruk, C. J. (2008). The psychology of self-esteem: A potential common ground for humanistic positive psychology and positivistic positive psychology. *The Humanistic Psychologist*, *36*(2), 143–158. https://doi.org/10.1080/08873260802111176

Munn, Z., Peters, M. D. J., Stern, C., Tufanaru, C., McArthur, A., & Aromataris, E. (2018). Systematic review or scoping review? Guidance for authors when choosing between a systematic or scoping review approach. *BMC Medical Research Methodology*, *18*(143). https://doi.org/10.1186/s12874-018-0611-x

Oberle, E., Guhn, M., Gadermann, A. M., Thomson, K., & Schonert-Reichl, K. A. (2018). Positive mental health and supportive school environments: A population-level longitudinal study of dispositional optimism and school relationships in early adolescence. *Social Science & Medicine*, *214*, 154–161. https://doi.org/10.1016/j.socscimed.2018.06.041

Organisation for Economic Co-operation and Development. [OECD] (2023). *Education GPS*. Organization for Economic Cooperation and Development. http://gpseducation.oecd.org

*Ouyang, M. K., Gui, D. N., Cai, X., Yin, Y. L., Mao, X. L., Huang, S. X., Zeng, P., & Wang, P. C. (2021). Stressful life events and subjective well-being in vocational school female adolescents: The mediating role of depression and the moderating role of perceived social support. *Frontiers in Psychology*, *11*, 603511. https://doi.org/10.3389/fpsyg.2020.603511

Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan—A web and mobile app for systematic reviews. *Systematic Reviews*, *5*(210). https://doi.org/10.1186/s13643-016-0384-4

Parkinson, J. (2008). *Review of scales of positive mental health validated for use with adults in the UK: Technical report*. Health Scotland. https://www.healthscotland.scot/media/2244/review-of-scales-of-positive-mental-health-validated-for-use-with-adults-in-the-uk.pdf

Peterson, C. (2009). Positive psychology. *Reclaiming Children and Youth*, *18*(2), 3–7.

Peterson, C., & Seligman, M. E. P. (2004). *Character strengths and virtues: A handbook and classification, Volume 1*. Oxford University Press.

Refsnes, A. H., & Danielsen, A. G. (2018). Yrkesfaglæreres opplevelse av sin rolle i det psykiske helsearbeidet [Vocational education teacher's experience of their role in mental health work]. *Tidsskrift for psykisk helsearbeid*, *15*(4), 273–284. https://doi.org/10.18261/issn.1504-3010-2018-04-02

*Sakiz, H., & Aftab, R. (2019). Academic achievement and its relationships with psychological resilience and socio-demographic characteristics. *International Journal of School & Educational Psychology*, *7*(4), 263–273. https://doi.org/10.1080/21683603.2018.1446372

Schmid, E., Jørstad, B., & Stokke Nordlie, G. (2021). How schools contribute to keeping students on track: Narratives from vulnerable students in vocational education and training. *Nordic Journal of Vocational Education and Training*, *11*(3), 47–65. https://doi.org/10.3384/njvet.2242-458X.2111347

Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology. An introduction. *American Psychologist*, *55*(1), 5–14. https://doi.org/10.1037//0003-066X.55.1.5

*Siembab, M., & Stawarz, N. (2019). How does life satisfaction change during the transition from school to work? A study of ninth and tenth-grade school-leavers in Germany. *Journal of Happiness Studies: An Interdisciplinary Forum on Subjective Well-Being*, *20*(1), 165–183. https://doi.org/10.1007/s10902-017-9945-z

Skorikov, V. B., & Vondracek, F. W. (2012). Occupational identity. In S. J. Schwartz, K. Luyckx & V. L. Vignoles (Eds.), *Handbook of identity theory and research* (Vol. 2, pp. 693–714). Springer.

Statistics Norway. (2022). *Gjennomføring i videregående opplæring* [Completion in upper secondary school]. In Statistics Norway. Retrieved February 24th, 2023, from https://www.ssb.no/utdanning/videregaende-utdanning/statistikk/gjennomforing-i-videregaende-opplaering

Stets, J. E. & Burke, P. J. (2014). Self-esteem and identities. *Sociological perspectives*, *57*(4), 409–433. https://doi.org/10.1177/0731121414536141

Stewart-Brown, S. (2013). Defining and measuring mental health and wellbeing. In L. Knifton & N. Quinn (Eds.), *Public mental health: Global perspectives* (pp. 33–42). Open University Press.

*Stheneur, C., Sznajder, M., Spiry, C., Marcu Marin, M., Ghout, I., Samb, P., & Benoist, G. (2019). Sleep duration, quality of life and depression in adolescents: A school-based survey. *Minerva Pediatrica*, *71*(2), 125–134.

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K., Colquhoun, H., Kastner, M., Levac, D., Ng, C., Sharpe, J. P., Wilson, K., Kenny, M., Warren, R., Wilson, C., Stelfox, H. T., & Straus, S. E. (2016). A scoping review on the conduct and reporting of scoping reviews. *BMC Medical Research Methodology*, *16*(15). https://doi.org/10.1186/s12874-016-0116-4

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K. K., Colquhoun, H., Levac, D., Moher, D., Peters, M. D. J., Horsley, T., Weeks, L., Hempel, S., Akl, E. A., Chang, C., McGowan, J., Stewart, L., Hartling, L., Aldcroft, A., Wilson, M. G., Garritty, C., Lewin, S., Godfrey, C. M., Macdonald, M. T., Langlois, E. V., Soares-Weiser, K., Moriarty, J., Clifford, T., Tunçalp, Ö., & Straus, S. E. (2018). PRISMA extension for scoping reviews (PRISMA-ScR): Checklist and explanation. *Annals of Internal Medicine*, *169*(7), 467–473. https://doi.org/10.7326/M18-0850

Trompetter, H. R., de Kleine, E., & Bohlmeijer, E. T. (2017). Why does positive mental health buffer against psychopathology? An exploratory study on self-compassion as a resilience mechanism and adaptive emotion regulation strategy. *Cognitive Therapy Research*, *41*, 459–468. https://doi.org/10.1007/s10608-016-9774-0

Uribe, F. A. R., Espejo, C. A. N., & Pedroso, J. D. S. (2022). The role of optimism in adolescent mental health: A systematic review. *Journal of Happiness Studies*, *23*, 815–845. https://doi.org/10.1007/s10902-021-00425-x

Vaillant, G. E. (2012). Positive mental health: Is there a cross-cultural definition? *World Psychiatry*, *11*(2), 93–99. https://doi.org/10.1016/j.wpsyc.2012.05.006

*van den Bogerd, N., Dijkstra, S. C., Tanja-Dijkstra, K., de Boer, M. R., Seidell, J. C., Koole, S. L., & Maas, J. (2020). Greening the classroom: Three field experiments on the effects of indoor nature on students' attention, well-being, and perceived environmental quality. *Building and Environment*, *171*, 106675. https://doi.org/10.1016/j.buildenv.2020.106675

*van den Toren, S. J., van Grieken, A., Mulder, W. C., Vanneste, Y. T. M., Lugtenberg, M., de Kroon, M. L. A., Tan, S. S., & Raat, H. (2019). School absenteeism, health-related quality of life HRQOL and

happiness among young adults aged 16-26 years. *International Journal of Environmental Research and Public Health*, *16*(18), 3321. https://doi.org/10.3390/ijerph16183321

von Simson, K., Brekke, I., & Hardoy, I. (2022). The impact of mental health problems in adolescence on educational attainment. *Scandinavian Journal of Educational Research*, *66*(2), 306–320. https://doi.org/10.1080/00313831.2020.1869077

*Warne, M., Snyder, K., & Gadin, K. G. (2013). Promoting an equal and healthy environment: Swedish students' views of daily life at school. *Qualitative Health Research*, *23*(10), 1354–1368. https://doi.org/10.1177/1049732313505914

Wiklund, M., Malmgren-Olsson, E. B., Ohman, A., Bergström, E., & Fjellman-Wiklund, A. (2012). Subjective health complaints in older adolescents are related to perceived stress, anxiety and gender - a cross-sectional school study in Northern Sweden. *BMC public health*, *12*, 993. https://doi.org/10.1186/1471-2458-12-993

World Health Organization. [WHO] (2022, 17. June). *Mental health: Strengthening our response*. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response

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The Influence of Innovative Characteristics, Work Readiness, and Vocational Self-Concept on Employability of Vocational College Students

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Abstract

Purpose: Vocational education and training is important to produce skilled and innovative labor to drive the country's development in the 4th industrial revolution (IR 4.0). The employability of vocational college students is crucial to meet the country's demand for 21st-century workers. This study aims to identify the influences of innovative characteristics, work readiness, and vocational self-concept on the employability of vocational college students. The study also examined the moderating role of gender.

Methods: A quantitative correlational design was carried out to achieve the objectives of the study. The samples consisted of 395 vocational college students from five vocational colleges located in the states of Kedah and Penang, Malaysia. Data were collected through online questionnaire survey, which is made up of four instruments: Youth Innovation Skills Measurement Tool, the Work Readiness Scale, the Vocational Rational Scale and the Perceived Future Employability Scale. The validity and reliability of these instruments were well established. Descriptive and structural equation modelling (SEM) analyses were carried out.

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Findings: Innovative characteristics ($\beta = 0.252$, $t = 5.041$, $p < 0.001$), vocational self-concept ($\beta = 0.386$, $t = 7.131$, $p < 0.001$) and work readiness ($\beta = 0.219$, $t = 3.787$, $p < 0.001$) had significant effects on employability of vocational college students. The model explained 53% of the variance in employability. Gender, however, did not moderate any of the three direct significant relationships.

Conclusion: This study found that innovative characteristics, work readiness, and vocational self-concept are factors that should be taken into consideration when developing education and career programs, interventions, and support services for vocational students. The graduate employment issues faced by vocational college students can be overcome if factors identified in this study can be enhanced. Similar approaches can be applied for both male and female students since gender is not a significant moderator. Overall, this study sheds light on the employability of vocational graduates and contributes towards improving career guidance and counseling practices for vocational students.

Keywords: Employability, Vocational Education and Training, VET, Innovative Characteristics, Work Readiness, Vocational Self-Concept

1 Introduction

Vocational education and training is important to produce skilled and innovative labor to drive the country's development in the 4th industrial revolution (IR 4.0) (Shabbir et al., 2020). Employability of students from vocational colleges is crucial to meet the country's demand for 21st-century workers (Sa-Nguanmanasak et al., 2019). However, training and moulding vocational college students to effectively meet the demands of the global industrial market is one of the major challenges of technical and vocational education training (TVET) (Aktas et al., 2017; Langthaler et al., 2022). Several countries, including those in Southeast Asia, have attempted to restructure TVET to enhance vocational college students' employability (Campbell, 2016). According to Massetor et al. (2021), in 2019, almost 22.4% (3046) of the vocational college graduates in Malaysia are still unemployed, and 727 people are in the status of waiting for employment (Ministry of Education, 2019). To overcome this problem, there is a need to identify factors that are related to vocational college students' employability. Hence, enhancing the employability of students from vocational colleges is a crucial national agenda for many countries (Sa-Nguanmanasak et al., 2019).

1.1 Research Background

Vocational graduates find themselves ineligible to compete with other TVET institutions like Polytechnic Institution and Community College because they lacked innovative characteristics like creativity, interpersonal skills and etc (Massetor et al., 2021). Vocational education traditionally emphasizes practical skills and specialized knowledge, often overlooking the cultivation of broader competencies and higher order thinking skills. Vocational students need to have innovative characteristics to produce new ideas, concepts products, to lead things or recognize opportunities especially in the emerging digitalization world which will enhance their employability. However, the influence of innovative characteristics and employability of vocational college students are seldom researched. According to Ishar et al. (2020), many vocational graduates are not innovative and creative enough to compete in the industry, which lead to their unemployment after graduation. However, due to a lack of studies that examine the influence between innovative characteristics and employment directly, the influence of this factor in vocational context could not be ascertained. Work readiness is among the key attributes that enhances the country's competitiveness. It is an important factor that drives graduates' employability (Lau et al., 2019). Students must be ready in terms of having good personal characteristics such as creativity, leadership, and innovative thinking. These characteristics are particularly crucial in the context of the IR4.0. IR4.0 is characterized by rapid technological advancements, automation, and digitalization, leading to significant transformations in industries and job roles. In this era of constant change, students with these innovative characteristics are better equipped to adapt to evolving technologies, embrace new opportunities, and contribute to the workforce effectively. They are more likely to be sought after by employers who value individuals with the ability to think critically, solve complex problems, and drive innovation. Conversely, students who lack these innovative characteristics may face challenges in securing employment as they may require additional training to keep up with the dynamic labor market demands. Therefore, fostering innovative characteristics among vocational college students is essential to get them ready for the competitive job market in IR 4.0.

Several studies (e.g., Yang & Wong, 2020) also suggest that employability is closely related to vocational self-concept. When students have a clear idea of vocational self-concept like on their interest, value, abilities and self-knowledge, vocational students should probably make better, effective career decisions in the future (Wikansari, 2017). Students with negative self-concept will limit the career choices by crossing out possible career in the list, which may increase the risk of unemployment (Wu et al., 2014). To date, most studies on vocational college students have focused more on the development of practical and vocational skills such as specific technical skills. There are few empirical studies that examine vocational college students' psychological factors and their employability in local context. There is also a lack of understanding on their current level of innovative characteristics, work readiness and

vocational self-concept. Without such information, effective career development programs and support system to enhance vocational college students' employability is less likely to be developed. Key factors identified in the literature reviews namely; innovative characteristics, work readiness and vocational self-concept should be examined in relation to employability. Research on this topic could fill in the literature gaps and contribute towards enhancing vocational college students' employability and competitiveness in the job market.

1.2 Factors Influence Employability

Past studies showed that vocational graduates find themselves ineligible to compete in the job market because they lack innovative characteristics (Massetor et al., 2021). Vocational college students need to have innovative characteristics to develop new ideas and products, lead things, and recognize opportunities (Massetor et al., 2021). According to Mansour (2021), candidate with high innovative skills are given the first priority in a job. Creativity, leadership, self-efficacy, energy, and risk-propensity are part of employee with innovative characteristics (Chell & Athayde, 2009). A recent study by Altinişik et al. (2023) has used the instrument above in the study regarding the relationship of innovative characteristics with employability of vocational students and the researchers recommended the use of the instrument in any innovative skills study. According to Shahroom and Hussin (2018), in IR 4.0, human jobs will be replaced by smart robots. Past literature shows that innovative characteristics have direct influence on the entrepreneurship and employability of vocational students (Li, 2021). Among China vocational students who came from a single-parent background, factors like self-efficacy, optimism, and motivation have an influence on their employability (Zhang, 2021). The amount of energy a vocational student also has influence towards employability because it increases the urge to starting their own business (Masri et al., 2021).

Employability is also closely related to vocational self-concept. Students with a clear idea of their vocational self-concept like their interests, values, abilities, and self-knowledge, can make better, effective, career decisions in the future (Wikansari, 2017). Whereas students with a negative vocational self-concept, on the other hand, will limit their career choices by crossing out possible career in the list, increasing the risk of unemployment (Wu et al., 2014). Vocational self-concept is an important element in the famous Super's vocational theory. According to Sururi (2020), Super's vocational self-concept is relevant to IR 4.0. Super's exploratory phase (age 15-24) is characterised by introductory time of listing down but not finalising choices. In the exploratory stage, there is crystallization, specifying, and implementing. At this stage students should have some idea about what they will pursue and formulate (Lau et al., 2019). Career flexibility is an indicator of employability (Lau et al., 2020). Through a person's choice behaviour, vocational interest and value do affect the job criteria (Hansen & Wiernik, 2018). It is stated that, students often look for satisfaction of a job through

work roles in which they can express themselves (Sururi, 2021). As supported by Wikansari (2017), there are very few studies on how vocational self-concept influences students' future job decisions. This study will be informative to provide extra evidence on this matter because vocational self-concept was found to be related to career indecision and positively associated with job acquisition (Wikansari, 2017).

In addition to innovative characteristics and vocational self-concept, work readiness is crucial to vocational college students' employability. As reported by Caballero et al. (2011), there are three components to work readiness namely (a) personal characteristics, (b) work competence, and (c) social intelligence. A person who is ready for work has the capability to perform well at the required level consistently with only minimal supervision and contribute value to the company. Students who are ready for work and have the necessary competencies are better prepared for employment after graduation and long term work success (Bryne, 2020). It is being mentioned in the study of Lau et al. (2019), that in order to have work readiness, students should possess good work ethics, adequate interpersonal skills, clear employment goal, optimism about future, ability to persevere difficulties, adapt to a new work culture, have capacity to learn new things, be agile, and keeping physically fit and mentally alert. Work readiness is a criterion used in recruitment and, one that is becoming increasingly valued and is expected to be possessed (beyond just certification) by candidates (Prikshat et al., 2019). This argument is supported by Mari et al. (2019) who claims that academic qualification alone does not guarantee a job in the competitive work market if the graduates lacks skills like work readiness. Higher institutions like vocational college face big pressure in preparing students for the digitalized industrial world (Ghavifekr & Radwan, 2021). According to Jiang (2022), vocational students' self-personal problems has relationship with their employability. Social intelligence also has influence on the employability of vocational students. As such, vocational colleges must be responsible in equipping students with the required skills that will allow them to manage their future careers. Work readiness is all about having the attributes and attitudes needed to be successful in work (Lau et al., 2019). Work readiness will enhance students' employability and get them ready for the dynamic and challenging 4.0 job market. Based on the objectives of this research work, the study proposed the following research questions:

1. Do innovative characteristics affect employability of vocational college students?

2. Do work readiness affect employability of vocational college students?

3. Do vocational self-concept affect employability of vocational college students?

The following hypotheses were proposed in this research work:

H1. Innovative characteristics have a positive influence on employability.

H2. Vocational self-concept has a positive influence on employability.

H3. Work readiness has a positive influence on employability.

1.3 Gender Differences in Employability Among Vocational College Students

Gender imbalance in vocational education is well known, yet it has only little attention until now (McDool & Morris, 2022). According to Lim et al. (2019), in 2013, the female labor force participation rate surpassed the 50% mark for the first time, and the rate was 54.7% in 2017. In Malaysia, the participation of females in higher education is more visible nowadays, but, the number of female students in vocational colleges is still less even though there is no quota issue. As mentioned by Rahayu and Aryanti (2022), TVET education is well-known among male students, rarely chosen by female students and only a small fraction of female students apply to TVET institutions like vocational colleges. Male students are more interested in technical engineering courses while female students are more interested in home economics courses like home management, clothing & textiles, food & nutrition, hospitality management, and child care (Chukwu et al., 2020).

With regards to innovative characteristics (creativity, leadership, energy, self-efficacy, and risk-propensity), most of the studies point toward males having an upper hand over females. Some of the basic attributes of business leaders are being brave, independent, and able to take risks (Gupta et al., 2017). Research done by Joensuu-Salo et al. (2015) says that men show stronger interest and higher risk taking to become entrepreneurs than women. According to Naukkarinen and Bairoh (2022), male vocational engineering students develop creativity easier compared to female students, that will be helpful in future work. Even in China, Zeng et al. (2022) find that male vocational students are more driven and exhibit elevated energy when it comes to adapting to work. But, as stated by Ismail et al. (2019), in some countries, the percentage of females enrolled in TVET is lower than males due to factors such as the government itself, school society and parents. The finding from the study by Abdullah et al. (2020), shows that there is a statistical difference between male and female students in vocational colleges on social intelligence, cross-cultural skills, and leadership skills. However, there is no significant difference between students' genders on initiative and self-direction or self-efficacy skills. The mean score of male students was higher compared to female students in the skills above.

Focusing on work readiness (personal characteristics, work competence, and social intelligence), there were no obvious and significant differences in work competence skills between male and female engineering students in Malaysia and Thailand, as both genders showcased similar levels of work quality, practical ability, personal character, moral principles, social intelligence, decision making skills, and adapting to formal organisation (Sa-Nguanmanasak et al., 2019). However, referring to a study by Ismail et al. (2020), on being work-ready, male students are slightly ahead of female students, especially on leadership, personality, knowledge extent, and social and emotional intelligence. Yet, female students are more work-ready as they have superior thinking skills, better team players and have more experience.

Finally, on vocational self-concept (vocational interest and value, vocational abilities, and self-concept), male vocational students have more inclination for higher aspiration, better education self-esteem, and greater flexibility in career compared to female students (Zeng et al., 2022). Based on a research by Avram et al. (2019), it is easier for students with stronger adaptability in their careers to give more importance to future career development and be more self-reliant in overcoming obstacles in academic tasks. Hence, male vocational students may tend to rank higher than female students in terms of vocational self-concept, according to those studies.

Answering the question of the effect of gender on the employability of vocational college students, a recent study suggests that there is actually not much effect on employability due to the gender gap in vocational students. The findings of a study by Masud et al. (2018) indicate that the employability of the TVET graduates was related to their personal strengths or abilities, and appreciation or value they received from the organisation, their motivation and support in their career progression, regardless of their gender. This suggests that employability can only be influenced by skills and has nothing to do with gender.

The following are hypotheses related to the moderating effects of gender:

H4. Female students moderate the relationship between innovative characteristics and employability.

H5. Female students moderate the relationship between vocational self-concept and employability.

H6. Female students moderate the relationship between work readiness and employability.

H7. Male students moderate the relationship between innovative characteristics and employability.

H8. Male students moderate the relationship between vocational self-concept and employability.

H9. Male students moderate the relationship between work readiness and employability.

1.4 Limitations

The samples were Malaysian Vocational Certificate (SVM) and Malaysian Diploma Certificate (DVM) students from all five vocational colleges in Penang which consist of 14 programs such as engineering programs like automotive technology and etc, design programs like graphic design and business administrative programs like business management and etc.

The deputy of directors and counselors were requested to give clear instructions to the students and provide assurance on their anonymity in answering of this survey. There were concern with the achievement of the number samples needed hence, permission to collect data from Alor Setar and Kulim vocational colleges from neighbour state, Kedah were acquired as a backup.

As for the delimitation of this study, since this study is focused on vocational college students, the findings of the study may not be generalized to students from other types of educational institutions. Moreover, the analysis carried out in this study does not look into innovative thinking, work readiness and vocational self-concept by each programs of vocational college. This study is more interested to provide an overview on the influence of innovative characteristics, work readiness, vocational self-concept on employability of vocational college students. Besides, all three variables were measured with established instruments that include five major characteristics namely creativity, self-efficacy, energy, leadership and risk-propensity in innovative characteristics, three major work readiness namely personal characteristics, work competence and social intelligence, three factors of vocational self-concept that are vocational interest and value, vocational abilities and self-concept. So, other form of characteristics, skills or factors are beyond the scope of this study.

2 Conceptual Framework

Figure 1 shows the conceptual framework of this study. Vocational college students' employability is influenced by their innovative characteristics (creativity, leadership, energy, self-efficacy, risk-propensity) which are stated in Chell and Athayde (2009), vocational self-concept (vocational interest and value, vocational abilities, self-concept) from Groenestege (2012), and work readiness (personal characteristics, work competence, social intelligence) by Caballero et al. (2011). This study aims to identify the influences of innovative characteristics, work readiness, and vocational self-concept on the employability of vocational college students. The study also examined the moderating role of gender. The link between these factors and employability is supported by the CareerEDGE theory, the DOTS employability model, and Career Development theory. CareerEDGE theory explains on five factors: career development learning, experience, degree subject knowledge, understanding and skills, generic skills, and emotional intelligence- that can lead towards employability through a com-

plex interaction with self-esteem, self-efficacy, and self-confidence (Pool & Sewell, 2007). Whereas, according to Paadi (2014), DOTS employability is designed as the opposite of the CareerEDGE model because it is a very simplified version compared to the CareerEDGE model. DOTS employability includes decision learning, opportunity awareness, transition learning, and self-awareness as important skills needed in employability (Watts, 2006). The Career Development theory explains that there are five processes of self-rating about future career (Super, 1990). Self-concept was proposed as the main psychological factor that influences employability (Super, 1990; Wu et al., 2014).

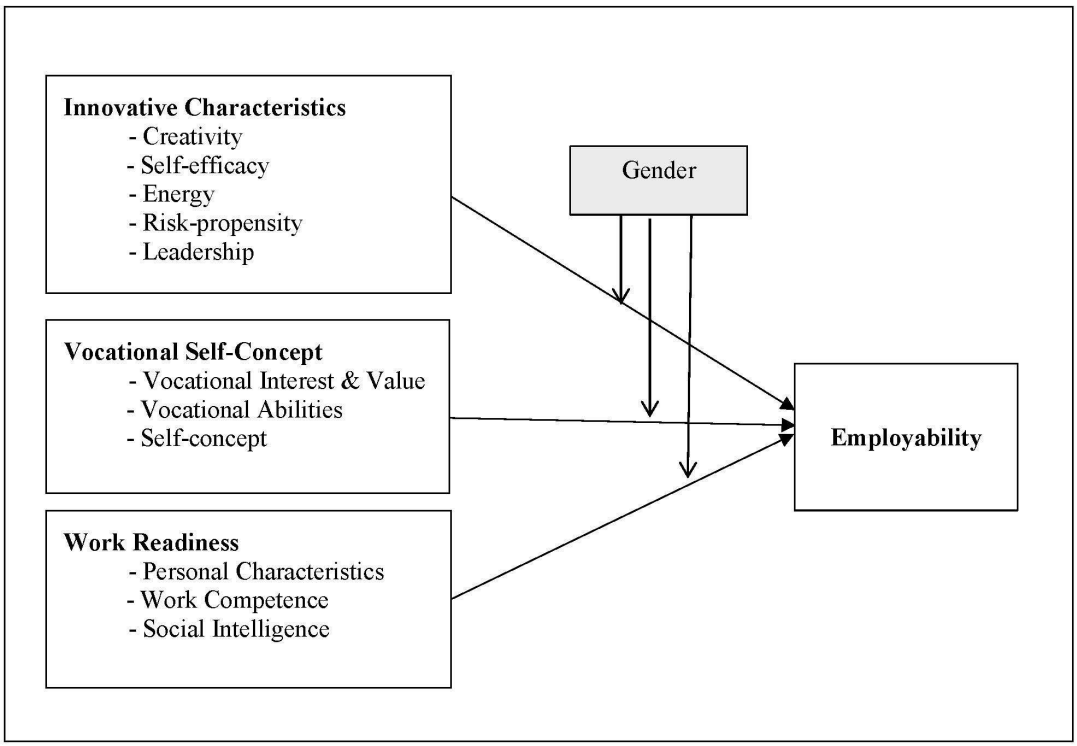

Figure 1: Conceptual Framework

3 Theoretical Framework

The relationships between innovative characteristics, work readiness, and vocational self-concept are supported by three main theories: Super's (1990) Career Development Theory, Pool and Sewell's (2007) CareerEDGE Theory, and Watts's (2006) DOTS Employability Model. While each theory emphasizes different variables, the CareerEDGE Theory and DOTS

Employability Model support the relationship between innovative characteristics, work readiness, and employability. Additionally, the DOTS Employability Model and Career Development Theory support the relationship between vocational self-concept and employability. Despite their differences, all three theories acknowledge the interconnections of these variables. This study utilized measurement tools such as the Youth Innovation Skills Measurement Tool by Chell and Athayde (2009), the Work Readiness Scale by Caballero et al. (2011), and the Vocational Rational Scale by Groenestege (2012) to explore the connection between these variables and employability. The theories explain how innovative characteristics, work readiness, and vocational self-concept influence employability. For example, Pool and Sewell (2007) suggest that the CareerEDGE skills, such as self-esteem, self-efficacy, and career development learning, impact individuals' responses to the work environment, which aligns with the positive relationship found in this study between innovative characteristics and employability.

The DOTS Employability Model emphasizes decision-making skills, job search skills, and self-presentation skills as contributors to employability. This supports the positive correlation and influence of work readiness on employability. Similarly, the Career Development Theory highlights the development of self-concept and the implementation of vocational preferences in achieving successful employability. The study's findings further support these theories, revealing positive correlations between all three independent variables and employability. The literature review by Paadi (2014; Wu et al., 2014) also underscores the significance of factors such as creativity, leadership, energy, self-efficacy, risk-propensity, work competence, personal characteristics, social intelligence, vocational value & interest and vocational abilities in employability. Therefore, all three theories receive support. The findings suggest that the theories used in this study can be integrated into a comprehensive theory of employability by incorporating all the components of innovative characteristics, work readiness, and vocational self-concept. The Career Development Theory appears suitable for this purpose, as it encompasses the contributions of these factors to employability. Thus, all three theories are relevant for explaining the employability of vocational college students (see Figure 2).

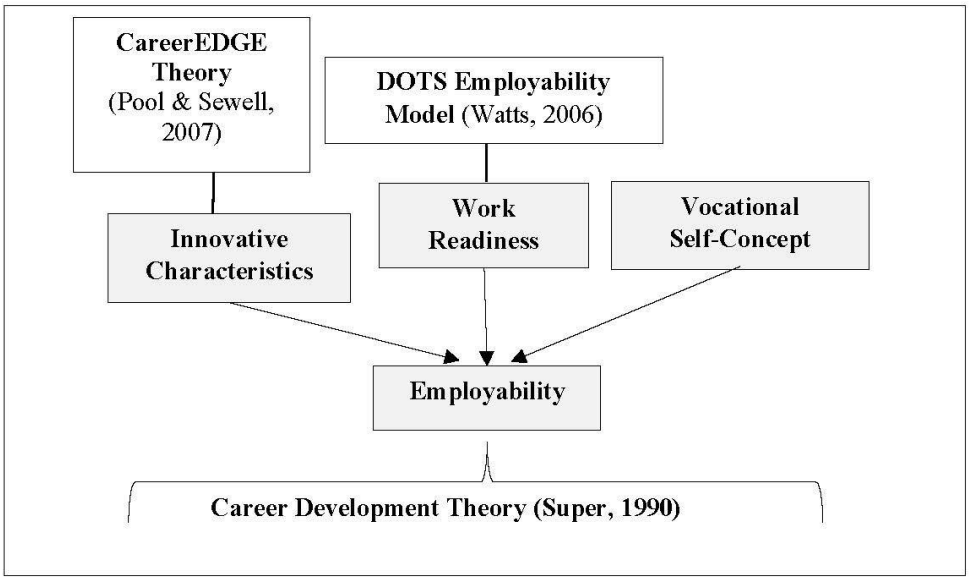

Figure 2: Source. Adapted from Pool and Sewell (2007), Watts (2006), Super (1990: Cited by Paadi 2014) and Wu et al. (2014)

4 Method

A quantitative correlational design was carried out to achieve the objectives of the study. The samples consisted of 395 vocational college students from five vocational colleges located in the states of Kedah and Penang, Malaysia. A total of 395 students from various engineering programs like Electric technology, design programs like Graphic Design and business administrative programs like Business Management and etc have responded to the survey.

Respondents were selected using Stratified Random Sampling technique. The validity and reliability of these instruments were established before the data collection. All four instruments were adapted to Malay language for the vocational students' better understanding. So, the check on translation and suitability were done with two TVET experts from two public universities in Malaysia. First expert is a professor from Universiti Tun Hussein Onn Malaysia (UTHM). The expert is the head of advanced centre for TVET, specializes in curriculum development and an expert of psychological factors like leadership, critical skills, work competency and etc. The second expert is from Universiti Sains Malaysia (USM), an expert that has TVET education background previously and specializes in curriculum interventions. Content validity depended fully on the comments from validators. Some items that were erased and most of the items were paraphrased according to the context of vocational students and for their easy understanding. Pilot study was done with three vocational

programme students: Welding Technology, Computer System & Network Technology and Industrial Machining Technology from a vocational college in Kedah. Items with low reliability were deleted and the Self-concept sub set from Vocational Self-concept were deleted due to very low Cronbach's Alpha (.39).

Descriptive and structural equation modelling (SEM) analyses were carried out. Responses were provided on four-point likert scale ranged "Strongly Disagree", "Disagree", "Agree" and "Strongly Agree". A four-point likert was chosen to make sure respondents make a fixed positive or negative response in order to avoid respondents move on without giving careful thoughts to the current question (Hopper, 2016). Approval to carry out the study was obtained from the Education Planning and Research Division, Ministry of Higher Education, the State Education Department, and all the vocational colleges involved. The research ethical guidelines were followed in this research in order to protect the respondents' confidentiality.

Data were collected through an online questionnaire survey, which is made up of four instruments (refer Table 1 for example): The Youth Innovation Skills Measurement Tool, which aims to offer strong measure of young student's innovation skills, to show the ways of revealing this capacity, to understand innovative behaviour within secondary schools, sixth form colleges and to identify any kind school or college initiatives that would promote the development of innovative attitudes and behaviour (Chell & Athayde, 2009), the Work Readiness Scale to assess "being ready" for job skills in college graduates with different background specializations (Caballero et al., 2011), the Vocational Rational Scale is to measure the self-concept crystallization in the field of career development (Groenestege, 2012), and the Perceived Future Employability Scale to measure young adults' perceived future employability, their perceptions on their future skills, experience, networks, personal traits, labour market knowledge and institutional reputation at the time of completing their formal education when they are on entering the labour market (Gunawan et al., 2018). The collected data were entered into the Statistical Package for the Social Sciences (SPSS) version 26 for descriptive statistical analysis. This was followed by the Partial Least Squares Structural Equation Modeling (PLS-SEM) analysis that was carried out via SmartPLS 3 to evaluate the measurement and structural models. The application of PLS-SEM in this study enables researchers to estimate complex model with many constructs, indicator variable, and structural paths so that the causal explanations on the relationship between the constructs (Sarstedt et al., 2017). Additionally, PLS-SEM can handle reflective model and consists of great statistical power which helps researchers identify the significance of a specific relationship efficiently (Hair et al., 2017). PLS-SEM model evaluation begins with the assessment of measurement model to check its reliability and validity of the construct, which then continues with the assessment of structural model to check the predictive capabilities of the model and the relationships between the constructs (Hair et al., 2017).

5 Results and Findings

Both descriptive and inferential statistics were run. Descriptive statistics were used to describe the data distributions and Structural Equation Modelling (SEM) analysis was used to answer the research questions, since this study focuses on relationships of innovative characteristics, work readiness and vocational self-concept on employability.

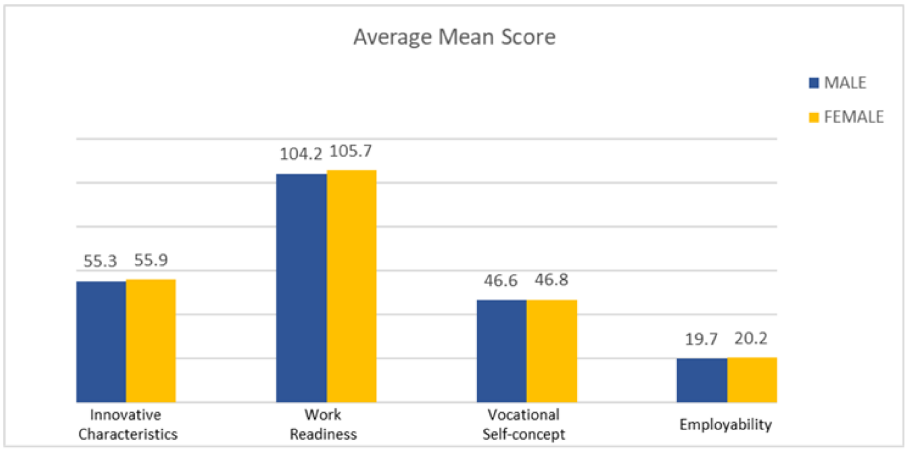

Figure 3: The Average Mean Score of Innovative Characteristics, Work Readiness, Vocational Self-Concept and Employability

The bar chart above shows the average mean scores for innovative characteristics, work readiness, vocational self-concept and employability between male and female students. Preliminary analysis showed that the mean scores for females on all the factors above were slightly higher than males, which provided the rationale to analyse the potential moderating role of gender.

5.1 Assessment of Measurement Model

To ensure that the model is functional, the first step of evaluating PLS-SEM results is to examine the measurement models (Hair et al., 2019). By examining PLS-SEM estimates, it allows researchers to check the reliability and validity of the construct measures (Hair et al., 2017). Since this study involves reflectively measured constructs, the model was assessed based on internal consistency reliability and validity. The values of composite reliability were checked for the internal consistency reliability of the model.

The four constructs namely vocational self-concept, work readiness, innovative characteristics, and employability and each of their indicators are shown in Table 1. First, composite reliability was reported to indicate whether the measurement model fulfils the internal consistency reliability. The present model composite reliability values 0.855 to 0.905, indicating the indicator variables achieved satisfactory internal consistency reliability. Next, the findings showed that the outer loadings ranged from 0.713 to 0.836, which fulfilled the minimum threshold of 0.7 for acceptable indicator reliability. The AVE of constructs recorded a range from 0.558 to 0.613, which were greater than the threshold of .5 (Garson, 2016). In short, the present measurement model achieved convergent validity as the indicators fulfilled the recommended values of outer loadings, composite reliability, and average variance extracted (AVE).

Table 1: Convergent Validity Results

Latent variables	Item	Outer loading	CR	AVE
Employability (EMP)				
EMP1	I would know the steps I need to take to do well in my chosen career	0.806	0.905	0.613
EMP2	I would have developed the ability to find out about job opportunities in my chosen field	0.779		
EMP3	Employers will be able to see that I am well motivated from what I have achieved	0.775		
EMP4	Employers will be able to see that I have clear goals for myself	0.762		
EMP5	Future employers would see that I have the right technical skills and knowledge that they want	0.792		
EMP6	I would have developed the reasoning and problem solving skills that future employers often require	0.784		
Innovative characteristics (IC)				
IC1	It's energizing and rewarding to help other people.	0.732	0.865	0.563
IC2	I feel really motivated when I produce something that no one else has.	0.788		
IC3	I want my work to provide me opportunities to show that I can overcome problems.	0.713		
IC4	Once I start something I will finish it.	0.790		
IC5	I would join a union/club group independently if it was something I really wanted to do.	0.725		
Vocational self-concept (VSC)				
VSC1	I have a real clear picture of my work-related attributes and characteristics	0.762	0.855	0.597
VSC2	I know my own values well enough to make a career decision right now	0.722		

VSC3	I know pretty much what I'm looking for in a college major and a career	0.836		
VSC4	I feel confident that my career plans match my personality, interests, etc	0.766		
Work readiness (WR)				
WR1	I can adapt to different social situations at work	0.742	0.883	0.558
WR2	I can develop good relationships with people at work	0.776		
WR3	I can easily adapt to new situations	0.741		
WR4	I have confidence in technical competency	0.736		
WR5	I can cope with multiple demands at work	0.739		
WR6	I can analyse and solve complex problems	0.747		

Note: CR = composite reliability; AVE = average variance extracted.

5.2 Discriminant Validity

After establishing the convergent validity, the assessment continues with the examination of discriminant validity. Scholars have recently suggested to assess heterotrait-monotrait (HTMT) ratio of correlations for discriminant validity (Henseler et al., 2015). The findings in Table 2 suggest that the values of HTMT are below the threshold value of 0.90. In other words, it proves the establishment of the discriminant validity of the present model.

Table 2: Discriminant Validity Results (HTMT)

	Employability	Innovative characteristics	Vocational self-concept	Work readiness
Employability				
Innovative characteristics	0.672			
Vocational self-concept	0.795	0.645		
Work readiness	0.708	0.641	0.834	

5.3 Assessment of Structural Model

The collinearity issue for the structural model (Figure 4) was examined to determine whether the predictor constructs are below the critical levels of collinearity (Hair et al., 2017). It is suggested to examine the values of variance inflation factors (VIF) for the assessment of the collinearity issue (Sarstedt et al., 2021). Based on the results, the VIF values of the constructs were lower than the critical value of 5 (Table 3), indicating that the issue of collinearity for all three sets of predictor variables did not exist.

Table 3: Inner VIF Values

	Employability	Innovative characteristics	Vocational self-concept	Work readiness
Employability				
Innovative characteristics	1.605			
Vocational self-concept	2.103			
Work readiness	2.176			

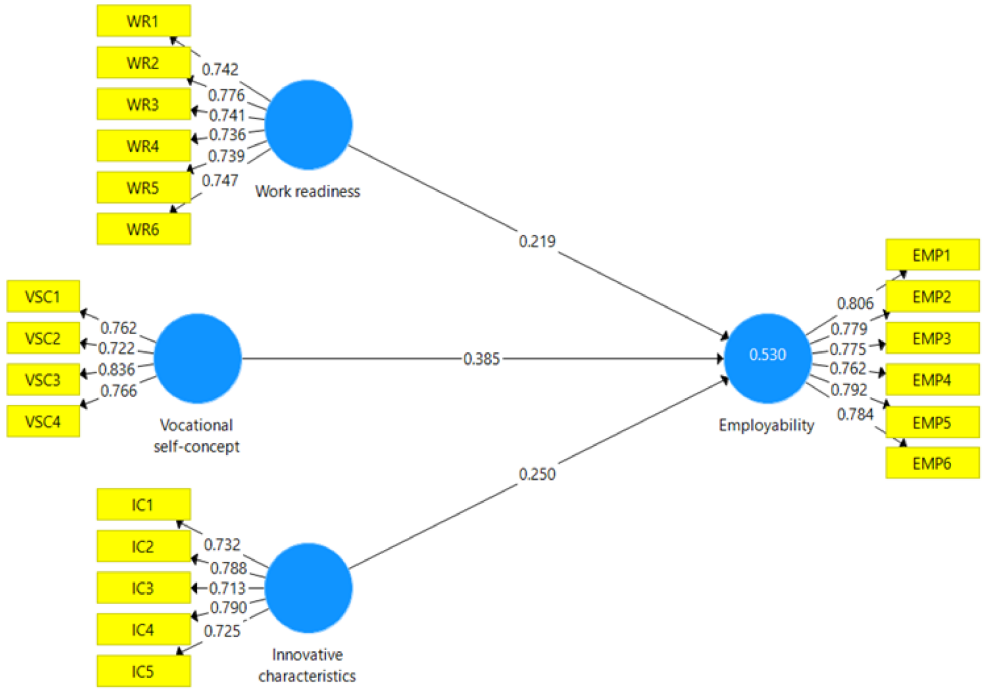

Figure 4: Structural Model

5.3.1 Direct Effect Path Coefficients

After confirming no collinearity issue, the analysis continues with an understanding of the predictive capabilities of the model by referring coefficient of determination (R2), cross-validated redundancy (Q2), and the path coefficients. The researchers started with the examination of the coefficient of determination, R2, value of the endogenous construct(s). The coefficient of determination, R2, reflects the level of the latent construct's explained variance. It is also known as in-sample predictive power which ranges from 0 to 1, with higher values

indicating a greater explanatory power (Rigdon, 2012). Based on the guideline, the R2 values of 0.75, 0.50, and 0.25 can be represented as substantial, moderate, and weak predictive power respectively (Henseler et al., 2009). In this study, the endogenous construct, EMP recorded an R2 value of 0.530, implying that the VSC, WR, and IC moderately explained 53% of the variance in EMP.

One way to examine the predictive accuracy is the Q2 values. In the blindfolding output, the findings revealed that the Q2 values of three endogenous constructs, EMF, IMF, and TRSL were recorded at 0.301. The findings suggest that the model has predictive relevance as the Q2 value is greater than 0 (Sarstedt et al., 2021). The next step is to assess the effect size, f2. When there is a removal of a specific predictor construct in the model, the change in the R2 value can evaluate whether the removed construct exerts a substantive impact on the endogenous constructs (Hair et al., 2017). This measure is known as the effect size. Effect size indicates the effect of a predictor latent variable at the structural level (Henseler et al., 2009). The effect size is a measure of the magnitude of an effect that is independent of sample size (Benitez et al., 2020). Guidelines by Cohen's (1988) explain that 0.02 represents small, 0.15 represents medium, and 0.35 represents large effects of the exogenous latent variables. In this study, the effect size f2 for the structural model relationship was calculated. Vocational self-concept (f2 = 0.160) had a medium effect size on employability because it was above the threshold of medium effect at 0.15. Both innovative characteristics (f2 = 0.090) and work readiness (f 2 = 0.051) had a small effect size on employability because it was above the threshold of small effect at 0.02. Therefore, this implied that the vocational self-concept had a larger effect size on employability compared to innovative characteristics and work readiness. The results proved the building of theory postulating the practical significance of vocational self-concept on employability among vocational college students.

In this study, structural equation modeling analysis was conducted to examine the path coefficient. First, three direct effect hypotheses were tested (see Table 4). Bootstrapping was conducted with a sub-sample of 5000 to test whether a path coefficient is significantly different from zero. In this study, three direct relationships were tested, as shown in Table 4: 1) Innovative characteristics and employability, 2) vocational self-concept and employability, and 3) work readiness and employability. According to the results, all the constructs recorded a t value greater than 1.96. First, innovative characteristics ($\beta = 0.252$, $t = 5.041$, $p < 0.001$) had a significant effect on employability. The finding suggests that the greater the innovative characteristics among vocational students, the higher their employability. Second, vocational self-concept ($\beta = 0.386$, $t = 7.131$, $p < 0.001$) exerted a significant effect on employability. When vocational students' vocational self-concept is higher, the employability becomes higher. Third, work readiness ($\beta = 0.219$, $t = 3.787$, $p < 0.001$) had a significant effect on employability. It implies that when vocational students' work readiness is high, their employability is high as well.

Table 4: Results of Direct Effect Path Coefficients

No	Relationship	Beta	t value	*p* value	Confidence interval (BC)		Result
					LL	UL	
H1	Innovative characteristics ⇨ Employability	0.276	5.670	0.000	0.183	0.373	Supported
H2	Vocational self-concept ⇨ Employability	0.406	7.742	0.000	0.303	0.509	Supported
H3	Work readiness ⇨ Employability	0.165	2.851	0.000	0.052	0.281	Supported

5.3.2 Multigroup Analysis

Measurement invariance of composite models (MICOM) is an important issue when conducting PLS-SEM multi-group analyses (MGA). Based on the guideline by Henseler et al. (2016), the MICOM procedure consists of three steps: (1) Configural invariance, (2) compositional invariance, and (3) the equality of composite mean values and variances. Based on Table 5, the results of Step 1 and 2 of MICOM indicated no lack of measurement invariance, thus establishing partial measurement invariance. When there was no issue of measurement invariance, the researchers continued with the multi-group analysis. It allows the comparison between the standardised path coefficients across the groups via MGA (Henseler et al., 2016).

Table 5: Results of Measurement Invariance of Composite Models

Construct	Configural invariance	Compositional invariance assessment		
		Original correlation	5.00%	Compositional invariance
Employability	Established	0.999	0.998	Established
Innovative characteristics	Established	0.995	0.992	Established
Vocational self-concept	Established	0.996	0.993	Established
Work readiness	Established	0.999	0.994	Established

Once partial measurement invariance was established using MICOM, the researchers continued with the assessment of group differences via MGA. The results in Table 6 indicated that path coefficient differences were not statistically significant. This implies that there was no significant difference across gender (male vs female) in all three direct relationships.

Table 6: Results of Multigroup Analysis

Path	Path coefficients group 1 (Male)	Path coefficients group 1 (Female)	Path coefficients difference	Permutation p values
Innovative characteristics ⇨Employability	0.212	0.368	-0.156	0.178
Vocational self-concept ⇨Employability	0.384	0.391	-0.008	0.947
Work readiness ⇨ Employability	0.249	0.132	0.117	0.398

5.3.3 Moderating Effects

Based on the findings in Table 7, the gender variables (both male and female) did not exert any moderating effects on the relationship between (1) innovative characteristics and employability, (2) vocational self-concept and employability, and (3) work readiness and employability respectively. The findings suggest that all three direct relationships were not moderated by gender (Figure 3 and 4).

Table 7: Results of Moderating Effects

No	Relationship	Beta	t value	p value	Confidence interval (BC)		Result
					LL	UL	
H4	Innovative characteristics ⇨ Female ⇨ Employability	0.038	0.830	0.407	-0.055	0.126	Unsupported
H5	Vocational self-concept ⇨ Female ⇨ Employability	-0.016	0.347	0.729	-0.111	0.077	Unsupported
H6	Work readiness ⇨ Female ⇨ Employability	-0.059	1.158	0.247	-0.155	0.043	Unsupported
H7	Innovative characteristics ⇨ Male ⇨ Employability	-0.038	0.824	0.410	-0.128	0.053	Unsupported
H8	Vocational self-concept ⇨ Male ⇨ Employability	0.017	0.346	0.729	-0.078	0.112	Unsupported
H9	Work readiness ⇨ Male ⇨ Employability	0.059	1.179	0.239	-0.042	0.152	Unsupported

To conclude, the findings showed that vocational self-concept had a significant direct effect on employability. Second, work readiness exerted a significant direct effect on employability. Third, innovative characteristics had a significant direct effect on employability. Hence, Hypotheses 1, 2, 3 were supported. On the other hand, gender did not moderate any of the three direct significant relationships. Hypotheses 4 to 9 were not supported. Figure 5 indicates the results of moderation analysis for female students whereas Figure 6 displays the results of moderation analysis for male students.

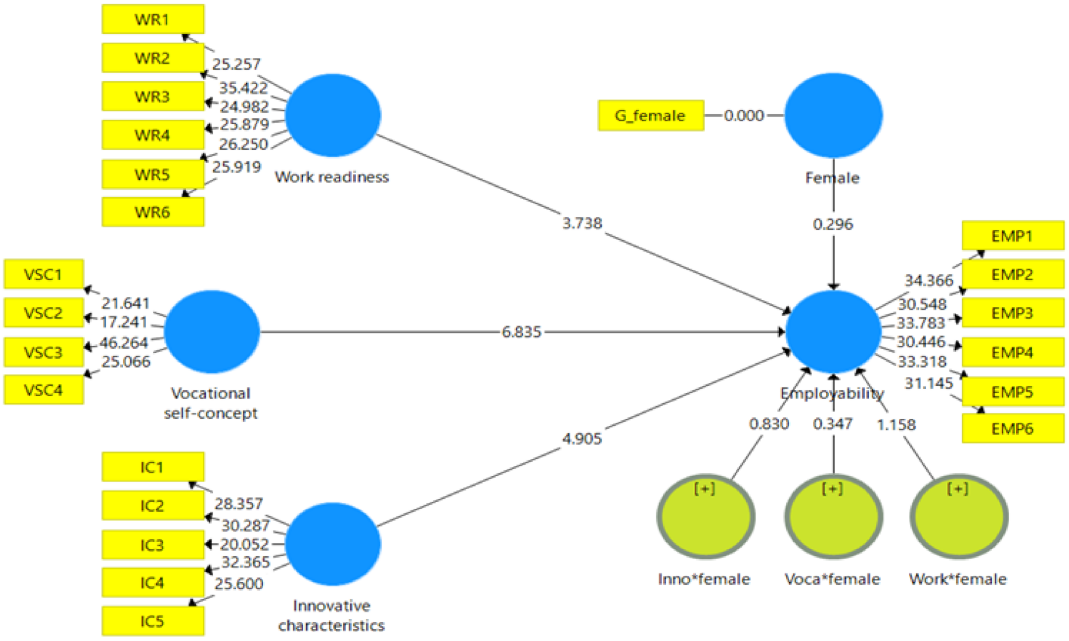

Figure 5: Moderation Analysis for Female

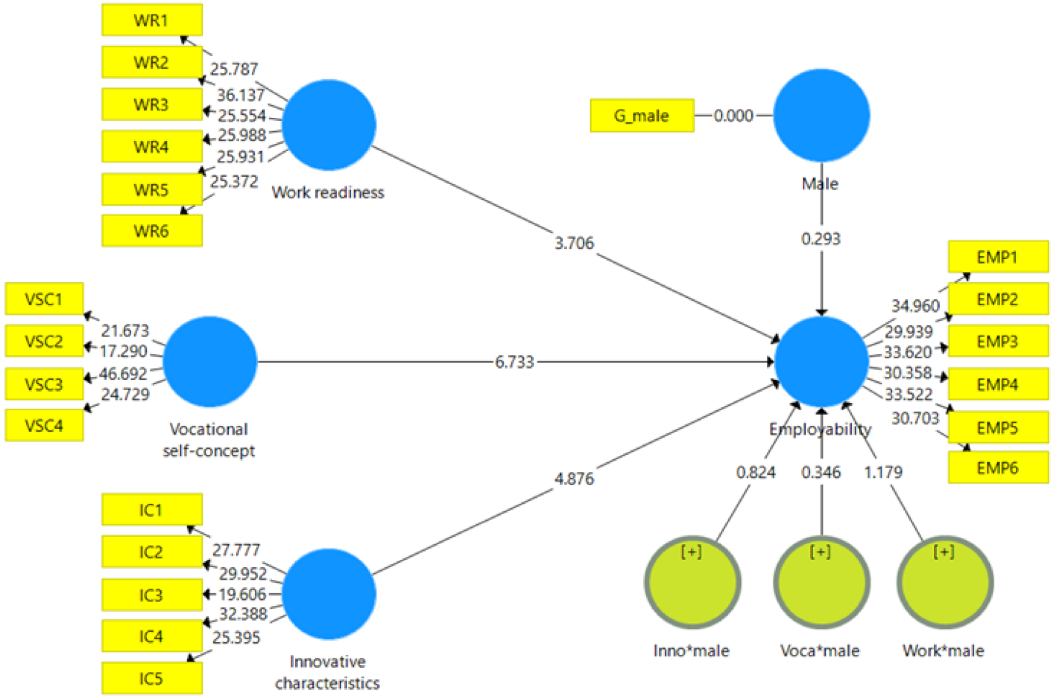

Figure 6: Moderation Analysis for Male

5.3.4 Results and Discussion

The findings showed that innovative characteristics ($\beta = 0.252$, $t = 5.041$, $p < 0.001$), vocational self-concept ($\beta = 0.386$, $t = 7.131$, $p < 0.001$) and work readiness ($\beta = 0.219$, $t = 3.787$, $p < 0.001$) had significant effects on employability of vocational college students. The model explained 53% of the variance in employability. The findings are supported by past studies. A study in China shows that the characteristics of innovation have an influence on vocational college students' employability and future entrepreneurship. It is being said that having a high innovation spirit is the only way to increase the employment of students (Li, 2021). According to Zhang (2021), psychological factors like self-efficacy, optimism, and motivation have an influence on vocational students' employability in China. This study did the analysis on all the students with single-parent and result shows that 60.1% self-efficacy has effect on their future employability. Self-drive has a positive relationship with job searching in the future due to an increase in career evaluation and exploration (Chen et al., 2022). Energy or the engagement in learning has influence towards future employability and in becoming their own boss (Masri et al., 2021). Comparing to previous literature review, Mansour (2021) says that, first job priority is given to candidate with high innovation skills believing they are good in generating novel ideas and being good in deciding best alternative for any problems to come, is supported with this study. The creators of the youth innovation skills measurement that was used for this study also say the same thing, creativity, leadership, energy, self-efficacy, and risk-propensity is the starter pack for employment (Chell & Athayde, 2009).

According to Jaafar et al. (2018), students with high work readiness skills will know how to manage a job. Study by Jiang (2022) shows that there is a high relationship between self-personal problems and vocational students' employability. It is being said that China vocational students when nearing graduation often get into employment with anxiety, worry, and emotion problems due to the constant changes in the job market environment (Jiang, 2022). Being intelligent socially, such as in tolerating frustration and coping with any problems, has a positive correlation with employability of vocational students. There is a need to cultivate the students' mental health and cultivate people-skill among them to prevent frustration in working place (Luo et al., 2022). According to Zhang (2021), psychological resilience like social behavior and emotional intelligence has a significant positive relationship with the employment. The higher their psychological resilience, the more they can cope with any social problems in the workplace and any employment process (Zhang et al., 2021). Past studies have found that there is a significant relationship between work readiness and employability among vocational college students.

As found by past studies, vocational self-concept, especially career resilience, was a strong indicator of employability in that study. Resilience is a process of valuing, appreciating, adapting and adjusting in your career (Lau et al., 2020). How much mental toughness in adapting, and adjusting to situations possessed by a student does influence their future employability

success. This is in line with the findings from Hansen and Wiernik's (2018) study, which found that vocational interest and values influence the work criteria through someone's choice behaviors.

In this study, a structural equation model that explains the employability of vocational college students was developed. This model can be used to develop interventions and career counselling support to enhance the employability of vocational students. Career counseling should focus on students' self-abilities, clarity, values, and interest in career development. Since, difference of gender has no effect towards all three variables, similar career counselling programs can be designed for both male and female. This can be done by career advisors and counselors before students choose their diploma programs. vocational colleges can carry out employment seminars, conduct mock interviews, arrange business visits, and conduct college students' professional intention surveys. Such initiatives will enhance students' innovative characteristics and get them ready to work in IR 4.0. To increase the level of work readiness and vocational self-concept, more entrepreneurship programmes can be done, rather than just focusing on working for other people, the students can also learn to start up their own business and be their own boss. Outstanding alumni can be invited to come and hold forums or talks on their experience.

6 Conclusion

In conclusion, the findings of this study have important implications on educational and theoretical perspectives on the employment of vocational graduates, career guidance and counseling practices in the field of vocational education.

As there is lack of research done on the level, relationship and influence of innovative characteristics, work readiness and vocational self-concept directly on the employability of vocational college students, this study could help to fill in the gap. The findings can be used as a help in improving the employability of vocational college students especially on the vocational self-concept. Overall, there are still little lack of studies regarding vocational self-concept that affects the future employability especially on vocational college students according to types and nature of vocational programs. This study hopefully provides useful implications to Kementerian Pendidikan Malaysia (KPM) in the sector of Technical Vocational Education and Training (TVET) and Vocational Colleges to come up with intervention programs, career counseling, elective courses focusing on improving attitudes, abilities, values towards their future work and most importantly career decision making skills and low level of vocational self-concepts.

All three theories in this study have similarities on describing innovative characteristics, work readiness and vocational self-concept that leads to employability. The results of this study extent further support for the theories involved because there is positive correlation on all

three independent variables with employability. Overall, findings also shows that the theories used in this study can be expanded by adding all the components of innovative characteristics, work readiness and vocational self-concept into a whole one theory that is Career Development theory because all this has contributions towards employability. All three theories involved is suitable to explain the employability of vocational college students.

Factors that influence the employability of vocational college students have been identified in this study. Vocational students with higher level of innovative characteristics, work readiness, and vocational self-concept were found to be more employable. The results suggest that innovative characteristics, work readiness and vocational self-concept are important factors that should be taken into account when developing education programs, intervention and support services to enhance the students' employability. The graduate employment issues faced by vocational college students can be overcome if their innovative characteristics, work readiness, and vocational self-concept can be enhanced. Similar approaches and interventions can be applied for both female and male students since gender was found to be an insignificant moderator.

Career counseling on prioritizing students' self-abilities, clarity, values and interest will lead to a high chance of being employed in the field of studies. This can be done by career advisors and counselors before students choose their programs. Vocational college can carry out employment seminars, conduct mock interviews, arrange business visits, conduct college students' professional intention surveys. Furthermore, outstanding alumni can be invited to hold forums, talks, share on their experience. Students actively participating in social practice, can continuously strengthen the social practice ability and ability to acquire work experience, will also enhance the sense of competition, and enhance the adaptability to future careers (Sun et al., 2019).

6.1 Future Research

Based on the findings of the study, vocational college students vary in the levels of innovative characteristics, work readiness and vocational self-concept. Most of them are high in innovative characteristics, moderate in work readiness whereas low in vocational self-concept. Since, during the pilot study, the sub set of self-concept were removed from the vocational self-concept because of a really low Cronbach's Alpha, in the future, the results of vocational self-concept according to different vocational programs can be further explored using bigger, different samples and adding back in the self-concept sub set into the instrument.

Zhang (2021) suggest that there is a need of studies on the relationship and influence of family environment on the employability of vocational college students. This recommendation is also supported with the evidence by a Malaysian study that says 60.1% of career exposure in Johor vocational college students is actually contributed by family and friends

(Bakry et al., 2020). Another variable that has link with the employability of vocational college students is English proficiency. A lot of vocational students in China have fear on speaking in English, leads to having hate and lack of interest towards the language (Lin, 2021). As research by Sumarsono et al. (2017) pointed out, vocational students in Indonesia are jobless and poor in overall communication skills because of a low level of English proficiency. So, the researchers made a textbook on English Language Teaching (ELT) specially for vocational students (Sumarsono et al., 2017). Problems regarding English language is not only in the neighbour countries like, China and Indonesia but in Malaysia too. According to the former Vice Chancellor of Universiti Sultan Zainal Abidin (UNISZA), Prof. Datuk Dr Hassan Basri said, one of the reason vocational graduates have difficulty in getting job is the lack in English communication skills (Massetor et al., 2021). A research finding in Batu Pahat and Kluang vocational college shows that, the students are very low in English proficiency due to less usage of the language in the classroom during studies (Massetor et al., 2021). So, teachers in vocational colleges should focus more on using English language during the teaching and practical session. There is also a need of more studies on the influence of English proficiency on the employability of vocational college students and ways to improve the proficiency, confidence and interest in speaking English language.

Findings on the level of innovative characteristics, work readiness and vocational self-concept shows that there is in need of more effective intervention programs or elective courses. Especially focusing on vocational self-concept will be a great way to enhance the skills needed for career later on because vocational students are very low in vocational self-concept. This is supported by a study from Bakry et al. (2020), that there is lack of proficiency in the career enhancing programs organized by government on TVET students. Vocational colleges should also figure out on being a major part of preparing work-ready students.

A study from China shows that, that improving a vocational student's attitude toward entrepreneurship like entrepreneurship training since their studies itself, may influence their self-belief to have their own job in the future (Lavelle, 2021). For now, China has experienced an increase in the pace of training applications particularly for vocational students (Chunying, 2020). To increase the level of work readiness and vocational self-concept, more entrepreneurship programs can be done, rather than just focusing on working for other people, the students can also learn to start up their own business and be their own boss. This pattern must be followed by many countries too especially Malaysia.

Ethics Statement

The ethical considerations and practices of the study have undergone three extensive evaluations. The evaluations were done by a panel of experts from Universiti Sains Malaysia (USM) and external vocational education expert from Universiti Tun Hussien Onn Malaysia (UTHM). In addition, approvals to carry out the study was also obtained from the Education Planning and Research Division, Ministry of Education Malaysia (Ref. No. KPM.600-3/2/3-eras [12669]) and the State Education Department (Ref. No. JPNPP.100-12/2/1 JLO2[8]), whereby the protocol and ethical considerations of the study have been carefully evaluated and endorsed. The IJRVET ethics statement has been adhered to.

References

Abdullah, Q. A., Humaidi, N., & Shahrom, M. (2020). Industry revolution 4.0: The readiness of graduates of higher education institutions for fulfilling job demands. *Romanian Journal of Information Technology and Automatic Control*, *30*(2), 15–26. https://doi.org/10.33436/v30i2y202002

Aida A. S., & Norhayati H. (2018). Industrial revolution 4.0 and education. *International Journal of Academic Research in Business and Social Sciences*, *8*(9), 314–319. http://doi.org/10.6007/IJARBSS/v8-i9/4593

Aktas, F., Pitts, K., Richards, J. C., & Silova, I. (2017). Institutionalizing global citizenship: A critical analysis of higher education programs and curricula. *Journal of Studies in International Education*, *21*(1), 65–80. https://doi.org/10.1177/1028315316669815

Altinişik, H. Z., Adigüzel, T., & Gençer, Y. G. (2023). Adaptation of youth innovational skills measurement tool for Turkish usage. *Kastamonu Eğitim Dergisi*, *31*(1), 155–164. https://doi.org/10.24106/kefdergi.1246467

Avram, E., Burtaverde, V., & Zanfirescu, A. Ș. (2019). The incremental validity of career adaptability in predicting academic performance. *Social Psychology of Education*, *22*, 867–882. https://doi.org/10.1007/s11218-019-09505-6

Bakry, N. S., Puad, M. H. M., Asimiran, S., Kadir, S. A., & Rashid, A. M. (2020). Exploring career decisions and employability skills among engineering students in vocational colleges. *Journal of Academic Research in Business and Social Sciences*, *10*(12), 448–461. http://doi.org/10.6007/IJARBSS/v10-i12/8339

Benitez, J., Henseler, J., Castillo, A., & Schuberth, F. (2020). How to perform and report an impactful analysis using partial least squares: Guidelines for confirmatory and explanatory IS research. *Information & Management*, *57*(2), 103168. https://doi.org/10.1016/j.im.2019.05.003

Bryne, C. (2020). What determines perceived graduate employability? Exploring the effects of personal characteristics, academic achievements and graduate skills in a survey experiment. *Studies in Higher Education*, *47*(1), 1–18, https://doi.org/10.1080/03075079.2020.1735329

Caballero, C. L., Walker, A., & Fuller-Tyszkiewicz, M. (2011). The work readiness scale (WRS): Developing a measure to assess work readiness in college graduates. *Journal of Teaching and Learning for Graduate Employability*, *2*(2), 41–54, https://doi.org/10.21153/jtlge2011vol2no1art552

Chell, E., & Athayde, R. (2009). The identification and measurement of innovative characteristics of young people. *NESTA Making Innovation Flourish*, 1–43. https://eprints.kingston.ac.uk/id/eprint/5985/2/Chell-E-5985.pdf

Chen, H., Liu, F., & Wen, Y. (2022) The influence of college students' core self-evaluation on job search outcomes: Chain mediating effect of career exploration and career adaptability. *Current Psychology*, *42*, 15696–15707. https://doi.org/10.1007/s12144-022-02923-4

Cheunga, R., Jin, Q., & Tam, T. (2019). Assessing the impact of work internships on career development among university students in Hong Kong. *Asia Pacific Career Development Journal*, *2*(1), 16–22. https://apcda.wildapricot.org/Resources/APCDJ/A0002_1_002.pdf

Chukwu, D. U., Anele, E. A, Omeje, H. O., & Ohanu, I. F. (2020). Assessing technical vocational education and training (TVET) labour market potentials: Comparison of conferees opinions. *Journal of Technical Education and Training*, *12*(2), 12–23. https://doi.org/10.30880/jtet.2020.12.02.002

Chunying, M. (2020). Mediating role of psychological capital in relationships between school-enterprise cooperation and employment of students higher vocational education institutions. *Journal of Sport Psychology*, *29*(4), 135–148. https://www.rpd-online.com/index.php/rpd/article/view/236

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Lawrence Erlbaum.

Garson, G. D. (2016). *Partial least squares: Regression and structural equation models*. Statistical Associates Publishing.

Ghavifekr, S., & Radwan, O. (2021). The effect of career management skills on career development abilities: Perspectives from tvet college students. *MOJEM: Malaysian online journal of educational management*, *9*(3), 78–92. https://borneojournal.um.edu.my/index.php/MOJEM/article/view/30573/13112

Groenestege, R. T. (2012). *Examining and revising the vocational rating scale using principal component analysis and mokken scale analysis* [Master Thesis]. https://www.semanticscholar.org/paper/Examining-and-revising-the-vocational-rating-scale-Groenestege/a664569d3d8c970b794e7575ebc1a0059b809552

Gunawan, W., Creed, P. A., & Glendon, I. (2018) Development and initial validation of a perceived future employability scale for young adults. *Journal of Career Assessment*, *27*(4), 610–627. https://doi.org/10.1177/1069072718788645

Gupta, V. K., Turban, D. B., Wasti, S. A., & Sikdar, A. (2017). The role of gender stereotypes in perceptions of entrepreneurs and intentions to become an entrepreneur. *Entrepreneurship Theory and Practice*, *33*(2), 397–417. https://doi.org/10.1111/j.1540-6520.2009.00296.x

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). SAGE Publications.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. http://doi.org/10.1108/EBR-11-2018-0203

Hansen, J.-I. C., & Wiernik, B. M. (2018). Work preferences: Vocational interests and values. In D. S. Ones, N. Anderson, C. Viswesvaran, & H. K. Sinangil (Eds.), The SAGE handbook of industrial, work & organizational psychology: Personnel psychology and employee performance (pp. 408–448). Sage Reference.

Henseler, J., Hubona, G., & Ray, P. A. (2016). Using PLS path modeling in new technology research: Updated guidelines. *Industrial Management & Data Systems*, *116*(1), 2–20. https://doi.org/10.1108/IMDS-09-2015-0382

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modelling. *Journal of the Academy of Marketing Science*, *43*, 115–135. https://doi.org/10.1007/s11747-014-0403-8

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (2009). The use of partial least squares path modeling in international marketing. *New Challenges to International Marketing*, *20*, 277–319. https://doi.org/10.1108/S1474-7979(2009)0000020014

Hopper, J. (2016) Why you need 4-point scales. Versta Research. https://verstaresearch.com/blog/why-you-need-4-point-scales/

Ishar, M. I. M., Derahman, W. M. F. W., & Kamin, Y. (2020). Practices and planning of ministries and institutions of technical and vocational educational training (TVET) in facing the industrial revolution 4.0 (IR 4.0). *Malaysian Journal of Social Sciences and Humanities*, *5*(3), 47–50. https://doi.org/10.47405/mjssh.v5i3.374

Ismail, I. M., Ahmad, N. A., Amiruddin, M. H., Ismail, M. E., & Harun, H. (2019). Identifying the employment skills among Malaysian vocational students: An analysis of gender differences. *Journal of Technical Education and Training*, *11*(3), 115–120. https://doi.org/10.30880/jtet.2019.11.03.014

Ismail, M. E., Hashim, S., Zakaria, A. F., Ariffin, A., Amiruddin, M. H., Rahim, M. B., Razali, N., Ismail., I. M., & Sa'adan, N. (2020). Gender analysis of work readiness among vocational students: A case study. *Journal of Technical Education and Training*, *12*(1), 270–277. https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/3106

Jaafar, S. N., Zakaria, N., & Rasheid, N. A. (2018). Career choice and employability skills for vocational college students. *Journal of Physics: Conference Series*, *1049*(1), 1–8. http://doi.org/10.1088/1742-6596/1049/1/012050

Jiang, P. (2022). Phenomenon of employment anxiety in higher vocational colleges and its influence on students' employability. *psychiatria danubina*, *34*(1), 277–278. https://hrcak.srce.hr/file/401266

Joensuu-Salo, S., Varamäki, E., & Viljamaa, A. (2015). Beyond intentions – what makes a student start a firm? *Education + Training*, *57*(8/9), 853–873. https://doi.org/10.1108/ET-11-2014-0142

Lau, P. L., Chung, Y. B., & Wang, L. (2019). Effects of a career exploration intervention on students' career maturity and self-concept. *Journal of Career Development*, *48*(4), 311–324. https://doi.org/10.1177/0894845319853385

Lau, P. L., Wilkins, K. G., & Wong, Y. J. (2020) Examining the indirect effects of self-concept on work readiness through resilience and career calling. *Journal of Career Development*, *47*(5), 551–564. http://doi.org/10.1177/0894845319847288

Langthaler, M., Wolf, S., & Schnitzler, T. (2022). The political economy of skill formation in a rentier state: The case of Oman. *International Journal for Research in Vocational Education and Training*, *9*(1), 23–43. https://doi.org/10.13152/IJRVET.9.1.2

Lavelle, B. A. (2021). Entrepreneurship education's impact on entrepreneurial intention using the theory of planned behavior: Evidence from Chinese vocational college students. *Entrepreneurship Education and Pedagogy*, *4*(1), 30–51. http://doi.org/10.1177/2515127419860307

Li, W. (2021). The influence of the integration of innovation and entrepreneurship education and professional education on the employment ability of vocational college students. *Information Processing and Advanced Education*, 314–318. https://doi.org/10.1145/3456887.3456957

Lim, B. F. Y. (2019). Women left behind? Closing the gender gap in Malaysia. *Japan Labour Issues*, *3*(17), 22–29. https://www.jil.go.jp/english/jli/documents/2019/017-00.pdf#page=24

Lin, L. (2021) Design of English classroom teaching in higher vocational colleges based on cognitive psychology. *Psychiatria Danubina*, *33*(8), 505–506. https://hrcak.srce.hr/file/390253

Luo, Z., Wang, S., & Wang, Z. (2022). The impact of college students' frustration tolerance on employment anxiety: The mediating role of coping styles. *8th International Conference on Humanities and Social Science Research (ICHSSR 2022)*, 850–855. Atlantis Press. https://doi.org/10.2991/assehr.k.220504.156

Mansour, A. (2021). The competence and employability of public technical and vocational education and training graduates in Khartoum State - Sudan. *Technium Social Sciences Journal*, *21*, 235–249. https://techniumscience.com/index.php/socialsciences/article/view/3793

Mari, T. S., Srirangam S., Gunasagaran, S., Kuppusamy, S., & Ang, F. L. (2019). Architecture graduate work readiness: The gap between learning and employability. *Journal of Physics*, *636*, 1–9, https://doi.org/10.1088/1757-899X/636/1/012010

Masri, N., Abdullah, A., Asimiran, S., & Zaremohzzabieh, Z. (2021). Relationship between engagement in learning entrepreneurship education and entrepreneurial intention among vocational college students. *Journal of Social Sciences & Humanities*, *29*(1),19–38. https://doi.org/10.47836/pjssh.29.S1.02

Massetor, N. A., Zulfadli, M., & Marian, M. F. (2021). K-workers practice in increasing graduate employability to overcome the challenges of the fourth industrial revolution. *Research and Innovation in Technical and Vocational Education and Training*, *1*(1), 225–231. https://publisher.uthm.edu.my/periodicals/index.php/ritvet/article/view/261

Masud, R., Muthalib, A. A., & Ismail, I. (2018). Gender inequality: A comparative study of participation in technical courses. *Journal of Counselling and Educational Technology*, *1*(1), 10–13. https://doi.org/10.32698/0121

McDool, E., & Morris, D. (2022). Gender differences in science, technology, engineering and maths uptake and attainment in post‐16 education. *The Manchester School*, *90*(5), 473–499. https://doi.org/10.1111/manc.12403

Ministry of Education. (2021). Risalah asas pendidikan jabatan pendidikan negeri pulau pinang.

Naukkarinen, J., & Bairoh, S. (2022). Gender differences in professional identities and development of engineering skills among early career engineers in Finland. *European Journal of Engineering Education*, *47*(1), 85–101. https://doi.org/10.1080/03043797.2021.1929851

Paadi, K. (2014). Perceptions on employability skills necessary to enhance human resource management graduates prospects of securing a relevant place in the labour market. *European Scientific Journal*, 129–143. https://core.ac.uk/download/pdf/328024466.pdf

Pool, L. D., & Sewell, P. (2007). The key to employability: Developing a practical model of graduate employability. *Education & Training Journal*, *49*(4), 277–289. https://doi.org/10.1108/00400910710754435

Prikshat, V., Kumar, S., & Nankervis, A. (2019). Work-readiness integrated competence model: conceptualisation and scale development. *Education+Training*, *49*(4), 277–289. https://www.emerald.com/insight/content/doi/10.1108/ET-05-2018-0114/full/html

Rahayu, I. S., & Aryanti, T. (2022). *Gender in vocational education. 4th International Conference on Innovation in Engineering and Vocational Education (ICIEVE 2021)*. Atlantis Press.

Rigdon, E. E. (2012). Rethinking partial least squares path modeling: In praise of simple methods. *Long Range Planning*, *45*(5-6), 341–358. https://doi.org/10.1016/j.lrp.2012.09.010

Sa-Nguanmanasak, T., & Khampirat, B. (2019). Comparing employability skills of technical and vocational education students of Thailand and Malaysia: A case study of international indu-

strial work-integrated learning. *Journal of Technical Education and Training*, *11*(3), 94–109. https://publisher.uthm.edu.my/ojs/index.php/JTET/article/view/4280

Sarstedt, M., Ringle, C. M., & Hair, J. F. (2021). Partial least squares structural equation modeling. In C. Homburg, M. Klarmann & A. E. Vomberg (Eds.), *Handbook of market research* (pp. 1–47). Springer. https://doi.org/10.1007/978-3-319-05542-8_15-2

Shabbir, M. S., Mohd Anuar, A., Ashad, M., & Mohommed Ali, A. S. (2020). 4th Industrial revolution and TVET: The relevance of entrepreneurship education for development. *Opción, Aňo*, *35*(24), 11–21. https://www.researchgate.net/publication/338611746_4th_Industrial_Revolution_and_TVET_The_Relevance_of_Entrepreneurship_Education_for_Development

Sumarsono, P., Mahsyud, Wardhani, A., & Farah, R. R. (2017). The development of authentic English language teaching (ELT) textbook of vocational school. *International Journal of English Research*, *3*(6), 29–31. https://eprints.umm.ac.id/45621/21/Sumarsono%20Masyhud%20Wardhani%20Farah%20-%20Teaching%20Material%20Textbook%20English%20Language%20Teaching%20%28ELT%29%20Vocational%20School%20Automation%20and%20Management%20Office.pdf

Sun, X., Yang, Y., & Lv, X. (2019). Study on the ways of training undergraduates' employment ability under the mode of low carbon economy development. *IOP Conference Series: Materials Science and Engineering*, *612*(5), 1–7. https://doi.org/10.1088/1757-899X/612/5/052035

Super, D. E. (1990). A life-span, life-space approach to career development. In D. Brown, L. Brooks & Associates (Eds.), *Career choice and development: Applying contemporary theories to practice* (2nd Ed., pp. 197–261). Jossey Bass.

Sururi, A. (2020). Exploring career crystallization among Indonesian student in Malaysia. *Journal of Multicultural Studies in Guidance and Counselling*, *4*(1), 1–13, https://ejournal.upi.edu/index.php/JOMSIGN/article/viewFile/23662/11914

Watts, A. G. (2006). Career development learning and employability. *The Higher Education Academy*. https://www.advance-he.ac.uk/knowledge-hub/career-development-learning-and-employability.

Wikansari, R. (2017). Students satisfaction, vocational self concept, academic self efficacy, and occupational identity among vocational higher education students in urge of free trade zone. *International Conference on Global Education*. https://icge.unespadang.ac.id/asset/file/files/icge%20V/Tema%201/A.%20GLOBAL%20EDUCATION_4.pdf

Wu, Y. L., Tsai, Y. L., & Chen, C, W. (2014). Examining the experiences of career guidance, vocational self-concept, and self-perceived employability among science education majors in Taiwan. *Journal of Baltic Science Education*, *13*(2), 182–190.

Yang, L., & Wong, L. P. W. (2020). Career and life planning education: Extending the self-concept theory and its multidimensional model to assess career-related self-concept of students with diverse abilities. *Sage Publication*, *3*(4), 659–677. https://doi.org/10.1177/2096531120930956

Zhang, D. (2021). Impacts of credit constraints on innovation propensity and innovation performance: Evidence from China and India. *Asia-Pacific Journal of Accounting & Economics*, *30*(2), 304–326. https://doi.org/10.1080/16081625.2021.1872033

Zeng, Q., He, Y., Li, J., Liang, Z., Zhang, M., Yi, D., & Quan, J. (2022). Hope, future work self and life satisfaction among vocational high school students in China: The roles of career adaptability and academic self-efficacy. *Personality and Individual Differences*, *199*, 111822. https://doi.org/10.1016/j.paid.2022.111822

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Teacher's Agency and the Cooperation With Entrepreneurs in Entrepreneurship Education

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Abstract

Purpose: Vocational education and training (VET) in Finland takes place more and more at workplaces. Hence, the teachers' cooperation with companies has become important. Little research has been done on the teacher's activities in business cooperation and the factors affecting business cooperation. The teacher's decisions and choices are made possible through the teacher's autonomy and agency. The teacher's agency is understood as a capacity to utilise autonomy. In this study, the teacher's agency is reflected in their activity in developing entrepreneurial learning environments and activity in developing regional entrepreneurship education (EE). The study was conducted among Finnish VET teachers. In Finland EE is understood in its broad sense and the teacher is in a significant position choosing where, how and with whom they implement EE. The main research question in this article is: How does the VET teacher's agency in EE affect their cooperation with entrepreneurs?

Methods: The data consists of 933 vocational teachers' responses. An open online survey tailored for teachers was used in the data collection (Measurement Tool for Entrepreneurship Education). Ordinal regression analysis has been used to analyse the data.

Results: The teacher's agency is a significant factor explaining his/her level of cooperation with entrepreneurs. The results show that the teacher's activity, desire, and ability to express

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agency, strengthens the use of companies in teaching. Surprisingly, the teacher's personal entrepreneurial background and the number of companies in the area do not act as explanatory factors for entrepreneurs' cooperation. The study makes several suggestions on teachers' perceptions of the factors explaining and creating agency as an entrepreneurship educator.

Conclusions: In Finland, teachers' autonomy is high. Teachers have the freedom to utilise their agency in many ways. They can, for example, make their own decisions and renew their teaching in many ways if they are willing and encouraged to do so. It seems like the question is more about management and teacher identity. The teacher's agency should be strengthened, and the teacher should be given the option to act more freely. Furthermore, the teacher's autonomy is not enough; agency is also needed.

Keywords: VET Teacher, Agency, Entrepreneurship Education, Cooperation With Entrepreneurs, Regional Context

1 Introduction

This study examines the vocational education and training (VET) teacher's agency and how it affects business cooperation in entrepreneurship education (EE). Generally, the concept of agency refers to the teacher's ability to act in a certain socio-cultural context (Hunter & Cooke, 2007). In this study the socio-cultural context is related to entrepreneurs and companies in the region. Utilising his/her agency, the teacher makes independent choices about his/her teaching, and especially about where, how and with whom the teaching takes place (Eteläpelto et al., 2013; Vähäsantanen, 2015). EE benefits from cooperation with entrepreneurs and local businesses (Fayolle & Gailly, 2008) and therefore requires the teacher's active role in organising circumstances for cooperation. Moreover, several EE studies have shown that studying in a real-life context and with entrepreneurs has a positive effect on students' learning of entrepreneurship (Birdthistle et al., 2016; Cooper et al., 2004; Kickul et al., 2010; Seikkula-Leino et al., 2010; Sommarström et al., 2017).

Agency is reflected as the activity of the teacher in cooperating with the region's entrepreneurs in his/her teaching and as the activity of the development of EE in their region (Andersson & Köpsén, 2019). In VET, learning and teaching increasingly takes place in workplaces and thus business cooperation is especially important (Hievanen et al., 2022; Tapani & Salonen, 2019).

Teachers have been found to be autonomous in their teaching (Erss & Kalmus, 2018; Teng, 2019). In this study we suggest that agency is strongly related to teachers' autonomy (e.g., Erss & Kalmus, 2018). In effect, autonomy enables the teacher to express his/her agency within his/her capacity to act in different contexts (Hunter & Cooke, 2007; Ryan & Deci, 2000; Sommarström et al., 2021; Vangrieken et al., 2017; Vähäsantanen, 2015).

EE research has covered several different viewpoints in the VET context, including teaching practices (e.g., Ruskovaara & Pihkala, 2013), teacher education (Seikkula-Leino et al., 2012; Zaťková & Ambrozy, 2019) and students' skills (Sandirasegarane et al., 2016). There is some research concerning teachers' autonomy and agency (van Dam et al., 2010; Erss & Kalmus, 2018; Hadar et al., 2019; Molla & Nolan, 2020; Sommarström, 2022; Teng, 2019; Vangrieken et al., 2017). However, the connection between the VET teacher's agency and EE has remained empirically unexplored. To fill this research gap, the main research question in this article is: *How does the VET teacher's agency in EE affect their cooperation with entrepreneurs?*

In this research, the teacher's agency is reflected in their activity in developing entrepreneurial learning environments and their activity in developing regional EE. Earlier studies have suggested that a region's entrepreneurship level (e.g., Dodd & Hynes, 2012) and the teacher's own entrepreneurship experience and connections with entrepreneurs may have an impact on cooperation with entrepreneurs (Mårtensson et al., 2019).

This article makes two major contributions: First, it theoretically introduces teacher's agency as a relevant concept highlighting the factors guiding teachers in their implementation of EE. Second, it empirically shows the role of a teacher's agency in EE through the teacher's participation in the development of learning environments for EE and of regional EE development.

2 VET and Entrepreneurship Education in Finland

In Finland, EE is understood in its broad sense. It includes both an active and self-initiated individual, an entrepreneurial learning environment, education, the cooperation of an activity network that supports entrepreneurship, and society's active and entrepreneurial policy (Ministry of Education, 2009). The Finnish entrepreneurship guidelines are guided by measures of entrepreneurship promotion and EE at different school levels. Entrepreneurship is defined as a key competence for lifelong learning in basic vocational qualification. This includes learning to adapt to the changing conditions of working life and acquiring the necessary capabilities and skills needed to manage new situations (Ministry of Education and Culture, 2017).

This study has been conducted among Finnish VET teachers who work at VET institutes. VET study programme is 180 ECTS credits in total, the curriculum is competence-based, and the studies are customer-oriented. This kind of curriculum has been used in Finland since the VET reform in 2018. An individual study and competence development plan is drawn up for every student. Students can acquire skills in different learning environments and flexibly combine them. Teaching organized in the workplace in connection with practical tasks is called learning in working life. Studying at the workplace can cover an entire degree, a module, or a smaller part of the studies (Vocational Education and Training Act 531/2017).

VET has the national qualification requirements, where entrepreneurship is present as a compulsory course for all students, that is called Entrepreneurship and entrepreneurial activities (1 ECTS credit). Every VET student completes this course. In addition to this, students have the opportunity to choose two optional courses. One of the courses, Business planning (15 ECTS credits), focuses especially on the contents of the business idea and competences related to starting a company. The other optional course, working in a company (15 ECTS credits), focuses on planning a company's operations and profitability, building customer and cooperation relationships and implementing business operations (eRequirements, n.d.).

Learning outcomes are defined in the national qualification requirements. The concept of entrepreneurship is the observation and seizing of opportunities and the ability to transform ideas into activities that produce economic, cultural, social, or societal value. These include creativity, innovativeness, risk management and responsibility, as well as the ability to plan, set goals and lead activities to achieve goals (Ministry of Education and Culture, 2017). The English concepts "enterprise education" and "entrepreneurship education" are the closest in content to the Finnish concept of entrepreneurship education. In VET the term refers to the development of skills required of an entrepreneur, but also to the skills of lifelong learning intended for all employees (Ministry of Education, 2009).

3 Concept Definitions, Theory and Hypothesis Development

In Finland, teachers have a great deal of autonomy in their work. Teacher autonomy refers to a positive notion of freedom to make professional pedagogical decisions (e.g., Vangrieken et al., 2017). In this article we use the concept of agency to describe the actions in which the teacher may or may not choose to use his/her autonomy. In understanding the teacher's undertakings in EE, the teacher's autonomy is an important factor affecting his/her activities. However, the teacher's autonomy is a latent capacity, and its usefulness depends on the teacher's choice of using it (Vangrieken et al., 2017). In this sense agency and autonomy form a tight theoretical setting that we use in understanding the teacher's activities in the use of entrepreneurs in teaching.

In this study, we define an entrepreneurial learning environment as an environment which develops students' creativity and self-direction (Ettis, 2022; Fillis & Rentschler, 2010). Cooperation with entrepreneurs refers to the teacher's activity in inviting companies and/or entrepreneurs in the region to the school and/or to going with the students on a visit to a company (Cooper et al., 2004; Kickul et al., 2010; Pittaway & Cope, 2007; Pittaway & Hannon, 2008; Shepherd, 2004; Solomon, 2007). We define the teacher's activity in participating in regional development with the help of three aspects. The development of EE refers to the preparation of strategic documents and plans, such as the teacher being involved in developing either regional entrepreneurship, the curriculum, and/or the EE strategy of the region (Seikkula-Leino et al., 2010; Seikkula-Leino et al., 2012). Next, we describe the theory in more and we justify the formation of the hypotheses.

3.1 Agency–Autonomy Connection

Research on the teacher's agency is extensive and covers several different perspectives, e.g., the social (Bandura, 2006; Emirbayer & Mische, 1998), gender and equality perspectives (McNay, 2004) and the concept has been defined in different ways depending on the discipline (Eteläpelto, 2008). In this research, agency is seen as the teacher's actions to utilise autonomy (Hunter & Cooke, 2007). Agency is understood as a socially created and functional phenomenon, which especially includes influencing and making choices and decisions (Eteläpelto et al., 2013). These decisions and choices include, among other things, 1) making decisions at work, 2) participating in common work practices, 3) renewing work practices, and 4) negotiating identity (Vähäsantanen et al., 2017). In addition to these, Hökkä et al. (2014) also point out that activity, initiative, participation, and experience in managing one's own work and life are most often agency-related issues. Thus, agency depends on one's own activity and it is based on acting as desired. The desired behaviour can come either from oneself, from the management or from outside the educational institution (Eteläpelto et al., 2013; Tan & Ng, 2012; Vähäsantanen et al., 2009; Vähäsantanen, 2015).

Autonomy can be made possible or limited by management and regulations (Hardie et al., 2022; Hargreaves, 2000; Joensuu-Salo et al., 2023; Slemp et al., 2020; Sommarström et al., 2020; Tan et al., 2012). Autonomy motivates the teacher (Slemp et al., 2020). Sommarström et al. (2021) found out that in the implementation of EE, the impact of autonomy influences the teacher's actions. They showed how autonomy is utilised in three different ways in relation to the national curriculum requirements, as either exceeding the requirements, following them carefully or ignoring them. Autonomy can lead to either excellent or poor results in EE (Sommarström et al., 2021). Autonomy gives the teacher and school opportunities to act, but it does not explain the teacher's agency and background factors behind those actions. The point is that even if the teacher's autonomy to make decisions in EE is significant, it does not necessarily increase the utilisation of entrepreneurs in EE. Teachers make independent decisions and interpret qualification requirements differently (Sommarström et al., 2021). Agency and exploring the issues behind the decisions would give a better picture of the decisions made by the VET teacher.

3.2 The VET Teacher's Activity in Creating an Entrepreneurial Learning Environment and Cooperation in EE

There is evidence that the learning environment and teaching practices are the most consequential factors for students' learning in EE. Several researchers have stated that active teaching practices, i.e., those that are student-led, practice-oriented and entail projects done in a real-life environment are more effective (Birdthistle et al., 2016; Cooper et al., 2004; Kickul et al., 2010; Seikkula-Leino et al., 2010; Sommarström et al., 2017). However, it has

also been stated in previous literature that teacher-led teaching practices would be more effective in learning entrepreneurship (Stadler & Smith, 2017). In any case, the opposite view has gained more weight in the research literature.

To implement practice-oriented and real-life teaching, the teacher needs good connections with entrepreneurs and has to act autonomously towards achieving this aim. Andersson and Köpsén (2019) state that cooperation with companies develops the teacher's professional skills and strengthens his/her agency (see also Bandura, 2006; Eteläpelto et al., 2013; Vähäsantanen, 2015). The teacher's strong agency is related to feelings of competency and possibility for action (Beijaard et al., 2004). If a teacher thinks it is important to work with entrepreneurs, and is able to do so, he/she will make choices and take a stand on what makes them an agent of their own work (Eteläpelto et al, 2013; Molla & Nolan, 2020).

However, entrepreneurship is still often implemented in a school environment rather than in cooperation with entrepreneurs (Haase & Lautenschläger, 2011; Huusko et al., 2018; Ruskovaara et al., 2015b; Ruskovaara & Pihkala, 2013, 2015; Sommarström, 2022). Earlier research has shown that teachers have difficulties in changing from teacher-led teaching to teaching with entrepreneurs (Kunnari et al., 2021; Sommarström et al., 2017), and teachers' knowledge of the real-life context is minimal (Puustinen et al., 2022). There are various views on the reasons for these difficulties. Recently, Sommarström (2022) argued that the main problem with utilising entrepreneurs in teaching seems to be the lack of school leaders' support and resources for cooperation. Van Dam et al. (2010) suggests that the teacher's willingness to cooperate with companies depends on the school's atmosphere, that is, its entrepreneur-friendliness. Developing EE practices, learning environment and cooperation require the teacher's active role, support from the leaders and sufficient resources (Hardie et al., 2022).

Interestingly, according to Ruskovaara et al. (2015b) the teacher's personal entrepreneurial experience does not explain entrepreneurial cooperation, and VET teachers may have difficulties in teaching entrepreneurship and may feel unsure about teaching it (van Dam et al., 2010; Fejes et al., 2019) as they are specialists in teaching their profession (Andersson & Köpsén, 2019; Brennan Kemmis & Green, 2013; Farnsworth & Higham, 2012; Unwin, 2008). According to Huusko et al. (2018), VET teachers' competence of teaching entrepreneurial knowledge and skills or using proper teaching practices are not at a level that encourages students to learn entrepreneurship. They do not use proper teaching practices in relation to collaboration with entrepreneurs.

According to agency theory, the teacher implements and renews his/her own work by making decisions, and the teacher also creates his/her professional identity and thereby takes a stand on how teaching should be carried out. The teacher's agency is reflected in his/her activity in developing entrepreneurial learning environments, and this in turn supports cooperation activities with entrepreneurs. Therefore, we propose hypothesis 1:

H1: A teacher's agency reflected by his/her activity of developing entrepreneurial learning environments has a positive relationship with his/her cooperation with entrepreneurs

3.3 The VET Teacher's Activity Regarding the Regional Development Aspect in EE

The importance of VET institutes performing regional development is not clear to leaders, teachers, and entrepreneurs. Even though studies and teaching of entrepreneurship have expanded (Huusko et al., 2018) and some schools have set up centres in the region to support entrepreneurship in cooperation with entrepreneurs (Oksanen-Ylikoski & Ylikoski, 2015), the promotion of entrepreneurship and EE contents still requires structuring in VET school (Huusko et al., 2018). Teachers can be seen as key actors in making connections with entrepreneurs and creating structures for EE.

Galvão et al. (2017) state that EE can be utilised to develop region and that a common goal for the relevant actors is needed for this. Also, investments in EE positively influence regional development (Galvão et al., 2020). Walter and Dohse (2012) found that in areas where entrepreneurial activity and density are low, active teaching methods produce better entrepreneurial activity and attitudes among students. They suggest that through EE, teachers can increase students' self-employment intentions by using active teaching methods, including real-life projects in cooperation with entrepreneurs. In this setting, teachers respond to the regional circumstances by adjusting their level of EE (Walter & Dohse, 2012).

Earlier research has raised the issue of the relationship between EE and regional entrepreneurship (Dodd & Hynes, 2012; Järvi, 2012; Kolho et al., 2022; Kotey, 2006; Walter & Dohse, 2012). Dodd and Hynes (2012) examined the importance of the regional context for increasing entrepreneurship and implementing EE in six European countries. According to their study, regional features shape EE and its contexts, such as educational objectives, outcomes, resources, and cultures for schools' entrepreneurship programmes. From this perspective, the specific features of the region have an impact on EE (Bandera et al., 2018; Lindh & Thorgren, 2016; Nabi & Liñán, 2011; Thomassen, 2020; Walter & Dohse, 2012). According to Dodd and Hynes (2012), the regional specificities should be considered in the planning and implementation of EE.

The regional specificities are reflected as the large regional variation in entrepreneurship. For example, in Finland, the new enterprise rate varies largely among the regions. In Kainuu, the new enterprise rate is 50% lower than in Uusimaa (Statistics Finland, 2018) Recently, Roundy (2022) suggested that teachers' autonomy and ability to design their own work is crucial in how they are able to utilise the regional entrepreneurs and companies, in teaching entrepreneurial skills (e.g., Roundy, 2022; Yemini & Bronshtein, 2016). Based on the discussion above, we formulate hypothesis 2 as follows:

H2: A teacher's agency as reflected by his/her activity in developing EE in the region has a positive relationship with cooperation with entrepreneurs.

As entrepreneurial activity and density in the region (Davidsson & Wiklund, 1997) as well as teacher's own background may both have an effect on EE (see Ruskovaara et al., 2015b; Walter & Dohse, 2012), we include two control variables in our study: Entrepreneurial activity in the region (measured by the business density and new business rate in the region) and teacher's entrepreneurial background. Figure 1 illustrates the research model between teachers' agency and entrepreneurs' cooperation in EE.

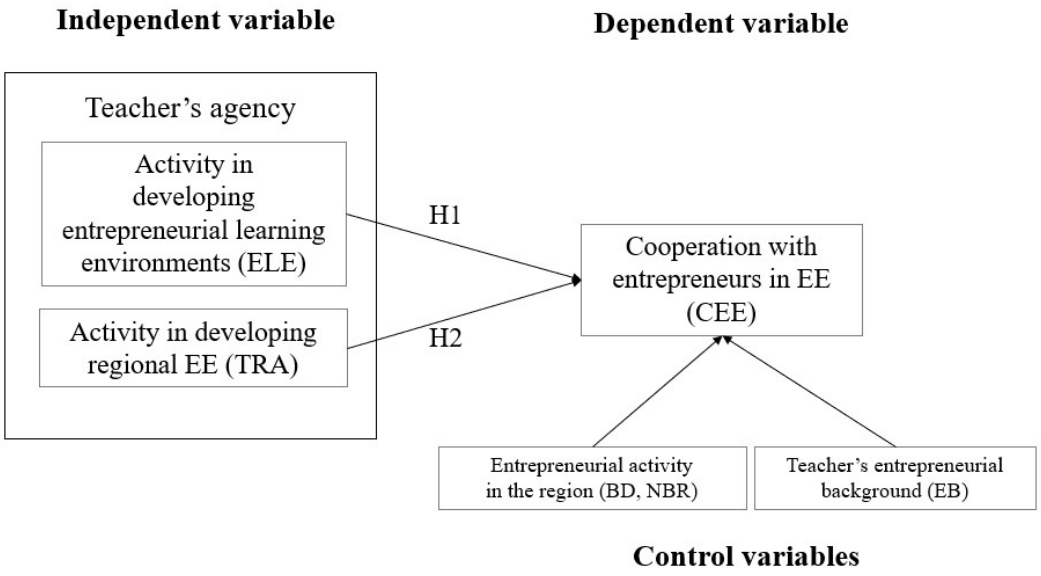

Figure 1: Research Model

4 Data and Methods

In this section, we outline the data and the methods used for conducting this research. The discussion is divided into three subsections: Context and data collection, repondents, and finally, the approach used for data analysis.

4.1 Research Context and Data Collection

This study was conducted in Finland. EE has been included in the VET qualification criteria since 1995 in Finland (Ministry of Education, 2009; Ministry of Education and Culture, 2017). The national qualification criteria are a set of rules that teachers must follow (eRequirements, n.d.), but teachers are free to plan how they teach and implement the criteria,

for example, how they collaborate with local businesses in their teaching. The teacher's own activity therefore plays an important role in the development of both teaching and cooperation. The regional development task for the institutes is defined in the Act of Vocational Education and Training 531/2017. According to Kukkonen (2018), this regional development task means that teachers should be involved in developing working life, i.e., cooperating with entrepreneurs in their field.

The data was gathered by using the Measurement Tool for Entrepreneurship Education (MTEE) (Ruskovaara et al., 2015a), which is an open online survey tailored for teachers (www.lut.fi/mittaristo). Professional networks and different entrepreneurship promoters have been helping to share the link with VET teachers, who were encouraged to respond to it voluntarily. In the survey, teachers self-evaluate their teaching, its contents and teaching practices used in EE as well their regional activity in developing EE. The survey consists of approximately 140 questions. In this study, six of the questions were examined.

4.2 Respondents

The data used in this article consists of 933 VET teachers' responses. In the data, 562 (60.2%) of the respondents were women and 371 (39.8%) were men. In Finland, 54% of vocational education teachers are women. Thus, the respondents represent the distribution relatively well. Among the fields of vocational education, engineering education is the largest in Finland (Vipunen, 2019). The respondents represent well all fields of vocational education, not only the so-called female-dominated fields. The share of teachers who had no experience as an entrepreneur was comparatively high at 58.5%. From this point of view, it seems that the data is not biased with VET teachers that are positively inclined towards entrepreneurship. Overall, the respondent profile corresponds well with the general characteristics of Finnish VET teachers, and they effectively represent all Finnish regions and all areas. Half of the respondents represent teachers from Southern Finland.

4.3 Variables, Reliability, and Validity

The MTEE survey has been carefully developed and formulated as a questionnaire together with a test group of teachers to improve the readability and clarity of the objects, and finally, tests and re-tests have ensured the tool's reliability and validity (Ruskovaara et al., 2015a). The items are based on earlier research on entrepreneurship and EE (see Table 2). Each variable in table 2 is explained more detailed and what is their theoretical background in the study. Please see more in chapter 2.

Table 2: Variables and Their Theoretical Background

Variable	Items	Source
Dependent variable		
Cooperation with entrepreneurs in EE (CEE)	Invited entrepreneurs or representatives of the business world to take part in instruction	Cooper et al., 2004; Cope, 2007; Pittaway & Solomon, 2007
	Arranged a field trip to a business enterprise	Kickul et al., 2010; Solomon, 2007
	Invited an entrepreneur to present their work	Pittaway & Hannon, 2008; Shepherd, 2004; Solomon, 2007
Independent variables		
Teachers' activity in developing entrepreneurial learning environments (ELE)	Developed learning environments that inspire creativity	Eteläpelto et al., 2013; Vähäsantanen, 2015
	Developed learning environments that encourage self-directed actions of students	
Teachers' activity in developing regional EE (TRA)	Developed competence and skills of work life in the region	van Dam et al., 2010; Dodd & Hynes, 2012; Walter & Dohse, 2012
	Developed regional curriculum in relation to entrepreneurship education	

4.3.1 Dependent Variable

The dependent variable in our study is cooperation with entrepreneurs in EE (CEE). This was measured with three items related to involvement of an entrepreneur in the implementation of teaching. Teachers were asked to evaluate how many times in the preceding six months they had implemented the following teaching practices:

CEE1: Invited an entrepreneur to participate in teaching.

CEE2: Arranged a field trip to a business enterprise.

CEE3: Invited an entrepreneur to their classroom to present their work.

The internal consistency of the scale was good. Cronbach's alpha was 0.85, which is well above the recommended cut-off value of 0.70 (Nunnally & Bernstein, 1994). All of the factor loadings were 0.80 or above, and the composite reliability was 0.86. Hair et al. (2010) recommends factor loadings greater than 0.60 and composite reliability greater than 0.70. In addition, the average variance extracted (AVE) value was 0.68, which was above the recommended value of 0.50 (Fornell & Larcker, 1981). Thus, the convergent validity was at a suitable level.

We converted the variable to indicate three levels. The first level includes teachers, who had values from 0 to 1.0 on the CEE scale. These teachers were considered to be at the 'basic level'. There were 35.9 percent basic-level teachers in our data. The second level includes teachers with values 1.1 to 5.0 on the CEE scale. These teachers were considered to be at the

'intermediary level'. There were 38.6 percent of teachers on this level in the data. The highest level includes teachers with values over 5.0 on the CEE scale. These teachers were classified to be at the 'master level'. Ultimately, 25.5 percent of the teachers in the data fell into this category.

4.3.2 Independent Variables

The independent variables in our study are teachers' activity in developing entrepreneurial learning environments and teachers' activity in developing a regional entrepreneurial ecosystem (see Table 3), which both reflect teachers' agency. We included teachers' own entrepreneurial background and entrepreneurial activity in the region as control variables in our study.

Teachers' activity in developing entrepreneurial learning environments (ELE) was measured with two items. Teachers were asked to evaluate on a scale of one to five, how actively they were involved in (1) developing learning environments that inspire creativity (ELE1), and (2) developing learning environments that encourage self-directed actions of students (ELE2). The factor loadings were above 0.80, AVE was 0.67, Cronbach's alpha 0.80, and composite reliability 0.80. Thus, the scale showed reasonable convergent reliability.

Teacher's regional activity (TRA) was measured with a sum variable that was created based on three dummy variables. The dummy variables were:

1) Has the teacher developed competence and skills of work life in the region? (Yes/No)

2) Has the teacher developed a regional curriculum in relation to entrepreneurship education? (Yes/No)

3) Has the teacher developed a regional plan for entrepreneurship education? (Yes/No)

The final scale had values ranging from zero (all three items "no") to three (all three items "yes").

4.3.3 Control Variables

Entrepreneurial background was operationalised as zero for teachers with no entrepreneurial background and one for teachers with entrepreneurial background. Regional entrepreneurial activity was measured with two independent variables: Business density in the region (the number of companies/the number of inhabitants) and new business rate in the region (the number of new companies/the number of companies).

The discriminant validity of the scales was examined with average shared variance and maximum shared variance. As both values were smaller than the average variance extracted (see Hair et al., 2010), we concluded that the discriminant validity was good.

Table 3 presents the minimum and maximum values, mean values, and standard deviations of the original scales. For performing ordinal regression analysis in the next phase, all the scale values were standardised. Table 3 includes the correlations of the scales.

Table 3: Descriptive Statistics of the Scales and Correlations

	Min/Max	Mean	SD	1	2	3	4	5
1. CEE	1.0/3.0	1.89	0.78	1				
2. BD	0.06/0.09	0.07	0.01	-0.03	1			
3. NBR	0.05/0.12	0.09	0.02	-0.02	-0.411***	1		
4. ELE	0.0/4.0	2.40	0.89	0.33***	-0.046	0.02	1	
5. TRA	0.0/3.0	1.31	0.93	0.269***	0.040	-0.07*	0.32***	1
6. EB	0.0/1.0	0.41	0.49	0.07*	0.01	-0.06	0.16***	0.18***

Note: CEE=Cooperation with entrepreneurs in EE, BD=Business density, NBR=New business rate, ELE=Teacher's activity in developing entrepreneurial learning environments, TRA=Teacher's regional activity, and EB=Teacher's entrepreneurial background; *p<0.05; ***p<0.001

5 Results

We used ordinal regression analysis to examine (H1): *A teacher's agency reflected by his/her activity of developing entrepreneurial learning environments has a positive relationship with his/her cooperation with entrepreneurs*. With the same analysis we tested (H2): *A teacher's agency reflected by his/her activity in developing EE in the region has a positive relationship with cooperation with entrepreneurs*. There were three levels of CEE: The basic level, the intermediary level, and the master level. The control variables were regional entrepreneurial activity measured by business density and new business rate and the teacher's entrepreneurial background.

The proportional odds (PO) model was used. There are some assumptions for using the model. The dependent variable should be measured on an ordinal level, and independent variables should be measured on either the continuous, categorical, or ordinal level. There should be no multi-collinearity, and the assumption of proportional odds should be met (i.e., the effects of any explanatory variables are consistent or proportional across the different thresholds). The first two assumptions were met. For checking possible multicollinearity, we analysed variance inflation factors (VIF). All the VIF values were below 10 (from 1.0 to 1.2), which indicates no multicollinearity. The assumption of proportional odds was examined

with the test of parallel lines. It produced a non-significant p-value of 0.96. Hence, all the four assumptions for performing ordinal regression analysis were met.

Hypothesis 1: Ordinal regression analysis shows that the teacher's agency reflected by activity in developing entrepreneurial learning environments has a significant positive relationship with his/her level of CEE (Wald 63.656, $p < 0.001$). The more active the teacher is, the higher his/her level of CEE.

Hypothesis 2: The same applies to the teacher's agency reflected by regional activity (Wald 33.949, $p < 0.001$); his/her activity in regional development has a significant positive relationship with his/her level of CEE. The higher the teacher's activity in developing the regional entrepreneurial ecosystem, the higher his/her level of CEE. Hypotheses one and two are thus both supported.

Control variables: Entrepreneurial activity in the region does not explain the teacher's level of CEE. Neither business density nor new business rate have statistical value in the model. In addition, the teacher's entrepreneurial background has no statistical value in the model.

The fit for the model is strong (Chi-square 149.746, $p < 0.001$). Non-significant values of Pearson and deviance also indicate a good fit. The Pseudo R-Square value of Nagelkerke is 0.18.

In summary, the main result of our study is that the teacher's agency in EE has a positive and a direct effect on cooperation with entrepreneurs. This agency is reflected by the teacher's activity in developing learning environments in their school, and by the teacher's activity in developing regional EE plans, skills, and curriculum. Thus, the teacher's agency is a significant factor explaining the teacher's activity in cooperating with entrepreneurs; the stronger the agency, more likely the teacher uses entrepreneurs actively in his/her teaching.

6 Discussion

Our study focused on the research question of how the VET teacher's agency in EE affects cooperation with entrepreneurs. We used the agency theory to understand how the teacher's activity affects cooperating with entrepreneurs in the region. By doing so, we wanted to provide understanding on the factors behind activity regarding cooperation. We stated two hypotheses 1) A teacher's agency reflected by his/her activity of developing entrepreneurial learning environments has a positive relationship to the cooperation with entrepreneurs, and 2) A teacher's agency reflected by his/her activity in developing EE in the region has a positive relationship with his/her cooperation with entrepreneurs. Both hypotheses were supported.

There are two important points to consider regarding the research results. First, based on earlier research, the entrepreneurial activity of students and the entrepreneurship of the region can be helped by using active teaching methods in a real-life learning environment (Birdthistle et al., 2016; Cooper et al., 2004; Kickul et al., 2010; Seikkula-Leino et al., 2010;

Sommarström et al., 2017). Our results suggest that the teacher needs to have the option of expressing his/her agency and acting accordingly. This activity empowers them as agents of their own work (Eteläpelto et al, 2013; Molla & Nolan, 2020).

These results imply that if the goal is to get companies more actively involved in the implementation of VET and EE, the teacher must be given time and encouraged to cooperate with entrepreneurs. Peers and management are likely to have an important role in encouraging the teacher in their entrepreneurial tasks (Joensuu-Salo et al., 2023; Slemp et al., 2020; Sommarström, 2022).

Second, our research results show that the more opportunities the teacher is given to develop EE, the more he/she utilises the companies and entrepreneurs of the region in his/her work. Exploiting his/her agency, the teacher assumes responsibility for his/her work and seeks relevant partners for cooperation in the implementation of EE. The teacher's agency can promote the active involvement of the teacher as a part of the world around the school and the construction of learning environments.

Our study shows that the teacher's agency is a relevant concept that guides them in their implementation of EE. This is important as the teacher's unwillingness or inability to carry out the EE curricula is one of the most striking puzzles within EE research (Seikkula-Leino et al., 2012). The teacher's agency, in this case active development in EE, has a positive relationship with cooperation with entrepreneurs. This suggests that supporting teacher autonomy and encouraging entrepreneurial activity are key elements in boosting the teacher's activity in a local context (e.g., van Dam et al., 2010; Slemp et al., 2020).

As we stated earlier, agency is a necessity for autonomy (Hunter & Cooke, 2007). Concerning this article's research context, previous research has stated that in Finland, teachers' autonomy is high (Erss & Kalmus, 2018). According to Vähäsantanen et al. (2017), teachers in Finland have the freedom to utilise their agency in many ways. They can, for example, make their own decisions and renew their teaching. Contrary to previous research results, the activity of cooperation with companies it is not related to the teacher's own entrepreneurial background (Ruskovaara & Pihkala, 2015) or the number of companies in the area (Davidsson & Wiklund, 1997), nor the autonomy of the teachers (Hunter & Cooke, 2007; Ryan & Deci, 2000; Slemp et al., 2020; Sommarström et al., 2021; Vangrieken et al., 2017; Vähäsantanen, 2015). Instead, based on our results, this is more likely a question of the teacher's agency that needs to be developed and given the possibility to act accordingly. Subsequently, the teacher's autonomy is not sufficient; agency is also needed.

Educational authorities have maintained that wider cooperation with entrepreneurs is needed in VET if entrepreneurship in society is to be increased (Ministry of Education, 2009; Ministry of Education and Culture, 2017). Following this, the teacher must be given the opportunity to utilise their agency and the power to decide where, how and with whom they implement EE. According to our research, the teacher's cooperation activities with

entrepreneurs are improved by the fact that they have the opportunity to develop learning environments that promote entrepreneurship and the opportunity to participate in the development of EE in their school and region.

The results of our research show that when the teacher gets to influence his/her own work, and he/she has the opportunity to develop learning environments, the curriculum and the activities of his/her region, business cooperation and agency are also strengthened (see Vähäsantanen et al., 2017). It seems that it is a question of management and increasing the teacher's motivation to engage in cooperation outside the school environment (Joensuu-Salo et al., 2023; Slemp et al., 2020; Sommarström et al., 2020). In addition, teacher identity needs to be re-examined (Vähäsantanen et al., 2017).

Finally, this raises the question how we train VET teachers for this cooperation task and what kind of teacher identity teacher training strengthens. It is evident that cooperation networks are highly important for teachers implementing EE in VET institutions (Hievanen et al., 2022; Kunnari et al., 2021; Sommarström et al., 2017; Tapani & Salonen, 2019).

7 Limitations and Suggestions for Further Research

This study has some limitations. First, the data was gathered from only one country. In Finland, teachers are free to make choices and independent decisions if they want to cooperate with entrepreneurs and to implement EE. The teacher is free to use their autonomy and act, i.e., implement agency. This may have affected the generalisability of the results of the study. However, the teachers' agency and the factors behind it are the topics of wider interest and of interest to international readers. Second, our study builds on a dataset with fewer than one thousand respondents. As the empirical research on the relationship between teacher autonomy, agency and EE is sparse, we suggest that wider quantitative studies are required to observe the mechanisms related to the factors explaining and creating the VET teacher's agency as an entrepreneurship educator. Also, the management involvement effect on the teacher's autonomy, agency, and activity warrants more careful analysis. As far as we know there are no studies on the role of VET management in EE although they are likely to be highly relevant. The first studies concerning management have recently been published, and they deal with basic education and higher education (see Joensuu-Salo et al., 2023; Sommarström et al., 2020). In addition, it is very interesting that according to this study neither the teacher's own entrepreneurial background nor the volume of entrepreneurs in the region are significant regarding how actively the teacher uses companies in his/her teaching. In other words, if the cooperation with companies needs to be enhanced in VET schools the solution is not to recruit teachers with an entrepreneurial background but instead to support the agency of the teachers. Future research should concentrate on the factors that promote the teacher's active engagement with the world outside the school.

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Ethics Statement

This paper did not require approval by an ethics committee. For data collection, the Measurement Tool for Entrepreneurship Education (MTEE) was used. MTEE is an online survey accessible at www.lut.fi/mittaristo, which remains open at all times. Finnish VET teachers participated in the survey voluntarily by providing their responses.The ethical principles in accordance with the IJRVET Ethics Statement were implemented.

References

Andersson, P., & Köpsén, S. (2019). VET teachers between school and working life: Boundary processes enabling continuing professional development. *Journal of Education and Work*, *32*(6–7), 537–551. https://doi.org/10.1080/13639080.2019.1673888

Bandera, C., Eminet, A., Passerini, K., & Pon, K. (2018). Using mind maps to distinguish cultural norms between French and United States entrepreneurship students. *Journal of Small Business Management*, *56*(S1), 177–196. https://doi.org/10.1111/jsbm.12398

Bandura, A. (2006). Toward a psychology of human agency. *Perspectives on Psychological Science*, *1*(2), 164–180. https://doi.org/10.1111/j.1745-6916.2006.00011.x

Beijaard, D., Meijer, P. C., & Verloop, N. (2004). Reconsidering research on teachers' professional identity. *Teaching and teacher education*, *20*(2), 107–128. https://doi.org/10.1016/j.tate.2003.07.001

Birdthistle, N., Costin, Y., & Hynes, B. (2016). Engendering entrepreneurial competencies in the youth of today: A teacher's perspective. *Education + Training*, *58*(7/8), 766–782. https://doi.org/10.1108/ET-02-2016-0031

Brennan Kemmis, R., & Green, A. (2013). Vocational education and training teachers' conceptions of their pedagogy. *International Journal of Training Research*, *11*(2), 101–121. https://doi.org/10.5172/ijtr.2013.11.2.101

Cooper, S., Bottomley, C., & Gordon, J. (2004). Stepping out of the classroom and up the ladder of learning: An experiential learning approach to entrepreneurship education. *Industry and Higher education*, *18*(1), 11–22. https://doi.org/10.5367/000000004773040924

van Dam, K., Schipper, M., & Runhaar, P. (2010). Developing a competency-based framework for teachers' entrepreneurial behaviour. *Teaching and Teacher Education*, *26*(4), 965–971. https://doi.org/10.1016/j.tate.2009.10.038

Davidsson, P., & Wiklund, J. (1997). Values, beliefs and regional variations in new firm formation rates. *Journal of Economic Psychology*, *18*(2–3), 179–199. https://doi.org/10.1016/S0167-4870(97)00004-4

Dodd, S., & Hynes, B.C. (2012). The impact of regional entrepreneurial contexts upon enterprise education. *Entrepreneurship & Regional Development*, *24*(9–10), 741–766. https://doi.org/10.1080/08985626.2011.566376

Emirbayer, M., & Mische, A. (1998). What is agency? *American Journal of Sociology*, *103*(4), 962–1023. https://doi.org/10.1086/231294

eRequirements. (n.d.). *Vocational education*. https://eperusteet.opintopolku.fi/#/en/selaus/ammatillinen (accessed October 15, 2022).

Erss, M., & Kalmus, V. (2018). Discourses of teacher autonomy and the role of teachers in Estonian, Finnish and Bavarian teachers' newspapers in 1991–2010. *Teaching and Teacher Education*, *76*, 95–105. https://doi.org/10.1016/j.tate.2018.08.003

Eteläpelto, A. (2008). Perspectives, prospects and progress in work-related learning. In S. Billett, C. Harteis & A. Eteläpelto (Eds.), *Emerging perspectives of workplace learning* (pp. 233–247). Brill. https://doi.org/10.1163/9789087906450_016

Eteläpelto, A., Vähäsantanen, K., Hökkä, P., & Paloniemi, S. (2013). What is agency? Conceptualizing professional agency at work. *Educational research review*, *10*, 45–65. https://doi.org/10.1016/j.edurev.2013.05.001

Ettis, S. A. (2022). How do personal values help to build generation Y's entrepreneurial intentions? The role of gender differences. *Gender in Management: An International Journal*, *37*(1), 108–125. https://doi.org/10.1108/GM-02-2021-0035

Farnsworth, V., & Higham, J. (2012). Teachers who teach their practice: The modulation of hybridised professional teacher identities in work-related educational programmes in Canada. *Journal of Education and Work*, *25*(4), 473–505. https://doi.org/10.1080/13639080.2012.708726

Fayolle, A., & Gailly, B. (2008). From craft to science: Teaching models and learning processes in entrepreneurship education. *Journal of European industrial training*, *32*(7), 569–593. https://doi.org/10.1108/03090590810899838

Fejes, A., Nylund, M., & Wallin, J. (2019). How teachers interpret and transform entrepreneurship education? *Journal of Curriculum studies*, *51*(4), 554–566.

Fillis, I., & Rentschler, R. (2010). The role of creativity in entrepreneurship. *Journal of enterprising culture*, *18*(01), 49–81.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Galvão, A., Ferraira, J. J., & Marques, C. (2017). Entrepreneurship education and training as facilitators of regional development. A Systematic literature review. *Journal of Small Business and Enterprise Development*, *25*(1), 17–40. https://doi.org/10.1108/JSBED-05-2017-0178

Galvão, A., Marques, C., Ferreira, J., & Braga, V. (2020). Stakeholders' role in entrepreneurship education and training programmes with impacts on regional development. *Journal of Rural Studies*, *74*, 169–179. https://doi.org/10.1016/j.jrurstud.2020.01.013

Haase, H., & Lautenschläger, A. (2011). The 'teachability dilemma' of entrepreneurship. *International entrepreneurship and management journal*, *7*(2), 145–162. https://doi.org/10.1007/s11365-010-0150-3

Hadar, L. L., & Benish-Weisman, M. (2019). Teachers' agency: Do their values make a difference? *British Educational Research Journal*, *45*(1), 137–160. https://doi.org/10.1002/berj.3489

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate data analysis (7th ed.). Pearson.

Hardie, B., Highfield, C., & Lee, K. (2022). Attitudes and values of teachers and leaders towards entrepreneurship education. *Research Papers in Education*, *38*(4), 1–25. https://doi.org/10.1080/02671522.2022.2028891

Hargreaves, A. (2000). Four ages of professionalism and professional learning. *Teachers and teaching*, *6*(2), 151–182. http://doi.org/10.1080/713698714

Hievanen, R., Kilpeläinen, P., Huhtanen, M., Tuurnas, A., Loukusa, V., Pylväs, L., Rasinaho, K., Taakala, J., Tujula, M., & Vieltojärvi, M. (2022). *Kumppanina työelämä. Arviointi työelämässä oppimisesta ja työelämäyhteistyöstä ammatillisessa koulutuksessa*. [Partnering with working life – Evaluation of workplace education and training and working life cooperation in vocational education and training]. Kansallisen koulutuksen arviointikeskus, KARVI Julkaisut 23:2022. https://karvi.fi/wp-content/uploads/2022/09/Kumppanina-tyoelama-Arviointi-tyoelamassa-oppimisesta-ja-tyoelamayhteistyosta-ammatillisessa-koulutuksessa.pdf

Hunter, J., & Cooke, D. (2007). Through autonomy to agency: Giving power to language learners. *Prospect*, *22*(2), 72–88.

Huusko, M., Vettenniemi, J., Hievanen R., Tuurnas, A., Hietala, R., Kolhinen, J., & Ruskovaara, E. (2018). Yrittämään oppii yrittämällä. Yrittäjyys ammatillisessa koulutuksessa ja korkeakouluissa -arviointi. [You learn to try by trying. Evaluation of entrepreneurship in vocational education and higher education]. Kansallisen koulutuksen arviointikeskus, KARVI Julkaisut 25:2018. https://karvi.fi/publication/yrittamaan-oppii-yrittamalla-yrittajyys-ammatillisessa-koulutuksessa-ja-korkeakouluissa-arviointi-2/

Hökkä, P., Paloniemi, S., Vähäsantanen, K., Herranen, S., Manninen, M., & Eteläpelto, A. (2014). *Ammatillisen toimijuuden ja työssä oppimisen vahvistaminen: Luovia voimavaroja työhön*!. University of Jyväskylä. http://urn.fi/URN:ISBN:978-951-39-6020-9

Joensuu-Salo, S., Peltonen, K., & Hämäläinen, M. (2023). The importance of HEI managerial practices in teachers' competence in implementing entrepreneurship education: Evidence from Finland. *The International Journal of Management Education*, 100767. https://doi.org/10.1016/j.ijme.2023.100767

Järvi, T. (2012). Teaching entrepreneurship in vocational education viewed from the regional and field perspectives. *Journal of Vocational Education & Training*, *64*(3), 365–377. https://doi.org/10.1080/13636820.2012.691538

Kickul, J., Griffiths, M., & Bacq, S. (2010). The boundary-less classroom: Extending social innovation and impact learning to the field. *Journal of Small Business and Enterprise Development*, *17*(4), 652–663. https://doi.org/10.1108/14626001011088787

Kolho, P., Oikkonen, E., & Pihkala, T. (2022). Entrepreneurship education practices in VET: The roles of the teacher and the local region. *Nordic Journal of Vocational Education and Training*, *12*(2), 50–74. https://doi.org/10.3384/njvet.2242-458X.2212250

Kotey, B. (2006). Entrepreneurship and regional development: A theoretical framework. *Small Enterprise Research*, *14*(2), 20–45. https://doi.org/10.5172/ser.14.2.20

Kukkonen, H. (2018). Osaamisperusteisuus ja opettajan identiteetti. [Teacher identity positions in competency-based education]. In H. Kukkonen and A. Raudasoja (Eds.), *Osaaminen esiin – am-*

matillisen koulutuksen reformi ja osaamisperusteisuus (pp. 24–35). Tampere: Tampereen ammattikorkeakoulun julkaisuja. http://www.tamk.fi/-/julkaisu-osaaminen-esiin

Kunnari, I., Tuomela, V., & Jussila, J. (2021). Teacher-facilitators' job-crafting: Making meaning and relevance in authentic learning environments. *International Journal of Management, Knowledge and Learning*, *10*, 115–126. http://doi.org/10.53615/2232-5697.10.115-126

Lindh, I. & Thorgren, S. (2016). Entrepreneurship education: The role of local business. *Entrepreneurship and regional development*, *28*(5-6), 313–336. https://doi.org/10.1080/08985626.2015.1134678

McNay, L. (2004). Agency and experience: Gender as a lived relation. *The Sociological Review*, *52*(2), 173–190. https://doi.org/10.1111/j.1467-954X.2005.00530.x

Ministry of Education. (2009). *Guidelines for entrepreneurship education*. https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/78871/opm09.pdf?sequence=1 (accessed October 15, 2022)

Ministry of Education and Culture. (2017). *Guidelines for entrepreneurship education 2017*. https://okm.fi/documents/1410845/4363643/Entrepreneurship-for-Education-Guidelines.pdf (accessed October 15, 2022)

Molla, T., & Nolan, A. (2020). Teacher agency and professional practice. *Teachers and Teaching*, *26*(1), 67–87. https://doi.org/10.1080/13540602.2020.1740196

Mårtensson, Å., Andersson, P., & Nyström, S. (2019). A recruiter, a matchmaker, a firefighter: Swedish vocational teachers' relational work. *Nordic Journal of Vocational Education and Training*, *9*(1), 89–110. https://doi.org/10.3384/njvet.2242-458X.199189

Nabi, G., & Liñán, F (2011). Graduate entrepreneurship in the developing world: Intentions, Education and Development. *Education+ Training*, *53*(5), 325–334. https://doi.org/10.1108/00400911111147668

Nunnally, J. C., & Bernstein, I. H. (1994). The Assessment of Reliability. McGraw-Hill.

Oksanen-Ylikoski, E., & Ylikoski, T. (2015). Tensions in creating an innovative community of vocational education and entrepreneurship. *International Journal of Innovation, Creativity and Change*, *2*(2), 76–82. https://urn.fi/URN:NBN:fi:amk-202202182622

Pittaway, L., & Cope, J. (2007). Entrepreneurship education: A systematic review of the evidence. *International Small Business Journal: Researching Entrepreneurship*, *25*(5), 479–510. https://doi.org/10.1177/0266242607080656

Pittaway, L., & Hannon, P. (2008). Institutional strategies for developing enterprise education: A review of some concepts and models. *Journal of Small Business and Enterprise Development*, *15*(1), 202–226. https://doi.org/10.1108/14626000810850937

Puustinen, M., Säntti, J., & Simola, H. (2022). Five decades of persistent decontextualisation of academic teacher education in Finland. *International Journal of Educational Research*, *116*, 102053. https://doi.org/10.1016/j.ijer.2022.102053

Roundy, P. (2022). Teacher entrepreneurial ecosystems: How local communities support teacher entrepreneurs. *Entrepreneurship Education and Pedagogy*, *5*(4), 627–657. https://doi.org/10.1177/25151274211069032

Ruskovaara, E., & Pihkala, T. (2013). Teachers implementing entrepreneurship education: Classroom practices. *Education+ Training*, *55*(2), 204–216. https://doi.org/10.1108/00400911311304832

Ruskovaara, E., & Pihkala, T. (2015). Entrepreneurship education in schools: Empirical evidence on the teacher's role. *The Journal of Educational Research*, *108*, 236–249. https://doi.org/10.1080/00220671.2013.878301

Ruskovaara, E., Pihkala, T., Seikkula-Leino, J., & Rytkölä, T. (2015a). Creating a measurement tool for entrepreneurship education: A participatory development approach. In A. Fayolle, P. Kyrö & F. Liñán (Eds.), *Entrepreneurship Research in Europe Series* (pp. 40–59). Edward Elgar Publishing.

Ruskovaara, E., Pihkala, T., Seikkula-Leino, J., & Järvinen, M. R. (2015b). Broadening the resource base for entrepreneurship education through teachers' networking activities. *Teaching and Teacher Education*, *47*, 62–70. https://doi.org/10.1016/j.tate.2014.12.008

Ryan R. M., & Deci E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*(1), 68–78. https://selfdeterminationtheory.org/SDT/documents/2000_RyanDeci_SDT.pdf

Sandirasegarane, S., Sutermaster, S., Gill, A., Volz, J., & Mehta, K. (2016). Driven entrepreneurial education in vocational schools. *International journal for research in vocational education and training*, *3*(2), 106–126. https://doi.org/10.25656/01:12390

Seikkula-Leino, J., Ruskovaara, E., Hannula, H., & Saarivirta, T. (2012). Facing the changing demands of Europe: Integrating entrepreneurship education in Finnish teacher training curricula. *European Educational Research Journal*, *11*(3), 382–399. https://doi.org/10.2304/eerj.2012.11.3.382

Seikkula-Leino, J., Ruskovaara, E., Ikävalko, M., Mattila, J., & Rytkölä, T. (2010). Promoting entrepreneurship education: the role of the teacher? *Education + Training*, *52*(2), 117–127. https://doi.org/10.1108/00400911011027716

Shepherd, D. A. (2004). Educating entrepreneurship students about emotion and learning from failure. *Academy of Management Learning & Education*, *3*(3), 274–287.

Slemp, G. R., Field, J. G., & Cho, A. S. (2020). A meta-analysis of autonomous and controlled forms of teacher motivation. *Journal of Vocational Behavior*, *121*, 103459. https://doi.org/10.1016/j.jvb.2020.103459

Solomon, G. (2007). An examination of entrepreneurship education in the United States. *Journal of Small Business and Enterprise Development*, *14*(2), 168–182. https://doi.org/10.1108/14626000710746637

Sommarström, K. (2022). Teachers' practices of entrepreneurship education in cooperation with companies (Doctoral dissertation, Lappeenranta-Lahti University of Technology LUT, Finland). https://lutpub.lut.fi/handle/10024/163763

Sommarström, K., Oikkonen, E., & Pihkala, T. (2020). Entrepreneurship education–paradoxes in school–company interaction. *Education + Training*, *62*(7/8), 933–945. https://doi.org/10.1108/ET-08-2019-0171

Sommarström, K., Oikkonen, E., & Pihkala, T. (2021). The school and the teacher autonomy in the implementing process of entrepreneurship education curricula. *Education Sciences*, *11*(5), 215. https://doi.org/10.3390/educsci11050215

Sommarström, K., Ruskovaara, E., & Pihkala, T. (2017). Company visits as an opportunity for entrepreneurial learning. *Journal for International Business and Entrepreneurship Development*, *10*(3), 298–315. https://doi.org/10.1504/JIBED.2017.085505

Stadler, A., & Smith, A. M. (2017). Entrepreneurship in vocational education: A case study of the Brazilian context. *Industry and Higher Education*, *31*(2), 81–89. https://doi.org/10.1177/0950422217693963

Statistics Finland. (2018). Yritykset. https://stat.fi/en/topic/enterprises (accessed February 20, 2022)

Tan, C., & Ng, P. T. (2012). A critical reflection of teacher professionalism in Cambodia. *Asian Education and Development Studies*, *1*(2), 124–138. https://doi.org/10.1108/20463161211240106

Tapani, A., & Salonen, A. O. (2019). Identifying teachers' competencies in Finnish vocational education. *International journal for research in vocational education and training*, *6*(3), 243–260. https://doi.org/10.13152/IJRVET.6.3.3

Teng, F. (2019). Understanding teacher autonomy, teacher agency, and teacher identity: Voices from four EFL student teachers. *English Teaching & Learning*, *43*(2), 189–212. https://doi.org/10.1007/s42321-019-00024-3

Thomassen, M. L., Williams Middleton, K., Ramsgaard, M. B., Neergaard, H., & Warren, L. (2020). Conceptualizing context in entrepreneurship education: A literature review. *International Journal of Entrepreneurial Behavior & Research*, *26*(5), 863–886. https://doi.org/10.1108/IJEBR-04-2018-0258

Unwin, L. (2008). Shaping teaching and learning in TVET. In F. Rauner, R. Maclean & N. C. Boreham (Eds.), *Handbook of technical and vocational education and training research*. Springer.

Vangrieken, K., Grosemans, I., Dochy, F., & Kyndt, E. (2017). Teacher autonomy and collaboration: A paradox? Conceptualising and measuring teachers' autonomy and collaborative attitude. *Teaching and Teacher Education*, *67*, 302–315. https://doi.org/10.1016/j.tate.2017.06.021

Vipunen. (2019). *Education Statistics Finland*. https://vipunen.fi/fi-fi/_layouts/15/xlviewer.aspx?id=/fi-fi/Raportit/Opettajatiedot%20-%20yhteinen%20-%20kelpoisuus%20-%20sukupuoli.xlsb (accessed January 29, 2023)

Vocational Education and Training Act 531/2017. https://www.finlex.fi/fi/laki/ajantasa/2017/20170531 (accessed January 29, 2023)

Vähäsantanen, K. (2015). Professional agency in the stream of change: Understanding educational change and teachers' professional identities. *Teaching and teacher education*, *47*, 1–12. https://doi.org/10.1016/j.tate.2014.11.006

Vähäsantanen, K., Paloniemi S., Hökkä, P., & Eteläpelto, A. (2017). Ammatillinen toimijuus. Rakenne, mittari ja tuki. University of Jyväskylä. https://jyx.jyu.fi/handle/123456789/53149

Vähäsantanen, K., Saarinen, J., & Eteläpelto, A. (2009). Between school and working life: Vocational teachers' agency in boundary-crossing settings. *International journal of educational research*, *48*(6), 395–404. https://doi.org/10.1016/j.ijer.2010.04.003

Walter, S. G., & Dohse, D. (2012). Why mode and regional context matter for entrepreneurship education. *Entrepreneurship & Regional Development*, *24*(9–10), 807–835. https://doi.org/10.1080/08985626.2012.721009

Yemini, M., & Bronshtein, Y. (2016). The global–local negotiation: Between the official and the implemented history curriculum in Israeli classrooms. *Globalisation, Societies and Education*, *14*(3), 345–357. https://doi.org/10.1080/14767724.2015.1123086

Zaťková, T. Š., & Ambrozy, M. (2019). VET teacher preparation in Slovakia and the new professionals–entrepreneurship trainers for VET. *TEM Journal*, *8*(1), 248–254. https://doi.org/10.18421/TEM81-35

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Challenges, Future and Policy Orientations: The 1960s–1970s as Decisive Years for Swiss Vocational Education and Training

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Abstract

Purpose: The years 1960-1970 were decisive years in the development of Swiss vocational education and training (VET). The post-World War II economic boom, technological innovations and the debate concerning equal opportunities and the democratisation of education put the VET system under pressure. Reforms were thus undertaken to increase the attractiveness of the system and to respond to the shortage of qualified workers at the time. At the same time, reforms were adopted increasing the theoretical and general knowledge content of VET and improving the quality of training. The aim of our article is to describe these reforms and to show how they relate to a certain image of the future of society.

Method: Our article is based on an analysis of historical documents written between 1962 and 1972 in Switzerland on the subject of VET. These documents will, firstly, be used for a historical reconstruction of the situation and of the major challenges of the time; and secondly, they will be subjected to a discourse analysis in order to identify the main arguments that characterised the public debate at the time.

Results: Our article shows how the reforms undertaken take shape on the basis of a certain image of the future of society and of VET held at the time: An image characterised by constant and rapid changes, increasing insecurity, need for adaptation and flexibility, complexification and specialisation of work tasks.

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Conclusion: The article will also underline how the responses to the challenges posed by this image of the future will be at the origin of new VET policy orientations that will characterise the evolution of Swiss VET up to the present day: A trend towards *academisation*, with more academic and general content; a trend towards *pedagogisation*, with increased pedagogical attention to curricula and teacher training; *differentiation*, with the creation of new certifications; permeability, with the opening of vocational tracks to higher education; and *"learnerisation"*, with the gradual change of the figure of the apprentice from a "worker" to a "learner". Far from being limited to the evolution of Swiss VET, these five orientations describe movements that recent studies show also at the European level.

Keywords: VET, Vocational Education and Training, History of VET System, 1960s and 1970s, Future, Swiss, Policy Orientations

1 Introduction

The evolution of vocational education and training (VET) institutions is often characterized as a steady flow of small reforms, some kind of a slow evolution or "incremental change" (Streeck & Thelen, 2005). However, when reading historical reconstructions of national VET systems, we sometimes come across expressions such as "decisive years", "pivotal years" and "turning points". Expressions that emphasize how certain historical periods or even moments appear to be particularly important for the evolution of these systems. Historical institutionalism has recently brought into play the notion of "critical junctures" (Busemeyer & Trampusch, 2012; Mahoney, 2000; Pierson, 2000; Streeck & Thelen, 2005). This notion emphasises the decisive character of a given slot of time for the understanding of the evolution of institutions.

Our paper[1] will concentrate on the period 1960-1970, one of these decisive periods in the development of VET systems in western countries (see e.g., Busemeyer &Trampusch, 2012). During this period, many countries were launching reforms of their VET systems in response to the new socio-economic conditions after the Second World War. This movement of reforms was also at the origin of the first attempts to develop a European VET policy, culminating with the foundation of CEDEFOP in 1975 (cf. CEDEFOP, 2004). This paper, however, will focus on the Swiss case, where these years correspond to the post-war economic boom and the high point of the so-called "educational expansion". Even if several studies have already been able to reconstruct the evolution of the Swiss education system in this period (cf.

1 This paper is based on a research project funded by the Swiss National Science Foundation, PN 100019_179203. "The Evolution of VET in Switzerland Between Federal Framework and Cantonal Specificities", in which Lorenzo Bonoli, Philipp Gonon, Jackie Vorpe and Lena Freidorfer participated. The outlines of this paper were presented at the Congress « The Future Potential of Vocational Education and Training: Strengthening VET for the Next Generation » 2-4 February 2022, organized at the Swiss Federal University of Vocational Education and Training, online. We thank Thomas Ruoss and Jackie Vorpe for their comments on an earlier draft of the article.

Bonoli & Vorpe, 2022; Büchel, 2018; Criblez, 2001; Gonon, 2018; Gonon & Zehnder, 2016; Zehnder & Gonon, 2017), in-depth analyses of the impact of this period on the development of the Swiss VET system up to the present day are still lacking.

The main aims of our article are threefold. The first aim is to confirm the importance of this historical period for the development of Swiss VET, by identifying debates and concrete measures adopted at that time that still characterise the field today.

The second aim of our article is to analyse in depth these debates and concrete measures in order to better understand how they are rooted in the challenges of the time and to explain the exact conditions of their emergence. This analysis will, on the one hand, pay particular attention to how these debates and concrete measures referred to and were based on a specific representation of the future of society and of VET of the time. On the other hand, our analysis will lead us to identify, within these same debates and concrete measures, five new orientations in VET policy emerging during these years as a response to that representation of the future. As will be seen later, these five orientations are academisation, pedagogisation, differentiation, permeability and, to use a neologism, "learnerisation". While these orientations can be read primarily as reactions to the challenges of the time, they also offer a set of analytical tools to better understand the reforms to come up to the present day.

Trends towards *academisation, pedagogisation, differentiation or permeability* have already been identified in the literature (see Criblez, 2001, 2002; Gonon 2008, 2018). In this respect, the originality of our contribution is therefore an in-depth investigation of the origins of these trends, showing how these VET policy orientations emerge from the debates of the time as interconnected responses to socio-economic challenges linked to a certain image of the future of society and the role of VET: An image characterised by constant and rapid changes, increasing insecurity, need for adaptation, complexification and specialisation of work tasks, plus an increasing need for mobility and flexibility. In addition, our analysis identifies a fifth orientation towards *"learnerisation"*, which can be briefly described as the progressive shift of the figure of the apprentice from a *worker* figure to a *learner* figure. This orientation has so far been little addressed[2] but has emerged as an important trend in our research[3].

Directly related to the definition of these five trends, the third aim of our article is to propose general categories that could contribute to constituting a theoretical frame supporting further research at the international level. In this perspective, these five orientations have to be considered as analytical tools to describe and analyse the evolution of VET systems at the international level. They should be considered in relation to the few existing studies attempting to develop a historical comparative analysis, as for example the vast CEDEFOP project on "future scenarios" of VET in Europe (CEDEFOP, 2020). Even though based on different theoretical and methodological bases, the CEDEFOP studies identify some analogous tendencies

2 With the exception of the studies of Bonoli (2017) and Berner (2019).

3 Cf. in particular the PhD of Lena Freidorfer (2022), based on the same SNF project as our article.

on the evolution of the European VET system. This convergence of our analysis with the CEDEFOP analysis suggests the possibility of a generalisation of these five tendencies from the Swiss case to a broader international context.

As mentioned above, particular attention will be paid to the "representations of the future" that we find in the sources of the time[4]. An analysis of past reforms and historical trends cannot avoid dealing with this question: Any reform, when proposed, defended and adopted, inevitably refers to a representation of the future, which justifies it and makes it indispensable in the eyes of its proponents. This perspective helps us to better understand the perceived challenges of the time and the expectations regarding the measures proposed. At the same time, this perspective helps us to identify the five orientations mentioned above, which can be considered as interpretative lines rooted in the past, confirmed in the present and opening up towards the future.

In other words, our background questions will be the following: What images does the future take on in the debates of this period in the domain of VET? What measures are proposed and adopted based on these images? Can we identify general orientations in VET policy that guide the adoption of these measures and what impact do these orientations have up to the present day?

2 Theoretical and Methodological Approach

In order to find answers to these questions, we set up a research framework based on a *multidimensional* and *systemic* approach, which, on the one hand, focuses its attention on the widest possible range of factors describing the functioning of VET, such as economic, educational, social and political factors, and, on the other hand, refers to a perspective that underlines the articulation of these factors in an interconnected system.

We refer hereby to recent work in the history of Swiss education and VET, which has highlighted the need for an approach that is as broad as possible, taking into consideration not only institutional, but also pedagogical, economic and socio-cultural aspects (Bonoli & Eigenmann, 2021; Bonoli & Gonon, 2022; Criblez, 2001, 2008; Gonon, 2018). At the same time, this approach is further reinforced by a reference to historical institutionalism (cf. Busemeyer & Trampsuch, 2012; Thelen, 2004), which provides us with a solid theoretical basis for investigating the political-economic logics that characterize the evolution of VET systems as institutions.

4 The study of the "future in the past" is not original to our approach. There is indeed a relatively well-developed stream of studies on the "history of the future", see in particular Hölscher (1999), Graf and Herzog (2016), Seefried (2013), Rehlinghaus and Teichmann (2019). For a recent contribution on the subject of the future of VET in Switzerland from a historical perspective, see Jorns (submitted).

Against this theoretical background, we have developed a two-level methodological approach. Firstly, we carried out a historical reconstruction of the period in question. This involved extensive research in the cantonal and federal archives, where we were able to collect numerous sources: Laws, reports, parliamentary debates, official statistics, specialized publications, press articles, etc[5]. The material collected allowed us to carry out a historical reconstruction with the main aim of describing the socio-economic and political situation of VET in Switzerland during the period in question. Secondly, we subjected these same sources to a discourse analysis (Keller, 2011; Landwehr, 2009). We refer to a very broad notion of discourse which refers to "sets of statements obeying common rules" (Revel, 2009, p. 36). These sets of statements emerge as recurrent formulations or recurrent arguments in communicative practices at a determined moment on determined issues, reflecting what we might call different "orders of discourse", to use Foucault's formula (Foucault, 1971). This perspective will lead us to highlight the way in which *public debates* – understood as the whole range of public language productions available at a given time – spoke about VET and to identify the most frequently recurrent arguments used by the different actors. The five orientations highlighted in our introduction emerge from this discourse analysis. They constitute recurrent arguments regularly appearing in the public debates, referred to by different actors in the domain of Swiss VET, and guiding VET policies.

Our discourse analysis perspective also allows us to explain the way in which we consider the images of the future at the time. What we are going to analyse are "discourses" that propose predictions about the future evolution of society and the adaptations that VET should adopt. 'Future' in our analysis therefore refers to certain discursive formulations, which are recognised by the use of the future verb tense or by the temporal location of the object of discourse successive to its discursive production.

We will not primarily consider the future forecast in terms of its adequacy to the reality as it may have developed in later years (see Beckert, 2016). We will remain at the level of discourse and assess the extent to which this or that forecast has influenced other discourses: In other words, the extent to which this or that image of the future is present and generalised in the discourses around 1960-1970 and the extent to which this or that future forecast marks the discourses up to the present day. However, we will pay particular attention to a specific type of discursive production, i.e., texts produced in the framework of legislative processes, in particular policy papers involved in the process of the definition of laws or regulations, and the resulting laws or regulation texts. This kind of text allows us to go beyond the limits of a strict discourse analysis to consider the effects of discourses on the adoption of concrete

5 Our analysis is based on a set of sources collected in the frame of the research project "The evolution of VET in Switzerland" (see footnote 1). In this context, we have established a large corpus of texts on VET in Switzerland, written between 1950 and 1975, concerning the general national debate as well as the situation and the debate in the cantons of Zürich, Geneva and Ticino. The corpus includes official documents (laws, regulations, ordinances, government messages, parliamentary reports, parliamentary debates, statistics, etc.), specialised publications (specialised journals, scientific publications, reports of professional associations or trade unions, etc.), press articles (in particular from the Neue Zürcher Zeitung, Corriere del Ticino and Journal de Genève), and other archive documents (internal circulars, administrative letters, handwritten notes, etc.).

legislative measures. It is at this level that discourses show a concrete effect on real practices, to the extent that these particular discursive productions (policy papers, laws or regulation texts) have a direct impact on concrete VET policy decisions.

In this respect, we can notice how all policy papers concerning reforms or improvements to existing structures contain a "future" dimension, insofar as any reform prefigures new arrangements that are not yet in force. From a discursive point of view, it is particularly interesting to note that the explicit reference to a future helps to ensure a certain discursive efficacy to these positions, which can thus be based on a kind of "anticipated objectivity" of what society will be like. The reference to the future thus becomes a form of rhetorical justification to support the desire for change on the part of this or that actor, by accentuating its necessity and urgency. In other words, it is more discursively effective to defend an idea by linking it to a future that is considered "certain", than by motivating it in relation to contemporary individual interests. At the same time, the reference to the future often functions as the starting point of the debate, in which it is ensured that a common vision of the issues at stake is shared, even though the successive proposals for reform may differ. It is therefore not surprising that the image of the future of society was in our sources relatively uniform among the various actors at the time. The differences emerge more in the consequences to be drawn from this common vision.

3 VET in the Context of the Economic Boom, Technological Development and Educational Expansion

On the basis of a first analysis of the sources collected, we were able to establish a historical reconstruction of the situation at the time, which highlights three phenomena of particular relevance to our argument. The 1960s-1970s were years of "economic boom", "technological development" and "educational expansion" in Switzerland. On the one hand, Switzerland, like most European countries, experienced in this period an economic boom, with an impressive technological development, which was reflected in a very rapid growth of its gross domestic product and in a very high demand for skilled and unskilled labour (cf. Halbeisen et al., 2021). This new socio-economic situation was also perceived in the VET debate. Paul Sommerhalder, VET school inspector and influential voice, underlines e.g. the technological evolution in these words:

> *The most striking features of our time are dynamism and upheaval, in all areas of life. Science is influencing technology and technology is reshaping the world, ruthlessly doing away with traditional ways of thinking, working and living. (Sommerhalder, 1970, p. 5)*

This image of a period of great technological change, which is disrupting not only the world of work but also the daily lives of citizens, will profoundly influence the images of the future

of society, on which proposals for reform of the education system are based in order to meet the new challenges[6].

On the education side, this period was also marked by an extensive development of the whole educational domain, with a prolongation of compulsory schooling, an increase in the average number of years of education, an expansion of the offer of education at all levels (from kindergarten to higher education) and an opening up of upper secondary education and higher education to a wider population (cf. the notion of 'democratisation' of education) (Criblez, 2001; Criblez & Magnin, 2001).

In this context of economic boom, technological evolution and educational expansion, VET was under particular pressure to reform in order to contribute to economic growth by improving the general level of qualifications and to be in touch with contemporary educational and cultural aspirations of the population. More specifically, VET had to face three main challenges (see Bonoli & Vorpe, 2022). The first challenge, from 1950 onwards, was the high demand for a skilled workforce in connection with the economic development. So, VET had to relaunch itself and to improve its attractiveness in order to respond to the shortage of qualified workers and stay abreast of the competition from baccalaureate schools. The second challenge was the increasing complexity of the qualifications required. Expectations concerning workers' knowledge and skills were increasing. The discourses of the time spoke of the "intellectualisation of professions". This expression underlined the necessity for those in all kinds of occupation to possess more theoretical and general knowledge. The third challenge manifested itself a little later from the 1960s onwards and consisted in a widespread social demand for better equality of opportunities and social justice. We are in the period where the movement of the "democratisation of education" gained momentum. In relation to this third challenge, we also have to mention the rise among young people of new educational and social expectations, which grew from the end of the 1960s. These new expectations culminated in protests by apprentices in cities like Basel, Geneva, Bern and Zurich (Eigenmann & Geiss, 2015), and provoked reactions among VET policy makers (Tabin, 1989), reactions aimed at preventing a legitimation crisis of VET and avoiding a shortage of qualified labour, (Gonon, 2017).

These three challenges had to be tackled in order to keep VET attractive, abreast of technological and economic changes and responsive to social inclusiveness. In other words, in order to avoid a crisis of acceptance, future VET would need to develop a positive image for young people, society and the economy.

These challenges offer us a first clue from which to describe the image of the future at that time. A challenge always implies a projection towards the future of possible actions and requires new answers, as the old solutions no longer work. These three challenges also bring

6 Cf. Stettler (1994) for a general description of images of the future in Switzerland in the 1950s. These images are widely found in representations of the future in Europe, as in the analyses of the situation in West Germany and France by Kellershohn (2022).

us back to three general aims of VET (cf. Bonoli & Gonon, 2022): A strictly economic aim, that is to meet the need of companies for a qualified workforce; an educational aim, to complete compulsory education and meet the need for cultural upliftment of the population; and finally, a social aim, to integrate the largest number of young people into post-compulsory education with equal access conditions. As we will see, during these decisive years the balance between the weight of these three aims changes progressively.

4 The Responses to the Challenges: Four Key Publications

Even though our analysis is based on a broader set of sources[7], we will focus in the next pages on four core publications at the time, that allow us to describe the forecasts of the future and the measures proposed, summarizing the whole of the debate at the time. These publications were produced by four different key players in Swiss VET, players who have influenced and still influence the debate in the field. Although they come from different actors and reflect different interests, they all contribute to a common discourse, that of the revival of VET in the 1960s and 1970s. These four publications will allow us to show how the five general orientations mentioned in the introduction emerge from the texts of this period and how these same orientations, beyond occasional differences, are widely shared even among actors with different interests.

The first document is the "Federal Council's Message of 1962 presenting the VET Act", that would be voted in 1963. The Swiss Confederation had taken over the general coordination of VET from 1930 with a federal law on VET. In 1962, the Federal Council proposed a revision of that law to Parliament and explained its tenor in a Message before the discussion in the chambers. In Swiss politics, these messages have the task of describing the situation in the field, justifying the need for a new law and explaining the articles in the law one by one. Such a document is therefore a particularly interesting tool for reconstructing the debates of the time and, in particular, for noting the image of the future that they convey.

The second document is the "Report on VET of the Swiss Craft Association" (*Schweizerischer Gewerbeverband* – SGV) written in 1970. The SGV is by far the most influential professional association in Switzerland in the field of VET. Since its foundation in 1880, it has marked all the important moments in the development of Swiss VET, including the adoption of the first VET law in 1930, which was largely based on a draft proposed by the association. The association's influence was important also in the 1960s and 1970s. With this report, the SGV tried to influence the political and public debate in order to relaunch VET, which was seen as being in crisis at that time.

The third document is a report, "Proposals for improving VET", from the Federation of Swiss Trade Unions (*Schweizericher Gewerkschaftsbund* – SGB), written in 1971. Even though

7 See footnote 5.

unions play a comparatively lesser role in the development of VET in Switzerland, compared to other countries (Emmenegger et al., 2018), they can nevertheless be considered as important actors of the domain. They took part in expert commissions and in parliamentary debates and their policy papers contributed to animating the public debate on VET. We will see how some ideas formulated in the SGB report will influence the further development of the system.

The fourth document is the "Final Report on the work of the Federal Expert Commission for the Improvement of Vocational Apprenticeships", the so-called "Grübel Commission", named after the Director of the Federal office for industry, crafts and labour (*Bundesamt für Industrie, Gewerbe und Arbeit – BIGA*) Alfred Grübel, written in 1972. In the Swiss policy making procedure, extra- parliamentary expert commissions play an important role. They bring together representatives of a wide range of interests covering all political sensitivities and sectors of activities. They normally aim to find compromise positions that can achieve broad political support on which new laws can be built and which reduce the risks of blockage in the parliamentary debates (Kriesi, 1995; Vatter, 2014). The Grübel Commission was set up in 1969 by the Minister of the Federal Department of Economic Affairs. It was composed of some twenty experts representing the Confederation, the cantons, employers, trade unions and the education sector. The stances taken by this commission strongly influenced the political and public debate at the time and finally the revision of the 1963 law, that would lead to a new law in 1978.

4.1 The Government Message of 1962

The government message of 1962 presenting a new Vocational Training Act sets the general framework for the debates at the time. This document outlines the expected future of VET and the challenges that the field will need to address. It then proposes concrete measures in a draft law that will be accepted in parliament in 1963[8]. This kind of document reflects broad discussion at a pre-parliamentary level and the search for compromise between different interests, in order to arrive at the formulation of a draft law that can be supported in parliament. Thus, it is of interest to see on which points a common ground was worked out.

At the centre of the vision of the expected future, we find the "unceasing technical change" (Bundesrat, 1962, p. 869) that Swiss society and in particular the economy was experiencing at that time: The shift of activities to the secondary and tertiary sectors, the development of new forms of production marked by mechanisation and automation, which in turn give rise to new professions. These are new occupations with broader qualification requirements, which reflect the new production requirements, because "the growth of automation will create a strong demand for skilled labour, as the construction, manufacture, adjustment and repair of automata require intelligent and carefully trained specialists" (Bundesrat, 1962, p. 872).

8 Cf. Gonon and Freidorfer (2022) for a more profound analysis of the issues around the 1963 VET Law.

At the same time, the need for a new professional figure is clearly emerging: The "intermediate manager": "The uninterrupted progression in production increases the need for technically trained personnel capable of planning, building, organizing work, monitoring deadlines and calculating the wages of pieceworkers" (Bundesrat, 1962, p. 871).

A further requirement aimed at catching up with the constant technical evolution was also formulated. The 1962 message underlines the tendency for people to change jobs and occupations more often and the need, even for qualified workers, in order to be up to date, to engage in "further training".

Faced with these challenges, VET would need to provide broad basic training and avoid excessive specialisation. Initial VET should give the apprentice "the starting point for his or her professional advancement" (Bundesrat, 1962, p. 873), a training which is not limited to imparting "the skills and knowledge indispensable for the exercise of their profession, but must also form their character and personality", which are the basic conditions for "facilitating each person's social advancement" (Bundesrat, 1962, p. 874).

Last but not least, VET must be able to attract the largest possible number of young people in order to meet the need for skilled labour, also through an "efficient and modern system" of education and training, which is essential in order to "make use of the reserves of labour" (Bundesrat, 1962, p. 874) which the Swiss economy particularly needed.

This description of the expected future and the challenges for VET was largely shared during the 1960s and the responses of the 1963 law were largely supported by economic and political milieux[9]. Nevertheless, the law of 1963 rapidly emerged as insufficient and outdated shortly after it came into force. Only five years after the vote in parliament, Paul Sommerhalder (already quoted above) stated:

> *The new law of 1963 is a child of the economic boom, when people wanted to profit from good business and hardly had time for training issues. So again, the conditions for a progressist law were not the best. Therefore, we are not surprised if the new law brought nothing new! (Sommerhalder, 1968, p. 227)*

The debates on VET continued regarding the future and its challenges. The texts that we will present in the following paragraphs are part of these same debates and are directly involved in the discussions concerning the revision of the 1963 law, which led to the new law of 1978.

9 This support became explicit in the referendum against the new federal law project. In fact, the VET act of 1963 was subject to a referendum against a rather marginal article concerning the designation of "technical engineers" (Gonon, 2018; Wettstein, 2020). The Swiss population largely accepted the law with 69% of the votes.

4.2 Swiss Craft Association (SGV) and Federation of Swiss Trade Unions (SGB): Common and Contrasting Visions

The Swiss Craft Association (SGV) took a stand in a report in 1970. One year later, the Federation of Swiss Trade Unions (SGB) also produced a report with its "Proposal for the improvement of VET".

The imagined future as it emerges from the two documents, documents which reflected the positions of two interest-specific actors, is – perhaps surprisingly - not that far from the image already depicted by the government Message of 1962. The future of VET and of society in general is characterized by constant technological change provoking insecurity and a need for adaptation. The two reports also highlight trends toward specialisation and complexification of qualifications, requiring more theoretical and general knowledge. The SGB report also mentions the "increase in the influx of information" (Schweizerischer Gewerkschaftsbund [SGB], 1971, p. 3) and underlines the need for adaptability and mobility for individuals. While the general description of the future and the challenges it brings with it seems relatively similar in the two reports, differences emerge when analysing the priority of the challenges and the responses to be given. For the SGV, the major challenge was to be able to meet the growing need of Swiss companies for skilled labour, a need that could only be met by improving the quality and attractiveness of VET. For the SGB, the major challenge was to ensure that all young people had the necessary skills and general culture to enter and remain in the labour market and to participate as responsible citizens in society. This also meant improving VET, but with the emphasis on access to quality education and training for all.

4.3 The Two Most Contested Issues: Dual Model and Differentiation Projects

However, these two actors were openly opposed on two themes, which will largely characterize the debate of the time: The defence of the dual model and the promotion of "differentiation" of VET diplomas. For the SGV, it was clear that the revival of VET must be based on the dual apprenticeship:

> *The Swiss VET system with its emphasis on dual apprenticeship has fundamentally proven itself. Even with a view to the future development of VET, there are many advantages to maintaining the focus on company-based apprenticeships. (Schweizerischer Gewerbeverband [SGV], 1970, p. 12)*

Even though the support for the dual model was absolute, the SGV recognizes the need to "modernise" it: "The SGV's commitment to dual apprenticeship therefore presupposes that there must be a constant willingness to make system-compliant adjustments to economic, social and technical developments and to the training needs of young people" (SGV, 1970, p. 13).

In more detail, this modernisation should place more emphasis on theoretical and general education. This would of course imply an increase in teaching hours in vocational schools. But not only that. In order to avoid a kind of a loss of control on the part of the professional associations over the contents of training, the SGV proposed developing what were then called "introduction courses" (branch courses, today). Courses, under the responsibility of the professional associations, where theoretical and general knowledge related to the profession would be transmitted.

In contrast to the SGV, the SGB had a more nuanced position towards the dual model. On the one hand, the dual model was strongly criticised. Dual apprenticeship was no longer appropriate to respond to future challenges. Full-time vocational schools were more suitable: "The current system of master apprenticeship in its present form no longer meets modern requirements. [...] Basic training must therefore take place in actual full-time vocational schools or training workshops" (SGB, 1971, p. 6).

Among the arguments brought up against the dual model, we find the risk of exploitation and poor training and the impossibility for some companies to train apprentices appropriately due to increasing specialisation. However, the SGB report seems to be aware of its limited political influence on mainstream VET policies and of the difficulty of giving up a form of training that is deeply rooted in Swiss traditions. So, the report opens the way to a compromise: If the dual model had to be maintained, it should be strongly reformed with better working and learning conditions for apprentices, and a strong increase in the role of school, that is with more school teaching and with a broader education, including more theoretical and general knowledge. This is partly in line with the SGV's call for a reform of dual apprenticeship with a stronger emphasis on theoretical and general knowledge.

The second point where a contrast appears is the project of differentiation of VET diplomas. The SGV supported the idea of creating three types of certificates for initial VET. One, with higher requirements, for an elite of young people (the *Berufsmittelschule* [BMS]); a second, the "normal" certificate; and a third certificate with lower requirements for young people with a lower profile (*Anlehre*). The aim of this differentiation was, on the one hand, to improve the quality of teaching in vocational schools by reducing the heterogeneity of the classes, and on the other hand, to increase the attractiveness of VET for young people with stronger academic profiles who would otherwise choose general education programmes.

The SGB opposed this project of differentiation. On the one hand it conceded the interest of creating a new program (the BMS) with broader theoretical and general teaching: "The only purpose of the BMS is to train the lacking middle and lower cadre more quickly. In this sense, it cannot be denied a certain justification" (SGB, 1971, p. 7). On the other hand, it underlined the overall goal of reform in the domain as the improved quality of VET for all young people and not only for an elite: "The focus of reforms must be on improving training for the majority of apprentices" (SGB, 1971, p. 7). The SGB thus underlined the necessity to

improve the conditions of work and training for all apprentices by recognizing their status, not only as young workers, but also as young persons in education – as learners–, who should be compared not with other workers but with baccalaureate school students. In this perspective, it asks for apprentices for more general education, more holidays, shorter working hours and sports classes.

These two reports also mention a series of other less controversial points which concern a general improvement of the field: In particular, better organisation and planning of training, better preparation of teachers and trainers, better integration of VET into the education system with better permeability, and finally, clear support for VET research to ensure monitoring and innovation in the field.

4.4 From the Debates to the Concrete Measures Proposed by the Grübel Commission

The public debate on the relaunching of the VET reaches a first formulation of concrete measures in the work of the Grübel Commission. This commission was set up in 1969 to "draw up proposals for the improvement of dual apprenticeship", so that it could "by means of various measures become attractive again and position itself as a real alternative to the baccalaureate schools" (Expertenkommission, 1972, p. 1).

With these premises, it is not surprising that the commission agreed on the importance of safeguarding dual apprenticeship: "By a large majority, the commission considers the master apprenticeship to be the most suitable form for our initial training" (Expertenkommission, 1972, p. 1). However, the commission also agreed that reforms were needed to update this model.

The commission proposed 16 measures. Some of these were oriented to increasing the theoretical and general contents in VET classes, with more hours at school and the development of "introduction courses" under the controls of professional associations (see measures A; B5, B3, B10). Other measures aimed at the improvement of the pedagogical quality of the training though better training programs, didactic handbooks, reform of the exams and better training for teachers and trainers (B1, B2, B3, B9, B10, B11, B13, B14). Another group of measures was centred on the improvement of the learning conditions of apprenticeship, on a better control of working conditions, on the introduction of sports classes, on the broadening of the general contents and on a better preparation for further education or for entering higher education (A, B6, B7, B8). Finally, some measures recommended a greater differentiation of the curricula, with the creation of three different certificates: An elite programme (*BMS*), a "normal" certificate, and a program with low exigencies (*Anlehre*) (Measures A, C.).

All in all, the Grübel Commission took up most of the SGV's proposals, in particular the centrality of the dual model and differentiation projects, while further developing the aspects

related to the improvement of the pedagogical quality of training. The positions of the SGB are only partly reflected in its report. Especially on the two contested issues presented above, the commission adhered to the SGV's positions. However, a number of the proposed measures were in fact also broadly supported by the SGB: In particular the measures concerning more general knowledge, better pedagogical conditions of training and better consideration of the interests of young people in training as "learners". In addition, the idea of qualitative apprenticeship with more general knowledge for all young people, which was a main demand emerging from the SGB report, has progressively spread in the public debate up to the present day, influencing successive reforms.

The issue of differentiation remained a highly controversial issue up to the debates around the new law of 1978. It was because of the introduction of a training programme for young people with a lower profile (*Anlehre*) that the trade unions launched a referendum against the law. The trade unions feared that this new certificate was "not primarily intended to accompany the socially and educationally weaker young people to a simple initial vocational qualification, but that employers [were] aiming at a generalised wage dumping" (Sigerist, 2008, p. 292). In the decisive vote, however, the referendum was rejected by the voters. The new federal law on VET was accepted with 58% of the votes, confirming the line taken by the government and before it by the Grübel Commission. This vote also confirms the influence of the SGV on Swiss VET policy.

4.5 Summing Up: Five Major Orientations Running Through the Totality of the Debates

If we take a step back and look at the four publications in the context of the totality of the debates at the time, we can identify five new VET policy orientations, which are particularly salient in these texts, but which also run through all our sources. From a historical perspective, they can be considered as general answers proposed at that time to the challenges of the future of society and VET. From a theoretical perspective, these orientations must be considered as analytical tools that help us to better understand debates and measures taken in the period 1960-1970 as well as to better describe the evolution of the successive debates and reforms, up to the present day.

The first orientation that clearly emerges from our sources and that finds explicit references in the four publications presented above is an orientation towards *academisation*. From the 1960s onwards, the debates of the time regularly highlight the need for VET to expand and provide access to more theoretical and general knowledge content in order to meet the new qualification requirements of the labour market and the population's desire for more pathways into higher education. This is reflected in a trend towards more school hours in vocational school, the introduction of branch courses, the expansion of optional courses, the

establishment of new fully developed programs with more general knowledge such as the *BMS* certificate and later the federal vocational baccalaureate.

The second is an orientation towards *pedagogisation* of VET. From the 1960s onwards we witness greater attention paid in debates to the pedagogical dimension of VET, which materialized in the expansion and improvement of the training of teachers and trainers, in the revision of training regulations and of examination modalities, in the setting up of didactic tools to facilitate the transmission of competences, and in a desire for the standardisation of practices.

The third orientation is towards *differentiation*. In order to better respond to the demands of the market and society, the need for a broader and more differentiated range of training programs also emerges from the debates of the time. This differentiation will progressively occur with, on the one hand, the introduction of three different levels of initial vocational training, and, on the other hand, the development of higher VET and the opening up of VET to tertiary education.

The fourth orientation is towards more *permeability* in the whole system. It was from the 1960s onwards that the notions of lifelong learning, mobility and flexibility entered the debates on the education system. They culminated in the term of 'permeability', which initially referred above all to the need to be flexible, to stay up to date, to change profession, and later became also synonymous with the possibility of changing pathways in the education system and pursuing training or education at a higher level. The term also reflects the awareness of the need to conceive of educational pathways as something that does not stop after a first certificate but continues throughout a professional career. Also, here we can mention some concrete measures, in particular the opening up of VET to tertiary education and the development of continuing education.

Finally, the fifth orientation is towards what we might call the *"learnerisation"* of apprentices. By means of this neologism, we wish to designate the greater attention emerging from the debates of the time on the figure of the "apprentice". This attention progressively leads to a modification of the perception of the apprentice from a "worker" to a "learner". This implies, on the one hand, greater attention to the educational dimensions of training with improvement in the whole pedagogical setting of apprenticeship, increased protection against abuse and better control over the quality of training, and on the other hand a rapprochement of apprentices with learners in general schools at secondary II level (in particular baccalaureate schools), with, for example, an increase in the number of holidays , the introduction of sports classes in vocational schools, an increase in general education content and the opening up of educational pathways to higher education at tertiary level, and now even to university.

5 Conclusion

If we look back from today at the representations of the future at the time in question, we can highlight several interesting points. First of all, although the economic and social situation is profoundly different today, it is interesting to note how the future challenges evoked in the 1960s-1970s are not completely different from the challenges we identify today for VET: Notions of increasing complexity, instability, rapid economic and social changes, and increasing technological evolution are still largely present today in the future perspectives for VET. The consequences for individuals are also similar: The need to adapt, to be flexible, to enter continuing education (cf. lifelong learning), on the one hand, and on the other hand, the need for more transversal competences, soft skills and general knowledge[10]. In such a context, VET is called upon, today as then, to improve its quality, to increase the number of well-trained people and to ensure social and professional integration for as many young people as possible.

Secondly, the decisions and measures put in place in the 1970s are still central to the Swiss VET system today: The priority given to dual apprenticeship, a certain balance between vocational schooling and workplace practice, branch courses, the presence of three certificates for IVET, the pedagogical preparation of teachers and trainers, the existence of teaching aids for in-company training, the promotion of VET research. This confirms the importance of this "decisive period" in the evolution of the Swiss education system.

Thirdly, these same decisions and measures were taken following the five orientations presented above, that emerged in the 1960s-1970s and that constitute to some extent the driving forces behind the development of Swiss VET over the last 70 years. The current debates around "Vision 2030"[11] lead us to assume that they will also be the driving forces in the future.

With regard to these five VET policy orientations, we can notice how they address mainly educational and social issues. This clearly reflects a rebalancing of the aims of Swiss VET. As Bonoli and Gonon (2022) show, while economic aims linked to the training of skilled labour remain predominant, from the 1960s/1970s onwards, social aims (i.e., integration and social mobility) and educational aims (citizens' education and openness to higher education), have gained importance. It is undoubtedly this broadening of the aims attributed to Swiss VET that ensures that it is not only widely supported by all political forces, but that it is also still considered as one of the essential tools of public policies to meet the challenges of the future, and thus addressing economic, educational and social issues.

If we now adopt a more general point of view going beyond the specificities of the Swiss case and consider the international debate, we can highlight the way in which our analysis helps to better understand how changes occur in highly complex institutions such as VET

10 This can also be seen today in the framework of "Vision 2030": An initiative launched by the Swiss government and the most important actors in the field of VET to prepare and reform Swiss VET for future challenges, cf. https://www.sbfi.admin.ch/sbfi/de/home/bildung/berufsbildungssteuerung-und--politik/projekte-und-initiativen/berufsbildung-2030.html (03.05.2023).

11 See previous footnote.

systems. Our article shows that even though the future (especially technological) seemed to demand a revolution in the socio-professional reality of the time, the measures adopted were anything but revolutionary. They were progressive adjustments, which, confirming the idea of "incremental change", adapted, corrected and complemented structures that already existed. Moreover, our analysis, by combining the idea of "critical junctures" with the idea of general orientations, underlines the fact that, if indeed, at specific moments in a country's history, windows of opportunity may open, this does not mean that revolutions are possible, on the contrary, these windows open onto paths of change largely conditioned by existing structures.

Finally, by identifying five general orientations in the evolution of the Swiss system, our article proposes a set of theoretical tools to describe the evolution of VET systems also in other countries in a comparative perspective. These five orientations can for instance help us to better understand the general international movement that took off in the 2000s with the intention to "modernise" apprenticeship and VET in general, insofar as the reforms proposed in the various countries follow analogous orientations (see CEDEFOP, 2009). In the same perspective, if we consider the vast project recently carried out by CEDEFOP on the "future of VET" (CEDEFOP, 2020), we can notice how some similar orientations can also be identified in the evolution of VET systems in Europe over the last 30 years. In particular, the report notes a certain "academic drift" (cf. CEDEFOP, 2020, p. 71), which tends to broaden the contents of VET and bring it closer to general education provision; furthermore a "pluralistic drift" (cf. CEDEFOP, 2020, p. 73) of VET provisions, which covers both an increase in the range of programmes as well as a better integration and permeability of the different educational offers of VET or general education. More in-depth studies remain to be done in this perspective: The *historical* comparative research on VET has so far been very poorly developed.

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Ethics Statement

The research for this article was based on written documents available to the public in Swiss libraries and archives. Our research did not involve the direct participation of "human subjects".

Quoted Sources

Bundesrat. (1962). Botschaft des Bundesrates an die Bundesversammlung zum Entwurf eines Bundesgesetzes über die Berufsbildung (vom 28. September 1962). Bundesblatt, 44, 885–980.

Expertenkommission. (1972). *Schlussbericht über die Arbeiten der Eidgenössischen Expertenkommission für die Verbesserung der Berufslehre (Grübel-Kommission)*. Bundesamt für Industrie, Gewerbe und Arbeit.

Schweizerischer Gewerbeverband (SGV). (1970). Berufsbildungsbericht des Schweizerischen Gewerbeverbandes. *Gewerbliche Rundschau*, 4, 1–47.

Schweizerischer Gewerkschaftsbund (SGB). (1971). Vorschläge zur Verbesserung der Berufsbildung. *Separatdruck aus "Gewerkschaftliche Rundschau"* (2), 1–6.

Sommerhalder, P. (1968). Berufsbildung im Umbruch. *Schweizerische Blätter für Gewerbeunterricht*, 10, 225–230.

Sommerhalder, P. (1970). Berufsbildung im Umbruch: 1. Aktuelle Tendenzen; 2. Berufsmittelschule. *Schriftenreihe des Instituts für Bildungsforschung und Berufspädagogik des Kantons Zürich*, 3, 1–56.

Literature

Beckert, J. (2016) Imagined futures. fictional expectations and capitalism dynamics. Harvard University Press.

Berner, E. (2019). Der "Lehrling": Qualifizierung einer Kategorie im schweizerischen Rechtsdiskurs (1870–1930). In C. Imdorf, R. Leemann & P. Gonon (Eds.), *Bildung und Konventionen* (pp. 311–339). Springer. https://doi.org/10.33057/chronos.1713

Bonoli, L. (2017). An ambiguous identity: The figure of the apprentice from the XIX century up to today in Switzerland. In F. Marhuenda (Ed.), *Vocational education beyond skill formation. VET between civic, industrial and market tensions* (pp. 31–49). Peter Lang. https://doi.org/10.1556/063.2021.00062

Bonoli, L., & Eigenmann, P. (2021). Komplexität, Spannungsfelder und Kompromisse. Eine Relektüre der Geschichte der Berufsbildung in der Schweiz. In S. Dernbach-Stolz, P. Eigenmann, C. Kamm & S. Kessler (Eds.), *Transformationen von Arbeit, Beruf und Bildung in internationaler Betrachtung* (pp. 41–60). Springer. https://doi.org/10.1007/978-3-658-32682-1_3

Bonoli, L., & Gonon, P. (2022). The evolution of VET systems as a combination of economic, social and educational aims. The case of Swiss VET. *Hungarian Education Research Journal, 12*(3), 1–12. http://doi.org/10.1556/063.2021.00062

Bonoli, L., & Vorpe, J. (2022). Swiss VET between national framework and cantonal autonomy: A historical perspective. *Education Sciences, 12*(114), 1–19. https://doi.org/10.3390/educsci12020114

Büchel, K. (2018). *Duale Berufsbildung als Teil der 'Bildungsexpansion': der Kanton Luzern als Beispiel für die expansive Entwicklung der dualen Berufsbildung von 1954 bis 1980*. Universität Zürich [doctoral dissertation]. https://doi.org/10.5167/uzh-156966

Busemeyer, M., & Trampusch, C. (2012). *The political economy of collective skill Formation*. Oxford University press.

CEDEFOP. (2004). *Formation professionnelle. Une histoire de la formation professionnelle en Europe. De la divergence à la convergence, Revue Européenne, no. 32*. CEDEFOP. https://www.cedefop.europa.eu/files/32-fr.pdf

CEDEFOP. (2009). *Modernising vocational education and training - Background report, Vol. 1/2*. Publications Office of the European Union. https://www.cedefop.europa.eu/files/3050_II_en.pdf

CEDEFOP. (2020). *Vocational education and training in Europe, 1995-2035. Scenarios for european vocational education and training in the 21st century.* Publications Office of the European Union. https://www.cedefop.europa.eu/files/3083_en.pdf

Criblez, L., & Magnin, C. (2001). Editorial: Die Bildungsexpansion in der Schweiz der 1960er- und 1970er Jahre. Schweizerische Zeitschrift für Bildungswissenschaften, 23, 7–11.

Criblez, L. (2001). Bildungsexpansion durch Systemdifferenzierung — am Beispiel der Sekundarstufe II in den 1960er- und 1970er-Jahren. *Schweizerische Zeitschrift für Bildungswissenschaften, 23*, 95–118.

Criblez, L. (2002). Gymnasium und Berufsschule. Zur Dynamisierung des Verhältnisses durch die Bildungsexpansion seit 1950, *Traverse, 9*, 29–40.

Criblez, L. (2008). *Bildungsraum Schweiz. Historische Entwicklung und aktuelle Herausforderungen*. Haupt Verlag.

Eigenmann, P., & Geiss, M. (2015). There is no outside to the system: Paternalism and protest in Swiss vocational education and training, 1950-1980. In E. Berner & P. Gonon (Eds.), *History of VET in Europe – Cases, concepts and challenges* (pp. 403–428). Peter Lang. https://doi.org/10.3726/978-3-0343-2354-3

Foucault, M. (1971). *L'ordre du discours*. Gallimard

Freidorfer, L. (2022). *Vom "Lehrling" zum "Lernenden" – Zur Wahrnehmung Jugendlicher in Ausbildung im Zuge der Transformation der beruflichen Bildung in den Jahren von 1950 bis 1970*. Universität Zürich [doctoral dissertation].

Gonon, P. (2008). Education for industry – Employability avant la lettre. In P. Gonon, K. Kraus, J. Oelkers & S. Stolz (Eds.), *Work, education and employability* (pp. 241–257). Lang. https://doi.org/10.25656/01:19466

Gonon, P. (2017). Quality doubts as a driver for Vocational education and training (VET) reforms – Switzerland's way to a highly regarded apprenticeship system. In Pilz, M. (Ed.), *Vocational education and training in times of economic crisis* (pp. 341–354). Springer. https://doi.org/10.1007/978-3-319-47856-2_18

Gonon, P. (2018). L'expansion de la formation professionnelle: Le cadre législatif au centre des réformes de la formation professionnelle. In L. Bonoli, J.-L. Berger & N. Lamamra (Eds.), *Enjeux de la formation professionnelle en Suisse* (pp. 33–52). Seismo.

Gonon, P., & Freidorfer, L. (2022). Education and training regimes within the Swiss vocational education and training system. A comparison of the cantons of Geneva, Ticino, and Zurich in the context of educational expansion. *Education Sciences, 12*(1). https://doi.org/10.3390/educsci12010020

Gonon, P., & Zehnder, L. (2016). Die Berufsbildung der Schweiz als permanenter Kompromissbildungsprozess. In J. Seifried, S. Seeber & B. Ziegler (Eds.), *Jahrbuch der berufs-und wirtschaftspädagogischen Forschung 2016* (pp. 43–58). Verlag Barbara Budrich. https://doi.org/10.25656/01:12703

Graf, R., & Herzog, B. (2016). Von der Geschichte der Zukunftsvorstellungen zur Geschichte ihrer Generierung. Probleme und Herausforderungen des Zukunftsbezugs im 20. Jahrhundert. *Geschichte und Gesellschaft, 42*, 497–515. https://zeithistorische-forschungen.de/sites/default/files/medien/material/2013-3/Graf_Herzog_2016.pdf

Halbeisen, P., Müller, M., & Veyrassat, B. (2021). *Histoire économique de la Suisse au XXème siècle*. Editions Livreo-Alphil.

Hölscher, L. (1999). *Die Entdeckung der Zukunft*. Wallstein Verlag.

Jorns, K. (submitted). Reaktive Chronopolitik: Berufsbildung im Dauerzustand defuturisierte Zukunft - "Temporalorientierung in politischen Zukunftsvorstellungen im Gesetzgebungsprozess der schweizerischen Berufsbildung". In *Jahrbuch für Historische Bildungsforschung*, 29. Klinkhardt.

Keller, R. (2011). Diskursforschung. *Eine Einführung für SozialwissenschaftlerInnen*. VS Verlag. https://doi.org/10.1007/978-3-531-92085-6

Kellershohn, J. (2022). *Die Politik der Anpassung. Arbeitswelt und Berufsbildung im Ruhrgebiet 1950-1980*. Böhlau.

Kriesi, H.-P. (1995). *Le système politique suisse*. Économica.

Landwehr, A. (2009). *Historische Diskursanalyse*. Campus.

Mahoney, J. (2000). Path dependency in social history. *Theory and Society, 29*, 507–548. https://www.jstor.org/stable/3108585

Pierson, P. (2000). Increasing return, path dependency and the study of politics. *The American Political Sciences Review, 94*, 251–267. https://doi.org/10.2307/2586011

Rehlinghaus, F., & Teichmann, U. (Eds.). (2019). *Vergangene Zukünfte von Arbeit. Aussichten, Ängsten und Aneignungen im 20. Jahrhundert*. Dietz.

Revel, J. (2009). *Le vocabulaire de Foucault*. Ellipses.

Seefried, E. (2013). Steering the future. The emergence of "Western" futures research and its production of expertise, 1950s to early 1970s. *European Journal Futures Research, 29*, 1–12. https://doi.org/10.1007/s40309-013-0029-y

Sigerist, P. (2008). Berufsbildung zwischen Wirtschafts- und Lernförderung. In T. Bauder & F. Osterwalder (Eds.), *75 Jahre eidgenössisches Berufsbildungsgesetz* (pp. 287–310). Hep.

Stettler, N. (1994). "Die Zukunft ist errechenbar...". In J.-D. Blanc & C. Luchsinger (Eds.), *Achtung: die 50er Jahre! Annährungen an eine widersprüchliche Zeit* (pp. 95–117). Chronos.

Streeck, W., & Thelen, K. (2005). Introduction: Institutional change in advanced political economies. In W. Streek & K. Thelen (Eds.), *Beyond continuity. Institutional change in advanced political economies* (pp. 1–39). Oxford University Press. https://nbn-resolving.org/urn:nbn:de:0168-ssoar-194981

Tabin, J.-P. (1989). Formation Professionnelle en Suisse. Histoire et Actualité. Réalités sociales.

Thelen, K. (2004). *How institutions evolve: The political economy of skills in Germany, Britain, the United States, and Japan*. Cambridge University Press.

Vatter, A. (2014). *Das politische System der Schweiz*. Nomos Verlag UTB.

Wettstein, E. (2020). *Berufsbildung- Entwicklung des Schweizer Systems*. Hep.

Zehnder, L., & Gonon, P. (2017). Civic and market convention as driving forces of the development of Swiss VET. In F. Marhuenda (Ed.), *Vocational Education beyond Skill Formation: VET between Civic, Industrial and Market Tensions* (pp. 271–292). Peter Lang. https://doi.org/10.3726/b11500

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The Role of VET in a Green Transition of Industry: A Literature Review

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Abstract

Purpose: This article examines the role of Vocational Education and Training (VET) in a green transition of industry. In the world of industry, battling climate change is often treated as a technical issue, but recent research on VET has tried to balance the technological paradigm with more human-centric approaches. The literature review addresses emergent VET research that presents various and partially competing perspectives on the purpose of VET in relation to climate change.

Methods: We use an integrative literature review to investigate this complex topic. This technique is particularly useful for making sense of emergent research concepts, as well as various, and partially competing, theoretical and methodological approaches. It also allows us to incorporate literature from different countries and VET systems. The main search was performed in Scopus during March 2023, and included studies published within a timespan of eight years (2016–2023).

Findings: Through a qualitative content analysis, we have identified five cross-cutting themes in the literature: Conceptualising ill-defined concepts of green jobs and skills; high-tech solutions in the movement towards a fourth industrial revolution versus inclusive growth for VET greening; towards sustainable work-based learning for green skills in VET; radical transformative approaches to a just green transition; and the co-creation of skill-formation

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ecosystems. The analysis has highlighted the ways in which VET can take on different roles in the green transition, and that these roles can be developed successively in parallel with a green transition in industry. In the development of the role of VET, it is also relevant to consider the contrast between *transitional* approaches and *transformative* approaches in VET research. While transitional approaches are recurrently marked by empirical research in specialised areas and subsystems within society, transformative approaches are characterised by a stronger focus on societal transformation (large-scale changes), power dynamics, and social justice.

Conclusion: In conclusion, we suggest an analytical model that synthesises research on what role VET can play in a green transition of industry. The development model highlights that VET can take on different roles in a green transition and can gradually develop in parallel with a green transition in industry.

Keywords: Climate Crisis, Green Transition, Industry 4.0, Vocational Education and Training, VET

1 Introduction

Although high on the political agenda, battling climate change is quite a recent theme in VET research. The role of VET can be situated within a broader societal context. It includes questions about technological change and the rapid expansion of green jobs and skills, requiring the reskilling and upskilling of many industrial workers, as a response to climate change. To put it somewhat incisively, industrial revolutions can both strain the ecological environment and be a source of hope that new eco-friendly technologies will contribute to greener societies and industries. The vision of a fourth industrial revolution (Industry 4.0) is predominantly associated with a multitude of new digital technologies (Avis, 2020) (e.g., 3D printing, the Internet of Things, robots, artificial intelligence), new materials (e.g., bio- or nano-based) and new production processes (e.g., data-driven production, synthetic biology). Such technological innovations are expected to fundamentally transform industry, its structure and organisation, business models, products, production and distribution chains. Consequently, requirements to develop workers' skills and competencies through education and skill-formation systems will follow.

The fourth industrial revolution is usually framed as a linear, technical, and inevitable logical progression, in which the first industrial revolution is followed by the second, third, and so on (Avis, 2020). Some researchers (Demir & Cicibas, 2017) even claim that we are already moving from Industry 4.0 towards the fifth industrial revolution (Industry 5.0), where the focus is on collaboration between people and machines, as well as sustainable production, green jobs and skills, and resilience, which includes endurance

and the ability to deal with change. The movement towards green industries is also strongly supported by several international organisations, such as the United Nations, the International Labour Organisation (ILO), The Organisation for Economic Co-operation and Development (OECD), and the European Commission (EC). Within these organisations, there is an overarching consensus that a green transition means counteracting climate change and environmental destruction, manifested in common agreements and objectives set out in, for example, Agenda 2030, the Paris Agreement, and the EU's Green Grant.

Within these policy contexts, VET is regarded as an important aspect of skill-formation systems, which promotes green skills and jobs (Avis, 2020). Knowledge about different types of VET and skill-formation systems is essential in order to understand current research on a green transition in VET. Given the heterogeneous nature of vocational education internationally, it is relevant to pay attention to comparative and holistic approaches to VET (e.g., Busemeyer & Trampusch, 2012; Jørgensen et al., 2018; Thelen, 2014). Until quite recently, however, very few research overviews have focused on the role of VET in connection with a green transition (Avis, 2020).

This article examines the role of VET in a green transition of industry. The main research question is: What role can VET have in making the move towards a green transition of industry? The next section presents the integrative literature review method. Thereafter, the findings of the literature review are presented. It is followed by a discussion that aims to contribute to a synthesis by providing a conceptual understanding of this relatively new research area and a reflection upon further research directions in VET.

2 Literature Review Method

An integrative literature review is used to investigate the complex topic of the role of VET in a green transition of industry (Torraco, 2016; see also Gessler & Siemer, 2020). This literature review technique is particularly useful for making sense of emergent research concepts, as well as various, and partially competing, theoretical and methodological approaches. It also allows us to incorporate literature from different countries and VET systems (see Appendix 1). The main search was performed in Scopus during March 2023, and included studies published within a timespan of eight years (2016–2023). The choice to limit the search to eight years was based on the increase in studies about VET and green transitions that we observed during this time period. The literature review limited the main source of data to peer-reviewed articles. However, four studies (three peer-reviewed articles and one conference paper) were manually selected (using Google Scholar) because we assessed them as being central to the topic of the article. In a three-step selection and assessment process (by title, abstract, and full-text analysis), any re-

cords that did not focus on both VET and climate change were excluded. Based on the quality assessment, 36 full publications (30 peer-reviewed articles and six peer-reviewed conference papers) were included in the literature review (see Figure 1).

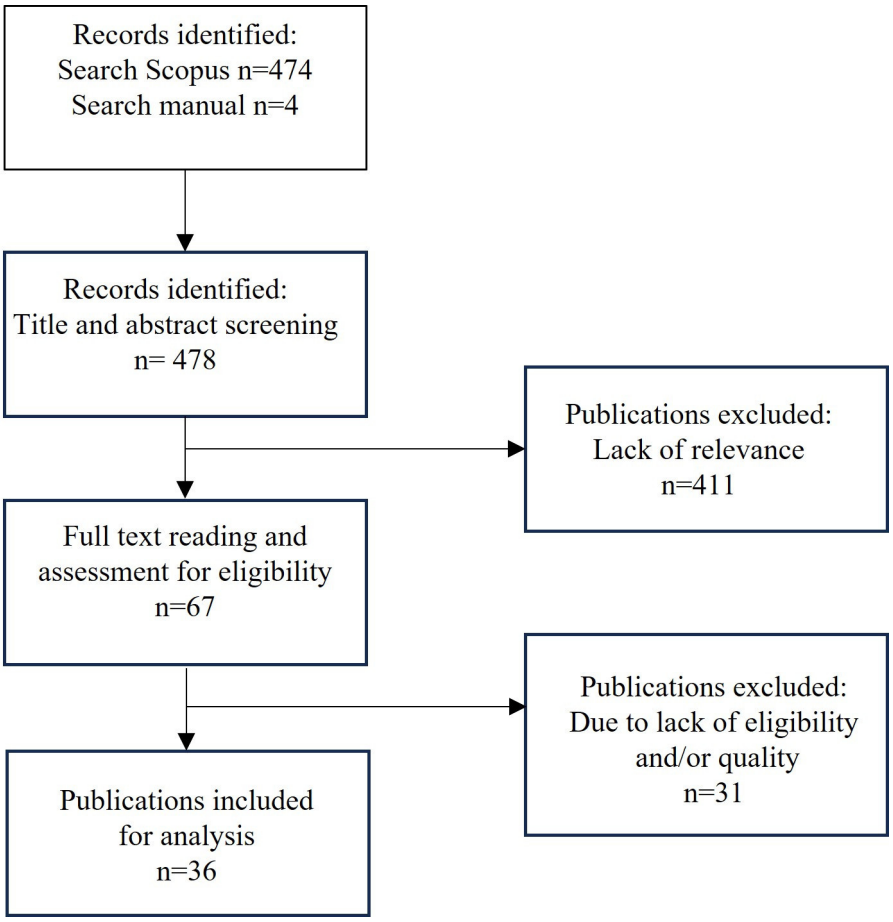

Figure 1: Flowchart Over the Publication Selection and Assessment Process

The 36 selected publications were analysed by using an inductively driven thematic content analysis (Braun & Clarke, 2006). Through the analysis, we identified five cross-cutting themes in the literature, involving different types of research contributions: 1) A conceptualisation of green jobs and skills in VET; 2) high-tech innovations and inclusive growth for VET greening; 3) towards sustainable work-based learning for green skills in VET; 4) a radical green transformative approach in VET; 5) the co-creation of skill-formation ecosystems. By introducing these themes, we also analyse the role of VET in making the move towards a green transition in industry.

3 Findings of the Literature Review

The following section presents the five cross-cutting themes identified in the literature.

3.1 Conceptualisation of Green Jobs and Skills in VET

The first section addresses research that has made substantial contributions to conceptualising the most common (and ill-defined) keywords in the VET literature: Green jobs and green skills. Indeed, the studies are quite diverse. Taken together, the literature on green skills covers multiple perspectives representing the voices of policymakers, employers, unions, industry and firms, VET teachers, and VET students.

VET and Policy Discourses on Green Jobs

Policy-oriented research on green jobs has focused on the tension between international commitments and national policy priorities. Based on document analysis and surveys involving stakeholders in different labour-market sectors in ten Asian countries, Sharpe and Martinez-Fernandez (2021) conclude that all Asian member states have developed national strategies to implement the ILO's (2018) vision for green jobs in prioritised labour-market sectors (building and construction, manufacturing industries, agriculture, and tourism). All of these countries have also made inroads into defining and counting (approximately 12 million) green jobs. Despite these national commitments, the level of collaboration and dialogue between different national and international policy arenas and stakeholders is weak. In addition, supportive policy ecosystems, such as active labour-market policies and social insurance, are not sufficiently in place (Sharpe & Martinez-Fernandez, 2021). This lack, it is argued, has serious consequences for VET, which is supposed to manage a multitude of partially conflicting challenges, such as supporting skill formation, employment, social inclusion, and simultaneously fighting unemployment and climate change. It is unlikely that this can be achieved without economic and political support systems. Therefore, a holistic approach to the "policy-readiness" for a green transition is key (Sharpe & Martinez-Fernandez, 2021). However, a weakness of this study is that it is largely based on the narratives of dominant official actors in various labour-market sectors and only covers the employment dimension of green jobs, which risks leaving aside other partners in the field of VET.

Other policy-oriented studies problematise the 'orthodox' perspectives on VET and green jobs that centre on dominant western discourses of economic growth driven by corporate and political interests. In the context of South Africa, Lotz-Sisitka et al. (2023) argue for the importance of establishing an ecosystem approach to VET, including boundary-crossing social learning networks that link formal and informal VET. In a similar vein, Langthaler et al. (2021) argue that green jobs must be anchored in a social justice approach to VET, in which economic growth is a means rather than an end. This human-centric approach highlights

neglected *social green skills* that are considered relevant to VET, including: multi-stakeholder learning involving diverse voices; embodied and empathic learning that encompasses inner reflection and listening as well as an ethic of care and empathy; and learning that identifies and confronts contradictions, framing new solutions and trying them out.

Conceptualising Green Skills

Green jobs and green skills seem to be everywhere and nowhere. Technological green skills are considered most important in the VET literature. However, studies (Nikolajenko-Skarbalė et al., 2021; Sern et al., 2021; Stanef-Puica et al., 2022) based on document analysis and interviews with experts present a multitude of different green technological, generic, and soft skills that industry requires to be implemented in VET. Rosenberg et al. (2018) have tried to develop a holistic analytical model focusing on the learning needs and competencies that are necessary to drive a green transition in various sectors. Three overall and overlapping skill areas are identified: (1) Technical skills, (2) relational skills, and (3) transformative skills to support social and organisational changes. In VET, there is often a great learning need for technical skills, but relational and transformative skills (collaborating, communicating, leadership skills, imagining change, integrating development goals, and applying policy) also emerged as significant in Rosenberg et al.'s (2018) data concerning different firms and workplace settings. These areas of competence influenced how technical skills were developed and applied. Technical skills were tied to particular industrial contexts and workplace settings, while relational and transformative skills were more generic. Not all of these skills necessarily have to be present in all employees, but different competencies could be distributed across a team involving different professional roles and tasks. For VET, this implies that educational curricula must build capacity to involve such a variety of skills and competencies.

A Pedagogical Framework for Green Skills in VET

Research has also contributed to a pedagogical framework for green skills based on surveys and interviews with VET teachers and trainee teachers (Nurdianshyah, 2019; Ramli et al., 2019; Setiawan et al., 2017). To become a highly qualified VET teacher, it is argued, teachers are expected to master: 1) Teaching in 'hard' (technological) skills, 2) imparting technical skills combined with the knowledge, values, and attributes necessary for green job preparation by Technical VET (TVET) graduates, and 3) soft skills (e.g., communicative and relational skills).

These studies also problematise the fact that green skills are overwhelmingly conceptualised by experts in jobs that require higher education, neglecting the perspectives of most industrial workers and students in initial VET. Ramli et al. (2019) argue that green industries need a mixture of 'traditional' and new green skills. For example, construction companies that carry out building and housing projects will require skilled workers who are also up to date with energy efficiency.

Only two of the studies found in Europe conceptualise green skills in initial VET. A longitudinal study (Barbosa et al., 2020) in Portugal tracks how the perceptions of VET teachers and former VET students of green skills and sustainable development evolve over time due to different learning experiences in education and work. This provides a dynamic perspective on green skills learning trajectories, in contrast to merely listing preferred skills. Finally, a Swedish study (Gustavsson et al., 2018) describes a pedagogical innovation in vocational teacher education where an assignment for VET student teachers was to design, conduct, and evaluate an interdisciplinary course for initial VET students about sustainable development. Extra-curricular courses and lectures in sustainable development are very common in the Swedish educational system, from primary school to higher education, but they are not yet established in vocational teacher programmes. A survey of the VET students' experiences of the course showed that they were very positive and inspired to learn more about green skills and jobs.

3.2 High-Tech Innovations and Inclusive Growth for VET Greening

A recurring theme in the Asian VET literature is high-tech innovations to battle climate change, which is severely affecting the living conditions and health of many people in the region. Through the analysis, we can identify a field of tension between two strands of research: High-tech innovations supported in higher vocational education and envisioned by a fourth industrial revolution, versus inclusive growth for VET greening that includes initial VET.

High-Tech Innovations and the Green Transition

The first strand of research focuses on the attitudes and preparedness among students in higher vocational education and vocational colleges to contribute to a green transition (Liu et al., 2022; Mahmud et al., 2023; Nurdianshyah et al., 2019; Zubir et al., 2021). Based on a survey covering 363 Chinese students at a vocational college, Liu et al. (2022) show that female students had a more favourable attitude towards the educational dimension of sustainable development than male students. The study concludes that TVET fosters generic and critical abilities, and a questioning mind, that result in a positive attitude towards learning green skills. Comparable results were reported among Malaysian students at technical vocational colleges (Mahmud et al., 2023; Nurdianshyah et al., 2019) regarding their readiness for Industry 4.0 and attitudes towards green jobs and skills. Recommendations put forward in the above studies are the implementation of innovations in curricula, including the *green campus* (to reduce the carbon footprint of students, teachers, and human-resource management) and *green research*, that is, programmes in sustainable development.

However, research also acknowledges skills gaps between education curricula and high-tech industries. As a pedagogical innovation in Indonesia (Saputri & Ediyono, 2022), researchers and teachers invited experts to vocational colleges and TVET institutions to hold

lectures about green jobs and skills. The above study was based on an analysis of 332 engineering lectures concerning electrical and mechanical green skills. A common message in these lectures is that green jobs are becoming more important for VET students' employment and further careers. That is, the students must prepare for emerging green jobs, and future green jobs that do not yet exist.

The research on high-tech green skills also includes pedagogical innovations relating to how learning and teaching is best organised (Moldovan, 2017; Nandiyanto et al., 2022). These studies acknowledge a field of tension between engineers' technical approaches and teaching methods. Questions about how learning and teaching is best organised are considered important for students to gain a deeper understanding of how products can become climate-friendly and environmentally sustainable. The studies also conclude that technical expertise should be supplemented by interdisciplinary approaches to a green transition. For example, in the fields of advanced bio-nanotechnology (da Silvia et al., 2019; Nandiyanto et al., 2022) the studies suggest that course curricula could combine specialised high-tech skills with humanistic and ethical perspectives on sustainable development.

The Appreciation of Initial VET

In contrast to the first strand of research, the second strand places great emphasis on including the masses of young people and workers to make the move towards a green transition. More specifically, questions about the quality and efficiency of initial VET are addressed (Monavvarifard & Alibaygi, 2023; Napathorn, 2021; Salem & Najihah, 2023; Saputri & Ediyono, 2022). Hence, it is acknowledged that initial VET has a significant role to play in the green transition. Investments in green jobs can potentially proceed hand in hand with investments in initial VET, and, in effect, improve the status, attractiveness, and appreciation of VET.

On the other hand, it is recognised that such changes will not be a quick fix. The problem is that initial VET in Asia is associated with low-paid work, poor working conditions, and brown industrial jobs (Napatorn, 2022). Research on initial VET systems in Malaysia and Palestine (Salem & Najihah, 2023) reveals a contrast between policy and social experience. Surveys on the opinions of experts and vocational teachers in the Palestinian VET sector have concluded that there is no significant relationship between sustainable growth and quality improvement in initial VET (Salem & Najihah, 2023). While investments in green technologies are being made in higher TVET programmes (universities), mainstream VET suffers from the lack of a comprehensive system in practice. Other studies have highlighted the limitations of systematic updates on green jobs and green skills in both industries and VET (Napathorn, 2021). The dominant focus on industrial technological revolutions (Industry 4.0) in the literature on a green transition in VET is also problematised in research about VET in the large agricultural sector in Middle Eastern countries. For example, Monavvarifard and Alibaygi (2023) argue that modern technologies must be in tune with key social learning goals, such as learning by doing and learning to live together.

3.3 Towards Sustainable Work-Based Learning for Green Skills in VET

Most pedagogical research on VET deals with the challenge of integrating green skills (based on experts' opinions) into school curricula. Another strand of research covers training and learning in workplace settings. The latter literature acknowledges that vocational education, along with positive attitudes to green skills, are not a sufficient condition for industries to introduce green innovations into workplaces: Firms must also be innovative in collaborative processes and spend more time on training VET students, apprentices, and employees (Keshminder & Cheng, 2020; Napathorn, 2021, 2022).

In the context of VET in the European construction industry, the tension between a purely technical approach to promoting low-energy construction and a more human-centric view on work-based learning is examined. Ramioul et al. (2016) argue for an employee-centric approach to work-based learning in VET, which includes worker participation, empowered teamwork, investment in developing apprentices' and workers' capabilities, and improving job quality. Another comparative study (Barsotti, 2023) on the manufacturing industries that are envisioned by Industry 4.0 in five European countries concludes that VET providers, in cooperation with companies, should support workers better in becoming more digitally aware, and better prepared to undertake non-routine work tasks.

Comparative research (Clarke et al., 2020) on VET for low-energy construction in ten EU countries also refers to an employee-centric approach. In this comparative study, Belgium and Germany come closest to travelling 'the high road', which means that low-energy construction is closely integrated into VET programmes in the curricula and exam regulations for each occupation. In both countries' VET systems, students are taught building physics and knowledge of materials as well as the general skills, such as communication, coordination, and teamwork, that are relevant to the low-energy construction sector. In addition, in both countries, the construction industry's labour market is regulated and less fragmented than in many other European countries. This provides an infrastructure for work-based learning in close cooperation between companies and education providers. Bulgaria, Hungary, and Slovenia are categorised as countries that conform to a 'low road' to green construction (Clarke et al., 2020). In these 'low-road' countries, the fragmented nature of the construction sector, lack of labour-market regulation, and limited governmental investment in VET do not allow for the broad expertise and learning opportunities necessary for a green transition. Other countries are on the way to 'the high road'. Ireland, Italy, Poland, and Spain have developed a coordinated and comprehensive approach to integrating sustainable development elements into VET programmes, but they are still under-resourced and need improvement. The study by Clarke et al. (2020) concludes with the presentation of a toolset within the European Qualifications Framework, against which different VET programmes for low-energy construc-

tion can be assessed. However, they also concluded that quantitative and output-driven policy conceptions of green skills could potentially undermine qualitative aspects of the climate literacy needed by construction workers.

3.4 Radical Green Transformative Approach to VET

Critical research suggests the need for a radical transformative approach to VET in relation to climate change. In terms of methodology, these studies are guided by critical realism, sociology, feminism, and colonial studies, and have a strong theoretical and societal orientation. Based on the nature of this literature, the studies referred to below can be conceptualised as related to the vision of Industry 5.0 in terms of social and humanistic values. By contrast to the vision of Industry 4.0, the critics adopt a conflict perspective on society and VET. Leading research in the field (McGrath & Powell, 2016; Paryono, 2017) questions the hegemony of western notions of productivity and technocratic perspectives on a green economy. The vision of Industry 4.0 may imply that there is a global political consensus about the importance of reuniting productivity, high technology, and the greening of world economies. Instead, these authors argue that a consensus perspective conceals the fact that social realities for most people in Asian countries are structured within political economies that have emerged out of contestations and compromises in specific historical and geographical spaces. Thus, labour markets and education and training are characterised by inequalities and exclusions, profoundly influencing individuals' and communities' views on the value of different forms of education and training. However, inequalities do not fully define young people's aspirations, hopes, or actions. Therefore, the argument runs, structural changes in VET and society must provide hope that an alternative future is possible for the masses of VET students.

The conflict perspective is also based on studies focusing on capitalism and power struggles between different stakeholders in VET (see the introduction section). It is argued that progressive trade unions (Paryono, 2017) are credited with a central role in fighting for a green transition to proceed hand in hand with the pursuit of socio-economic equality. The role of trade unions as active players in relation to VET is essential to balance the dominant employers' perspective on VET. However, a double challenge for unions is the poor status of VET and to collaborate with social-ecological movements for sustainable development in order to balance green goals with decent working conditions in industry (Paryono, 2017). The low status of initial VET can create a vicious circle leading to the will to invest in green industrial jobs becoming a secondary issue.

Transformative VET in African Countries

In the context of research on African VET, the critical approach includes a vision of 'transformative VET', a term that was originally discussed at the Third International Congress on Technical and Vocational Education and Training (Powell, 2012). The crucial question is how

VET can contribute to the human development and societal changes needed to battle climate change and poverty (Powell, 2012). However, VET can support development but cannot generate it on its own. Therefore, Powell argues, VET must be approached from within a holistic theoretical framework with the capacity to link critical theories and empirical knowledge about the historical and actual development of skill-formation systems, and colonialist experiences of marginalisation. The segregation between African industry-focused VET systems and a separate skill system focused on agricultural and natural-resource management, which Powell traces back to the colonial era, reflects the unequal access to and ownership of land.

A systematic literature review (McGrath et al., 2020) reveals that vocational training in African countries is mostly associated with economic research on western-governed interventions (labelled 'vocational training') designed to tackle unemployment in settings where there is an employment crisis. However, this research neglects mainstream VET systems in Africa. The literature review also investigates the growing practice-focused research on learning, teaching, and pedagogy published in African VET journals. However, according to the (nine) authors, the main problem is that both western-oriented economic research and practice-oriented research is locked into a narrow individualistic perspective on human progress. In addition, the human capital theory is based on economic dynamics in the most advanced economies and downplays broader structural issues. The societal transformation of VET must be balanced with social and humanistic dimensions covering *community development* (youth inclusion and local labour-market experiences) and critical abilities based on agency (aspirations and decent work for human flourishing).

3.5 Co-Creation of Skill-Formation Ecosystems

Research on the role of VET in a green transition has focused on building new arenas for skills formation in collaboration between VET and working life. This includes the co-creation of: 1) Cross-disciplinary networks; 2) regional skills ecosystems; 3) digital infrastructures for mass education; and 4) intermediary institutions. Such initiatives can be seen as examples of a larger movement to reconstruct existing school-based VET systems and transgress the boundaries between different stakeholders involved in VET.

Building Capacity in VET Through Networks and Skills Ecosystems

The first research theme addresses two related key challenges: Skills gaps due to weak cooperation between education providers and working life, and radically increasing the numbers of skilled people involved in green skills formation. Thus, it is not only restricted to the existing workforce.

Two studies in Finland focus on 'green innovation ecosystems'. In the first case, the purpose of the research (Holm et al., 2017) was to improve the cooperation between in-

itial vocational education, higher education, and universities of applied science (higher TVET). In addition, the study examined knowledge supply chains by surveying stakeholders' views regarding green skills in different companies and trade associations, which was followed by workshops with the participants. All these exchanges resulted in the setting up of a cross-disciplinary network aiming to reach a holistic understanding of each partner's role and obligations within the knowledge supply chain. Reported challenges for the sustainability of the network was that financers only provided funding for specific fields, and there was no common understanding of the green economy.

The second study (Shamzzuzoha et al., 2022) surveyed the skills necessary to establish several 'centres of excellence' in VET for green innovations supported by the European-Union-funded project GREENOVET. The overall aim of these centres of excellence is to strengthen regional skill ecosystems, namely Styria in Austria, Leiria in Portugal, Skopje in Macedonia, and Vaasa in Finland. The focus on regional skills ecosystems can be seen partly against the background of the international VET literature based on typologies of green skills, which is broad and not specific to different countries or regions. The future-oriented goals for these strands of research are to establish new arenas for collaboration between researchers and stakeholders in VET and industries. This entails new missions and roles for VET.

Digital Solutions for Mass Education in Green Skills

Swedish research has provided innovative digital platforms to support mass education in the form of online courses of short duration (Leire et al., 2016; Pavlova et al., 2020). In contrast to online university courses about sustainable development, vocational online courses are more oriented towards developing specific green skills. In general, two challenges for massive online courses are low throughput among students and that they are time-consuming for teachers (e.g., answering hundreds of emails daily). To overcome these challenges, Leire et al. (2016) developed a model for online courses involving a set of different learning activities that create opportunities for students to choose different degrees of participation and progression. The model consists of: 1) Access to video and training materials and literature (non-graded level); 2) participation in discussion forums and written assignments (graded participation); and 3) completing course assignments and examinations (graded demonstration of competences). Such a model is also intended to facilitate education providers' planning of their own work, as different learning activities require different work efforts and perhaps even resulting in an increased workload. Interestingly, the massive online courses commonly involve students from a multitude of countries around the globe, not least from Asia and the Americas.

Another large collaborative research project (Pavlova et al., 2020) has developed digital platforms for mass education to promote resource efficiency in the Baltic Sea region (Sweden, Finland, Russia, and the three Baltic countries of Lithuania, Latvia, and Esto-

nia). In this project, courses and training materials for a green transition were developed in cooperation between VET and companies, along with channels for the dissemination of educational materials. Twelve teachers and 64 VET students from across the region collaborated with companies to develop course materials. The core of the extensive results is that the research team succeeded in getting companies and educational institutions to cooperate based on an interdisciplinary approach to the circular economy. What stands out in the study is that the students took the roles of 'training providers' for entrepreneurs. The students were also successful in generating ideas that business owners judged as possible to implement in their companies quite soon (Pavlova et al., 2020).

Intermediary Institutions for Mobilising Change in School-Based VET

A third strand of research addresses a recent, industry-driven 'innovation' to improve sustainability in the Swedish school-based VET system (Persson & Hermelin, 2018). The initiative, the 'Technical College Scheme' (TCS), is unusual in the Nordic context of universal, state-governed VET, which is largely oriented towards social inclusion, lifelong learning, and progression through the national education systems. The TCS is a certification scheme in technology for upper-secondary schools, which includes most of the technical and industrial VET programmes in Sweden. The scheme was initiated by stakeholders from industry, including trade unions. These cross-collaborations between different partners represent an intermediary institution in-between education and industrial companies. The aim of the TCS is to improve the quality, and industrial relevance, of VET. The criteria for certification include strong industrial involvement in school-based VET, requirements for high-quality, work-based learning, and the influence of regional actors in the planning of education. Quite recently, sustainable development and green industrial skills have been added as important goals. Yet, large Swedish industrial companies, which dominate the Swedish economy, continue to demand that upper-secondary school VET should prioritise broad general and vocational knowledge, and not focus primarily on specific skills. Indeed, this also reflects a neglected issue in the research on a green transition in VET and the world of industry; namely, the different conditions for small, medium-sized, and large companies, for example in providing comprehensive in-house training.

4 Discussion

A wide variety of research across many countries has contributed to our understanding of the role of VET in a green transition of industry. Therefore, there is a need to synthesise this research to determine what role VET can play in a green transition. The literature review indicates rapidly growing research on VET and a green transition in the so-called Global south. and European countries. As industry undergoes a green transition, while embracing

Industry 4.0 and Industry 5.0, the role of VET and its impact on developing ways to accomplish a green transition must be considered. The literature review shows that the role of VET develops successively, ranging from identifying green skills and jobs to co-creating skill-formation ecosystems that train a workforce equipped with the right skills (green, technical, and generic) in an ever-evolving industry (see Figure 2).

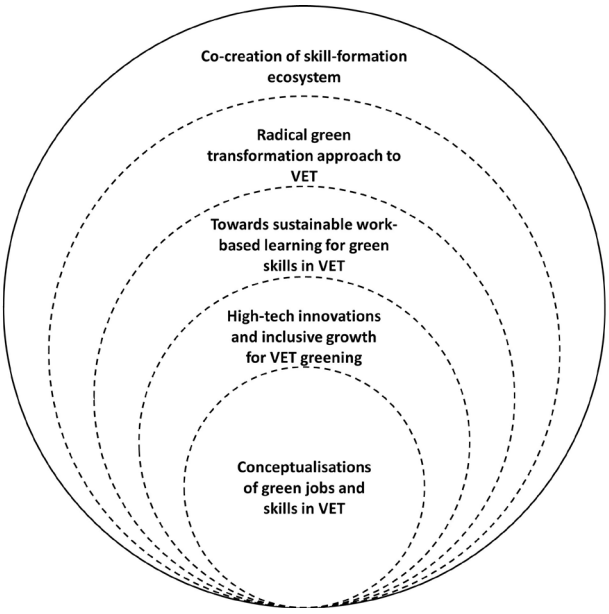

Figure 2: The Role of VET in a Green Transition, Ranging From the Conceptualisation of Green Jobs and Skills to the Co-Creation of a Skill-Formation Ecosystem

The implication of these conceptual studies on green jobs and skills is that green skills must be developed in collaboration between VET institutions and working life. This statement may seem trivial, but the concept of green skills in the literature reflects either the employers' views or the education providers' perspectives, seldom a combination of the two. In addition, the establishment of vocational teacher-training programmes at the university level can also be seen as an education-driven innovation that can potentially reduce the gap between the teaching professions and vocational teachers. This may also bridge the gap between academic and vocational skills. Collaborations between education providers at different levels within education systems are also key to recontextualising university-based typologies of green skills into educational practices.

The conceptualisation of green skills and jobs in VET also involves a policy dimension. An important stage in VET development is to realise its enormous potential to influence the global movement towards a green transition. In line with green transitional policies (e.g., those of the OECD, ILO, EC, and United Nations Educational, Scientific and Cultural Organization [UNESCO]), TVET is considered a driving force in the transition due to its close connection to industry. Industrial companies need green skills in order to adhere to both regulations and customer requirements related to a green transition. The (potential) synergistic effects of the unification of a policy-driven movement for a green industry driven by international organisations, and an industry-driven movement towards Industry 4.0, create a 'window of opportunity' for a green transition.

The literature review reveals two quite diverse lines of thought regarding green technical innovations in VET: High-tech innovations that engage a technological elite (e.g., engineers, vocational colleges, and universities) versus a bottom-up perspective that includes most VET students, apprentices, and employees in the world of work. A key challenge is the segregation between different socio-economic groups and educational sectors, which works against socially inclusive approaches to a just green transition.

As the literature review shows, sustainable work-based learning in VET deals with the pedagogical challenge of integrating green skills (based on experts' opinions) into school curricula. From a transitional development perspective, the first critical step is to develop a positive mindset about environmental issues as a basic requirement for engaging in transition processes towards a greener industry and society. The development of work-based learning in terms of educational curricula and massive online courses on green skills are examples of initiatives in this direction. The second step concerns the development of generic skills that consider climate impact and generic technical skills and industrial processes. Generic skills and lifelong learning are also a key prerequisite for the preparedness for future green jobs that do not yet exist. The third step is the development of new, specialised eco-friendly technologies and green jobs that can replace old jobs and old technologies. The latter may be perceived as threatening, but the alternative – i.e., preserving old jobs and old technologies – may also result in the loss of new jobs. Ultimately, at the highest level, most industrial workers are highly skilled in eco-friendly technologies. Given that this scenario on a large scale belongs to an imaginary future, the stepwise model implies that learning trajectories in green skills can move forward progressively at different stages. That is, people need to get started at the basic and general levels before they can reach the top. In terms of theory, we also acknowledge the need for a holistic understanding of green skills, ranging from a narrow, individualised conception of 'skills' up to VET approaches to *collective* skill formation that integrate different forms of knowledge and participation.

The literature on a green transition in industry can also benefit from well-established research on work-based learning. The roll-out of new industrial technologies, including me-

ga-trends such as automatisation, digitalisation, and AI, must also follow the principles of worker participation and sustainable work in workplace settings. That is, high-tech industries must also be innovative in supporting extensive learning among workers (Brockmann et al., 2010; Clarke et al., 2020). These tendencies are exacerbated in countries where there is as yet no comprehensive (introductory) collective formation VET system in place. The role of VET is then reduced to that of an instrumental technical approach to vocational training. We recognise that several Asian studies on a green transition also focus on the school-to-work transition. The logic of this is that a green transition must go hand in hand with the vast research on VET students' transitions into employment and skilled jobs, including opportunities for social mobility. These parallel transitions require large-scale changes in VET that link transitional approaches to societal transformative approaches.

The notion of a radical green transformation approach to VET is based more on critical and radical future visions than on the status quo. The critical approach raises further questions about how VET can contribute to a development that is human, in solidarity, and sustainable, and at the same time responds to the conventional concerns about employment, income, production, and technological development raised by representatives of the Industry 4.0 paradigm. In line with the vision of Industry 5.0, the critical literature clearly contributes to a human-centric approach to VET and industry. This means that the radical transition stage is generated by the contradictions between a technocratic paradigm versus human-centric approaches to inclusive growth. The latter can be illustrated by the vision of Industry 5.0, which is characterised by socially inclusive approaches to human development, not only for an elite but for industrial workers as well.

There is increasing interest in research on VET and the co-creation of green skill-formation ecosystems. This is partly a response to shortcomings in collaboration between different policy areas, support systems, and industry. New and dynamic partnerships and networks are emerging, creating a range of new relationships between stakeholders representing VET and industry, as well as intermediary institutions, and local and regional alliances. The impetus to collaborate comes from the need to build up ecosystems for skills supply and strengthen industry's need to upskill and reskill workers for a green transition. Innovative investments in digital solutions for mass education and online courses in green skills will require new roles for VET providers.

5 Conclusion

This article has highlighted the ways in which VET can take on different roles in the green transition, and that these roles develop successively in parallel with a green transition in industry. In the development of the role of VET, it is also relevant to consider the contrast between *transitional* approaches and *transformative* approaches in VET research. These two

concepts can be understood as a duality (not a dualism), as they are not mutually exclusive. All differences aside, we argue that both transitional and transformative dimensions are important for a holistic developmental perspective on VET and climate change. In the reviewed literature, both concepts provide nuanced perspectives on how to describe, interpret, and support desirable changes in VET to battle climate change. We suggest that the main difference stems from different research communities, which are concerned with either transition or transformation. Our literature review shows that transitional approaches are recurrently marked by empirical research in specialised areas and subsystems within society, such as different forms of VET, high-tech innovations in industries and firms, and the educational dimension of green skills. In contrast, transformative approaches are characterised by a stronger focus on societal transformation (large-scale changes), power dynamics, and social justice.

Based on the literature review, we can discern at least two different but partially overlapping transformative approaches to the role of VET in society. The first is a social-justice approach, which is marked by a conflict perspective on society. The transformative role of VET is argued to extend beyond the needs of the labour market by including the interests of people who are marginalised in both education and working life. The purpose of VET is thus redefined. That is, the multifaceted nature of different forms of VET must be more fully recognised in order to better support the needs of those who live in poor and precarious conditions.

The second transformative approach draws upon comparative studies on path dependencies and institutional change in VET (e.g., Thelen, 2014). Following this research tradition, the scope of radical changes in the field of VET is circumscribed by struggles between multiple stakeholders in VET. The research on collective skill formation provides a conceptualisation of the combined effects of state commitment and employer involvement in the development of VET. Comparative studies on collective skill-formation systems in VET have usually been defined in relation to industry and craft (i.e., the labour market). In the present literature review, we have expanded the object of inquiry by focusing on the role of VET in contributing to battling the climate crisis, which also involves other international organisations and stakeholders, as well as socio-ecological concerns.

6 Limitations and Further Research

The integrative literature review has been useful to investigate the complex topic of the role of VET in a green transition of industry. However, one limitation is that the completed literature review cannot claim to provide a representative picture of all ongoing research that focus on green transition in relation to VET. This is partly because the selection is mainly based on English-language studies, partly because a significant number of studies have been published

in the field over a short period of time. Undoubtedly, it is a rapidly growing field of research, which makes it difficult to obtain a complete overview of the role of VET in the green transition of industry.

Despite the limitation, the present literature review has enough value to contribute to the body of research in the field of VET. The literature review suggests a further direction for research on transformative approaches, which is a need not only to continue to focus on stakeholders in industry, in VET, or in socio-ecological movements, but also to focus on the links between these stakeholders. The increasing interest in research for co-creating green skill-formation ecosystems is partly a response to shortcomings in the collaboration between different policy areas and support systems as well as industry. A possible role for VET to take on is to coordinate skill-formation ecosystems and facilitate their co-creation with other stakeholders. However, further research is needed before VET can take on such a role because, as studies in the field of VET indicate, bringing stakeholders together to collaborate will require them to solve many difficult issues. Therefore, studies of the collaborative efforts to establish a skill-formation ecosystem involving stakeholders from national organisations, educational institutions and industry would be welcome. A closer collaboration between stakeholders could pave the way for VET to battle climate change more effectively.

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Ethics Statement

This integrative literature review did not require approval by an ethics committee. Nevertheless, the ethical principles in accordance with the IJRVET Ethics Statement have been implemented in the reporting of our review so that the entire research process is available to the reader.

References

Avis, J. (2020). *Vocational education in the fourth industrial revolution: Education and employment in a post-work age*. Palgrave. https://doi.org/10.1007/978-3-030-52032-8

Barbosa, B., Benedicto, B., Amaral Santos, C., Filipe, S., Costa, F., Melo, A., Paiva Dias, G., & Rodrigues, C. (2020). A closer look at VET education through the lenses of sustainable development goals. *Proceedings of the ICERI 13th annual International Conference of Education, Research and Innovation*. Online Conference. http://doi.org/10.21125/iceri.2020.1169

Barsotti, M. (2023). Educational (mis)match in the context of new manufacturing: A qualitative comparative analysis study in five European countries. *International Journal of Finance & Economics,* 1–23. https://doi.org/10.1002/ijfe.2767

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Brockmann, M., Clarke, L., & Winch, C. (2010). *Bricklaying is more than Flemish bond: Bricklaying qualifications in Europe*. CLR.

Busemeyer, M. R., & Trampusch, C. (2012). *The comparative political economy of collective skill formation systems*. Oxford University Press.

Clarke, L., Sahin-Dikmen, M., & Winch, C. (2020). Overcoming diverse approaches to vocational education and training to combat climate change: The case of low energy construction in Europe. *Oxford Review of Education*, *46*(5), 619–636. https://doi.org/10.1080/03054985.2020.1745167

da Silvia, M. A. B., Costa, P. R., & Kniess, C. T. (2019). Environmental training and developing individual environmental sustainability competences in Brazilian chemical sector companies. *Industrial and Commercial Training*, *51*(1), 40–51. https://doi.org/10.1108/ICT-12-2017-0105

Demir, K. A., & Cicibas, H. (2017). *Industry 5.0 and a critique of Industry 4.0. Proceedings of international management information systems conference, Istanbul*. IMISC'17 – 4th International Management Information System

Gessler, M., & Siemer, C. (2020). Umbrella review: Methodological review of reviews published in peer-reviewed journals with a substantial focus on vocational education and training research. *International Journal for Research in Vocational Education and Training*, *7*(1), 91–125. https://doi.org/10.13152/IJRVET.7.1.5

Gustavsson, S., Henning Loube, I., & Kvarnemo, C. (2018). Learning for sustainable development in vocational teacher education. *Nordic Journal of Vocational Education and Training*, *8*(3), 19–35. https://doi.org/10.3384/njvet.2242-458X.188319

Holm, T., Vennervirta, P., Pöykkö, T., Hämeenoja, E., & Teirasvuo, N. (2017). Identification of skills needed for central areas of green and low-carbon economy, for the needs of labor market, in Finland. *European Journal of Sustainable Development Research*, *1*(1), 1–8. https://doi.org/10.20897/ejosdr.201705

International Labour Office. (ILO) (2018). *Greening with jobs*. World Employment and Social Outlook 2018 – Greening with jobs (ilo.org)

Jørgensen, C., Olsen O-J., & Persson Thunqvist, D. (2017). *Vocational education in the Nordic countries: Learning from diversity* (1st ed.). Routledge. https://doi.org/10.4324/9781315414492

Keshminder, J. S., & Cheng, C. S. (2020). Mechanisms used by chemical manufacturing firms to promote green skills among employees: A case study in Malaysia. *International Journal of Environment and Sustainable Development*, *19*(2), 138–152. http://doi.org/10.1504/IJESD.2020.106658

Langthaler, M., McGrath, S., & Ramsarup, P. (2021). *Skills for green and just transitions: Reflecting on the role of vocational education and training for sustainable development*. Briefing Paper 30, Austrian Foundation for Development Research (ÖFSE).

Leire, C., McCormick, L., Luth Richter, J., Arnfalk, P., & Rodhe, H. (2016). Online teaching going massive: Input and outcomes. *Journal of Cleaner Production*, *123*, 230–233. https://doi.org/10.1016/j.jclepro.2015.12.014

Liu, X., Chen, Y., Yang, Y., Liu, B., Ma, C., Craig, G. R., & Gao, F. (2022). Understanding vocational accounting students' attitudes towards sustainable development. *Journal of Vocational Education & Training*, *74*(2), 249–269. http://doi.org/10.1080/13636820.2020.1760333

Lotz-Sisitka, H., Sisitka, L., Chakona, G., & Maniwane, M. (2023). Evaluating boundary crossing social learning in vocational education and training: A value creation approach. *Southern African Journal of Environmental Education*, *39*(1), 1–28. http://doi.org/10.4314/sajee.v39.04

Mahmud, M. F., Aripin, M. A., Junaifi, N. H., Seth, N. H. N., & Sultan, A. A. M. (2023). Perspectives of Malaysian academics on the preparation of fourth industrial revolution for construction technology program. *International Journal of Evaluation and Research in Education*, *12*(1), 114–120. http://doi.org/10.11591/ijere.v12i1.24092

McGrath, S., & Powell, L. (2016). Skills for sustainable development: Transforming vocational education and training beyond 2015. *International Journal of Educational education*, *50*, 12–19. https://doi.org/10.1016/j.ijedudev.2016.05.006

McGrath, S., Ramsarupb P., Zeelenc, J., Wedekinda,V., Allaisb, S., Lotz-Sisitka, H., Monk, D., Openjuru, G., & Russon, J-A. (2020). Vocational education and training for African development: a literature review. *Journal of Vocational Education & Training*, *72*(4), 465–487. https://doi.org/10.1080/13636820.2019.1679969

Moldovan, L. (2017). Framework development for European quality assurance in VET towards environmentally sustainable economy. *Procedia Engineering*, *181*(1), 1064–1071. https://doi.org/10.1016/j.proeng.2017.02.508

Monavvarifard, F., & Alibaygi, A. (2023). TVET model for building safety and sustainable agriculture in Iran by 2030 and beyond. *Environmental Education Research*, *29*(3), 423–450. https://doi.org/10.1080/13504622.2022.2151573

Nandiyanto, A. B. D., Fiandini, M., Hofifah, S. N., Ragadhita, R., Al Husaeni, D. F., Al Husaeni, D. V. A., Maryanti, R., & Masek, A. (2022). Collaborative practicum with experimental demonstration for teaching the concept of production of bioplastic to vocational students to support the sustainability development goals. *Journal of Technical Education and Training*, *14*(2), 1–13. http://doi.org/10.30880/jtet.2022.14.02.001

Napathorn, C. (2021). The development of green skills across firms in the institutional context of Thailand. *Asia-Pacific Journal of Business Administration*, *14*(4), 539–572. https://doi.org/10.1108/APJBA-10-2020-0370

Napathorn, C. (2022). The implementation of green human resource management bundles across firms in pursuit of environmental sustainability goals. *Sustainable Development*, *30*(5), 787–803 https://doi.org/10.1002/sd.2271

Nikolajenko-Skarbalė, J., Viederytė, R., & Šneiderienė, A. (2021). The significance of "green" skills and competencies making the transition towards the "greener" economy. *Rural Sustainability Research*, *46*(341), 53–65. https://doi.org/10.2478/plua-2021-0017

Nurdianshyah, N., Mulyanti, B., & Sucita, T. (2019). Green skills for electrical engineering students. Annual Conference of Science and Technology. *Journal of Physics, Conference series* 1375(012086), 1– 9. https://doi:10.1088/1742-6596/1375/1/012086

Paryono, P. (2017). The Importance of TVET and its contribution to sustainable development. In *AIP Conference Proceedings*, 1887(020076), 1–14. https://doi.orgparyo/10.1063/1.5003559

Pavlova, A., Sergienko, O., Wang, Z., Heikinheomo, L., & Obuka, V. (2020). Creating aligned studies in resource efficiency and circular economy in the Baltic Sea region. *International Multidisciplina-*

ry Scientific Geo-Conference Surveying Geology and Mining Ecology, 20(5.2), 658–692. https://doi.org/10.5593/sgem2020/5.2/s22.084

Persson, B., & Hermelin, B. (2018). Mobilising for change in vocational education and training in Sweden: A case study of the 'Technical College' scheme. *Journal of Vocational Education & Training*, *70*(3), 476–496. https://doi.org/10.1080/13636820.2018.1443971

Powell, L. (2012). Reimagining the purpose of VET: Expanding the capability to aspire in South African further education and training students. *International Journal of Educational Development, 32*(5), 643–653. https://doi.org/10.1016/j.ijedudev.2012.01.008

Ramioul, M., Benders, J., & van Peteghem, J. (2016). Green construction and team design: Low road and high road teams to build energy-friendly houses. *World Review of Entrepreneurship, Management and Sustainable Development*, *12*(1), 33–49. https://doi.org/10.1504/WREMSD.2016.073421

Ramli, S., Rasul, M. S., & Affandi, H. M. (2019). The importance of green skills from the perspective of TVET lectures and teacher trainees. *International Journal of Innovation, Creativity and Change, 7*(6), 186–199.

Rosenberg, E., Lotz-Sisitka, H. B., & Ramsarup, P. (2018). The green economy learning assessment South Africa: Lessons for higher education, skills and work-based learning. *Higher Education, Skills and Work-based Learning*, *8*(3), 243–258. https://doi.org/10.1108/HESWBL-03-2018-0041

Salem, I. S., & Najihah, A. W. (2023). Overcoming the climate change challenges through vocational and technical education programs. *Res Militaris*, *13*(2), 1953–1963.

Saputri, F., & Ediyono, S. (2022). Education framework 2030: Do vocational school students have green skills? *Jurnal Kependidikan*, *8*(3), 605–616. https://doi.org/10.33394/jk.v8i3.5355

Sern, L. C., Baharom, N., Foong, L. M., Nadrah, W. M. W. H., Islamiah, R. D., & Ana, A. (2021). Integrating green skills into TVET curricula in polytechnics Malaysia. *Journal of Technical Education and Training*, *13*(3), 15–19. https://doi.org/10.30880/jtet.2021.13.03.002

Setiawan, A. (2017). Identification of green skills acquisition in Indonesian TVET curricula. *Proceedings of the Green Construction and Engineering Education (GCEE) Conference 2017*, 1887, art. No. 020074. https://doi.org/10.1063/1.5003557

Shamzzuzoha, A., Cisneros Chavira, P., Kekale, T., Kuusniemi, H., & Jovanovski, B. (2022). Identified necessary skills to establish a center of excellence in vocational education for green innovation. *Cleaner Environmental Systems*, 7, 1–10. https://doi.org/10.1016/j.cesys.2022.100100

Sharpe, S., & Martinez-Fernandez, C. (2021). The implications of green employment: Making a just transition in ASEAN. *Sustainability*, *13*(13), 7389. https://doi.org/10.3390/su13137389

Stanef-Puica, M-R., Badea, L., Serban-Oprescu, G-L., Serban-Oprescu, A-T., Frâncu, L-B., & Cret, A. (2022). Green jobs: A literature review. *International Journal of Environmental Research and Public Health*, *19*(13), 7998. https://doi.org/10.3390/ijerph19137998

Thelen, K. (2014). Varieties of liberalization in the new politics of social solidarity. Cambridge University Press. https://doi.org/10.1017/CBO9781107282001

Torraco, R. J. (2016). Writing integrative literature reviews: Using the past and present to explore the future. *Human Resource Development Review*, *15*(4), 404–428. https://doi.org/10.1177/1534484316671606

Zubir, M., Zulfadly, M., Sern Lai, C., Adib Farhan, Z., Ming Foong, L., Badaruddin, I., & Affero, I. (2021). Dimension of green skills: Perspectives from the industry experts. *Journal of Technical Education and Training*, *13*(1), 159–166. https://penerbit.uthm.edu.my/ojs/index.php/JTET/article/view/7944

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