OECD Reviews of Vocational Education and Training

Teachers and Leaders in Vocational Education and Training

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BETTER POLICIES FOR BETTER LIVES

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Foreword

Global megatrends, such as automation, digitalisation, the green transition and population ageing, are bringing about structural changes in labour markets around the world. These changes have an impact on skills demand and supply. Vocational education and training (VET) can play a key role in responding to changing skill needs by equipping young people and adults with the right skills.

As in all parts of the education system, teachers and institution leaders are at the heart of high-quality VET. Their importance was highlighted during the COVID-19 pandemic, when the commitment and creativity of teachers and education institution leaders safeguarded the continuity of teaching and learning. Teachers in VET need to have a unique combination of pedagogical and industry-specific skills and knowledge that allow them to effectively teach vocational theory and practice to students. Moreover, as students in VET are often more diverse than in general education programmes, VET teachers play a key role in motivating students and overcoming barriers to learning. Leaders of VET institutions manage complex organisations that often involve close ties with local stakeholders and require smart investment in tools and technologies for teaching a diverse set of VET programmes.

In light of structural changes in the labour market and associated changing skill needs, VET teachers need opportunities to keep their skill and knowledge up to date with workplace practices. They also need to keep abreast of new technologies for teaching and learning and innovative pedagogical approaches. The COVID-19 pandemic has underlined the benefits of the use of digital technologies in education, but also brought some key challenges to light – especially in VET, where practical learning is the norm. Institution leaders play a key role in attracting and retaining VET teachers with the right skills and providing opportunities for professional development. In this respect, the ability of leaders to develop close ties with the world of work is becoming of even greater importance in a changing labour market.

In spite of their important role, data and information on effective policies and practices for attracting, training and retaining VET teachers and leaders are limited. This report aims to fill the knowledge gap, by assessing the key challenges and opportunities for VET teachers and leaders as skills needs change, and by providing international good practice examples and policy pointers to ensure that teachers and leaders can deliver high quality VET. The report is part of the OECD Centre for Skills' broader work on VET, which supports countries in building attractive, inclusive and responsive VET systems.

This report was drafted by Shinyoung Jeon, Pauline Musset and Rodrigo Torres from the OECD Centre for Skills, under the supervision of Marieke Vandeweyer (manager of the VET team) and Andrew Bell (Acting Head of the OECD Centre for Skills). The report has benefited from helpful comments provided by Mark Pearson (Deputy-Director for Employment, Labour and Social Affairs), colleagues in the Centre for Skills, the Directorate for Employment, Labour and Social Affairs, and the Directorate for Education and Skills. Administrative and editorial assistance was provided by Charity Kome, Jennifer Cannon and Rasa Silyte-Niavas from the OECD Centre for Skills and by Sally Hinchcliffe. Aurelien Kaske and Koshi Murakoshi provided research support.

The views expressed in this report should not be taken to reflect the official position of OECD member countries.

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We also greatly appreciate the time given by hundreds of other colleagues who contributed to this report by generously sharing their experience and insights on the topic throughout the project period. Particular thanks is also owed to national experts of VET and skills, who commented on the draft reports and provided background information through an OECD questionnaire.

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Acronyms and abbreviations

ACL	Adult and community learning
ACDEVEG	Australian Council of Deans of Education Vocational Education Group
AI	Artificial intelligence
ALL	Adult Literacy and Lifeskills Survey
AR	Augmented reality
CEDEFOP	European Centre for the Development of Vocational Training
CSS	College Staff Survey
CTE	Career and technical education
ECTS	European Credit Transfer System
EdTech	Education technology
EU-LFS	European Union Labour Force Survey
FE	Further education
GCSE	General Certificate of Secondary Education
GNE-VET	Group of National Experts on VET
ICT	Information and communications technology
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
ITET	Initial teacher education and training
ITP	Independent training provider
KMK	Standing Conference of the Ministers of Education and Cultural Affairs of the Länder
NRCCTE	National Research Center for Career and Technical Education
PBL	Project-based learning
PD	Professional development
PGCE	Post-Graduate Certificate in Education
PIAAC	OECD Survey of Adult Skills
PISA	Programme for International Student Assessment
PTS	Passport to Success
R&D	Research and development
RTO	Registered Training Organisation
SELFIE	Self-reflection on Effective Learning by Fostering the Use of Innovative Educational Technologies
SES	Structure of Earnings Survey
SFC	Sixth form college

SIR	Staff Individualised Record
SME	Small and medium-sized enterprise
SREB	Southern Regional Education Board
STEM	Science, technology, engineering and mathematics
T2L	Teaching to Lead
TAFE	Technical and further education
TALIS	Teaching and Learning International Survey
TTF	Taking Teaching Further
VET	Vocational education and training
VR	Virtual reality
WBL	Work-based learning

Executive summary

Key findings

Teachers and leaders are central to vocational education and training (VET). Often referred to as a "dual profession", VET teachers require both pedagogical and industry knowledge to prepare young people and adults for the labour market. Institutional leaders in VET play many important roles, from developing and supporting teachers to engaging multiple stakeholders and improving the quality of VET through the allocation of resources and provision of instructional guidance.

The landscape of teaching and learning in VET is changing, as are the skills the labour market needs, reinforcing the need for VET teachers to keep abreast of new pedagogical approaches and classroom technology and keep up to date with the realities of the workplace. For example, increasing demand for basic, digital and soft skills in the labour market means VET teachers need to equip themselves with these skills and teach them to their students.

These diverse and changing requirements create several challenges for the sector. VET teacher shortages are significant in many OECD countries. Half of further education college principals in England (United Kingdom), half of states in the United States, and a third of VET principals in Denmark, Portugal and Turkey reported shortages. VET teacher supply is estimated 80% of the demand in Germany, 70% in Korea and 44% in Sweden. While training is crucial to prepare and develop VET teachers, many countries struggle to cover the full mix of skills they need. Moreover, VET teachers often face barriers to accessing training due to lack of support or incentives, and conflicts with their work schedule. Similarly, the complex set of responsibilities VET leaders face are not always matched with sufficient access to relevant training opportunities and targeted support.

Key recommendations

1. Ensure an adequate supply of well-prepared VET teachers

Increasing the attractiveness of VET teaching could encourage more people to join the profession. Financial incentives and support targeted at initial teacher education and training (ITET) and professional development (PD) can help attract and retain VET teachers. Likewise, targeted financial incentives and support can encourage industry professionals into VET teaching in shortage areas. VET teachers who receive targeted support during their careers are more likely to stay in the profession. For example, the attrition rates among new VET teachers can be reduced through mentoring and structured induction programmes. For experienced teachers, attractive career pathways and targeted support can encourage them to stay in the profession while allowing them to move into senior or management-level positions or into other subject areas.

Employing industry professionals can ease VET teacher shortages. As they generally lack the required teaching qualifications and pedagogical skills, providing flexible pathways for qualification, training and recruitment can ease their entry into teaching. For example, countries may relax qualification requirements, if needed, for industry professionals or for graduates from higher education specialising in the relevant

subjects, and provide alternative routes to obtaining teaching qualifications. Part-time work can also facilitate flexible teaching in VET, but should not come at the expense of VET teachers' working conditions and teaching skills. Collaboration between VET institutions and industry should be strengthened to facilitate the engagement of industry professionals in VET teaching.

2. Effectively prepare and develop VET teachers

Initial teacher education and training programmes should develop future VET teachers' pedagogical skills alongside their basic, digital and soft skills, and the vocational skills and knowledge needed by the labour market. There are many initiatives aiming to develop strong pedagogical and vocational skills in VET teachers. Education and training institutions have to keep their curricula up to date, collaborate with VET institutions to offer practical teacher training, and develop research and innovation into pedagogical approaches. Offering work-based learning opportunities in industry as part of ITET can be particularly helpful for those with no industry background.

Changing teaching and learning environments, as well as the changing needs of the labour market mean VET teachers need to continue to develop their skills after leaving ITET. Several countries give them the means and support to participate in PD. To make such participation more effective, VET teachers' training needs need to be assessed so that relevant, customised and engaging PD can be provided. Participation can be increased by fostering collaboration between VET stakeholders, including VET institutions, teacher and school networks, local companies, and universities and other associations.

3. Promote innovative pedagogical approaches in VET

Innovative pedagogical approaches can improve the quality of VET teaching and foster the development of transversal skills, including soft and digital skills. VET can benefit from the flexibility, cost- effectiveness, safety and other advantages of new technology, such as online learning, virtual/augmented reality, robotics and simulators. Encouraging the adoption of such approaches can begin by fostering VET teachers' capacity to take advantage of new and existing technology. Countries need to help VET teachers to regularly update their pedagogical knowledge and digital skills and adjust their teaching methods by providing training and networking opportunities.

To encourage the effective use of innovative pedagogical approaches, countries should also provide strategic guidance and institutional support to VET teachers. This could include guidance on how to choose effective teaching methods, combined with improving their access to digital devices, high-tech equipment and technical support. Countries can also promote innovation in VET by establishing partnerships between the VET sector and industry to improve the procurement of materials and equipment tailored to teaching and learning needs. More broadly, they need to raise awareness of the importance of innovation, information and communications technology (ICT) and soft skills in VET to encourage collaboration among relevant stakeholders to make VET more innovative.

4. Strengthen VET leadership

VET institutions need well-prepared leaders. They have to understand the VET sector and the labour market while also having the organisational and pedagogical leadership skills needed to improve teaching and learning. To ensure that VET leaders can effectively carry out their complex and varied roles, countries should ensure they are all equipped with the right skills by clarifying their roles and tasks and providing access to initial training and professional development, as part of a coherent skills development strategy. Leaders should also be supported in their role, especially at the start of their careers. It is also important to make VET leadership roles more attractive, by developing middle management roles and leadership teams to assist leaders with their responsibilities, giving suitable external candidates access to the profession, and supporting VET leaders through peer learning.

1 Assessment and recommendations

This chapter provides an overview of the report and a summary of the key findings and recommendations. It highlights the importance of teachers and leaders in vocational education and training (VET), explains the definitions and methodology used and outlines the changing landscape of teaching and leadership in VET.

The importance of teachers and leaders in VET

Teachers[1] and leaders are central to vocational education and training (VET), a unique form of education that focuses on practical skills and hands-on experience. Often referred to as a "dual profession" (Greatbatch and Tate, 2018[1]; OECD, 2015[2]; Andersson and Köpsén, 2015[3]), VET teachers generally have to have both pedagogical and occupational knowledge and experience. VET teachers prepare young people for work by teaching not only occupational skills but also transversal skills, such as basic and soft skills. They support the school-to-work transition of students with diverse backgrounds, including those who are struggling with academic studies, and adults in need of new, updated or improved skills.

Institutional leaders in VET play a crucial role in ensuring that this diverse group of students have access to high-quality teaching and learning that develops the skills they need. The effectiveness of VET institutional leaders has a significant impact on students' achievement and teachers' working conditions (Ruiz-Valenzuela, Terrier and Van Effenterre, 2017[4]). VET leaders need to be strategic and management focused and have a good understanding of the VET landscape and the factors that could affect it. They also need to encourage more innovative approaches to pedagogy, organisational and institutional matters, while keeping abreast of new and emerging technology that could improve the effectiveness of VET delivery.

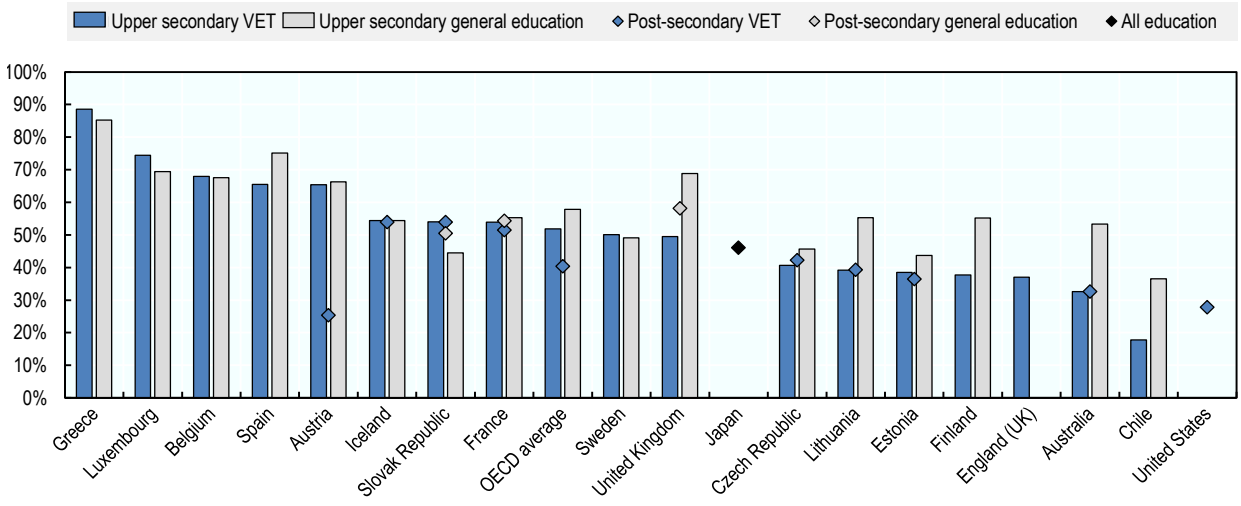
The importance of VET teachers and leaders came even further to the fore during the COVID-19 pandemic and the ensuing school closures implemented in many countries (OECD, 2020[5]). VET institutions train, assess and award qualifications for many of the professions that formed the backbone of economic and social life during the lockdown, from the health sector to the retail sector (OECD, 2020[6]). At the same time, VET institutions offer individuals who lost their jobs the opportunity to improve their skills or develop new ones to prepare for employment in different occupations or sectors. To ensure continuity of teaching during closures, many VET teachers and leaders had to be creative. For example, they found new or alternative ways of teaching and learning, often using digital technologies. They also filled students' learning gaps – caused by the closure of learning venues and interrupted work-based learning – by providing opportunities for practical learning at schools during summer vacations or even during the lockdown where countries allowed it in specific cases (OECD, 2020[5]).

Teachers and leaders are core resources for the effective provision of VET. On average across the 18 OECD countries, teacher compensation accounts for 52% of the total expenditure of public and private upper secondary VET institutions, and 40% of the total for post-secondary VET institutions (Figure 1.1). The differences between countries are substantial, with upper-secondary VET institutions in Greece spending 89% of their resources on teacher compensation but those in Chile spending only 18%. In the majority of countries with available data, the share of expenditure devoted to teacher compensation in VET is the same or lower than in general education (52% in VET versus 58% in general education at the upper secondary level on average across countries). The Slovak Republic is the main exception; the share for VET is 10 percentage points higher than for general education at the upper secondary level.

Despite their importance, there is limited knowledge and evidence about teachers and institutional leaders in VET. To fill this knowledge gap, this study aims to produce new insights into the strategies and policies that can best help develop and maintain a well-prepared teaching and leadership workforce in VET. The remainder of this chapter provides an overview of this report and a summary of its key findings and recommendations. Chapter 2 discusses key challenges and policy responses to ensuring an adequate supply of well-prepared teachers in VET. Chapter 3 explores effective ways to prepare and develop these teachers. Chapter 4 discusses innovative pedagogical approaches in VET. Finally, Chapter 5 examines important aspects of strengthening strategic leadership in VET. Box 1.1 provides details about the methodology used in this study.

Figure 1.1. Teachers account for an important share of VET expenditure

Share of expenditure for compensation of teachers (with active teaching responsibilities), all public and private VET institutions, 2017 or latest year



Note: In the case of the United Kingdom, VET institutions are all government dependent private institutions. Data for England (UK) refer to all staff costs in further education colleges (2016-17). Japan (2018) refers to total school education expenditure, excluding expenses for public universities, junior colleges and subsidies to private schools.
Source: OECD (2020[6]), Education at a Glance 2020: OECD Indicators, https://doi.org/10.1787/69096873-en; England: Association of Colleges (2018[7]), AoC 2018 Report on College Finances, www.aoc.co.uk/system/files/AoC%202018%20report%20on%20college%20finances%20%2014%20September%2018.pdf; Japan: MEXT (2020[8]), Report of Local Education Expense Survey for the First Year of Reiwa (FY2018), https://www.mext.go.jp/content/20201120-mxt_chousa01-100014633_c.pdf.

Box 1.1. About this study: Teachers and Leaders in VET

Objectives

This report aims to help countries develop, maintain and improve their teaching and leadership workforce in VET. While the challenges for teacher recruitment, retention, training and pedagogy as well as school leadership are widely documented and analysed (OECD, 2018[9]; OECD, 2005[10]; OECD, 2019[11]), the specific challenges around teachers and leaders in VET have been under-researched. This study addresses this gap and provides advice to governments and other stakeholders regarding teaching and leadership in VET.

Scope

This report focuses on teachers and institutional leaders in VET at International Standard Classification of Education (ISCED) Levels 3-5 (upper secondary, post-secondary non-tertiary and short-cycle tertiary) paying particular attention to upper secondary education.

Vocational trainers (or apprentice tutors or company trainers) who supervise and teach work-based learning in companies are outside the scope of this study. The study does not include special needs teachers, educational psychologists or counsellors.

Methodology

The report draws on comparative data and the experiences of several OECD countries to distil its policy messages. The information for this report was gathered through:

- *Data analysis and literature reviews:* Key data sources include *Education at a Glance* (EAG) 2020 (OECD, 2020[6]), including the results from an ad hoc survey of teachers in upper-secondary VET programmes; the Teaching and Learning International Survey 2018 (TALIS); the European Union Labour Force Survey 2017-19 (EU-LFS); and relevant national statistics.
- *Study visits and stakeholder interviews:* The OECD review team gathered inputs from a visit to the United States at the end of February 2020 and remote interviews with stakeholders in Denmark, England (United Kingdom),[1] Germany and Japan to discuss key policy questions and identify the main challenges and opportunities for teachers and leaders in VET. Supplementary interviews were conducted with experts in Australia and Belgium (French Community).
- *Inputs and review by the Group of National Experts on VET (GNE-VET)*: The OECD team gathered inputs from the members of the GNE-VET through a policy questionnaire. GNE-VET members and members of the Skills Strategy Advisory Group have also reviewed a discussion paper on the topic that included preliminary analysis and policy recommendations.

1. A visit to England was planned in March 2020 but was replaced by remote interviews as a result of the COVID-19 pandemic.

Definitions and methodology

Definition of VET teachers

This study uses two definitions of VET teachers (see Box 1.2 for details), one based on the subject taught and the other on the type of programme in which the teacher is active. The first defines VET teachers as teachers of vocational subjects, regardless of programme orientation. These VET teachers teach vocational subjects in vocational and/or general programmes. Their counterparts teach general subjects, also in vocational and/or general programmes. The second defines VET teachers as teachers in VET programmes, regardless of the subjects they teach. These VET teachers teach any type of subject – including general subjects – in VET programmes, while general education teachers in this definition teach any type of subject in general programmes.

Categories and definitions of VET teachers vary across countries, datasets and taxonomies, and each have their own limitations. Some existing datasets or taxonomies, including commonly used international occupational classifications, do not distinguish between the types of programmes or institutions in which teachers are employed. This means that even where VET teachers are distinguished from general subject teachers, they could still be teaching in general programmes, making the first definition more useful. On the other hand, not all countries distinguish teachers in VET programmes by teaching subject. The 2020 *Education at a Glance* publication shows that in 21 OECD countries teachers of general subjects can teach in both general and vocational programmes without changes to their terms and conditions (OECD, 2020[6]). The definition used in different parts of this report will therefore depend on the data source used.

Definition of institutional leaders in VET

Institutional leaders in VET refer to individuals who are appointed or employed in a recognised leadership position to oversee VET programmes and institutions and have responsibility for the goals set by an organisation that offers VET programmes. VET leaders can have different responsibilities in different countries and types of institutions. They could be school leaders in a single- or multi-field vocational school,

or heading a public or private VET institution providing adult learning programmes. They might also be responsible for VET programmes within comprehensive education institutions (that may also provide general education programmes). For example, leaders of VET institutions oversee upper secondary VET schools in Denmark and Germany; further education colleges, independent training providers and adult community centres in England (United Kingdom); vocational high schools, colleges of technology and specialised training colleges in Japan; and career and tech education programmes in high schools and community colleges in the United States.

Box 1.2. Taxonomy of VET teachers in international and national data

1. Teachers of vocational subjects regardless of programme orientation

In international surveys such as the EU Labour Force Surveys and the OECD Survey of Adult Skills, a product of the Programme for the International Assessment of Adult Competencies (PIAAC), VET teachers are defined following the International Standard Classification of Occupations (ISCO):

- **Vocational education teachers** *(232 in ISCO-08)* teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges. They prepare students for employment in specific occupations or occupational areas for which university or higher education is not normally required, whether they work in a general secondary school or in a vocational or technical school or college. This includes vocational teachers not only in VET programmes but also in general programmes, but excludes general subject teachers in VET programmes.

The same classification defines general education teachers as:

- **Secondary education teachers** *(233 in ISCO-08)* teach one or more subjects at secondary education level (whether their schools or programmes are vocationally oriented or not), excluding subjects intended to prepare students for employment in specific occupational areas. Thus, this includes general subject teachers both in VET and general education programmes.

Many other occupational classifications use a similar approach. In the United States, for example, the US Standard Occupational Classification categorises VET teachers in secondary education as Career/Technical Education Teachers, Secondary School (25-2032). Their general education counterparts are Secondary School Teachers, Except Special and Career/Technical Education (25-2031).

This report defines VET teachers by the subject they teach when referring to the OECD Teaching and Learning International Survey (TALIS), a large international survey of teachers and school leaders on their working conditions and the learning environments at their schools. TALIS surveys teachers and leaders in lower secondary schools in all participating countries, with some countries also participating at the primary and upper secondary levels (only six OECD countries/regions have available data at the upper secondary level). TALIS 2018 is organised into five policy areas: effective teaching, developing teachers, school leadership, and attracting and retaining teachers. When referring to TALIS data in this report, the following definitions are used:

- **VET teachers** refer to all upper secondary teachers who reported in TALIS that they teach practical and vocational skills in the survey year, regardless of the type of programme or school.
- **General education teachers** refer to all upper secondary teachers teaching subjects other than practical and vocational skills, regardless of the programme or school.

2. Teachers in VET programmes or VET institutions regardless of the subjects that they teach

The UNESCO-OECD-Eurostat data define **VET teachers** as classroom teachers and academic staff in upper secondary and post-secondary VET programmes. Their counterparts are **teachers in general education programmes**. Within this definition, the teaching workforce in VET programmes or institutions can be further divided into three different types.

- Teachers of vocational theory, who teach theoretical subjects, such as sales techniques and electronics, in VET programmes.
- Teachers of vocational practice, who teach practical applications, such as mechatronics practice in school workshops, in VET programmes.
- Teachers of general subjects, who are responsible for teaching academic subjects, such as mathematics and sciences, in VET programmes.

Certain occupational classifications use this institution- or programme-based approach to distinguish between general education and VET teachers. This is the case for the UK Standard Operational Classification, where VET teachers are categorised as Further Education Teaching Professionals (2312), and general education teachers as Secondary Education Teaching Professionals (2314). The former supervise and teach trade, technical, commercial, adult education, secondary and post-secondary courses to students beyond minimum school leaving age. These further education (FE) teaching professionals are the focus of the College Staff Survey (which covered 199 FE colleges and 9 603 teachers and leaders in 2018, although the response rate from both teachers and leaders was 14%) and the Education Training Professionals Survey (which covered 582 non-college FE providers plus 1 303 teachers and leaders online in 2019) in England.

The changing landscape of teaching and leadership in VET

Rapidly changing labour markets call for changes in VET teaching and leadership

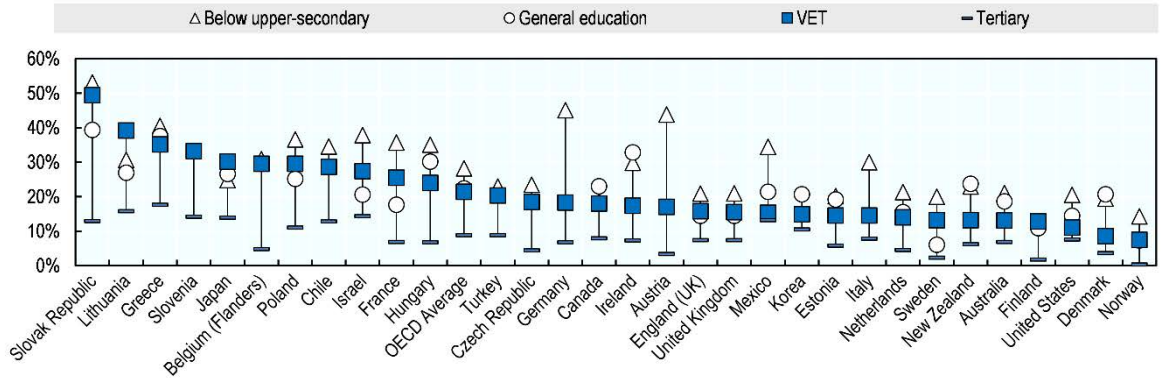
Digitalisation, automation, the transition to a low-carbon economy and the COVID-19 pandemic are having a major impact on the skills needed in the labour market, and therefore also on the skills that need to be formed through VET. The occupational composition of employment has changed in OECD countries in recent decades, with employment in middle-skill occupations growing more slowly than low- and high-skill occupations (OECD, 2020[12]). Digitalisation creates many jobs and changes existing ones, including jobs that require VET qualifications. Automation can transform a wide range of work tasks, including in sectors where VET traditionally plays a key role (OECD, 2019[13]; Nedelkoska and Quintini, 2018[14]). Further changes are expected in the coming years. For example, in many European countries, traditional VET occupations such as construction worker or plant operator are expected to become relatively less important in the coming decade, while occupations requiring a higher level of skills in fields that are often outside the scope of traditional VET programmes – but could potentially be delivered within VET systems – are growing (Cedefop, 2020[15]). In the United States, employment in higher-level VET occupations is also expected to grow, with *wind turbine service technicians* being the occupation with the strongest projected increase in employment (61%) (US Department of Labour, 2020[16]). These changes in skill needs will necessitate changes to VET curricula, and therefore also to VET teacher training and professional development. They could also imply changes to VET teacher recruitment strategies if more industry experience is desired. Stronger leadership will be fundamental to making these changes happen.

According to the Survey of Adult Skills (PIAAC), many occupations at high risk of automation – i.e. those jobs where a large share of the tasks involved could potentially be automated – had high shares of VET graduates among their young workers. This is the case in occupations such as metal and machinery trades

and electrical and electronics trades (Vandeweyer and Verhagen, 2020[17]). Across OECD countries, on average 28% of young people (16-34 years-olds) with below upper secondary education were employed in jobs at high risk of automation (Figure 1.2). By contrast, among those with an upper-secondary or post-secondary non-tertiary education, 22% of general education graduates and 21% of VET graduates on average[2] were employed in jobs at a high risk of automation. Only 9% of young tertiary education graduates were employed in jobs at a high risk of automation. Differences between countries are substantial, however, with more than one in three young VET graduates in Greece, Lithuania, the Slovak Republic and Slovenia being employed in highly automatable jobs, compared with less than 10% in Denmark and Norway. The differences between VET and tertiary education graduates were smallest in Denmark, Korea, Mexico and the United States, and largest in Belgium (Flanders), Lithuania and the Slovak Republic.

Figure 1.2. One in five young VET graduates are employed in jobs with a high risk of automation

Percentage of employed graduates (aged 16 to 34) employed in jobs at high risk of automation



Note: High risk of automation is defined as having a probability of automation of at least 0.7. The United Kingdom refers to England and Northern Ireland only. The sample includes employed individuals aged 16 to 34 who are not enrolled in formal education. General education and VET include those who graduated from upper secondary or post-secondary non-tertiary education. The OECD average is an unweighted average of the countries shown. Data include the survey years 2011-12, 2014-15 and 2017.
Source: OECD (2020[12]), *OECD Employment Outlook 2020: Worker Security and the COVID-19 Crisis*, https://doi.org/10.1787/1686c758-en.

As VET programmes need to evolve in order to adapt to changing skill needs, VET teachers must not only update their knowledge and practice, but also exploit new approaches to teaching, such as the use of virtual/augmented reality (VR/AR). This process has been accelerated by the COVID-19 pandemic, which has partially shifted VET towards remote learning to ensure the continuity of training. However, not all VET teachers are ready for this change, and there are large differences across countries in their preparedness. For instance, TALIS 2018 data show that before the pandemic the share of upper secondary VET teachers across the six OECD countries/regions with available data (Alberta [Canada], Denmark, Portugal, Slovenia, Sweden and Turkey) who did not feel prepared to support their students through the use of digital technology ranged from 9% in Portugal to 40% in Sweden (see Chapter 4, Figure 4.9). More evidence is needed to understand how well VET teachers managed the shift to remote teaching during the COVID-19 pandemic. Evidence from England, collected through surveys on the shift to online learning in 2020 carried out by the Association of Colleges, shows that 98% of 109 colleges reported that their teaching staff were (very or moderately) confident in delivering remote learning using a digital platform in July 2020 (AoC, 2020[18]). Similarly in November 2020, 98% of 97 colleges described their teachers' confidence and skills with online/blended teaching as moderate (64%) or strong (34%) (AoC, 2020[19]). VET teachers in Denmark and Germany also reported that they were able to smoothly shift to distance teaching as they were already prepared before the pandemic.

Teacher shortages may hamper effective provision of VET

Teacher shortages in VET are a common challenge in several OECD countries, as are skills shortages in some VET occupations. This double-shortage makes it particularly difficult to recruit and retain VET teachers – not just those teaching vocational subjects but also general subjects in VET programmes. For example, mathematics and science teachers are crucial for many VET subjects, but they are in severe shortages in several countries. These shortages may hamper the sustainable provision of VET, which exacerbate skill shortages.

In many countries, the VET teaching workforce is ageing. On average across the 26 OECD countries with available data, 44% of teachers in upper-secondary VET programmes were over 50 years old in 2018, compared to 41% in 2013 (Figure 1.3). This is higher than the share for general education teachers (39% in 2018), and the increase between 2013 and 2018 was also greater: a 3.5 percentage point increase for VET teachers compared to a 2.7 percentage points increase for general education teachers on average across 24 countries.[3] Data from European countries also show that 46% of VET teachers are aged 50 or older on average, compared to 29% of all tertiary-educated workers and 32% of workers overall. The increase between 2011-13 and 2017-19 was also faster among VET teachers (5 percentage points) than for all workers and tertiary-educated workers (2-3 percentage points).

The impact of VET teacher shortages could be significant. Even a minor shortage of teachers in VET can have a long-term impact, as through their impact on students, VET teachers have an impact on industry and the economy. VET teacher shortages can damage the stable provision of specific occupational courses and the sustainable supply of qualified workers for associated occupations. VET teacher shortages may also increase the costs of VET provision. For instance, in England (ACL Consulting, 2020[20]), higher costs during times of VET teacher shortages may be driven by increased use of lower- or less-qualified teaching staff and temporary or agency staff – which is not always cheaper than hiring suitably qualified teachers – and can lead to increased workloads and stress for existing staff. Shortages can reduce the time available for professional development for existing staff while increasing the need for training for less-qualified teaching staff. A reliance on temporary or agency staff is associated with low retention and high turnover rates which can damage pedagogical continuity. In the longer term, teacher shortages may lead to the decrease in the availability of VET courses or a narrowing of provision and choices for learners (ACL Consulting, 2020[20]).

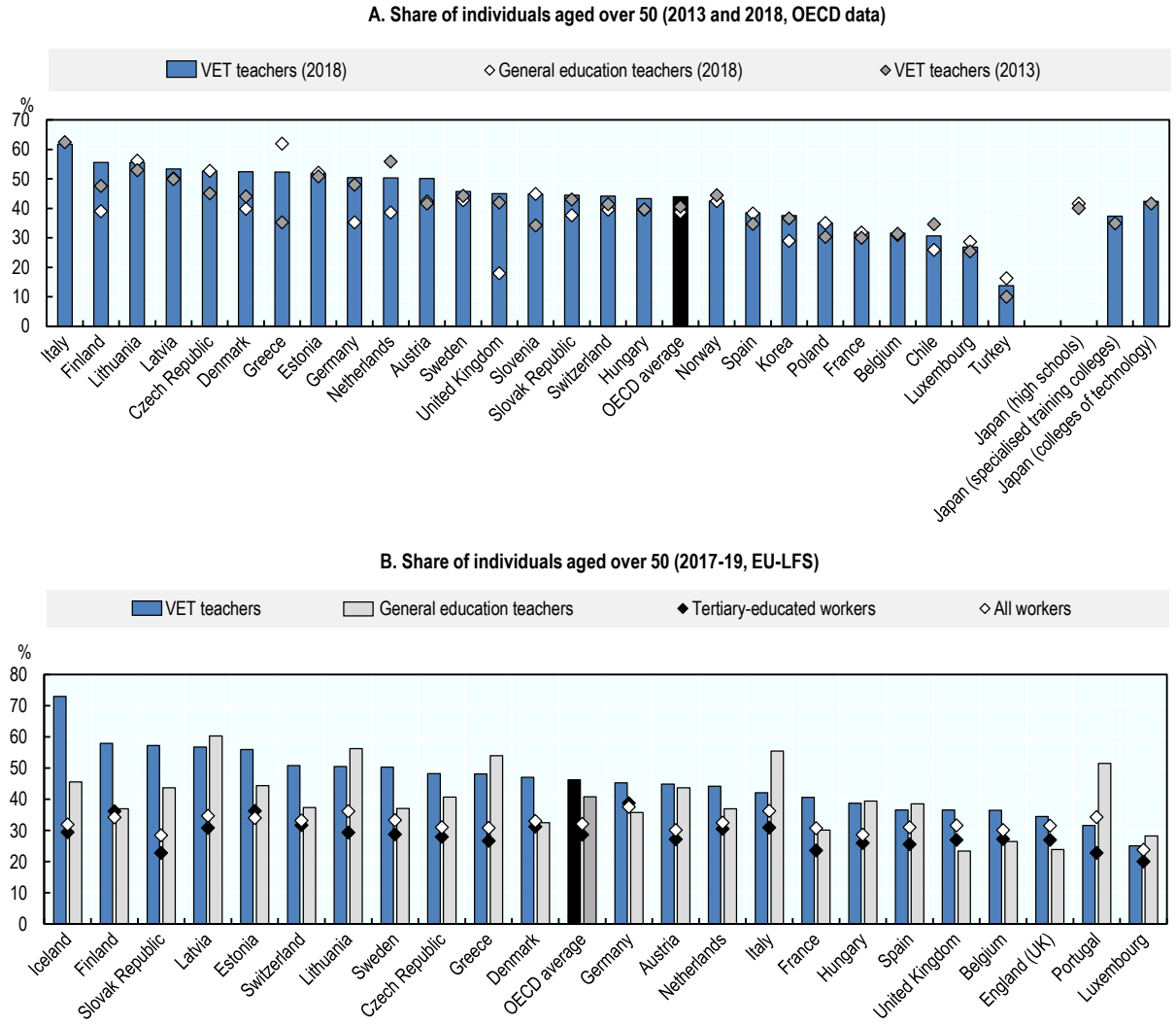
It is often argued that the automation of tasks can alleviate shortages in certain occupations or sectors, but it is unlikely that the demand for teaching professionals in general will be readily affected by automation and the increased use of technology in the education sector. Teaching across all education sectors is estimated to be at the lowest risk of automation of all occupations (Vandeweyer and Verhagen, 2020[17]), as the tasks done by teaching professionals cannot be easily replaced by technology. Teacher-led instruction remains important in the context of increased levels of technology use in VET and the rise of online courses. Online and distance VET courses are still teacher-mediated learning opportunities: teachers need to design and support the courses and teach and assess students. In fact, the widespread adoption of technology in the labour market may increase the need for teachers in order to equip students with the skills needed in increasingly automated economies and societies, and develop the skills they need to contribute to the further development of digitalisation (Vincent-Lancrin and van der Vlies, 2020[21]).

Attracting industry professionals to the VET teaching workforce is one strategy to avoid or overcome VET teacher shortages. Several countries set relatively relaxed qualification requirements for teaching VET with the aim of recognising the different levels of expertise and experience needed to teach in the sector. Other countries hire under-qualified VET teachers and encourage them to complete the training they need to obtain the required teaching qualification while working (see Chapter 2). Even in countries with relatively strict regulations for teacher qualifications, such as Germany, it is possible to hire industry professionals without teaching qualifications under certain circumstances. Despite the benefits of recruiting industry

professionals into VET, those who do not have the required teaching qualifications often lack pedagogical knowledge and ability and feel unprepared for teaching.

Figure 1.3. VET teachers are ageing

Share of individuals aged 50 and older

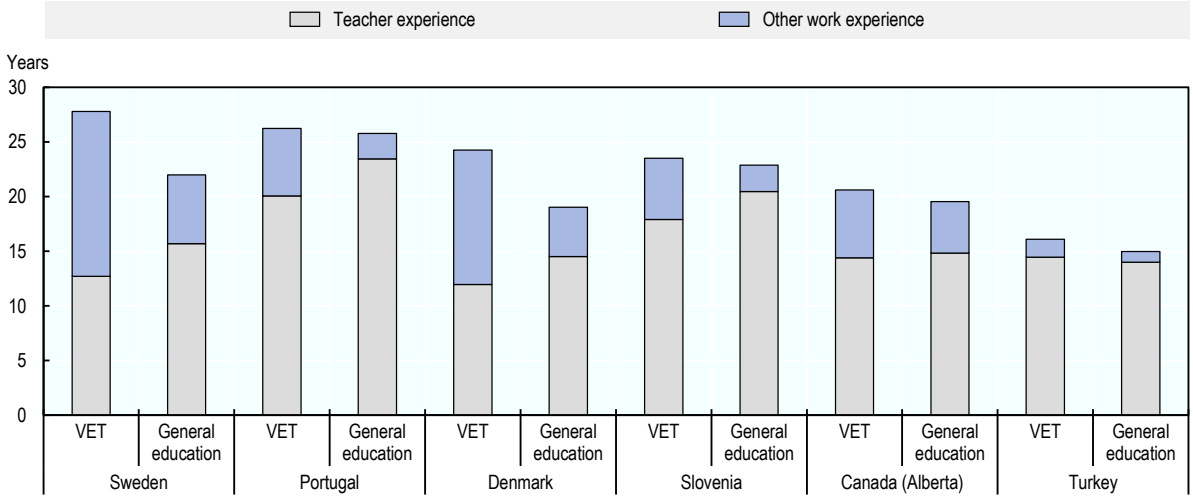


Note: In Panel A in this figure, teachers teach at upper secondary education level and the distinction between VET and general depends on programme orientation, not on the subject they teach. For Italy, 2016 data were used instead 2013, for Denmark 2014 instead of 2013, for Sweden 2016 instead of 2018, for Norway 2015 instead of 2013 and for Turkey 2014 instead of 2013. For Japan, 2013 and 2016 data were used; for high schools, the data do not distinguish programme orientation, whereas specialised training colleges and colleges of technology are considered as VET. The OECD average does not include Japan.
In Panel B in this figure, vocational teachers teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges (see Box 1.2).
Source: Panel A: OECD, (2020[22]), OECD.Stat, https://stats.oecd.org/index.aspx?r=103992#; Japan: MEXT (2018[23]), Summary of survey results, www.mext.go.jp/component/b_menu/other/__icsFiles/afieldfile/2018/03/28/1395303_03.pdf. Panel B: Eurostat (2020[24]), European Union Labour Force Survey (EU-LFS) 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey.

Many VET teachers gain industry experience before joining the profession, irrespective of whether this is a requirement or not. This is reflected in TALIS data, which show that VET teachers tend to have more non-teaching work experience that is not related to education and teaching than general education teachers (Figure 1.4). This suggests that VET teachers are more likely to enter the profession as a second career, having previously worked in industry or outside the education sector.

Figure 1.4. VET teachers often have more non-teaching work experience than general education teachers

Average years of experience by type of teacher and type of work experience



Note: VET teachers refer to upper secondary teachers who reported in TALIS that they teach practical and vocational skills. Teacher experience refers to their years as a teacher in total. Other work experience refers to years working in other non-education roles. The average total work experience of teachers is slightly higher (on average 1.6 years in general education teachers and 2.1 years in VET teachers) than the sum of these two categories of work experience. All years were reported regardless of whether they worked full-time or part-time.
Source: OECD (2019[25]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm.

Close connections between VET, industry and research remain crucial

Even more than in other forms of education, VET needs to be connected to the labour market and adjust as it changes. For this reason, various forms of interaction and exchange between VET schools and industry are encouraged, including work-based learning for both students and teachers. This is more difficult to provide for teachers than for students: work-based learning for teachers requires not only a good relationship between VET schools and industry, but also support that allows teachers time off from teaching and provides financial and other incentives. Ultimately, VET teachers' industry experience will pay back by supporting more effective learning and a smoother transition into employment for their students.

Another potential benefit from close connections between VET schools and industry is if it encourages experienced professionals from industry to become VET teachers. This can not only help reduce VET teacher shortages, as discussed above, but also increase the share of teachers whose skills and knowledge are up to date with industry practices. Moreover, their industry connections could help to strengthen the ties between their VET institution and the world of work.

Close connections between the VET sector and research institutions – e.g. universities that provide initial and professional teacher education and training, or VET research and innovation centres – also contributes to high-quality VET provision. Through close co-operation with universities and research centres that are

innovating in technology and pedagogy, VET teachers and leaders can become the vehicle for driving innovation in both the VET sector and industry, and equipping the future workforce with new in-demand skills for the labour market.

The skills VET teachers need are becoming more complex

Training programmes for teachers in VET programmes should reflect the fact that employees in today's workplaces need not just occupation-specific and technical skills but also stronger basic, digital and soft skills (UNESCO-UNEVOC, 2020[26]). Soft skills such as critical thinking, collaboration and communication are becoming more crucial for effective work in the collaborative environments enabled by new technologies. Basic skills, including literacy, numeracy and digital skills, are also essential to cope with changing labour markets and the increasing risks of automation. VET teachers need to facilitate the development of these skills among their students but not all of them know how to effectively teach such skills in a VET setting. In England, for example, the 2018 Training Needs Survey showed that 62% of FE institutions reported that their VET teachers require further training and development on teaching basic skills (English and maths) and incorporating these skills into VET programmes (Education and Training Foundation, 2018[27]). With the increasing online delivery of VET, teachers also need to have stronger digital skills. Among OECD countries with available data in TALIS 2018, the type of professional development VET teachers reported need most was ICT skills training (46% on average across six OECD countries/regions).

Initial teacher education and training (ITET) and professional development (PD) programmes for VET teachers need to adjust to changing curricula and teaching environments. Training programmes also need to meet the different needs of different groups of teachers. For example, teachers with industry backgrounds would need more pedagogical training, while those without industry backgrounds would need more opportunities to gain occupation-specific skills and experience.

Leadership is more important than ever in VET institutions

Institutional leaders in VET have a crucial set of roles to play, from developing and supporting teachers to engaging employers and other stakeholders, and improving the quality of VET provided, which may be through technological and pedagogical innovation. Leaders face increasing challenges in recruiting well-prepared teachers and putting incentives in place to retain them. VET leaders are also responsible for supporting teachers in their teaching responsibilities and managing pedagogical innovations. Evidence in England suggests that the effectiveness of VET institutional leaders (further education and sixth form college principals) is correlated with learners' achievement[4] and teachers' employment conditions[5] (Ruiz-Valenzuela, Terrier and Van Effenterre, 2017[4]). Similarly in Korea, instructional leadership in VET institutions has a statistically significant effect on the teaching competence of specialist VET school teachers (Kim and Phang, 2018[28]).[6]

While leaders in VET require multiple competences to carry out their diverse responsibilities, many of them are not well prepared before taking up their role, and might not receive the support they need throughout their career in terms of mentoring and professional development. VET leaders often have a teaching background but leaders need to be more than teaching and learning specialists; they also need a broad range of entrepreneurial and commercial skills. Specialised preparatory training for VET leaders is not always available. In the United States, for example, evidence shows that the training offer for VET leaders is declining (Zirkle and Jeffery, 2017[29]), and that existing programmes fall short in a few key areas, such as budgeting and finance (Inside Higher Ed, 2013[30]). While the status of leaders in education and training in secondary and postsecondary education and training settings is high in many OECD countries, and salaries are often higher than for teachers, challenging working conditions – especially in the first years of a leadership role – contribute to low retention rates. Common challenges for novice VET leaders include heavy workloads and complex task management, conflicts with teachers and students, and curriculum and instruction issues (Oleszewski, Shoho and Barnett, 2012[31]).

Key recommendations for effective VET teacher and leader policies

1. Ensuring an adequate supply of well-prepared teachers in VET (Chapter 2)

VET teacher shortages are a significant policy concern in several OECD countries. For example, In Denmark, Portugal and Turkey, one third of VET school principals reported shortages of qualified teachers, according to 2018 TALIS data. In England, according to the 2018 College Staff Survey, 53% of further education college principals had found teacher recruitment difficult over the last three years. In the United States, more than half of states reported that they had teacher shortages in one or more VET subjects, according to 2018-19 Teacher Shortage Areas data. Germany estimates that the number of VET teachers would be around 80% of the demand in the coming decade. In Sweden, the supply of new VET teachers is estimated less than half of the demand in the coming decade. In Korea, new VET teachers replaced only 70% of retirees in the past five years. Even in some countries where VET teacher shortages are not pronounced, such as Finland, Japan, the Netherlands and Norway, shortages are anticipated in specific fields and localities.

VET teacher shortages are related to the limited attractiveness of the profession as a career. For example, teachers' salaries – representing the largest single cost in VET – have a direct impact on the attractiveness of the teaching profession. However, in a number of countries, the profession does not offer competitive salaries compared to industry and/or other educational institutions. In addition, many VET teachers feel that their profession is not valued in society. High workloads, poor management of VET institutions and lack of career development opportunities also have an effect on job satisfaction, which in turn has an effect on VET teacher retention.

Countries can ensure a better supply of VET teachers by increasing the attractiveness of VET teaching careers and actively employing industry professionals as VET teachers.

1.1. **Increasing the attractiveness of VET teaching careers:** Well-targeted incentives and support are proven to be effective to attract and retain VET teachers: for example, targeted bonus and wage incentives for teacher recruitment and retention in VET at shortage subjects or sectors; and financial support for initial teacher education and training and professional development. Belgium (Flanders), England, Korea, Norway and the United States use targeted incentives and support to attract industry professionals or highly qualified teachers to VET teaching. Offering career development support to improve the retention of VET teachers can also help increase the attractiveness of VET teaching careers. VET teachers with targeted career support are more likely to stay in the profession. Attrition among new VET teachers can be reduced by providing them with less challenging working environments when they start and with reduced teaching and administrative workload to have mentoring and structured induction programmes. Mandating induction programmes for new VET teachers can be helpful, and mentors can provide key support during the early years of teaching although, as experiences from Austria and Turkey have shown, having enough well-trained mentors for the induction phase is crucial. Norway provides new VET teachers with guidelines and courses, and Germany offers them the option to receive didactic and methodological advice even after their quite extensive preparatory service period. For more experienced teachers, attractive career pathways with targeted career support encourages them to stay in the profession while allowing them to move into a senior or management-level position or into another subject areas.

In order to attract more industry professionals as VET teachers, countries should aim at:

1.2. **Providing flexible pathways into VET teaching**: This can be achieved by relaxing entry qualification requirements, if needed, for industry professionals and graduates from higher education specialising in the relevant subject, and providing flexible pathways to obtaining teaching qualifications. Relaxed entry qualification requirements are used as a tool to smooth the

path from industry into VET teaching in Japan, Korea and the United States. However, care must be taken to ensure that relaxed entry rules do not come at the cost of lower quality. Several countries attract industry professionals to enter the teaching profession without the required teaching qualification, but they are either required (in Denmark) or encouraged (in England) to obtain the qualification afterwards. Korea is planning to relax entry qualification requirements for professionals to teach in VET in fields which currently lack relevant teaching qualifications or training for VET teachers, in order to meet rapidly changing labour market demand. Support to help these professionals obtain necessary qualifications is crucial, by providing flexible, modular ITET without going through a full ITET programme while ensuring that such training focuses on skill gaps.

1.3. **Attracting more industry professionals to teach in VET while working in industry**: This can be achieved by facilitating flexible work arrangements and increasing collaboration between VET providers and industry. Flexible work arrangements such as part-time teaching and co-teaching with fully qualified teachers can help industry professionals to combine working in industry, training as a teacher and teaching in VET. Part-time VET teachers with industry backgrounds can bring a number of benefits, such as overcoming teacher shortages, reducing costs, increasing flexibility in VET provision and bringing in up-to-date knowledge from industry. To fully take advantage of these benefits, the teaching quality and working conditions of these part-time teachers need be ensured. Such flexible work arrangements for industry professionals teaching in VET could be further promoted and facilitated through collaboration between VET institutions and industry. For example, to recognise the mutual benefits for industry and the VET sector and ease VET teacher shortages, a business-education partnership in the United States created a teaching certificate for industry professionals. Policies that permit in-company trainers to more easily become VET teachers and vice versa can also help attract industry professionals into the teaching profession and encourage the exchange of personnel between industry and the VET sector, as has happened in Germany and Portugal.

2. Effectively preparing and developing VET teachers (Chapter 3)

VET teachers need dual competences. On the one hand, they need to have theoretical and practical knowledge of the subjects they teach and continuously update their expertise in response to changes in technology and working practices. They are often also required to have relevant work experience. On the other hand, they need to have pedagogical knowledge, but often have limited pedagogical preparation. A changing environment for teaching and learning also requires VET teachers to have a wide range of transversal skills including basic, digital, problem-solving and soft skills.

To effectively prepare and develop VET teachers in the face of changing learning and teaching environments requires well-designed initial teacher education and training and professional development opportunities. However, according to 2018 TALIS data, ITET for VET teachers appears to be weaker in developing the required pedagogical skills than training for general education teachers, although the effectiveness of well-designed ITET is evident (see Chapter 3: Figure 3.5 and 3.6). A significant proportion of VET teachers do not have the opportunity to develop the full mix of skills they need through ITET programmes.

Countries will therefore benefit from effective and flexible ITET programmes for VET teachers.

2.1. **Effective and flexible initial teacher education and training programmes for VET teachers** are designed for:

- **Developing and strengthening VET teachers' pedagogical skills along with their basic, digital and soft skills:** Several initiatives exist to impart strong pedagogical skills to VET teachers. Many ITET institutions keep their curricula up to date, collaborate with VET institutions to offer

practical teacher training, and develop research and innovation in pedagogical approaches. Examples include university VET schools in Bavaria (Germany) and more broadly VET teacher training institutes established at Länder level in Germany, and the Teaching to Lead programme in the United States (see also Chapter 4).

- **Providing work-based learning opportunities in VET institutions and in industry**: Work-based learning in the context of ITET for VET teachers takes place in a VET institution to give trainees direct experience of teaching students in a classroom or a school workshop. In many countries, including Austria, Belgium, England and Germany, ITET concludes with a teacher practicum or an internship in a VET institution. Work-based learning can also be organised as an internship, externship or secondment to a company to equip future teachers with industry-relevant skills. In order to ensure that future VET teachers can develop their industry knowledge, building partnerships between ITET providers and employers is crucial.
- **Promoting flexible training and providing necessary support**: In countries where entry qualification requirements are flexible or teachers can obtain the required qualification while teaching, flexible provision is crucial to overcoming barriers to participation in training. This could include online ITET, weekend and evening classes, or part-time training. In order to encourage VET teachers who combine work and ITET to obtain a VET teaching degree, Sweden provides grants and reduces their working hours. In England, where ITET is fee-based and voluntary, new funding schemes have been introduced for those obtaining formal FE teaching qualifications, including the Taking Teaching Further programme. In Wales (United Kingdom), teacher training incentive grants are available for eligible students.

Although many VET teachers participate in professional development (PD) relatively widely, others face barriers due to a lack of support or incentives, or conflicting work schedules. Even among VET teachers who were able to participate in PD, many report significant barriers to accessing training opportunities.

2.2. **Increasing participation in relevant professional development opportunities:** In order to do so, countries need to consider:

- **Engaging and co-ordinating with stakeholders to ensure that VET teachers receive the training they need**: Making sure that VET teachers receive the necessary training – whether it is on pedagogical, industry or technological aspects – requires the collaboration and co-ordination with multiple stakeholders at different levels. VET institutions, teachers and school networks, local companies, universities and other relevant associations all play different, but crucial, roles in facilitating access to, encouraging and providing PD for VET teachers. For example, industry placements for VET teachers allow them to update their industry skills and knowledge in line with the most recent workplace practices. Denmark, England, the Slovak Republic, Spain and the United States provide good examples of such placements.
- **Giving teachers the means to participate in professional development**: In many countries, participation in PD is voluntary or dependent on senior management decisions, but some countries give teachers the support and resources they need to participate in PD or make it mandatory by law. In Finland, Germany (Bavaria), Italy and Slovenia, VET teachers are obliged to undertake training, while Denmark, Finland and Sweden have other mechanisms to ensure VET teachers' access to PD such as collective agreements between unions and employers or professional development plans. Across the six OECD countries/regions with TALIS data available, the most common measures supporting VET teachers' PD activities are time off from work and access to materials needed to participate in the activities. Financial support and incentives are also common tools to support access to PD in some countries, for example in Denmark and England.

- **Identifying VET teachers' training needs to offer relevant, customised and engaging professional development opportunities**: VET teachers are more engaged in PD when it is relevant to their teaching practice, curriculum and subject; customised to their needs; and up to date. In England, training needs analysis is used to identify skill gaps and PD needs for VET institutions and individual teachers.

3. Promoting innovative pedagogical approaches to VET (Chapter 4)

The increasing demand for digital and soft skills in the labour market means VET teachers need to foster the development of these skills in their students. Digital skills are indispensable to modern jobs, as automation and digitalisation are taking place in all economic sectors. Similarly, soft skills such as problem solving, team work, verbal communication and leadership are among the most valuable skills for workers, as these are not easily automatable and are strong complements to cognitive and technical skills. In an ever-changing labour market, digital skills and soft skills provide students with the flexibility to adapt to new jobs. VET teachers should gain deeper knowledge about how to develop these skills among their students, especially within practical settings, and integrate innovative teaching approaches into their daily practice.

New technologies such as virtual/augmented reality, robotics and simulators have the potential to foster innovation in VET teaching and learning. These technologies are flexible, cost-effective and safe ways to promote learning. They help students develop technical skills, but also soft and digital skills.

In order to benefit from these technologies and develop the skills that VET students need, countries could consider:

3.1. **Fostering the capacity of VET teachers to use innovative pedagogical approaches**: VET teachers need to have the right skills to make the most of innovative pedagogical approaches and new technologies. The COVID-19 pandemic exposed how many VET teachers struggled to teach online, confirming the finding from the 2018 TALIS data that around one quarter of upper secondary VET teachers did not feel prepared for the use of digital technologies in teaching. In order to assist VET teachers to update their knowledge on new pedagogies and technologies and their digital skills, teachers need access to PD opportunities. For example, Entr'Apprendre in the French Community of Belgium created work-based opportunities for VET teachers to learn about new technologies in the workplace. VET teachers also need support and guidance to choose effective teaching methods and benefit from PD activities that assist them in fostering students' soft skills. Initiatives such as PBLWorks and Passport to Success in the United States, or the Enhance Digital Teaching Platform in the United Kingdom, show that both face-to-face and online learning modules can effectively support the PD of VET teachers who are looking to innovate their teaching practice.

3.2. **Providing VET teachers with strategic guidance and institutional support for the integration of new technologies in VET**: In order to increase the use of technology in VET, access to digital devices, high-tech equipment and technical support need to be improved. Countries such as Denmark and Spain have established government-funded centres to strengthen the quality of teaching in VET provision. They also provide high-quality PD to VET teachers on the latest technologies in industry. Initiatives such as the Knowledge Centres for IT in Teaching and for Automation and Robot Technology in Denmark, and the Centre for Innovation in VET in Aragon, Spain, show that these centres are beneficial to both VET institutions and employers. A survey of teaching staff in Dutch VET schools found that the most important enabling factors for the successful adoption of digital technologies in teaching and learning are having a vision and goals that integrate digital technology adoption. Examples such as Digi-Check in Switzerland or SELFIE in EU countries, show how an initial assessment of the strengths and weaknesses of VET institutions in their use of technology can be a good starting point to produce a shared strategy among relevant stakeholders to support digital transformation in VET institutions.

3.3. **Establishing partnerships between the VET sector, industry and research institutions:** Countries can also promote innovative pedagogical approaches by establishing partnerships between the VET sector and industry, to improve their access to materials and equipment tailored to meeting teaching and student learning needs, which can further stimulate innovative teaching. For instance, a close collaboration between VET institutions and industry could provide VET teachers with the latest technology in industry to update their teaching practice. Governments could also establish innovation funds to support education technology (EdTech) companies producing digital resources for teaching, such as VR applications and simulators, to encourage the development and adoption of digital technologies in VET teaching for different industries. The development of these digital resources to enhance teaching could benefit from the knowledge of technology experts from research institutions.

3.4. **Raising awareness about the importance of innovation, ICT and soft skills in teaching in VET:** Establishing an agenda for policy change works best when there is a shared belief across stakeholders in VET – especially among teachers – about the importance of fostering the development of soft and digital skills and the adoption of technology in VET. In order for reform to take place, it needs a co-ordinated effort among policy makers, VET teachers, industry, researchers and education technology providers to expand the use of technology and promote innovative pedagogical approaches.

4. Strengthening leadership in VET (Chapter 5)

Institutional leaders in VET play a crucial set of roles, from recruiting and developing teachers to ensuring the quality of teaching and learning. They are also responsible for managing resources and engaging employers and other stakeholders. But VET leaders have not always gone through relevant training before taking up their role, nor do they always have access to PD opportunities. They also may find their first years in the profession highly challenging, and might become frustrated or disengaged and ultimately leave it altogether. For example, in England, one-third of further education (FE) college leaders said in 2018 College Staff Survey that they were likely to leave FE in the next 12 months.

Building and maintaining a pool of effective leaders in VET would be a major benefit to VET institutions and wider society. VET leaders should understand both the VET sector and the modern labour market while also having pedagogical and instructional leadership skills.

To ensure that VET leaders effectively carry out their multi-dimensional roles, countries can consider:

4.1. **Clarifying the roles of VET leaders**: An improved and up-to-date definition of leadership responsibilities would act as a key point of reference for those considering a VET leadership role, and those organising the selection and training of VET leaders. For example, Austria and Belgium (French Community) clarified the competences and responsibilities of VET leaders through their education reforms by clearly defining the tasks, roles and professional standards of relevant stakeholders including VET leaders. Training programmes for VET leaders have then been developed according to these standards.

4.2. **Ensuring VET leaders have access to flexible training opportunities as part of a coherent skills development strategy**: To ensure that VET leaders have the right skills to carry out their diverse responsibilities, they need access to specialised training before taking up their role, and to receive support throughout their career through mentoring and PD. Training programmes need to be easily accessible (e.g. through online learning) and aligned with the expected requirements for VET leaders. England provides FE college leaders with a training programme that supports them to understand their role, plan and think about leadership from diverse perspectives. The country also offers an online training programme in digital technology for leaders and teachers in the FE sector, which helps them to be aware of innovative pedagogical approaches and new technological

developments in different industries. Denmark provides optional courses for management staff in VET schools, specifically designed to strengthen their work in management and digital skills.

4.3. **Improving the attractiveness of the VET leadership role**: VET leaders face many challenges in complex working environments, especially if they are not well-prepared for their roles and receive limited support. Countries should ensure that VET leaders' working conditions are attractive. This can be done by creating middle management roles to support the work of VET leaders – while at the same time offering career progression opportunities for VET teachers to move into leadership. For example, Norway introduced the "teacher specialist" role in VET, for teachers with in-depth knowledge about a discipline or subject area who contribute to the collective PD of VET institutions. Pathways for people interested in taking on VET leadership roles from outside the teaching profession can also be created. Finally, particular efforts should be directed towards supporting VET leaders early in their careers, for example through an induction period for newly appointed leaders. Mentoring and peer-learning opportunities can also support VET leaders in carrying out their responsibilities. In England, the National Leaders of Further Education programme recruited a team of high-performing leaders to provide specialist support such as mentoring and skills development to struggling VET institutions.

Summary of policy recommendations

1. Teacher supply (Chapter 2)

- **1.1. Increasing the attractiveness of teaching careers in VET** by providing targeted incentives and offering career development support.
- **1.2. Providing flexible pathways into VET teaching** by relaxing entry qualification requirements, if needed, for industry professionals and at the same time providing flexible means to obtaining necessary teaching qualifications.
- **1.3. Attracting more industry professionals to teach in VET** by facilitating flexible work arrangements in VET teaching and increasing collaboration between VET providers and industry.
- **1.4. Improving the monitoring of VET workforce dynamics** to allow for the early identification of possible severe teacher shortages.

2. Teacher training (Chapter 3)

- **2.1. Designing effective and flexible initial teacher education and training programmes for VET teachers** to develop industry knowledge and pedagogical skills along with basic, digital and soft skills.
- **2.2. Increasing participation in relevant professional development opportunities**, by engaging and coordinating with stakeholders, giving teachers the means to participate in professional development, and identifying their training needs.

3. Innovative pedagogy (Chapter 4)

- **3.1. Fostering VET teachers' capacity to use innovative pedagogy**, by providing training opportunities to regularly update their pedagogical knowledge, the use of new technology, and their digital skills to implement them in the classroom.
- **3.2. Providing VET teachers with strategic guidance and institutional support for the integration of new technology into VET**, by establishing a shared vision and common goals to integrate digital technology to VET provision.

- **3.3. Establishing partnerships between the VET sector, industry and research institutions** to get access to the necessary materials and equipment and foster the production of digital resources for VET teaching.
- **3.4. Raising awareness of the importance of innovation, ICT and soft skills in teaching in VET,** to achieve a co-ordinated effort from VET stakeholders to expand the use of technology and innovative pedagogy in VET.

4. Strengthened leadership (Chapter 5)

- **4.1. Clarifying the roles of VET leaders,** by creating a definition of their leadership responsibilities to constitute a point of reference for those who are considering leading a VET institution, and for those organising the selection and training of VET leaders.
- **4.2. Ensuring that VET leaders have access to initial training and professional development opportunities** by providing training programmes that are easily accessible and aligned with the expected requirements for VET leaders, as part of a coherent skills development strategy.
- **4.3. Improving the attractiveness of the VET leadership role,** including through the creation of middle management roles; and the provision of induction, mentorship and peer-learning opportunities for VET leaders.

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Annex 1.A. List of interviewed institutions

Annex Table 1.A.1. List of institutions interviewed by the OECD VET team

Denmark (remotely)	- Danish confederation of VET and upper secondary schools (Danske Erhvervsskoler og Gymnasier) - EUC Syd - Vocational Educational Centre South - Knowledge Centre for Automation and Robot Technology South - Knowledge Centre for Welfare and Assistive Technology - Statistics Denmark - Technical Education Copenhagen
England (remotely)	- Association of Colleges - Department for Education - Education Training Foundation - Farnborough College of Technology - HOLEX - Mantra Learning - The University of Bolton
Germany (remotely)	- Bavarian State Ministry for Education and Culture - Baden-Wurttemberg Ministry for Culture, Youth and Sport - Landesinstitut für Lehrerbildung und Schulentwicklung - Staatlichen Landesseminars für das Lehramt an beruflichen Schulen im Saarland
Japan (remotely)	- Board of Education, Tokyo Metropolitan Government - Institution for Accreditation and Quality Assurance of Professional Higher Education (QAPHE) - Japan Society of Specialized Vocational Training Education, (University of Tsukuba) - Ministry of Education, Culture, Sports, Science and Technology (MEXT) - National Association of Vocational Schools of Japan - National Institute for School Teachers and Staff Development (NITS) - National Institute of Technology - Oita Prefectural Board of Education - Rokugo Koka High School
The United States (study visit)	- American Association of Community Colleges - American Federation of Teachers - Atlantic Technical College and Technical High School. Fort Lauderdale, FL. - Career and Technical Education Technical Assistance Center of New York - DC State Board of Education - DC State Superintendent of education - Idaho State University - Maryland State Department of Education - North Dakota State University - North Virginia Community College - Ohio State University - Penn State University - Purdue University - University of Central Florida - University of Central Missouri - University of Minnesota - US Department of Education

Notes

[1] A VET teacher may also be called a trainer, assessor, tutor, lecturer, educator or instructor.

[2] The difference in the probability of having a job that faces a high probability of automation between young adults with an upper secondary VET degree and those with an upper secondary general degree is not statistically significant on average across OECD countries.

[3] Changes in the average or median age of FE teachers can hide changes in the proportion of older FE teachers. In England, for example, the 2018-19 Staff Individualised Record (SIR; see Chapter 2 for more details) indicates that the median age is similar to 5 years ago, but that the proportion of staff aged over 60 increased (Education and Training Foundation, 2020[32]).

[4] The study used a panel of principals in further education institutions in England over the period 2003-15, and combined it with data on education performance coming from Individualised Learner Records, the National Pupil Database and the Higher Education Statistics Agency. It also exploited the information contained in the Staff Individualised Records. It focused only on the outcomes of publicly funded learners, i.e. young learners who did their General Certificate of Secondary Education (GCSE) exams between 2002 and 2014. Switching from a principal who is at the bottom 25th percentile in terms of performance (recruitment and wage policies set by the principals) to a principal who is in the top 75th percentile increased students' probability to achieve UK Level 2 by 16 percentage points (pp), to achieve Level 3 by 14 pp, and to enrol in a Level 4 or above by 4 pp.

[5] The share of teachers with a permanent contract, the share of female teachers, the share of teachers with Qualified Teacher Status (QTS) and teacher's average salary. The results show that switching from a principal who is at the bottom 25th percentile in terms of performance to a principal who is at the top 25th percentile would increase the share of teachers under a permanent contract by 13 pp, the share of female teachers by 6 pp, the share of certified teachers by 14 pp, and the average gross annual salary of teachers by GBP 3 511.

[6] The population for this study was 26 138 teachers in 473 specialised vocational high schools. Using a random sampling method considering the organisational level (more than 30) and individual level (more than 5 members in the group), the study sampled 450 teachers in 50 specialised vocational high schools. *Instructional leadership* was measured based on the questions used in TALIS (Teaching and Learning International Survey). *Teaching competence* was measured based on 28 standardised questions about teaching skills in pedagogical planning, preparation, deployment, guidance, management and capacity in vocational training in collaboration with industry, etc.

2 Ensuring an adequate supply of well-prepared teachers in vocational education and training

This chapter explores key challenges and policy responses to ensuring an adequate supply of well-prepared teachers in vocational education and training (VET). Based on the assessment of the extent of VET teacher shortages in countries where data are available, the chapter examines the causes of such shortages and their potential impact on the effective delivery of VET. It then identifies measures and incentives to effectively attract, recruit and retain teachers in VET.

Key messages for ensuring an adequate supply of well-prepared teachers in VET

VET teacher shortages are significant in many OECD countries, caused by factors related to the limited attractiveness of the VET teaching profession, including employment conditions, salaries, and a lack of financial incentives and career support.

The supply of VET teachers could be improved by making the profession more attractive. Targeted incentives and support to encourage participation in initial teacher education and training (ITET) and professional development (PD) could help attract and retain VET teachers. Focusing incentives on industry professionals in shortage areas could help attract those with relevant experience. VET teachers who receive targeted career support are also more likely to stay in the profession. For example, attrition rates among new VET teachers can be reduced by assigning them to less challenging working environments for their first placements and reduced teaching or administrative workloads so they have sufficient time for receiving mentoring and structured induction programmes. Offering experienced teachers attractive career pathways and targeted career support can encourage them to stay in the profession and to move into senior or management-level positions or into other subject areas.

Employing a greater number of professionals from industry can ease VET teacher shortages. As they often the lack necessary teaching qualifications and pedagogical skills, flexible recruitment and qualification pathways can help them become VET teachers. Countries might relax entry qualification requirements, if needed, for industry professionals and graduates from higher education specialising in relevant subjects, but should provide flexible alternatives to gaining any required teaching qualifications. Part-time work arrangements can also facilitate flexible VET teaching, but this should be combined with ensuring that part-time teachers' working conditions and teaching skills are not compromised.

Policy pointers

- 1.1. Increasing the attractiveness of teaching careers in VET.
- 1.2. Providing flexible pathways into VET teaching.
- 1.3. Enabling industry professionals to teach in VET.
- 1.4. Improving the monitoring system of VET workforce dynamics.

The state of VET teacher shortages

Teachers in vocational education and training (VET) are unique in terms of how they are recruited and trained – they are required to have not only subject and pedagogical knowledge but, in many cases, work experience in their industry. Moreover, VET teachers' skills can be in high demand in occupations other than teaching, making it harder to recruit and retain VET teachers in the related subjects. This is not only the case for teachers of vocational subjects, but also for those teaching general education subjects in VET programmes. Teacher populations are also ageing in many countries, and particularly VET teachers. Countries facing these issues need to develop strategies to bring enough new talent into the VET teaching workforce to meet forecast demand.

This section examines how teacher shortages are identified and presents evidence on the extent of VET teacher shortages in countries where data are available. The sections that follow discuss the causes of these shortages, and how countries can tackle these challenges.

International data on VET teacher supply and demand are diverse and poorly aligned

VET teacher shortages need to be measured and treated differently from shortages in other occupations. Although teacher shortages can be defined as the inability to fill teaching vacancies at current wages with individuals qualified to teach in the fields needed (i.e. demand exceeding supply), the VET teaching profession has some features that make shortages hard to define.

In order to measure VET teacher shortages, there are additional factors to take into account. The total supply of VET teachers includes the number of individuals with relevant VET teaching qualifications, but also the number of industry professionals with relevant experience and skills who enter the teaching profession. Therefore, the anticipated supply of VET teachers will vary depending on the country's initial VET teacher education and training systems and how much movement there is between the VET sector and industry. The age at which VET teachers enter and exit the profession also matters for measuring teacher supply, as it determines for how many years they can serve. Supply also depends on retention rates among VET teachers, which in turn depends substantially on the level of support they receive, such as mentoring, working conditions and incentives. Underlying factors – often unmeasurable or subjectively measured – such as societal values and the reputation of VET teaching may also affect the supply of VET teachers.

The demand for VET teachers is largely dependent on the number of VET students, but class sizes and student-teacher ratios are also important determinants (Box 2.1), along with other indicators such as teachers' working time and the division of time between teaching and other duties. Countries with a decreasing number of students may still face difficulty in recruiting VET teachers. For example, in Denmark, there are fewer students entering VET than there were,[1] but this does not automatically lead to a lower demand for VET teachers because specialised courses are maintained despite reduced enrolment. The demand for VET teachers is also influenced by the demand for workers in occupations that require VET qualifications or skills, as well as the training needs of workers in these occupations.

As a result of these complexities, not many countries regularly and systematically collect comprehensive data focused on VET teachers, including the number of teachers, hiring needs and shortages.[2] Collecting comprehensive data on VET teachers may be more challenging in countries where recruitment routes are diverse and where VET teachers often work in multiple VET institutions and sometimes divide their time between teaching and industry. VET teacher shortages are often measured through subjective assessments in surveys, for example surveys of VET institutional leaders about difficulties in recruiting teachers. However, some countries use a variety of data and qualitative information to assess shortages. For example, in England (United Kingdom), the Migration Advisory Committee carries out an annual exercise to define a UK-wide Shortage Occupation List, which identifies the occupations that are facing shortages and that are deemed appropriate to be filled by migrant workers. To identify which occupations face shortages, the committee uses information on wages, vacancies and employment, together with stakeholder evidence (MAC, 2020[1]). This exercise includes all "skilled" occupations, i.e. occupations classified above a certain level in the Regulated Qualifications Framework, including Further Education Teaching Professionals.

Likewise, few countries have data that can be used to forecast future demand for and supply of VET teachers. In Germany, the Standing Conference of the Ministers of Education and Cultural Affairs of the Länder (KMK) forecasts the demand for and supply of VET teachers and any resulting imbalance (Figure 2.2). Sweden also produces a forecast of teacher demand and supply, with the latest published numbers based on the 2018 teacher register (number of teachers, the proportion of qualified teachers and of those who actually work as teachers), 2019 population projections, student-teacher ratios and other inputs. Statistics Norway projects teacher shortages using education and labour market statistics. The US Bureau of Labor Statistics' Employment Projections projects occupational employment including projections for career and technical education (CTE) teachers in both secondary and post-secondary education (2019-29).

Box 2.1. VET teacher shortages and class sizes

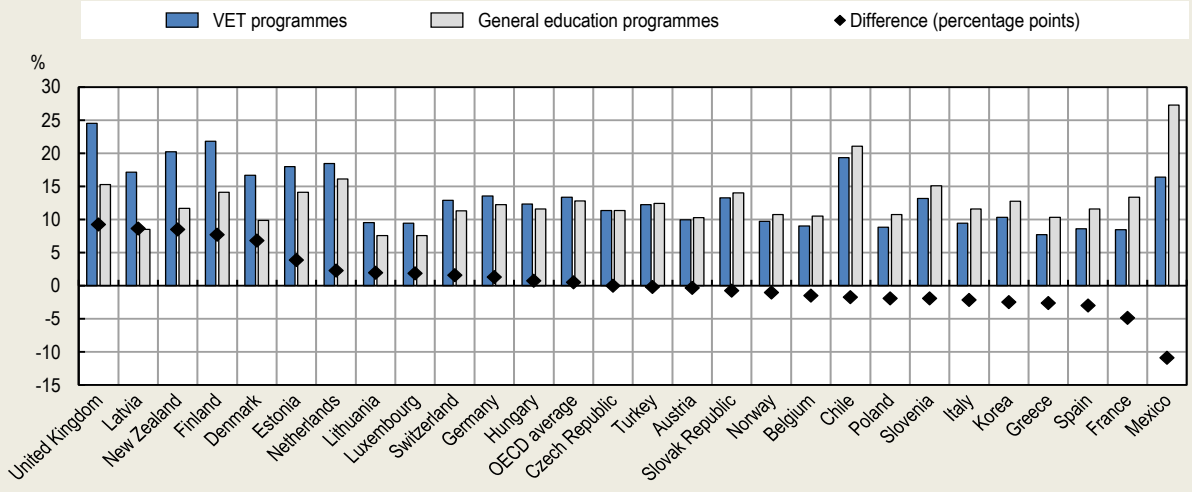
Class sizes and student-teacher ratios are among the determinants of the demand for teachers (OECD, 2020[2]). Countries can reduce the pressure on teacher supply by increasing student-teacher ratios. Figure 2.1 shows that student-teacher ratios in upper secondary education differ widely across countries. On average in OECD countries, the ratio is roughly the same for both VET and general programmes, but in some countries the difference is significant.

The level of work-based learning (WBL; i.e. time outside the education provider) in VET influences the student-teacher ratio (OECD, 2020[2]). Countries with a higher level of WBL tend to have a larger number of students per teacher (therefore the student-teacher ratio in practice can be reduced by WBL trainers), while VET systems with a substantial school-based learning component tend to have the same or smaller student-teacher ratio as general education. Field of study also influences this ratio, with some technical fields requiring greater instructor supervision. For example, the United Kingdom has one of the smallest shares of upper secondary VET students graduating from the technical fields of engineering, manufacturing and construction and health and welfare (which are sectors requiring greater instructor supervision) among OECD countries. The United Kingdom also has nine more students per teacher in vocational programmes than in general ones, the largest difference across OECD countries. In contrast, the fields of study of upper secondary VET graduates in Austria, Germany and Switzerland are more diversified (meaning that the number of students is balanced across different fields of study), which may explain the similar student-teacher ratios between general and VET programmes in these countries (OECD, 2020[2]).

In the context of the 2020 global COVID-19 pandemic, changes in class size based on guidelines on social distancing may also result in potential imbalances between the supply of teachers and student demand (OECD, 2020[2]).

Figure 2.1. Student-teacher ratios are among the determinants of teacher demand

Ratio of students to teaching staff in upper secondary education, by programme orientation (2018)



Note: For Estonia, Italy, Switzerland and the United Kingdom, upper secondary includes programmes outside upper secondary level. Switzerland includes public institutions only. This ratio cannot be interpreted in terms of class sizes (data not available for VET) as it does not take into account the amount of instruction time students have relative to the length of teachers' working days, nor how much time teachers spend teaching.
Source: OECD (2020[2]), *Education at a Glance 2020: OECD Indicators*, https://doi.org/10.1787/69096873-en.

While research and knowledge about these aspects has been limited (Behrstock-Sherratt, 2016[3]), some countries are strengthening their measurement of VET teacher demand and supply. In England, the Staff Individualised Record (SIR) collected data on teachers in the further education (FE) sector for 27 years with the last data being collected for 2018/19. However, teacher population estimates were not always included in the data and response rates varied across different types of providers. England is currently working to improve the data available on the FE workforce by introducing a workforce data collection from 2021 – this will become mandatory the following year, replacing the SIR. England has also gathered relevant data through the College Staff Survey in 2018 and its follow-up survey in 2019 among leaders, teachers and college staff in general and specialist FE colleges (Thornton et al., 2018[4]; Thornton et al., 2020[5]). Additionally, the 2019 Education and Training Professionals Survey was conducted among independent training providers, adult and community learning providers, and sixth form colleges (IFF Research, 2020[6]).

Internationally comparable data on VET teacher shortages are especially limited, as countries differ in how they define VET teachers (see Chapter 1) and how they measure or estimate supply and demand, reflecting the differences in their VET systems (Annex Table 2.A.1.). Even those countries that do not appear to have teacher shortages at the national level may in fact be facing shortages at local or sectoral/subject levels, which further increases the difficulty of making international comparisons.

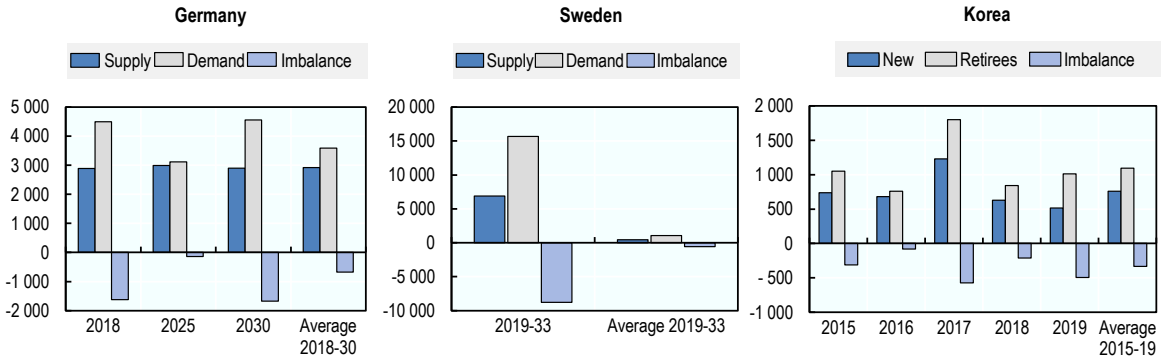
Despite limited data, some evidence suggests there are substantial VET teacher shortages in some countries and some fields

While there is no simple or uniform way to measure VET teacher shortages, in several OECD countries there is considerable concern about shortages of VET teachers. Based on available data and evidence, countries including Denmark, England, Germany, Korea, Portugal, Sweden and the United States show some signs of shortages of suitably qualified VET teachers. In the United States, for example, 98% of surveyed state directors of VET in a recent survey reported that remedying shortages of qualified VET instructors had been a key priority for their state and all those state directors indicated that this would be a priority for their state in the future (Advance CTE & CCSSO, 2016[7]). Other research indicates that as many as half the states across the country have major shortages of VET teachers (Jacques and Potemski, 2014[8]), and more than half of states reported that they have teacher shortages in one or more VET subject (2018-19 Teacher Shortage Areas in the United States). Australia,[3] Finland, Japan and Norway also show some signs of shortages in certain sectors or regions (countries' responses to the OECD questionnaire).

Some countries have made estimates of the expected shortfall in VET teacher numbers. In Germany, using the information from the KMK (KMK, 2019[9]), the estimated supply of VET teachers would be about 80% of the estimated demand per year between 2018 and 2030 (Figure 2.2). The German Education Union (GEW) estimated a greater shortage based on a larger estimated number of VET students (Dohmen and Thomsen, 2018[10]). In Sweden, a forecast by the Swedish National Agency for Education shows a risk of a shortage of trained upper secondary VET teachers. Based on information on examination needs[4] and estimated numbers of VET teacher training graduates, the agency estimated the supply of new VET teachers to be less than half of the demand for 2019-33 (Figure 2.2). Alternative calculations have assumed higher retention rates for VET teachers, but even these indicate future shortages. Future demand for upper secondary VET teachers in Sweden will grow from 6 838 full-time equivalents in 2018 to 7 900 in 2033, assuming that VET student application rates remain constant. While the average annual recruitment requirement is 830 full-time VET teachers for this period, this rises to 1 050 if the low retention rate of VET teachers compared to other teachers is taken into consideration, as well as teacher retirement rates and the growth in the student population (Skolverket, 2019[11]). In Korea, information based on the number of teacher entrants and retirees, implies that the supply of new VET teachers reached only about 70% of the replacement need in the past five years (Figure 2.2).

Figure 2.2. Germany, Korea and Sweden have quantifiable indicators of VET teacher shortages

Estimated number of qualified upper secondary VET teachers

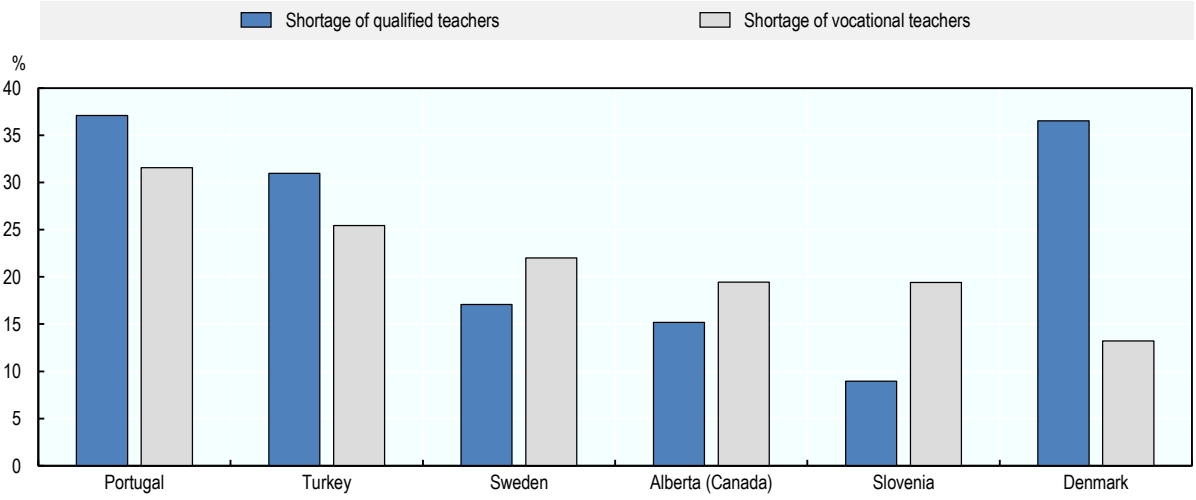


Note: Statistics published by the KMK No. 216: Teacher recruitment demand and supply in the Federal Republic of Germany 2018 to 2030 – summarised model calculations by the Länder. Swedish data refer to examination needs (demand) and estimated number of VET teacher training graduates (supply).
Source: Germany: KMK (2019[9]), Compact data on education, www.kmk.org/fileadmin/Dateien/pdf/Statistik/KMK_Statistik_Folder_2019_en_RZ_web.pdf; Sweden: Skolverket (2020[12]), Forecast of the need for teachers and pre-school teachers, www.skolverket.se/skolutveckling/forskning-och-utvarderingar/skolverkets-utvarderingar-och-rapporter/prognos-over-behovet-av-larare-och-forskollarare and Skolverket (2019[11]), *Lärarprognos 2019*, www.skolverket.se/getFile?file=5394; Korea: KEDI (2020[13]), Korean Education Statistics Service, https://kess.kedi.re.kr/eng/main.do.

Data from the Teaching and Learning International Survey (TALIS) 2018 provide internationally comparable data on teacher shortages. Figure 2.3 shows that a significant share of the leaders of upper secondary educational institutions reported that VET teacher shortages and qualified teacher shortages limited their school's capacity to provide quality instruction. In Denmark and Portugal, 37% of VET leaders reported shortages of qualified teachers. In Portugal, 32% reported shortages of vocational teachers.

Figure 2.3. VET leaders are concerned about VET teacher shortages

Percentage of upper secondary VET principals reporting that teacher shortages significantly hinder their school's capacity to provide quality instruction



Note: Upper secondary VET principals refer to those who reported in TALIS that their school offer at least one VET programme.
Source: OECD (2019[14]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm.

Some countries use several sources of information on teacher shortages, and it is not always easy to arrive at consistent overall conclusion from them. In England, although VET teachers (i.e. further education teaching professionals of both general and vocational subjects) do not feature on the shortage occupations list from the Migration Advisory Committee (MAC, 2020[1]), other evidence does point towards possible shortages. First, the Committee identified limited availability of training in some shortage occupations (MAC, 2020[1])[5] – this training shortage may suggest VET teacher shortages in those occupations. Second, several survey data sources indicate VET teacher shortages in England. According to the 2018 College Staff Survey, 53% of college leaders had found teacher recruitment over the last three years difficult (Thornton et al., 2018[4]). There are also shortages of mathematics teachers, who are crucial in many VET subjects, according to England's national survey of the mathematics teacher workforce in FE colleges (Noyes, Dalby and Lavis, 2018[15]). Moreover, using information from the Annual Population Surveys, one-year retention rates for VET teachers in the United Kingdom were 79% in 2017, lower than the average for the UK workforce (83%), and have declined slightly from 84% in 2013. In comparison, retention rates of secondary school teachers declined from 86% to 82% over the same period (ONS, 2019[16]).

Even in countries where VET teacher shortages are not an issue at the aggregate level, such as Finland and Norway, shortages can be found in specific fields. This is particularly the case in fields with a high employment rate, as in those cases VET teaching jobs might offer less attractive wages than those in the industry. In Norway, projections show that supply and demand are roughly in balance for VET teachers today, and that supply will grow faster than demand over the period 2016-40 (Statistics Norway, 2018[17]). However, Norway does currently face difficulty attracting applicants for VET teacher positions in certain fields, such as the building and technical industries (Norway's response to the OECD questionnaire). In England, the leaders of both further education colleges and independent training providers identified the fields of construction, engineering and manufacturing and digital/information technology (IT) as the most difficult vocational subjects to recruit in, and those with some of the highest vacancy rates[6] (Thornton et al., 2018[4]; IFF Research, 2020[6]). Teacher shortages are not only an issue for vocational subjects, but also general subjects that are crucial in many VET programmes. For example, since 2016, apprentices and lower-attaining post-16 students progressing to FE in England must attain a certain level of mathematics and English. Driven in large part by this policy change, FE college principals and leaders of adult learning providers have indicated that maths and English were the most difficult academic subjects to recruit in, and that the related fields of numeracy, English for speakers of other languages (ESOL) and literacy also had some of the highest vacancy rates (Thornton et al., 2018[4]; IFF Research, 2020[6]). For sixth form colleges, physics was the most difficult subject to recruit in (65%), followed by mathematics (50%) and chemistry (45%) (IFF Research, 2020[6]).

The attractiveness of the VET teaching profession

Some of the factors behind VET teacher shortages may be related to the limited attractiveness of the profession due to employment conditions and a lack of financial incentives and career support. During OECD stakeholder interviews in England, Japan and the United States (see Box 1.1 and Annex 1.A. in Chapter 1), some participants pointed out that the relatively low status and reputation of VET often translates into relatively few applicants for VET teaching positions, low retention rates and dissatisfaction with the profession compared to other competing careers.[7]

The profession's lack of attractiveness contributes to VET teacher shortages

VET teaching competes with careers in industry and other educational institutions

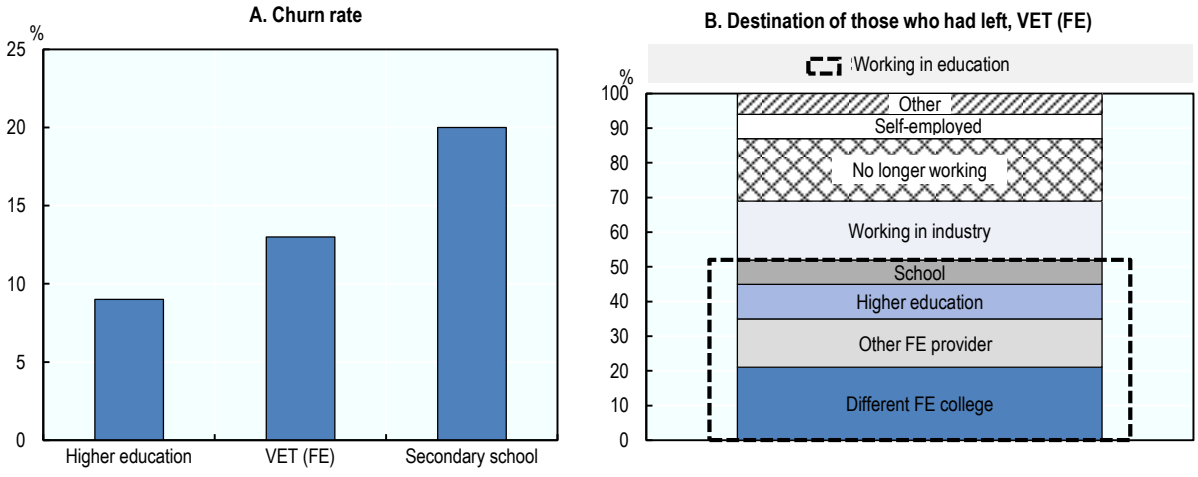
As with other careers in the education sector, the attractiveness of VET teaching careers, salaries and working conditions relative to alternative occupations affects how likely people are to undertake initial

teacher training and remain in the profession (OECD, 2019[18]). VET supports industry by developing and supplying qualified professionals, but also often has to compete with industry to recruit talent, particularly for occupations that are facing shortages, and is often unable to offer competitive salaries. Competition for staff with general educational institutions, especially when recruiting teachers of general subjects, particularly mathematics and science, can also be challenging. According to exploratory research in England, general secondary teaching is the closest occupation to the FE teaching profession, followed by industry occupations that match the vocational subject taught (Lake et al., 2018[19]). This shows that the VET sector has to compete with both general secondary teaching and industry in similar fields to recruit teachers.

VET teachers often move between the VET sector and other educational institutions or industry. According to the 2019 College Staff Survey Follow Up[8] in England (Thornton et al., 2020[5]), 13% of teachers and leaders in FE had left the college where they were employed when they were surveyed the year before. Among those who had left their college, around half (52%) remained working in education, including 35% who remained in the FE sector. The remainder were either working in industry (17%), no longer working (18%) or self-employed (7%) (Figure 2.4). The likelihood of leaving the FE sector had also risen among some teachers: the largest increase those reporting they were likely to leave was among engineering and manufacturing teachers (+17 percentage points since the 2018 survey) and construction (+6 percentage points), both sectors with particular recruitment challenges. Among newer teachers (those who had worked in FE for less than 3 years), 40% reported that they were likely to leave FE in the next 12 months in 2019 (31% in the 2018 survey). In comparison, FE colleges' churn rate was greater than higher education institutions' (9%), but lower than secondary schools' (20%). However, only 11% of secondary school teachers in England were intending to leave the profession entirely, which is lower compared to FE college teachers (IFF Research, 2020[20]). Similarly, the need for VET teacher recruitment in Sweden is largely driven by teachers leaving for other jobs (Skolverket, 2019[11]).

Figure 2.4. Some VET teachers leave their jobs to go into general education or industry in England (UK)

Share of teachers and leaders in England (UK) (VET only in Panel B)

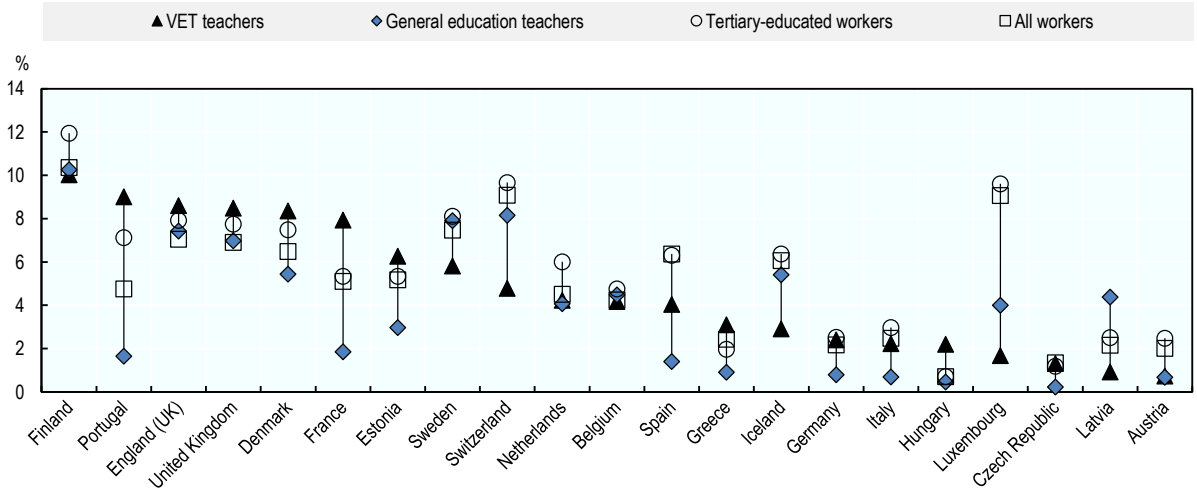


Note: Churn rate refers to the share of teachers and leaders who moved role within and outside the FE sector over the last year for any reason.
Source: Based on Thornton et al. (2020[5]), College Staff Survey 2019 Follow up, www.gov.uk/government/publications/college-staff-survey-2018.

According to the European Union Labour Force Survey (EU-LFS) data for 2017-19, about 9-10% of VET teachers in England, Finland and Portugal were looking for another job, while the share was about 8% for the United Kingdom overall (including all four regions), Denmark and France. In particular, a large share of VET teachers in Denmark, England (and the United Kingdom), Estonia, France, Hungary and Portugal were looking for another job that all other comparison groups including general education teachers (Figure 2.5). In contrast, VET teachers in Austria, Belgium, Finland, Iceland, Latvia, Luxembourg, the Netherlands, Sweden and Switzerland, are less likely than other groups to be looking for another job. Probit regression results using 2019 EU LFS data suggest that across European countries, VET teachers are slightly more likely (2 percentage points, statistically significant) to be looking for another job when compared to general education teachers with similar personal and job characteristics (Annex Table 2.A.3).

Figure 2.5. VET teachers in several countries are more likely than other workers to be looking for another job

Share of workers who are looking for another job, 2017-19



Note: VET teachers are those who teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges (see Box 1.2 in Chapter 1).
Source: Eurostat (2020[21]), European Union Labour Force Survey 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey.

Evidence from the United States (Texas) suggests that turnover intention of CTE teachers in the health science field, which faces VET teacher shortages, negatively correlates with job satisfaction. Job satisfaction accounted for almost 40% of the unique variation in turnover intention (Park and Johnson, 2019[22]).

Job security and salary levels are important factors influencing choices to become VET teachers

Employment security is an important determinant for entering a profession, and has a strong impact on retention and job satisfaction. This is certainly also the case for the VET teaching profession. The use of temporary contracts for VET teachers is widespread in several OECD countries. For example, many Australian VET teachers, whether they work for a public or private Registered Training Organisation (RTO)[9], are employed on insecure contracts, such as a casual contract (paid by the hour) or a short-term contract (semester by semester or year by year). Such flexible recruitment and time arrangements make it easier to hire industry professionals and allow VET teachers to also work in industry to bring up-to-date

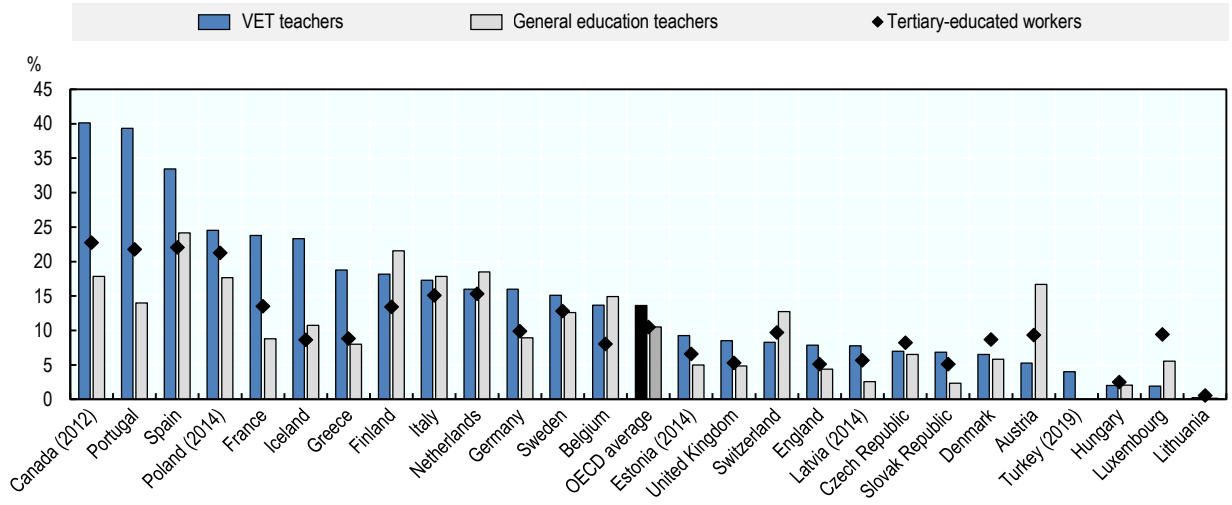
industry knowledge to VET, but casual VET teachers have no clear career prospects, and much more limited employment benefits (e.g. paid annual leave) than those employed on a permanent contract. While many of the casually employed teachers in some of the larger public RTOs are re-engaged time and again, the underlying insecurity does not make VET teaching an attractive career initially (ACDEVEG's response to the OECD questionnaire).

In most OECD countries with available data, temporary contracts are more common for VET teachers than both general education teachers and all tertiary-educated workers (Figure 2.6). In Canada, Portugal and Spain, for example, one out of three VET teachers have a temporary contract, which is much higher than among general education teachers. Among the nine European countries with available data, the main reason for VET teachers to be employed on a temporary contract was that they could not find a permanent job, except in the Netherlands and Germany where a large share of temporary VET teachers (60%) report having this type of contract because they are in training or probation (Figure 2.7).

The COVID-19 pandemic and its particularly strong impact on the VET sector has contributed to further employment insecurity – although the impact might be temporary. For instance, in England 8% of FE teachers were furloughed in 2020 compared to 2% of secondary school teachers, based on the national labour force survey (MAC, 2020[1]). Between August 2019 and August 2020, job postings for FE teachers decreased by 14.2% whereas those for secondary school teachers increased by 6.7%, based on Burning Glass Technology data (MAC, 2020[1]). These differences may be related to the fact that it is harder to teach vocational and practical skills on line than general and academic subjects and that the FE sector is privatised in England, whereas secondary schools are not.

Figure 2.6. VET teachers are more likely to have a temporary contract than general education teachers

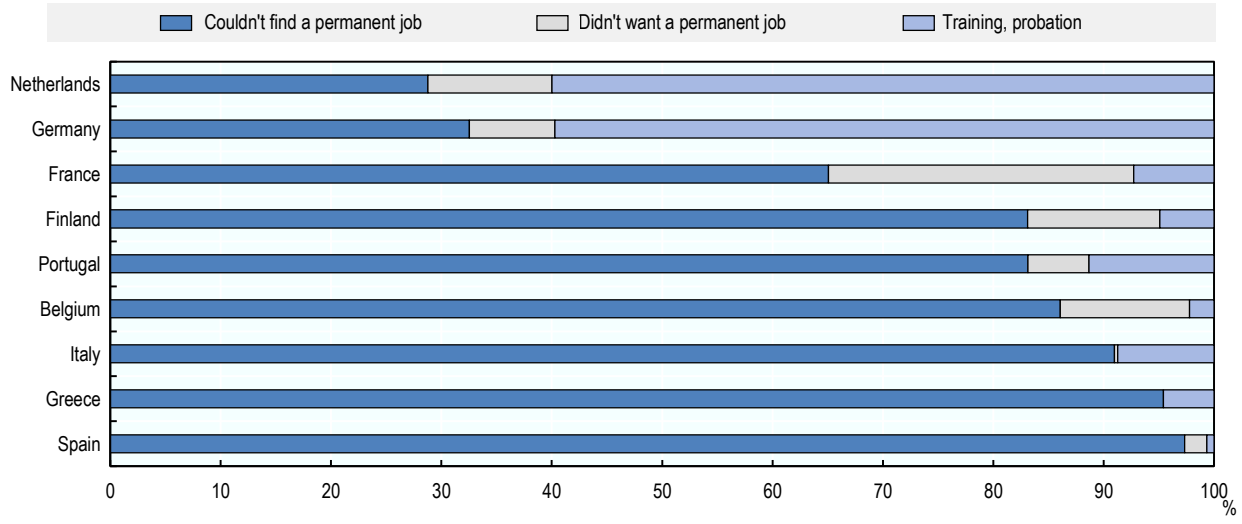
Share of workers who have a temporary contract, 2017-19



Note: VET teachers are those who teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges (see Box 1.2 in Chapter 1).
Source: Eurostat (2020[21]), European Union Labour Force Survey (EU-LFS) 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey. Estonia, Latvia and Poland: Eurostat (Eurostat, 2020[23]), European Union Structure of Earnings Survey (SES) 2014, https://ec.europa.eu/eurostat/web/microdata/structure-of-earnings-survey. Canada: OECD (2012[24]), Survey of Adult Skills (PIAAC) (2012), www.oecd.org/skills/piaac; Turkey: Akyildirim and Durgun (2019[25]), www.etf.europa.eu/sites/default/files/2019-11/turkey_cpd18_22_october_2019_25-10.pdf.

Figure 2.7. A large share of VET teachers with a temporary contract could not find a permanent job

Share of VET teachers with temporary contracts, by reasons of having a temporary contract



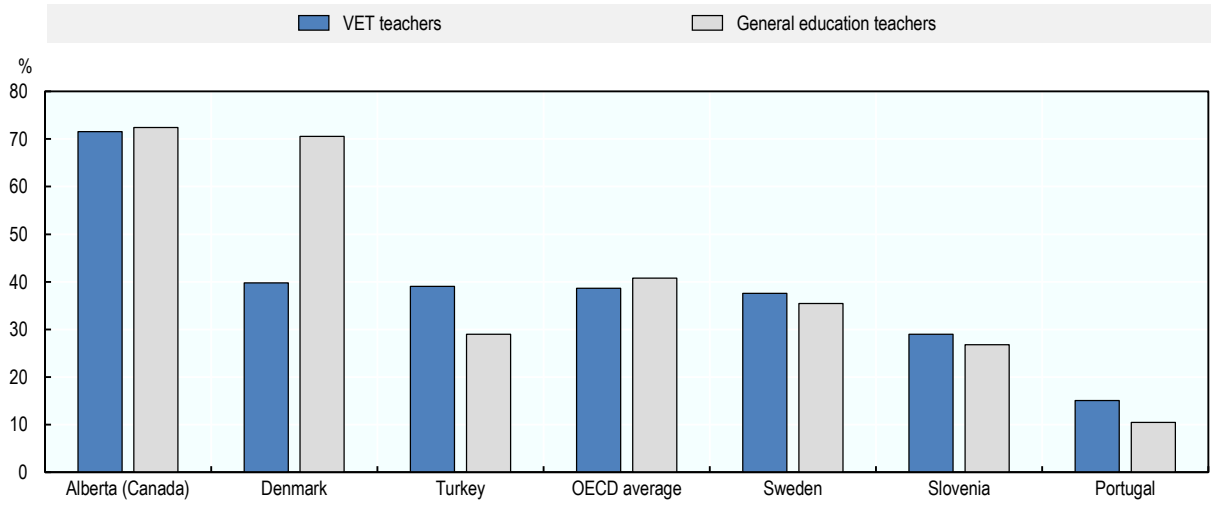
Note: VET teachers are those who teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges (see Box 1.2 in Chapter 1).
Source: Eurostat (2020[21]), European Union Labour Force Survey 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey.

Teachers' salaries represent the largest single cost in VET (see Figure 1.1 in Chapter 1) and also have a direct impact on the attractiveness of the teaching profession. They influence individuals' decisions to enrol in initial teacher education, to become a teacher after graduation, and to return to the teaching profession after a career interruption. They also have an impact on whether teachers choose to remain in teaching; in general, the higher teachers' salaries, the fewer people choose to leave the profession (OECD, 2020[2]). In England, according to the 2018 College Staff Survey (CSS), 41% of FE college principals said that pay affected the recruitment and retention of teachers in FE colleges: this included salaries being higher in industry (22%) and in non-VET schools (17%) (Thornton et al., 2018[4]). Salary levels – although not always the most cited or the only factor – were also among the main determinants of job satisfaction in CSS. According to the 2019 Education and Training Provider Survey, pay and benefits were not "the most difficult aspects of working in education and training", being reported by about 11-18% of VET providers (IFF Research, 2020[6]). In the six OECD countries/regions with TALIS 2018 data available, the share of VET teachers who were satisfied with their salary ranged from just over 70% in Alberta (Canada) to only 15% in Portugal (Figure 2.8). Only in Denmark were VET teachers much less satisfied with their salary than teachers in general education.

However, it is difficult to confirm whether the level of satisfaction reflects actual differences in salary levels relative to other teachers (or other jobs) with comparable personal and job characteristics. First, available data – both within countries and internationally – do not always allow the salaries of VET teachers to be compared with those of teachers in general education programmes who have the same level of qualification and work experience, nor with those of workers in relevant occupations outside the education sector (i.e. alternative occupations for VET teachers). Second, remuneration regimes may not be the same for VET teachers and general education teachers (e.g. teachers in VET institutions and secondary schools in Australia and England) or VET teachers may be remunerated from different sources (e.g. public, private or a combination of both). Moreover, in some countries, teaching qualifications are not required for VET teachers whereas general education teachers' qualifications are regulated, as is the case in England.[10]

Figure 2.8. About 40% of VET teachers on average are satisfied with their salary

Percentage (%) of teachers surveyed in TALIS who reported satisfaction with their salary



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). Responses combine those who "agreed" and "strongly agreed". The average represents the unweighted average of the six OECD countries/regions.
Source: OECD (2019[14]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm.

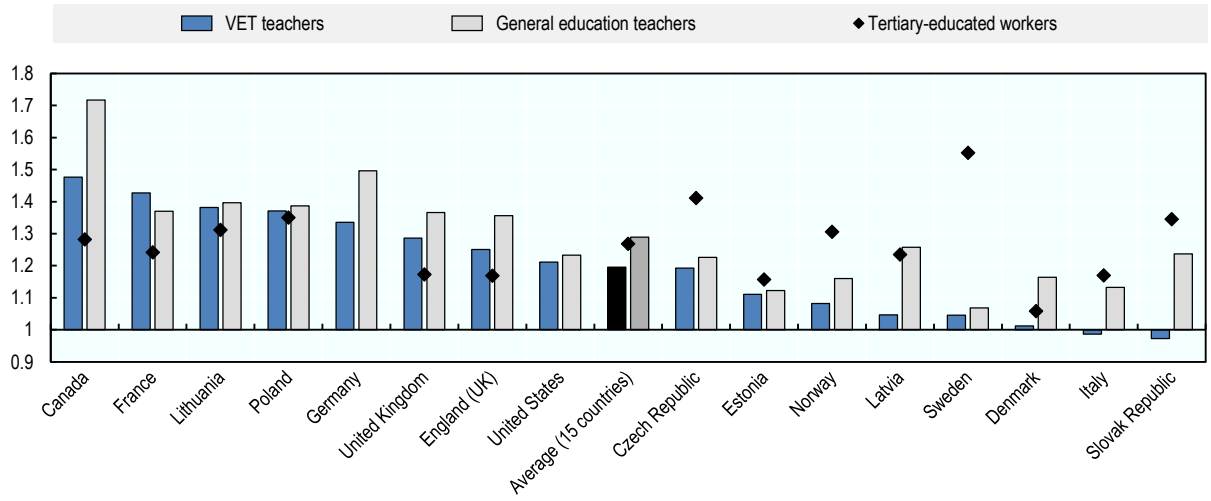
While the statutory salaries of upper secondary teachers with 15 years of experience and the minimum qualifications were similar in general and VET programmes in the 19 OECD countries with available data (OECD, 2020[2]), their actual salaries may differ. Where there are differences, this may reflect differences in the age distribution of teachers, their qualification levels and experience or differences in the allowances available and tasks undertaken. Other benefits, such as regional allowances for teaching in remote areas, family allowances, reduced rates on public transport and tax allowances for the purchase of instructional materials, may also form part of teachers' total remuneration (OECD, 2020[2]).

Data from the Structure of Earnings Survey (SES) 2014 and other sources of information on earnings show that the median salaries of VET teachers (defined by teaching subject, not by programme orientation) are 7.8% lower than those of general education teachers for the 15 countries with available data (based on median monthly earnings for all but 3 countries; see Figure 2.9 for details). Even when controlling for certain personal and job characteristics, a regression analysis using SES data for European countries finds that full-time VET teachers tend to earn less per month than full-time general education teachers among the countries taking part (a 3.8% difference, statistically significant).[11] A similar regression analysis shows that age, tenure and education level are generally positively correlated with the level of VET teachers' salaries.[12] The data also allow teachers' salaries to be compared to those of other reference groups. For example, in half of the countries with available data, VET teachers earn higher salaries than tertiary-educated workers; only in France do they earn higher salaries than general education teachers (Figure 2.9).[13]

Evidence from national data also suggests a similar story. In England, according to ASHE 2019, FE teachers' median full-time annual wage is about GBP 2 600 below that of secondary school teachers (MAC, 2020[1]). According to the National Careers Service (2020[26]), FE lecturers, tutors or teachers earn between GBP 24 000 and 37 000 (working 35-37 hours a week), varying by sector and subject, while secondary school teachers earn between GBP 24 373 and 41 419 (working 37-45 hours a week). In addition, as the pay for VET teachers is also usually below the level earned by those working in the relevant industry, VET teaching may not be attractive to highly skilled trades and professionals.

Figure 2.9. VET teachers earn less than general education teachers

Ratio to the median wage of all workers (which is equal to 1)

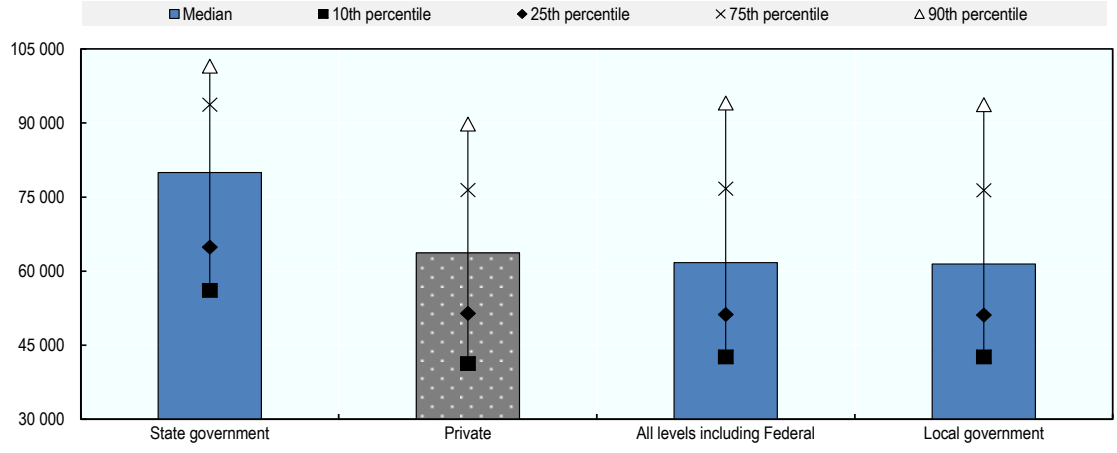


Note: Figures relate to the median monthly salary except Denmark (average earnings in DKK per hour worked), Germany (wage for all workers refers to the hourly wage for four 40-hour weeks), Sweden (average monthly salary), and the United States (annual mean salary). For the United States, VET teachers and general education teachers both refer to teachers at the secondary education levels. For the Structure of Earnings Survey (SES) 2014, VET teachers refer to those teaching vocational subjects in secondary schools, colleges and further education institutions while general education teachers refer to those teaching general subjects at secondary education levels (see Box 1.2. in Chapter 1). The analysis using SES excludes workers in enterprises with few than 10 employees and own account workers when calculating the salaries of all workers.

Source: Sweden: SCB (2019[27]), Statistics Sweden, www.scb.se/en; Denmark: Statistics Denmark (2019[28]), Statistikbanken, www.dst.dk/en ; Germany: based on BA (2020[29]), Entgeltatlas, https://con.arbeitsagentur.de/prod/entgeltatlas/tabelle?region=1&geschlecht=1&branche=1&dkz=59472&mode=3; Canada: OECD (2012[24]), Survey of Adult Skills (PIAAC) (2012), http://www.oecd.org/skills/piaac/publicdataandanalysis; Norway: Statistics Norway (2019[30]), SSB 2019, https://www.ssb.no/en; United States: US Bureau of Labor Statistics (2020[31]), Occupational Employment Statistics May 2019, www.bls.gov/oes/tables.htm. Data for the rest of the countries are based on Eurostat (Eurostat, 2020[23]), European Union Structure of Earnings Survey (SES) 2014, https://ec.europa.eu/eurostat/web/microdata/structure-of-earnings-survey.

Figure 2.10. VET teachers' wages may differ depending on the school level, funding model and other factors

Annual mean wage of secondary CTE teachers in the United States, USD, May 2019



Note: CTE refers to career and technical education, which is equivalent to VET in the United States.

Source: US Bureau of Labor Statistics (2020[31]), Occupational Employment Statistics May 2019, www.bls.gov/oes/tables.htm.

Another aspect to consider is that these average wages hide possible differences between certain types of VET teachers, types of schools and other factors. For example, in the United States, there is little difference between the average wage levels of secondary school teachers of general subjects and of career and technical education (CTE) teachers (Figure 2.9). However, there is difference based on the type of institution (e.g. state-owned versus private) and the level at which teachers teach (e.g. secondary versus post-secondary) (Figure 2.10). Similarly in England, average salaries differ depending on the type of providers.[14]

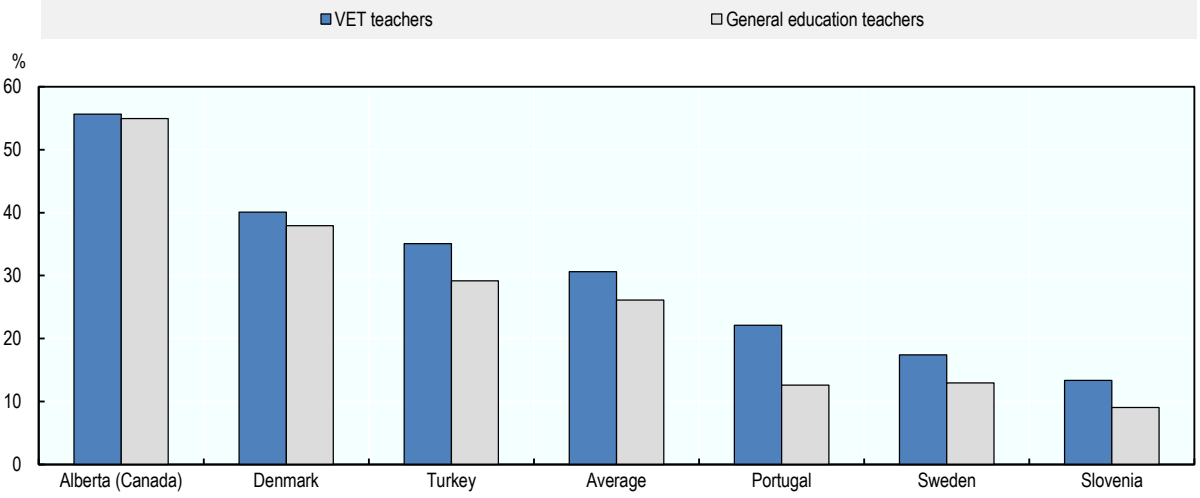
Several other factors affect VET teachers' satisfaction with the profession

While salary levels relative to competing industries and employment security are the main challenges to VET teacher recruitment and retention, there are additional issues that may also require attention depending on individual countries' contexts. These include society's recognition of the profession, career development opportunities, workload and management-related issues.

The level of societal recognition on the profession may influence the choice to enter VET teaching (OECD, 2020[32]). According to TALIS 2018, only 31% of VET teachers feel that the teaching profession is valued by society (Figure 2.11). However, country variation was substantial: 13% of VET teachers in Slovenia reported that their profession was valued by society, compared to 56% in Alberta (Canada). In all countries, VET teachers are slightly more likely to report that their profession is valued by society than general education teachers.

Figure 2.11. Not many VET teachers feel that teaching is valued in society

Share (%) of VET teachers who reported that they agreed that "the teaching profession is valued in society"



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). The average represents the unweighted average of the six OECD countries/regions.
Source: OECD (2019[14]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm.

Workload, management (see Chapter 5) and career development opportunities may also have an effect on job satisfaction, which in turn may have an effect on teacher retention. For example, according to the 2018 CSS in England, the reasons why teachers were considering leaving FE in the next 12 months (42% of teachers) were mostly related to workload (40%), perceived poor college management (39%) and pay (35%) (Thornton et al., 2018[4]). Related to the dissatisfaction with college management, 47% of teachers at poor-quality colleges (i.e. those rated "requires improvement" or "inadequate") said they were likely to

leave the FE sector (and expressed higher levels of dissatisfaction), compared with 38% of teachers at good-quality colleges ("outstanding" or "good") (Thornton et al., 2018[4]). The 2019 CSS Follow Up confirms this: the most common reasons given for leaving the FE sector among teachers and leaders who had done so were perceived poor college management (58%), followed by unmanageable workloads (46%).

The 2018 CSS (Thornton et al., 2018[4]) found that 59% of teachers were not satisfied with the opportunities available to develop their careers in FE. The level of dissatisfaction with career development opportunities was slightly lower among teachers working for other types of providers, according to the ETP survey (IFF Research, 2020[6]).[15] According to the 2019 CSS Follow Up (Thornton et al., 2020[5]), 37% of teachers who were surveyed in 2018 had been dissatisfied with opportunities to develop their career in FE.

Targeted financial incentives and career support can help make VET teaching careers more attractive

Well-targeted financial incentives and support can help attract and retain VET teachers

Financial support and incentives, including salary increases and compensation of teacher training costs, can make VET teaching careers more attractive and motivate qualified teachers to stay and progress in their profession. Supportive and attractive employment conditions, including salaries, can also have positive effects on teachers' willingness to remain in the profession and their capacity to provide high-quality learning environments for their students (OECD, 2019[18]). According to TALIS 2018, on average across the OECD, teachers – including both general and VET teachers – who are satisfied with their salaries and employment conditions are more likely than others to want to continue in teaching, and also to remain in the same school (OECD, 2020[32]).[16]

While the evidence on the effectiveness of financial incentives and support on VET teacher recruitment and retention is limited and mixed, well-targeted financial incentives and support are proven to be effective. Targeted support includes financial incentives for those taking up initial teacher education and training (ITET) and professional development, or financial (salary) incentives that are targeted on industry professionals in areas of teacher shortages. Research conducted in England suggests that financial incentives to encourage take up of ITET among FE teachers have met with varying degrees of success and are most effective when multiple complementary schemes are offered together, offering a suite of initiatives may help to increase awareness of the support available to potential candidates, and increase the visibility of the VET sector as a career option (CooperGibson Research, 2018[33]).

There are several examples of targeted bonus and wage incentives for teacher recruitment and retention in VET. These incentives can be targeted at specific subjects where it is difficult to recruit teachers, such as science, technology, engineering and mathematics (STEM), or the health care sector. For example, in Belgium (Flanders), individuals moving from the private sector into VET teaching in shortage subjects are allowed to enter the teaching profession at a higher tenure level (to a maximum of 8 years), which means a salary of up to EUR 300 per month above the baseline salary (Vlaams Ministerie van Onderwijs en Vorming, 2020[34]).[17] England also provided a range of financial incentives to attract high-quality graduates to teach mathematics and English in FE colleges. The evaluation of these initiatives found that overall they had a positive impact on the number of new trainee teachers and their rates of completion and employment as a teacher in FE sector, but that not all incentives were effective (Box 2.2). In the United States, various federal, state or local-level grants are available to improve recruitment and retention of highly qualified teachers or industry professionals in VET (Box 2.3). Norway provides a grant scheme for industry professionals who have a trade- or journeyman's certificate or similar but no teacher training. The scheme offers candidates a grant to complete the course needed to become a qualified VET teacher.

Some countries have also tried to make VET teaching more attractive by salaries. In Korea, for example, as part of the Plan for Vocational High School Support and Employment Promotion 2020, the government is planning to increase the salaries of adjunct teachers from industry by more than 10% to attract them into

VET teaching. However, in many countries, it is not easy to raise salary levels overall, and especially not to the levels at which industry pays highly skilled workers, regardless of whether salaries are set in accordance with civil servant remuneration regimes or otherwise.

VET teachers' salaries are defined in different ways in different countries. For example, in Denmark, the teachers' trade union negotiates teachers' salaries with employers, using the base salary set by the government as a framework. VET institutions can adjust VET teachers' salaries based on their levels of qualifications and experience, but in many cases there are no incentives based upon performance or experience. In England, FE providers define teachers' salaries (market-based), and there is no framework or external intervention other than a non-binding guideline and recommendation on pay (e.g. by the Association of Colleges for FE colleges). In Austria, Germany and Korea, where VET teachers are civil servants or regulated by equivalent laws and regulations, teachers receive government-defined salaries, although in Germany central or regional governments can adjust teachers' salaries in order to guarantee performance levels, awards and allowances (see Box 2.7 on teacher recruitment).

Countries could consider targeted salary increases given that some VET teachers' salaries depend on multiple factors such as the relevant sector or occupation, and their level of education and experience, and type of VET institution (e.g. public or private; national or regional). It may be possible to increase salary levels without increasing overall teaching costs through the better management of human resources. In England where FE colleges can set their teachers' salaries, some colleges have been able to achieve low teaching costs by managing their staffing mix, managing costs per teacher (e.g. greater use of high-performing staff with lower tenure), and optimising the number of learners per teacher (through managing teaching contact hours, class or group sizes and teaching hours per learner), according to the Association of Colleges (AoC, 2015[35]).

Box 2.2. Targeted financial incentives and support to attract and retain highly qualified professionals into VET teaching in England (UK)

Taking Teaching Further programme

The Taking Teaching Further (TTF) programme (started in 2018) is funded by the Department for Education and delivered by the Education and Training Foundation. It aims (1) to increase the number of skilled FE teaching professionals by helping providers to support experienced industry professionals to enter the FE teaching profession; and (2) to raise the profile of FE teaching, particularly among industry professionals. The programme supports industry professionals in prioritised subject areas[1] to become vocational teachers, covering the cost of a teaching qualification, reducing their workload during the first year of teaching and providing other early career support such as mentoring and paired teaching. In addition to the initial investment of GBP 5 million in 2018-20 to recruit and train around 150 new FE teachers, the Department has made GBP 10 million available during 2020-22 to support the recruitment, training and retention of over 500 FE teachers across any of the 15 technical teaching routes.[2] Although the programme is still ongoing, the early indication based on stakeholder interviews suggests that it has brought some positive effect.

The TTF programme also supports the roll out of "T Levels" – new technical study programmes – by supporting providers to recruit teachers into T Level subject areas. T Levels aim to transform vocational education at the upper secondary level and will exist alongside apprenticeships to meet employment needs. School-based VET will last for two years, and includes a technical part that is being designed in co-operation with employers. The first three programmes were rolled out in September 2020 with dedicated qualifications in the sectors of education and childcare, digital, and construction with further sectors to be added in the coming years.

Further Education (FE) Workforce Programme

The FE Workforce Programme (2013-16) aimed to address FE workforce challenges arising from policy changes, including those relating to maths and English. The programme included:

- Bursaries for FE Initial Training Education (GBP 4 000-25 000), to attract graduates to teach in FE.
- A Subject Knowledge Enhancement scheme that funds ITET providers to deliver maths subject knowledge training in preparation for or alongside an ITET course.
- A Golden Hello scheme for new maths teachers who have worked in the sector for two years and spend over half their time teaching General Certificate of Secondary Education (GCSE) courses.
- Recruitment incentive grants for FE providers to support the recruitment of new maths teachers.
- A pilot Premium Graduate scheme, which provided a two-year enhanced ITET scheme for high-calibre new entrants to the FE sector.
- A range of funded enhancement activity to enable existing teachers to access fully funded development and training to be able to teach English or maths.

The programme aimed to create capacity equivalent to an additional 2 500 maths teachers and 2 600 English teachers in FE with the skills to deliver GCSEs by the end of the 2015/16 academic year either by training existing teachers to deliver these subjects or to recruit new teachers into the sector. According to the official evaluation report of the recruitment element, the FE bursary scheme had a positive impact on the number of trainee teachers ITET (53% of the recipients surveyed reported that they would not have enrolled in such a programme without the bursary) by offering grants to graduates and providing incentives for FE colleges to promote their initial teacher education programme – although better targeting would have improved the impact. An evaluation of the Maths Enhancement Programme and English Enhancement Programmes, which were both designed to train existing teachers, found that they helped to increase the number of maths and English teachers, and improved the quality of teaching according to participants. Other recruitment initiatives (the maths teacher Golden Hello programme, recruitment incentives and premium graduate scheme) had limited an impact on attracting teacher candidates, partly due to a lack of awareness about these aspects of the programme.

1. Childcare and education, digital, construction, engineering and manufacturing, or another priority STEM subject specialist area where teaching vacancies are hard to fill.
2. Agriculture, Environmental and Animal Care; Business and Administrative; Catering and Hospitality; Construction; Creative and Design; Digital; Education and Childcare; Engineering and Manufacturing; Hair and Beauty; Health and Science; Legal, Finance and Accounting; Protective Services; Sales, Marketing and Procurement; Social Care; Transport and Logistics.

Source: DfE (2017[36]), Post-16 technical education reforms: T level action plan, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/760829/T_Level_action_plan_2017.pdf; DfE (2019[37]), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/842382/2019_T_Level_Action_Plan.pdf; DfE (2020[38]), Introduction of T Levels, https://www.gov.uk/government/publications/introduction-of-t-levels/introduction-of-t-levels DfE, (2019[39]), 160 more industry professionals to be recruited as FE teachers, www.gov.uk/government/news/160-more-industry-professionals-to-be-recruited-as-fe-teachers; CooperGibson Research (2018[33]), Incentive programmes for the recruitment and retention of teachers in FE, https://www.gov.uk/government/publications/incentive-programmes-for-the-recruitment-and-retention-of-teachers-in-further-education-fe; ETF (n.d.[40]), Taking Teaching Further, www.et-foundation.co.uk/supporting/support-teacher-recruitment/taking-teaching-further; Zaidi, Howat and Rose (2018[41]), FE workforce programme evaluation, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/767260/Further_education_workforce_programme_evaluation.pdf

Box 2.3. Targeted financial incentives and support to attract highly qualified VET teachers in the United States

Transition to Teaching

The Transition to Teaching programme provides grants to recruit and retain highly qualified mid-career professionals (including qualified para-professionals) and recent college graduates, as teachers in high-need schools. It also encourages the development and expansion of alternative certification routes (to under state approved programmes) that would reduce the amount of time it takes for individuals to become certified teachers, based on their experience, expertise and academic qualifications in place of traditional course work in the field of education. The programme provides five-year grants to state and local educational agencies, or other organisations collaborating with them. Grantees develop and implement comprehensive approaches to training, placing, and supporting the teaching candidates they have recruited into their programmes, which must meet relevant state certification or licensing requirements. Grantees then ensure that programme participants are placed in high-need schools and districts, supporting them as they serve in these placements for at least three years.

Teacher Pathway Initiative

The US Department of Education also provided grants to upper secondary schools experiencing VET teacher shortages through High School Career and Technical Education Teacher Pathway Initiative (Office of CTAE, US Department of Education, 2017[42]). For example, the *Broward Educating Superior Technology Teachers* project built the high school CTE teacher pipeline in computer science and IT to address the skills gap in Broward County's computer science/IT in-demand industry occupations. The project recruited and prepared Broward Schools' CTE teachers, non-CTE-teachers, industry professionals and Broward College Education Pathway students to earn a Business Education certification that enable them to teach technology courses (US Department of Education, n.d.[43]).

Teacher Loan Forgiveness Programme

The Teacher Loan Forgiveness Programme may cancel up to USD 17 500 study loans (e.g. Federal Family Education Loans) depending on the subject area taught, for highly qualified teachers on the condition that they teach full time for five years in a low-income school or educational service agency. A highly qualified teacher is defined as one who has attained at least a bachelor's degree, received full state certification as a teacher and not had certification or licensure requirements waived on an emergency, temporary or provisional basis. Mathematics or science teachers who taught students at secondary school level or special education teachers have advantage in this. In addition, a recent law established the New York state teacher loan forgiveness programme, which provide grants of up to USD 5 000 to teachers with education loans who agree to teach in the state in a shortage subject area or a hard-to-staff school district. This law applies to VET teachers given that VET has been identified as a teacher shortage area in New York, according to a report from the US Department of Education (ACTE and Advance CTE, 2019[44]).

Source: US Department of Education (2020[45]), Transition to Teaching, https://www2.ed.gov/programs/transitionteach/index.html; Federal Student Aid (2020[46]), Wondering whether you can get your federal student loans forgiven for your service as a teacher? https://studentaid.ed.gov/sa/repay-loans/forgiveness-cancellation/teacher.

Career development support can help to retain VET teachers

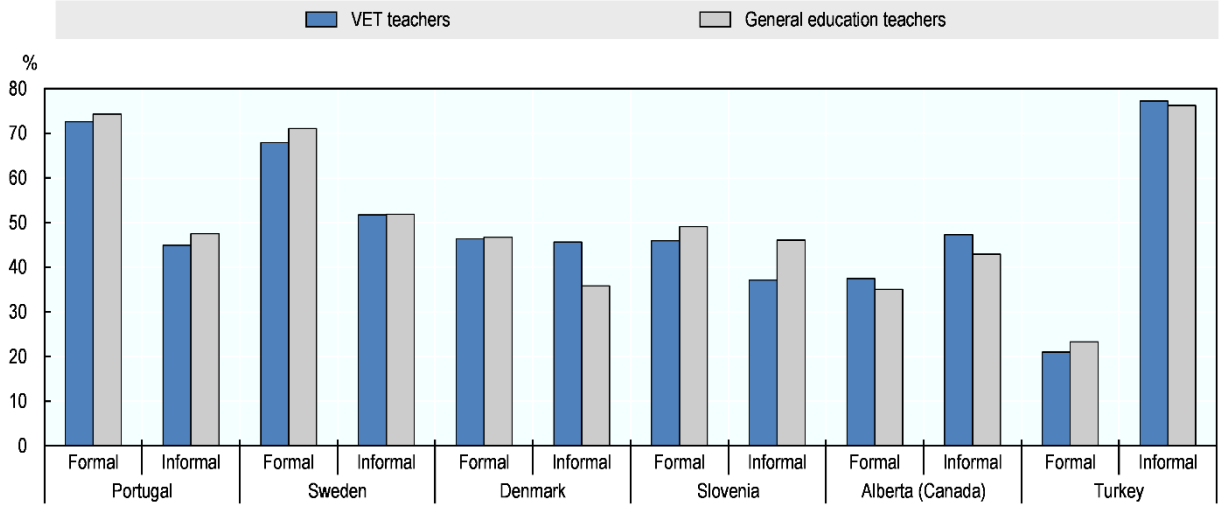
VET teachers who have targeted career support are more likely to stay in the profession and such support is particularly important for those who entered the profession after or while working in industry. For example, England's CSS 2018 suggests a positive correlation between retention and VET teachers' satisfaction with opportunities to develop their career. Among those teachers who were dissatisfied with the career development opportunities in FE, 69% said they were likely to leave the sector in the next 12 months, compared with 21% of teachers who were satisfied (Thornton et al., 2018[4]). There are various ways to support career development for VET teachers to stay in the profession.

- **Training and mentoring of novice teachers,** particularly new teachers recruited from industry, to strengthen their pedagogical skills (see Chapter 3).
- **Providing experienced VET teachers with relevant professional development and career progression opportunities:** for experienced teachers, providing professional development opportunities (see Chapter 3), providing opportunities for career mobility, and building attractive career pathways to become head teachers or VET institutional leaders are effective ways to motivate them to stay in the VET teaching profession.

Teachers at the start of their careers face particularly difficult situations and thus need much more support from VET institutions, mentors and other teachers. TALIS data show that teachers in their early career tend to work in more challenging schools and often work in more than one school at a time (OECD, 2020[32]).[18] In some countries, low teacher retention, in particular high attrition among new teachers, is a serious challenge. For example, Helms-Lorenz (2014[47]) reported that approximately 21% of secondary teachers in the Netherlands had stopped teaching after one year and 31% after five years, and the figures were slightly higher among teachers in vocational schools than those in general secondary education or pre-university schools (Helms-Lorenz,, 2014[48]). In England, the CSS 2019 follow-up showed that 27% of those who left their main college did so within a year of starting work there and a further 19% had left before completing three years' service (Thornton et al., 2020[5]).

Figure 2.12. Less than half of VET teachers received an induction on average

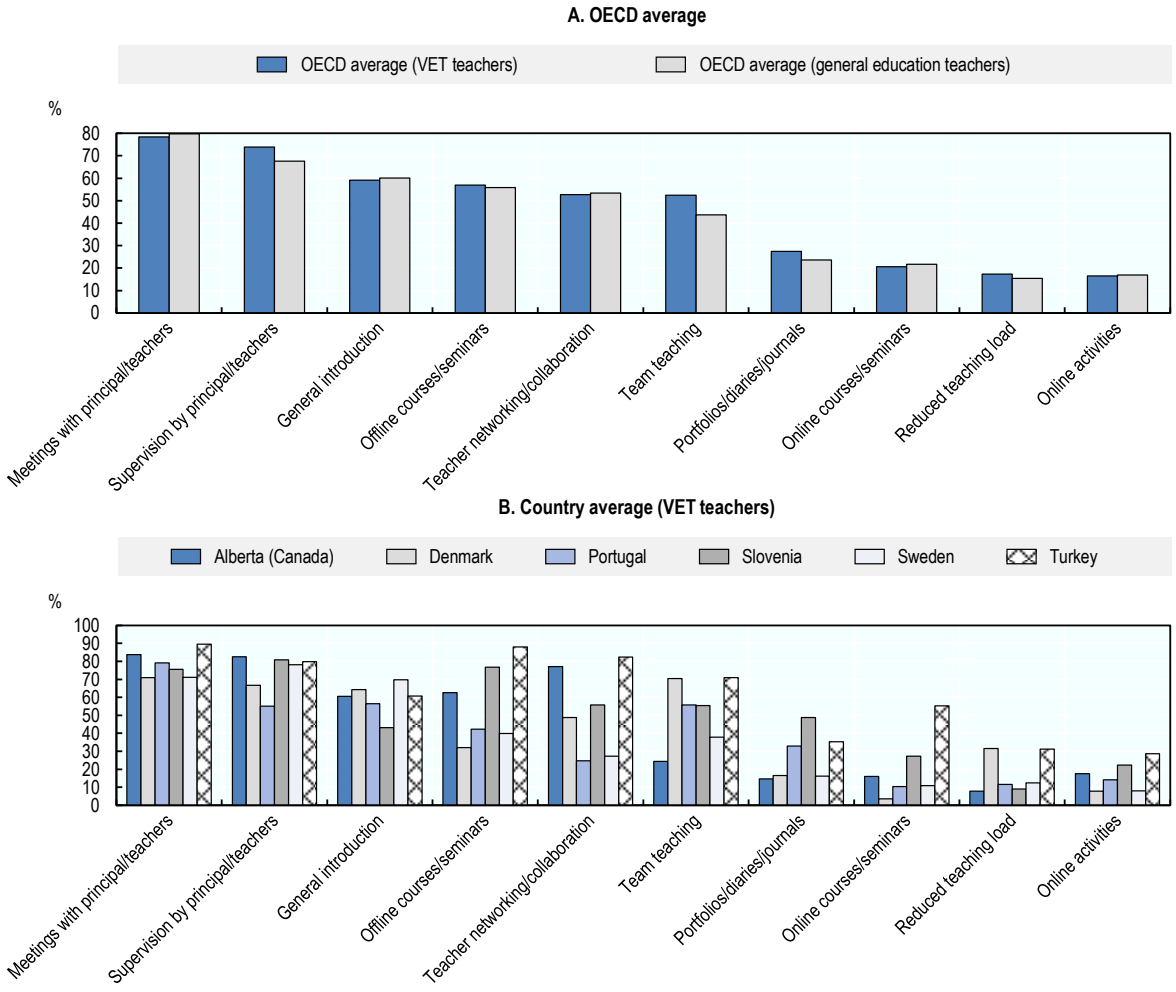
Share of teachers who received formal and informal induction, by type of teacher



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). Induction includes either during their first place of employment or at their current school.
Source: OECD (2019[14]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm.

Figure 2.13. VET teachers receive a variety of forms of induction to different degrees

Share of upper secondary VET teachers who were provided with the following induction when beginning work at the current school (only teachers who received some type of induction)



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). The OECD average refers to an unweighted average of the six OECD countries/regions presented here. Data for the individual countries refer to VET teachers only.
Source: OECD (2019[14]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm.

Lack of support for novice teachers and poor inductions – in particular for those who came from industry – can therefore result in higher staff turnover, lower retention rates and lower levels of job satisfaction and are likely to have a negative impact on teacher performance (De Bruijn, Billett and Onstenk, 2017[49]). Given that novice teachers need extra support, it is helpful for them to be assigned to less challenging working environments in their first placements (OECD, 2020[32]). Reduced teaching and administrative workloads to have sufficient time for mentoring and structured induction programmes can also reduce attrition in the early years (den Brok, Wubbels and van Tartwijk, 2017[50]).

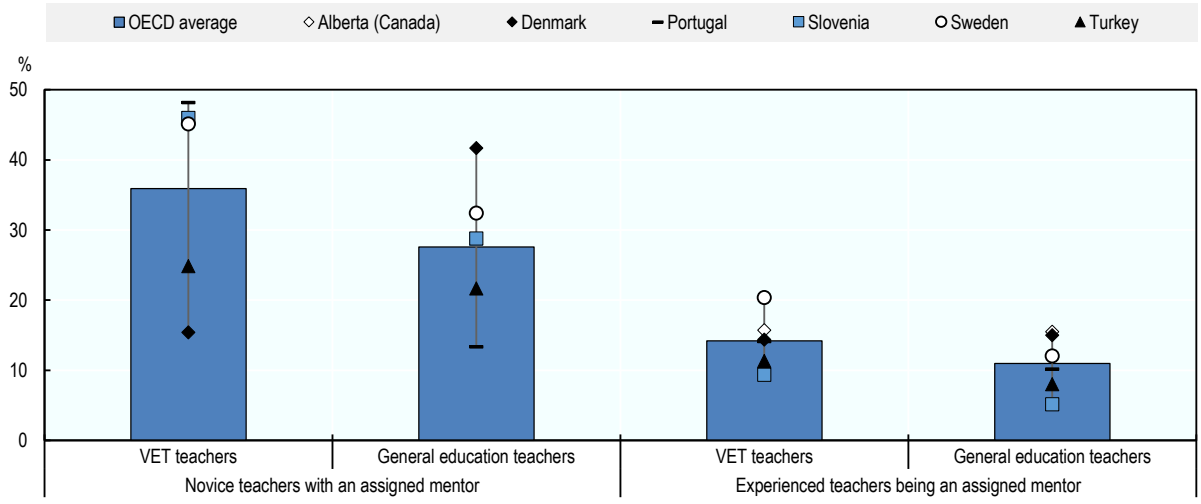
According to TALIS 2018, less than half of VET teachers in the countries with available data received any formal induction (Figure 2.12). Only in Portugal and Sweden did more than two-thirds of VET teachers receive a formal induction. In Turkey, despite the introductions of mandatory induction in 2016 (see below), induction remained largely informal (77% informal versus 21% formal for VET teachers). Differences between VET and general education teachers are small and not significant in all countries, with the

exception of informal induction in Denmark and Slovenia. In Denmark, informal inductions are more common among VET teachers than general education ones (46% versus 36%), whereas the opposite holds in Slovenia (37% versus 46%).

Induction can take many different forms, including personalised inductions (e.g. individual meetings with, or supervision by, leaders or experienced teachers or team teaching with experienced teachers), general inductions, induction courses, networking and reduced workloads. According to TALIS data, across the six OECD countries/regions with available data, the most common form of induction for both VET and general education teachers who received one was a personalised induction in the form of meetings with and supervision by leaders and experienced teachers (Figure 2.13). VET teachers received some types of personalised induction more often than general education teachers. For example, 74% of VET teachers were supervised by leaders and/or experienced teachers, compared with 68% of general education teachers and 53% did team teaching with experienced teachers (44% for general education teachers). In particular, VET teachers in Denmark are much more likely to benefit from team teaching with experienced teachers (75%) and a reduced teaching load (36%), compared to general education teachers (36% and 22% respectively), while the other types are relatively less common.

Figure 2.14. VET teachers are more likely to have or be a mentor than general education teachers

Share of teachers



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). Novice teachers refer to those who have less than 3 years of experience in teaching. Experienced teachers refer to those who have 3 years of experience in teaching or more. 'Mentoring' refers to a support structure in schools where more experienced teachers support less experienced teachers. It does not include mentoring of student teachers doing teaching practice. Alberta (Canada) was omitted for novice teacher variables due to insufficient sample size.
Source: OECD (2019[14]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm.

Mentors can provide crucial support during a teacher's first years of teaching. According to the 2018 TALIS data, on average in the six OECD countries/regions, only 36% of VET teachers with less than three years of experience in teaching were assigned a mentor (Figure 2.14). The variation across countries was large, with only 15% of novice VET teachers being assigned a mentor in Denmark, compared to almost 50% in Portugal, Slovenia and Sweden. In contrast, Denmark has the largest share of novice general education teachers receiving support from a mentor (42%), whereas the share falls to 13% in Portugal. In all countries except Denmark, novice VET teachers are more likely to be assigned a mentor than their peers in general education. Similarly, experienced VET teachers are on average more likely to be a mentor than teachers in general education, although the difference is small (14% versus 11% on average across the six OECD countries/regions with available data).

Box 2.4. Mentor training programmes for further education teachers in England (UK)

A new mentoring training programme will run from October 2020 to March 2021, aiming to give FE practitioners the opportunity to experience and practise a variety of mentoring techniques and undertake 40-50 hours of supported mentoring. Running over a six-month period, the professional development programme offers two strands of mentor training: one for practitioners who are new to mentoring, and one for experienced or qualified mentors. The "Advanced mentoring" programme is for FE practitioners who have one to two years' experience in mentoring or who have mentoring qualifications. It will also offer PD activities for more experienced or qualified mentors who will also undertake a small project to improve mentoring in their organisation.

FE providers participating in this programme will be eligible to apply for a grant of up to GBP 6 000 which will contribute towards the costs of reducing mentors' and mentees' timetables so that they can take part in the training as well as undertaking 40-50 hours of mentoring activity. Mentors who complete the courses will be awarded a digital badge.

Source: ESFA (ESFA, 2020[51]), *ESFA Update further education: 16 September 2020 - FE Mentor Training Programme*, www.gov.uk/government/publications/esfa-update-16-september-2020/esfa-update-further-education-16-september-2020#information-fe-mentor-training-programme.

While many countries provide some form of induction for novice VET teachers, there remains room for improvement. In the United States, there are no systematic induction programmes for new VET teachers at a national or state level, instead initial teacher education and training may play this role. Universities of teacher education provide programmes equivalent to induction for VET teachers as part of initial teacher training. For example, the University of Minnesota runs the Teacher Induction Programme for VET teachers in the agriculture sector, involving senior, regional and peer mentors. The Teaching to Lead programme provides coaching and professional development to novice CTE teachers in the United States before, during and after the first year of teaching (see Box 2.5).

Some countries provide guidelines on how new teachers should be welcomed and guided at the start of their careers. For example, the Norwegian Directorate for Education and Training has developed such guidelines, and the National Programme for Continuing Education for VET Teachers offer courses in guidance of (new) VET teachers. In 2020-21, 22 VET teachers are earning 30 European Credit Transfer System (ECTS) credits in the "Programme Guidance for VET teachers" course. In Germany, where teachers already do extensive preparatory service (two years practical training as part of their initial training while teaching in a VET school), their induction after becoming a fully qualified teacher gives newly qualified teachers the option to ask training staff (from teacher training institutes or institutions for in-service teacher training) for advice, particularly about didactic and methodological problems (KMK, 2017[52]).

Some countries mandate induction programmes for new VET teachers. Since 2019, all teacher training graduates in Austria have had an obligatory one-year induction period (induction courses at a teacher training university; supervised by a mentor), as a result of the new training guidelines for student teachers implemented in 2015 and 2016 (*PädagogInnenbildung NEU*). VET teachers of general subjects have a one-year induction phase which takes place in the school after graduating from a master's programme (Müller et al., 2018[53]). Such measures increase the need for resources for support and mentoring as well as for the training of mentors, and a 2018 survey of Austrian teacher training universities found that there were not enough trained mentors for the induction phase. In Turkey, a reformed six-month induction process was introduced in 2016 according to the Teacher Strategy Paper 2017-23, but much improvement needs to be made in terms of training and assigning mentors (Akyildirim and Durgun, 2019[25]).

Box 2.5. Teaching to Lead for career and technical education: Teacher preparation in the United States

In the United States, ITET requirements and delivery vary across states. The Teaching to Lead (T2L) teacher preparation programme is developed by the Southern Regional Education Board (SREB) and the National Research Center for Career and Technical Education (NRC-CTE). This programme aims to build the capacity of new and early-career CTE teachers to plan instruction, engage students, manage classrooms, create standards-driven assessments and gain confidence in their craft. It can also take the place of traditional teacher preparation programmes or alternative certification models.

T2L professional development and coaching is delivered by trainers with teaching and leadership experience, which may be SREB staff, post-secondary faculty or SREB-certified trained district or state personnel. T2L participants receive as many as 200 hours of training before, during and after the first year of teaching, including:

- Intensive instruction during the summer prior to the first year of teaching, delivered through mini lectures, individual and team assignments, teach-backs and facilitated discussions.
- Quarterly professional development sessions that prepare teachers for the next nine weeks opportunities to share problems and solutions within a community of peers.
- On-site coaching visits, on-site and virtual mentoring with experienced teachers and support from school leaders.
- Intensive reflection and instructional planning during the summer after the first year of teaching.

Through this training, teachers learn: what to do on the first day, in the first week and during the first nine weeks of school; how to plan instruction that incorporates academic, technical and workplace readiness standards; manage a classroom of diverse students with personalised instruction; plan real-world assignments; motivate and support students; and assess student learning. In a typical implementation, teachers participate in two years of additional professional development and coaching on: (1) how to create authentic assignments that enhance students' literacy, maths and science knowledge and skills by adopting instructional strategies from the NRCCTE at SREB's research-based Literacy-in-CTE, Math-in-CTE and Science-in-CTE models; and (2) how to collaborate with their colleagues to plan and implement standards-driven, project-based learning units in their disciplines.

The T2L induction model has been shown to improve teacher competence and self-efficacy in a study of the model conducted by the NRCCTE at SREB. T2L can be used by states, districts or schools to support new CTE teachers in the first or second year of teaching and beyond. This programme also provides intensive, sector-specific, research-based professional development and coaching services for teachers.

Source: SREB (2020[54]), *Teaching to Lead: Preparing CTE Teachers for Today's Students*, www.sreb.org/sites/main/files/file-attachments/19v02_teaching_to_lead_revised.pdf?1583852932.

Attractive career pathways with targeted support encourage VET teachers to stay in the profession while allowing them to move into a senior or management-level position (see Chapter 5). In some countries the career structures for teachers in general programmes and VET programmes are the same, while in other countries, such as Estonia, teachers in VET who teach vocational subjects have a spate career structure, based on a distinct set of professional standards (Santiago et al., 2016[55]). In Slovenia, teachers' career progression and salary increases are linked to teacher appraisal whereby school leaders evaluate the work of teachers at their school every year, carry out annual interviews, provide advice, and make recommendations for career advancement (OECD, 2016[56]).[19] In the state of Queensland (Australia),

TAFE teaching positions are graded as tutor, teacher, lead vocational teacher and educational team leader, each with a range of sub-categories and associated scale for wage increments (ICQ, 2016[57]). Chapter 5 discusses the mid-management career development in more detail.

Employing industry professionals as VET teachers

While increasing the attractiveness of the VET teaching profession can help prevent or tackle VET teacher shortages, attracting professionals from industry and graduates from higher education specialising in the relevant subject requires extra efforts. For example, regulatory barriers, such as restrictive entry qualification requirements or employment restriction, can discourage them from teaching in VET. In order to overcome such barriers, several recruitment and work arrangements for VET teachers can be promoted. In general, to facilitate the entry of such professionals into VET teaching, it is important to provide multiple and flexible ways to recruit and qualify VET teachers.

There are two main recruitment paths into VET teaching. One is through initial teacher education and training (ITET), the other is recruiting those with relevant vocational skills, with or without a certain level of qualifications. While recruiting ITET graduates is a typical and traditional way of recruiting teachers in both general education and VET (see Chapter 3), recruitment through alternative channels is often more common in VET. For example in Sweden, all school teachers should be certified, and only these teachers can have permanent employment and are allowed to set grades independently. In regards to VET teachers, however, the Education Act permits an exception: non-certified teachers in VET can have permanent employment and set grades independently if certified teachers are unavailable. Providing opportunities to develop pedagogical knowledge and practice (and ultimately obtain a teaching qualification) after starting to teach can also be an attractive option for those who only have vocational qualifications or industry experience without such qualifications. Flexible work arrangements such as part-time teaching and co-teaching with fully qualified teachers can also help industry professionals to combine working in industry, training as teachers and teaching in VET. Such arrangements can also be further facilitated through collaboration between VET institutions and industry.

Efforts to attract industry professionals are worthwhile, as there are numerous benefits to having teachers with industry experience, other than tackling VET teacher shortages. First, they can bring up-to-date and relevant knowledge and skills from industry. Second, they can use their professional networks to facilitate their students' work-based learning as well as strengthening connections between industry and VET. Third, they can support other VET teachers who do not have direct or up-to-date industry knowledge and experience, helping to improve the overall quality of VET provision and encouraging innovation and the use of advanced technology in VET. Fourth, they can fill gaps in VET provision in order to meet rapidly changing labour-market demand. For example, industry professionals can teach the skills needed in emerging occupations that have no established VET curricula or VET teaching qualifications or training.

Many countries recognise the importance of industry professionals and actively try to attract them to the VET sector. For example, the 2018 survey of State CTE Directors in the United States found that 98% of directors said that increasing access to industry experts is a high priority in their state. This reflects that the VET teacher shortage in the United States is often considered to be a shortage of industry experts in secondary education (Advance CTE, 2018[58]). Some countries have initiatives or policies in place to target specific groups to enter the teaching profession, such as migrants, retirees or military veterans (Box 2.6).

Box 2.6. Recruitment of specific population groups to the VET teaching workforce

England: Further Forces – recruit and retrain Armed Forces Service Leavers to teach technical subjects

Further Forces was devised to recruit military service leavers with relevant technical knowledge, skills and experience to be trained as teachers in the FE sector, as part of wider efforts to address teacher shortages in relevant subject/skill areas (particularly STEM subjects). The programme was launched in July 2017, supported by the government through grant funding to the Education and Training Foundation (ETF), which oversees the programme in partnership with the Gatsby Charitable Foundation. In autumn 2017, the government provided additional grant funding for the programme, with a target of recruiting 210 service leavers by July 2020. In total around 200 service leavers were recruited onto the programme. Of these recruits, 15% have now completed their training, 60% remain in training (with the last due to complete in summer 2022), and 25% have withdrawn.

Source: Education and Training Foundation (n.d.[59]), *Further Forces,* www.et-foundation.co.uk/supporting/support-teacher-recruitment/further-forces; Stanwix (2017[60]), *Further forces programme launched*, www.gatsby.org.uk/education/latest/further-forces-programme-launched.

Sweden: Recognition of prior learning for migrants

Recognition of prior learning for qualified migrant workers or those with relevant teaching experience can facilitate their entry into VET teaching. Sweden established a fast-track scheme during the humanitarian crisis to enable migrants who have relevant teaching experience to quickly be able to teach effectively while meeting standards. This is done through recognising their skills and qualifications earned in their home country and topping up the specific host country skills or other skills needed to become a teacher (Jeon, 2019[61]).

United States: Re-employment of retirees

Oregon has legislation (H.B. 4012, until 30 June 2023) that enables retirees in the Public Employees Retirement System to be re-employed as VET teachers without losing their retirement benefits (ACTE and Advance CTE, 2019[44]).

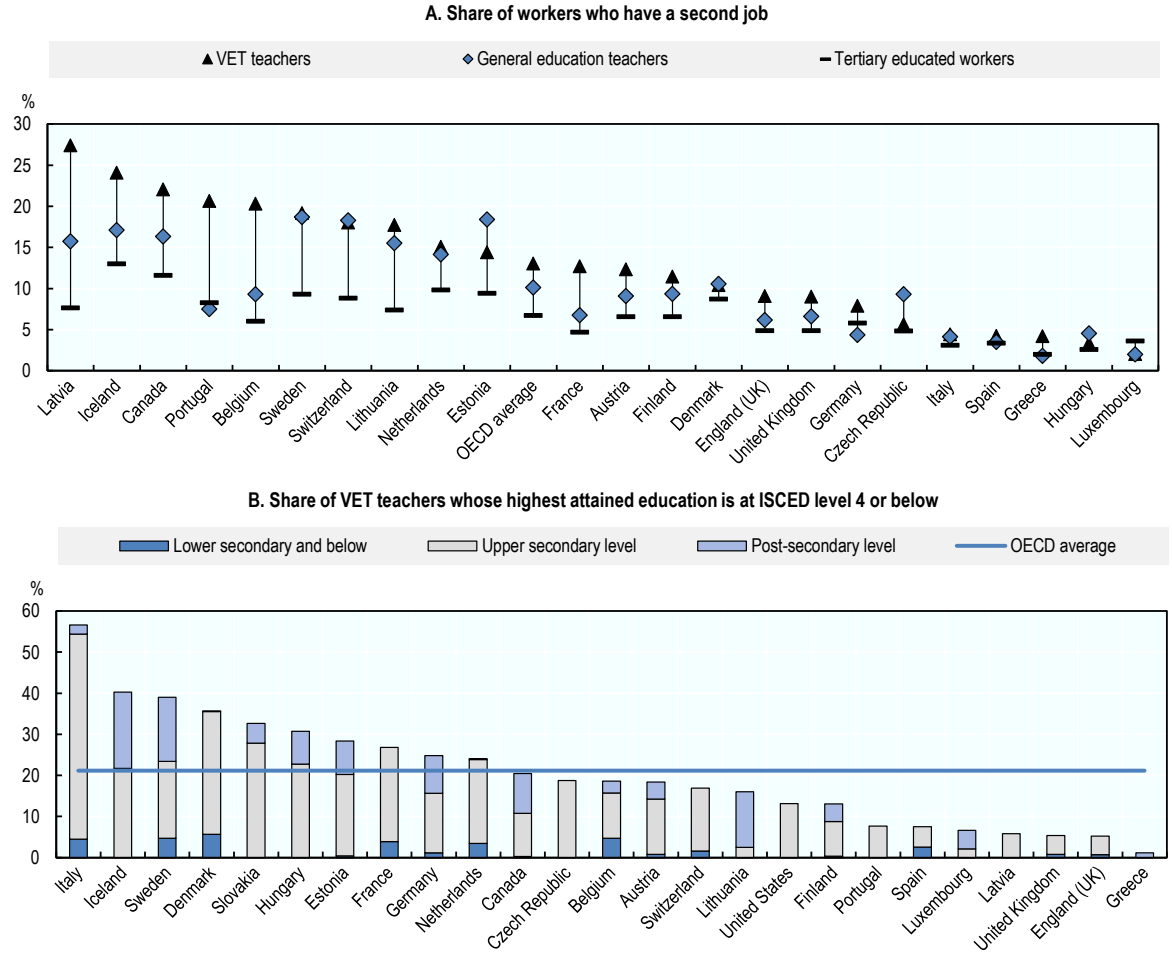
The extent to which industry professionals work as VET teachers is not known

There are no precise and comprehensive internationally comparable data on the extent to which industry professionals are working in the VET sector. Two types of proxy measures can provide some insight into this recruitment pathway, however. The first estimate is based on the share of VET teachers who have a second job, using the EU-LFS. According to this estimate, about 13% of VET teachers on average in European OECD countries work both in the VET sector and elsewhere, ranging from 27% in Latvia to 2% in Luxembourg (Figure 2.15, Panel A). In most countries, VET teachers are more likely to combine work and teaching than both secondary education teachers and all tertiary-educated workers. However, while this figure captures VET teachers who currently combine work in the VET sector with a different job, it does not cover those whose main job is in industry but who have a second job in VET teaching, nor those who came from industry but are currently working full-time as VET teacher.

A second estimate can be made based on the qualifications of VET teachers. The majority of countries (with available data) require VET teachers to have teaching qualifications of at least ISCED Level 5 (short-cycle tertiary) or above (Annex Table 2.A.1.). VET teachers whose highest educational attainment was ISCED Level 4 (post-secondary non-tertiary) or below are therefore likely to have been recruited through alternative channels. Based on this estimate, one in five VET teachers across OECD countries may have been recruited based on their industry experience or vocational qualifications (Figure 2.15, Panel B).

Country differences are large, with the share of VET teachers with their highest educational attainment at or below ISCED Level 4 ranging from only 1% in Greece to almost 60% in Italy. In reality, the incidence of recruitment through alternative channels is probably higher than this estimate, given that: (1) industry professionals who work as VET teachers might still have higher levels of education without having a teaching qualification; and (2) those recruited through alternative channels may have obtained the necessary qualification after becoming a VET teacher. On the other hand, qualification requirements might have changed over time, and teachers who entered the teaching profession years ago might have only needed lower qualification than the current requirements for new entrants.

Figure 2.15. Proxy measures suggest that it is fairly common for industry professionals to work as VET teachers



Note: The data for the United States in Panel B refer to teachers who teach career and technical education (CTE) at the secondary education level. For other countries, VET teachers are those who teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges" (see Box 1.2 in Chapter 1).
Source: Eurostat (2020[21]), European Union Labour Force Survey (EU-LFS) 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey, OECD questionnaire (the United States) and Canada: OECD (2012[24]), Survey of Adult Skills (PIAAC) (2012), www.oecd.org/skills/piaac.

The 2018 TALIS data also provide information on industry professionals in the teaching profession. As shown in Chapter 1, VET teachers tend to have more work experience that is not related to education and teaching than general education teachers. For example, in Denmark and Sweden VET teachers have on

average more than 10 years of work experience outside of teaching, while this is only 5-6 years for general education teachers. Only in Turkey do VET teachers have very limited work experience outside of teaching on average, at roughly the same level as general education teachers.

Evidence from England also suggests that many VET teachers have industry backgrounds. Around 72% of teachers and leaders in independent training providers (ITPs) and 64% of those in adult and community learning (ACLs) providers had experience outside of the education and training sector, while this was only the case for 39% of teachers and leaders in sixth form colleges (SFCs). In ITPs, 14% at the time of the survey also held a job outside of education, rising to 18% in ACLs but only 3% in SFCs (IFF Research, 2020[6]). This is in line with the findings from the 2018 College Staff Survey, which found that 64% of teachers in FE colleges had worked in industry before becoming a teacher, and that this was most likely among teachers of sales, marketing and procurement (88%); hair and beauty (87%); and agriculture (86%). More than one in six teachers (17%) were also working in industry (not necessarily related to subjects they taught in) at the time of the survey, and this was most common among teachers of hair and beauty (31%); creative and design (30%); and agriculture (29%) (Thornton et al., 2018[4]).

There are a range of flexible pathways into VET teaching

How VET teachers are recruited (Box 2.7) and what level of qualification is required varies across countries (Annex Table 2.A.1.) – with some countries imposing stronger restrictions or requirements than others. For example, in those countries where VET teachers are civil servants or permanent employees (e.g. Austria, Germany, Japan and Korea), VET teachers have to pass one or more teaching qualification exam, for which they have to complete initial teacher education and training (including practical training in some cases). In Denmark, England, Northern Ireland and Sweden, VET providers are the employers of their teachers and have autonomy over recruitment, which means that qualification requirements may vary, and in the case of England there is no minimum qualification. In the United States, requirements vary according to the state and the route into CTE. In Washington state, for example, VET teachers can apply for the Initial Career and Technical Educator Certificate (the first level certificate) if they have completed either the university route (bachelor's degree, WEST-E test, work experience and other requirements), or the business and industry route with verified required experience for each CTE area.

In some countries, VET teachers can start teaching without a teaching qualification, but they are required or encouraged to obtain the relevant qualification while working. They are hired based on an occupational qualification or their work experience. For example, in Denmark, VET teachers can achieve the required level of teaching qualification while teaching. The same is true in some states in the United States. In England, while there are no legal qualification requirements for teaching in FE, in practice FE providers often expect VET teachers – who frequently come from industry – to have, or work towards, a pedagogical diploma that is equivalent to ISCED Level 5 or higher. This varies depending on provider.[20]

Qualification requirements may also vary across different levels and types of VET programmes within a country. For example, in Denmark, in more theoretically oriented VET programmes (higher technical examination [højere teknisk eksamen or HTX] and combined vocational and general upper secondary leaving qualification [EUX]), VET teachers are required to have a bachelor's degree, while in more practically-oriented VET (EUD), industry professionals with at least five years of industry experience can start teaching without a pedagogical diploma (but have to obtain one later). EUD teachers have longer teaching hours but lower salaries than HTX and EUX teachers and are thus often more difficult to recruit.

Box 2.7. How teachers are recruited: Entry to the profession and professional status

Germany

Depending on the Länder, the application of newly qualified teachers should be sent to the Ministry of Education and Cultural Affairs in the specific Land or to the school supervisory authority responsible (in some cases, to a specific school). Their probation period (preparatory service) is usually from two (in the higher service) or three years (in the senior service) up to a maximum of five years.[21] Public school teachers in Germany are usually civil servants who are employed by the Länder. There are exceptions, where teachers are employed as salaried employees on the basis of fixed-term or open-ended employment contracts. This form of employment may be used in order to provide replacements for teaching staff who are on leave or where the requirements for civil servant status are not met. In two Länder (Berlin and Sachsen) teachers are only recruited as salaried employees, and have a six-month probationary period (KMK, 2017[52]).

Denmark

Principals in VET institutions have autonomy over teacher recruitment. The education ministry is not involved in teacher recruitment procedures, and teachers are not civil servants entering the system through tests. VET teachers are mostly full time, and permanent employees of VET institutions. Part-time teachers often have no formal pedagogical qualifications, but are well respected within their fields of work and are able to ensure that VET students acquire knowledge which is up to date with developments in their respective trades (Andersen and Kruse, 2016[62]).

England

Each VET provider recruits its own teachers. Candidates with work experience and/or relevant qualifications in a trade can apply directly for teaching vacancies and then train – on a voluntary basis – for a teaching qualification on the job, if their employer supports them (National Careers Service, 2020[26]). It is also possible for trainee teachers to undertake pre-employment training, which is typically delivered by universities.

Japan

Prefectural Boards of Education select and distribute teachers to each school. School principals have no autonomy over teacher recruitment and the education ministry is not involved in teacher recruitment procedures. Teachers are civil servants who enter the system through tests and they usually stay in the profession until retirement.

Table 2.1. The recruitment and professional status of VET teachers vary across countries

Country	Main recruiter/employer	Professional status: civil servant	Recruitment criteria	Recruitment process
Austria	Selected by the headmasters of the respective schools and employed by the regional school boards (Bildungsdirektionen).	Permanent employees.	Set by the recruiter.	Regional education boards or provincial governments.
Denmark	VET school principal.	No but mostly full time, and permanent employees.	Set by the recruiter.	Decentralised at the school level.

England (UK)	VET providers (FE sector).	No The same general employment law applies to all teachers.	Set by each VET provider.	Teachers apply (through an open recruitment process) for vacancies advertised directly by individual VET providers.
Germany	Education ministry or the school supervisory authorities (in some Länders, schools).	Usually yes: permanent employee at public schools Salaried employees in Berlin and Sachsen.	Job vacancies and aptitude, qualifications and record of achievement.	Centralised in the Land; by application by a fully qualified teacher.
Japan	Prefectural boards of education.	Yes	Through exams, possibly with interviews by board of education or school.	Centralised in prefecture.
Northern Ireland (UK)	VET providers (FE colleges).	No	Set by VET providers based on 2009 professional standards, endorsed by the NI government.	Open recruitment process.
Sweden	VET providers.	No, but mostly permanent employees	Qualifications, work experience.	Municipality or VET provider.
Slovenia	VET schools.	Yes	State professional exam.	
United States	Varies across states.			

Source: OECD consultation with countries. KMK (2017[52]), *The Education System in the Federal Republic of Germany 2016/2017*, www.kmk.org/fileadmin/Dateien/pdf/Eurydice/Bildungswesen-engl-pdfs/teachers.pdf; Andersen and Kruse (2016[62]), *Vocational education and training in Europe – Denmark*, www.kp.dk/wp-content/uploads/2020/02/vocational-education-and-training-in-europe-denmark.pdf; Eurydice (2020[63]), Teachers and Education Staff (United Kingdom - Northern Ireland), https://eacea.ec.europa.eu/national-policies/eurydice/content/teachers-and-education-staff-91_en; OECD (2016[56]), *Education Policy Outlook: Slovenia*, www.oecd.org/education/policyoutlook.htm.

Diverse entry pathways can encourage individuals with relevant experience and practical skills to become VET teachers

Restrictive qualification requirements may create barriers to attracting industry professionals into the VET sector. In the United States, relaxed qualification requirements are considered to be a tool to smooth inflows from industry into teaching in VET. For example, 15 states recently passed CTE teacher certification or development policies to address the recruitment and certification, as well as the preparation and professional development, of CTE faculty and staff (ACTE and Advance CTE, 2019[44]). Ohio grants alternatively licensed CTE teachers a four year teaching license known as an Alternative Resident Educator license (Zirkle, Jeffery and Shrewe, 2019[64]). Missouri created a one-year teaching certificate for visiting scholars from industry who are part of a business-education partnership and have relevant education credentials (Minnesota Department of Education, 2017[65]). A recent law in Michigan allows non-certified, non-endorsed individuals to teach in certain VET programmes[22] as long as they meet certain requirements, such as having acquired 2 years of professional experience in the relevant subject area during the past 10 years (ACTE and Advance CTE, 2019[44]). The impact of these measures remains to be seen, but in the context of restrictive and somewhat complicated licensing structures and certification policies (e.g. VET teachers needing to complete state-approved programmes to obtain a teacher certificate), such flexibility can encourage mobility between industry and VET teaching (Jacques and Potemski, 2014[8]). In Japan, industry professionals with relevant experience may acquire a special or temporary teacher licence without going through the official exam when they are proven to have relevant skills and experience. Special part-time lecturers, who can be recruited from industry, do not need a teacher licence. A subject-related bachelor's degree with additional credit related to teaching can also lead to a teacher licence.

Flexible pathways to obtaining teaching qualifications may also be helpful for meeting new labour-market demand, especially when there are not yet any relevant teaching qualifications or training for VET teachers, as in the example of Korea (Box 2.8).

Box 2.8. Relaxing qualification requirements in Korea to meet new labour-market demands

In Korea, teachers usually acquire teacher qualifications through examinations, but new measures are planned to facilitate multiple channels to recruit industry professionals. In its Plan for Vocational High School Support and Employment Promotion 2020, the Korean government is planning to adjust teacher retraining and (re)qualification to meet new labour-market demands, which may result in a revision of the teacher qualification examination decree.

The plan includes permitting individuals with relevant national technical qualifications (industrial engineer or higher) to teach vocational subjects relevant to emerging industries that do not yet have a relevant teacher qualification (e.g. industries related to new technologies such as autonomous driving, drones or artificial intelligence). A fast-track teacher training programme is also to be introduced for industrial experts in fields that have no established teacher training course, in order to meet the demand for skills in new industries. This fast-track training will allow the superintendent of education to issue teacher qualifications, which otherwise would generally be obtained through an exam. It can also allow industry experts who are specialists in emerging technology, such as robotics or the Internet of Things – areas where there are currently no qualified VET teachers –, to be employed as "industry-academic adjunct teacher" while awarding them VET teacher certifications. VET graduates who have worked more than three years in industry will be eligible to obtain VET teacher certifications. The country is also planning to allow VET schools more autonomy to hire qualified teachers based on labour-market needs.

Source: Korean Government (2020[66]), Plan for Vocational High School Support and Employment Promotion, www.gov.kr/portal/ntnadmNews/2167641.

Attracting experienced professionals from industry requires a good balance between flexibility and standards that ensure high-quality teaching and pedagogical innovations. While the qualifications of VET teachers are standardised to some degree in many countries (Cedefop, 2016[67]), these standards often vary across localities, occupations and subjects (Zirkle, 2019[68]). In other countries, qualifications are not standardised at all and depend instead on decisions made by each VET institution. This lack of standardisation is not surprising given the mix of skills and experience professionals need to deliver effective VET. Revising standards may be a challenge in many countries, as this would involve discussion and co-ordination among a range of VET stakeholders, and any revisions must take into account possible consequences for the supply and teaching ability of VET teachers.

In order to facilitate the recruitment and (re-)qualification of VET teachers, some countries may need to harmonise qualification requirements for VET teachers across regions and different levels of VET programmes or institutions. For example, in the United States, both vocational and pedagogical qualification requirements and structures vary from state to state, limiting VET teachers' mobility between states as well as between VET and industry. In Australia, although the majority of VET is carried out within Registered Training Organisations, VET also takes place in upper secondary schools. School teachers who teach VET in schools (where it is not outsourced to RTOs) are generally subject to the same qualification regimes as other school teachers, which vary by state and territory (ACDEVEG's response to the OECD questionnaire).

Ideally, industry professionals – or those who enter VET teaching with relevant skills but without the necessary teaching qualifications (e.g. recent graduates) – should be provided with pedagogical training. For example, in Sweden, as mentioned above, non-certified VET teachers can be permanently employed

in exceptional circumstances but VET providers are obliged to ensure that these teachers have the necessary knowledge of school curricula and access to in-service training. VET teachers in Denmark are not required to have a pedagogical qualification prior to starting employment, but should begin the vocational pedagogical diploma education no more than one year after being hired and complete it within six years. In Finland, the requirements for vocational teaching qualifications are relatively restrictive, at ISCED Level 6 (a bachelor's degree or equivalent) or higher, often taking 6-7 years to obtain, followed by at least 3 years of relevant work experience. However, pedagogical qualification requirements are relatively achievable (60 ECTS or one year of full-time study), which makes it more manageable for industry professionals to complete the necessary training, leading to 93% of VET teachers in Finland being qualified in 2019 (Finnish Board of Education, 2020[69]). Chapter 3 discusses VET teacher training in depth, suggesting that countries provide flexible, modular ITET which can enable industry professionals or graduates who have no experience or no pedagogical training to obtain teaching qualifications and competencies without going through a full ITET programme.

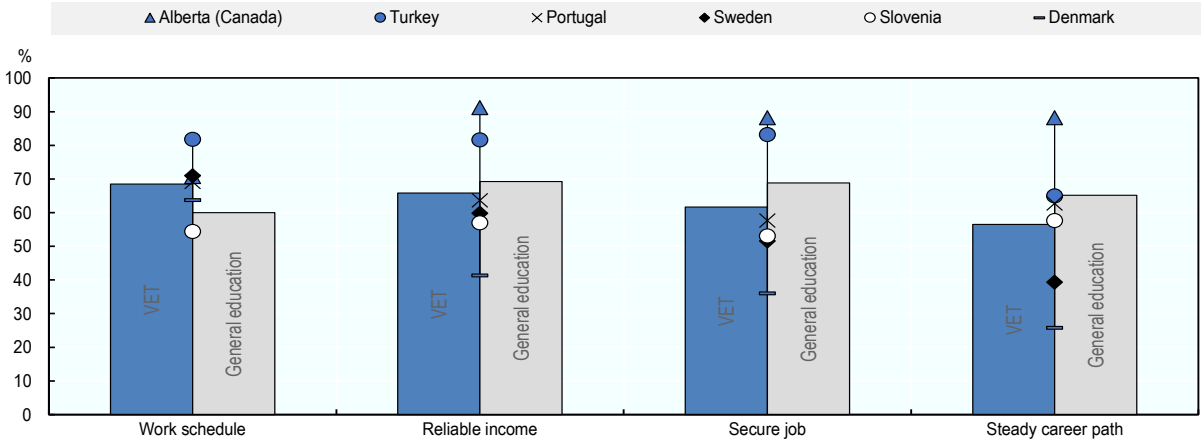
Attracting more industry professionals to teach in VET while working in industry has many benefits

Flexible arrangements can help practitioners combine teaching with working in industry

Industry practitioners recruited into VET can combine part-time teaching with continuing to work in their industry. Part-time work can be attractive, as it offers flexibility not only to those who want to combine their teaching responsibilities with other jobs, but also those who have other reasons for preferring not to work full time. In fact, for many, a relatively flexible work schedule is a reason for becoming a VET teacher. According to the 2018 TALIS data (Figure 2.16), a flexible working schedule was the most commonly reported reason for becoming a VET teacher (68% of respondents) across the countries with available data, followed by a reliable income (66%), job security (62%), and a steady career path (56%). Moreover, VET teachers were more likely to be attracted to the profession by the flexible working hours than general education teachers (60%).

Figure 2.16. Flexible work schedules are an important reason to become a VET teacher

Share of VET teachers who reported the following elements as important reasons for becoming a teacher

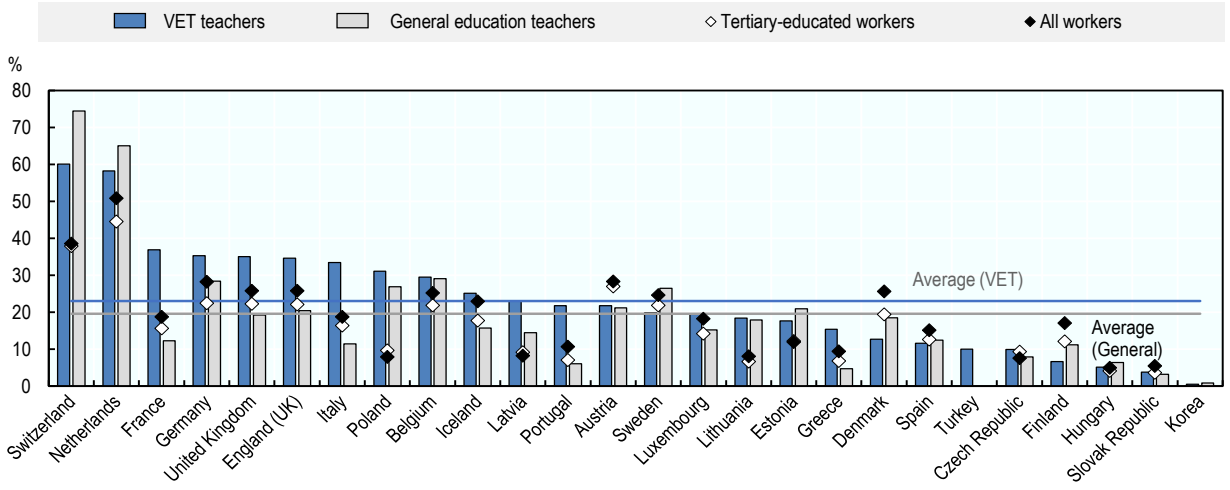


Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). Responses combine "moderate" and "high" importance. The bars represent the unweighted averages of the five countries and one region presented in this graph for VET and general education teachers. The country results refer to VET teachers only.
Source: OECD (2019[14]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm.

Several countries make intensive use of part-time VET teachers. For example, 60% of VET teachers in Switzerland, and 58% in the Netherlands, are part time although both countries have even higher shares of part-time general education teachers (Figure 2.17). Shares of part-time vocational teachers are also significant in France (37%), Germany (35%), England and the United Kingdom more widely (35%), and Italy (34%), more so than among general education teachers. Sweden (20%), Estonia (18%), Denmark (13%), Spain (12%) and Finland (7%) have a relatively small share of part-time vocational teachers, but the shares are also smaller for general education teachers (Figure 2.17). Those who work part time do so mostly for family or personal reasons or in order to participate in education and training, according to EU-LFS 2017-19 data. However, in France (50%), Greece (73%), Italy (54%) and Spain (71%), the majority of part-time VET teachers were working this way because they could not find a full-time job (Figure 2.18).

Figure 2.17. VET teachers are more likely to work part time than general education teachers

Share of part-time workers, 2017-19



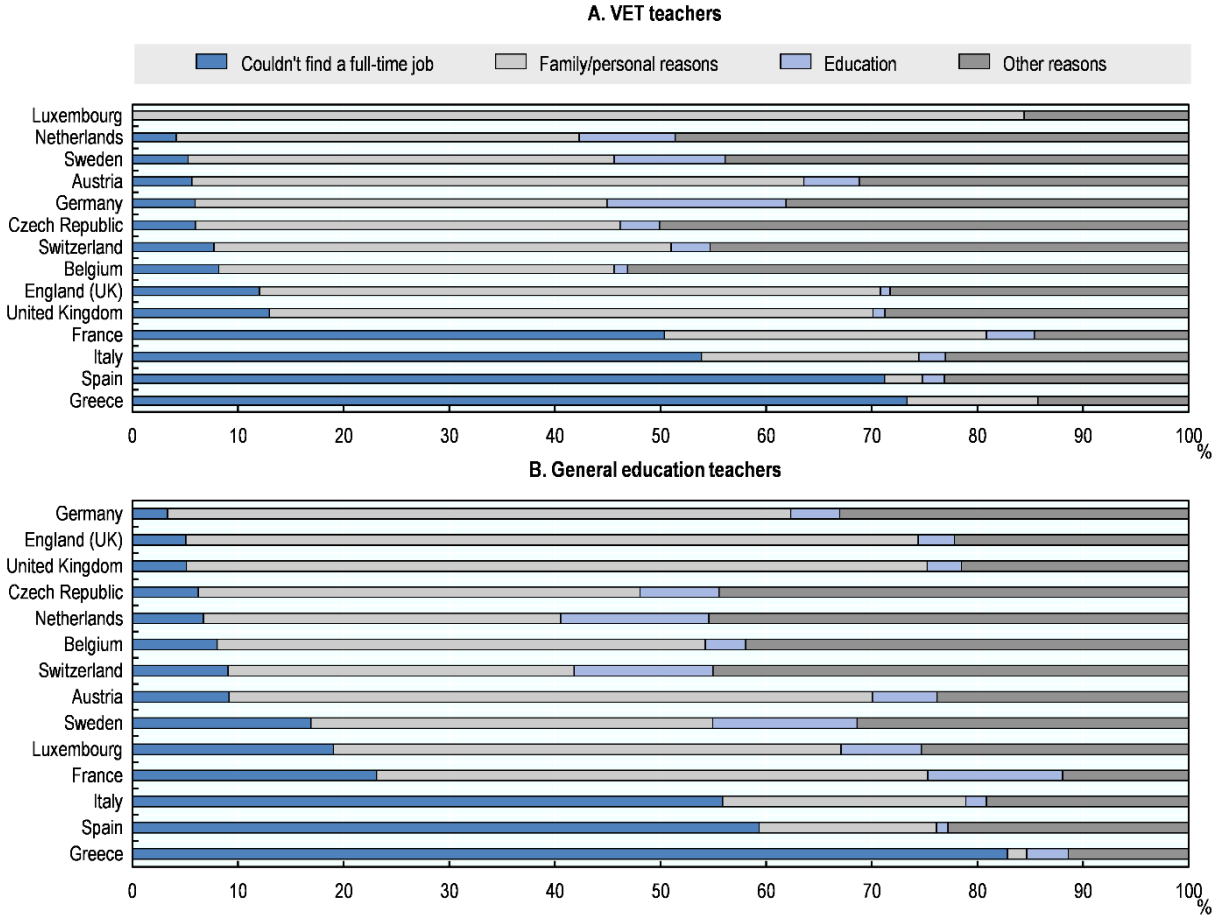
Note: VET teachers teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges (see Box 1.2 in Chapter 1). Average refers to 24 countries, excluding England and Turkey.
Source: Eurostat (2020[21]), European Union Labour Force Survey (EU-LFS) 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey; Korea from KEDI (2020[13]), Korean Education Statistics Service, https://kess.kedi.re.kr/eng/main.do; Poland from Eurostat (2020[23]), European Union Structure of Earnings Survey (SES) 2014, https://ec.europa.eu/eurostat/web/microdata/structure-of-earnings-survey; England from Education and Training Foundation (2020[70]), Workforce data and SIR Data Insights, www.et-foundation.co.uk/supporting/research/workforce-data; Turkey from Akyildirim and Durgun (2019[25]), *Continuing Professional Development for Vocational Teachers and Trainers and Principals in Turkey 2018*, European Training Foundation https://www.etf.europa.eu/sites/default/files/2019-11/turkey_cpd18_22_october_2019_25-10.pdf .

The share of part-time teachers may vary according to the type of VET institution, and the teachers' gender, qualifications and subject taught. For example, in England, about three-fifths of contracts issued by ITPs and SFCs were full-time (64% for ITPs and 60% for SFCs), compared to around one in five (18%) for ACL providers. ACL providers issued a much greater share of sessional or flexible-hour contracts (53% versus 13% for ITPs and 3% for SFCs) (IFF Research, 2020[6]). This reflects the nature of their provision, which is often delivered as evening classes or short part-time courses. Female VET teachers are more likely to work part time than male ones (Annex Table 2.A.2). Part-time VET teachers tend to be less qualified: for example, in Finland 86% of full-time teachers of vocational subjects were qualified, compared to 61% of part-time teachers in 2016. The proportion of qualified teachers also varies by field in Finland: hospitality and catering, tourism, health and welfare, and humanities and education had the highest share of part-time teachers while technology and transport had the lowest share (Kumpulainen, 2017[71]). However, even

when controlling for personal and job characteristics, probit regression results using EU-LFS 2019 data suggest that VET teachers in European countries have a higher probability of working part-time (9 percentage points), having a temporary contract (8 percentage points) and having a second job (4 percentage points) when compared to general education teachers (Annex Table 2.A.3); and similarly to tertiary-educated workers (Annex Table 2.A.4).

Figure 2.18. Working part time is compatible with other responsibilities

Share of part-time teachers, by reasons for working part-time



Note: VET teachers teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges (see Box 1.2 in Chapter 1).
Source: Eurostat (2020[21]), European Union Labour Force Survey 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey.

The spectrum of part-time VET teaching is wide. It includes part-time adjunct faculty who work at multi-campus VET institutions but aspire to a full-time position, and industry professionals who teach in the evening or weekends in an adult VET institution or who teach full-time for a full semester (see Box 2.9 for country examples). In the OECD stakeholder interviews, several providers noted they hire part-time teachers from industry to overcome shortages, reduce costs, increase the flexibility of their VET provision and to bring in up-to-date knowledge from industry. Efforts may be needed so that these advantages do not become disadvantages, such as making it harder to organise teaching timetables, or provide teachers with attractive wages, employment security or training opportunities. First, the teaching quality of these industry professionals who work as part-time VET teachers needs be ensured. Despite their greater levels of practical experience, instructor-practitioners can enter the field of teaching inadequately trained in

pedagogy (Johnson, 2017[72]). Currently, specific policy is lacking to help VET institutions take advantage of the benefits of using instructor-practitioners, or to set quality standards for these teachers and improve their qualification levels (e.g. the Netherlands (Koop-Spoor et al., 2020[73]) and the United States (Johnson, 2017[72])).

Second, the quality of their working conditions also need to be ensured. Industry professionals hired as part-time teachers are often treated as a temporary replacement rather than an invited expert who will continue to bring added value to the VET sector, as is the case in the Netherlands (Koop-Spoor et al., 2020[73]). The employment status of part-time teachers may not be as stable as full-time teachers. For example, analysis using EU-LFS data shows that on average across European countries, part-time teachers with another job have a greater probability of having a temporary contract, than either full-time teachers or part-time teachers with no other job (Annex Table 2.A.2). According to the 2019 *OECD Employment Outlook,* temporary and part-time workers also have more difficulties accessing job-related training (OECD, 2019[74]). Further analysis may be necessary to see to what extent part-time VET teachers benefit from the same opportunities to update their relevant skills and enjoy the same employment security as part-time teachers in general education.

Box 2.9. Industry professionals teaching VET part-time

Australia: Practitioner-VET teacher

The Australian Council of Deans of Education Vocational Education Group has recently advocated for a new role of "practitioner-VET teacher". These people would be full professionals in both VET and industry. This would recognise the fact that straddling industry and VET has advantages, and would enable people to continue careers in both. The Vocational Education Group has proposed that this should be piloted with major companies.

The Netherlands: Hybrid teachers

In the Netherlands, teachers who combine their teaching job with a job in another field are referred to as hybrid teachers. It is estimated that there are around 50 000 such teachers . Several initiatives have been set up to encourage and facilitate hybrid teaching. For example, the Brainport Eindhoven region, in collaboration with various educational institutions and companies, has started a pilot to give technicians a taste of hybrid teaching for 4-8 hours a week. Windesheim University of Applied Sciences and ABN-AMRO conducted a similar pilot for bank employees in 2020. However, its use has been limited. According to a survey, general and VET upper secondary schools do not have human resources (HR) policies on hiring hybrid teachers (but it is "more a matter of coincidence"), which means there is no distinction between a teacher who chooses to work part time or a hybrid teacher who chooses to combine two jobs (Koop-Spoor et al., 2020[73]).

The United States: Adjunct VocEd faculty

Community colleges increasingly hire part-time adjunct faculty to teach in VET courses. For example, in California, the expansion of VET programmes has increased the demand for highly specialised faculty who teach part time while remaining professionally active in their field. These teachers can have up to 67% of the paid workload of their full-time counterparts (Johnson, 2017[72]). Similarly, in Colorado community colleges have increased their hiring of part-time adjunct instructors by 44% between 2007 and 2015 (compared to 17% for full-time faculty), in part due to increasing delivery of VET courses. This follows national trends in college and university instructional employment over the past decades, driven by declining financial support. Adjunct faculty earn about USD 68 a week (or USD 21 288 annually), compared to an average of USD 188 a week (or USD 53 000-57 000 annually) for full-time faculty (Mumme, 2018[75]).

Industry professionals can also be active in VET institutions without formally being considered a VET teacher. This might be the case, if they teach only a relatively limited number of hours per year. They might (co-)teach part of a course or be invited to give guest lectures or practical demonstrations. This allows VET providers to bring in relevant and up-to-date industry experience in a flexible way, and can fill knowledge and skills gaps. Countries can support such flexible arrangements by creating a flexible regulatory environment, putting in place financial incentives or providing relevant training for professionals wishing to engage in such activities. In Flanders (Belgium), a two-year trial "dual teaching" project was launched in 2021 (Essenscia, 2020[76]). Within the project, professionals can teach in VET for a few hours per week on a temporary basis, in fields where schools have difficulty finding qualified VET teachers. These professionals can start teaching after a three-day pedagogical training programme (those who already have a teacher qualification are exempted). The training programme is financed by the government and the European Social Fund. Participating professionals continue to receive their normal wage, paid by their regular employer, who receives a lump sum subsidy per teaching hour from the government. In the Netherlands, individuals with specific expertise or knowledge can work as guest lecturers in upper secondary education, without having the required teaching qualification, for up to 160 hours per week (Rijksoverheid, n.d.[77]). The guest lecturer is the responsibility of the teacher. This type of teaching is mostly used for VET, as stricter rules apply in general education.

Increasing collaboration between VET providers and industry should be win-win

Strong relationships between VET institutions and industry are important not only to ensure the quality of VET provision but also to help supply and develop VET teachers. As discussed above, VET institutions can bring in industry professionals on short assignments or part-time VET teachers. VET teachers can also spend some time in industry as part of their professional development (see Chapter 3).

Collaboration between industry and the VET sector should be win-win. When local companies allow their employees to collaborate with a local VET institution (e.g. teaching there part time), they could also benefit in terms of recruiting apprentices or new VET graduates equipped with the skills they need. For instance, recognising such benefits and as a means to ease VET teacher shortages, a business-education partnership in Missouri, in the United States, allows industry professionals who are part of this partnership and have relevant education credentials to obtain a one-year teaching certificate. Policies that permit in-company trainers to easily become VET teachers and vice versa, can also help attract industry professionals into the teaching profession and promote the exchange of personnel between industry and the VET sector, as happens in Germany and Portugal (Box 2.10).

Box 2.10. Enabling in-company trainers to become VET teachers and vice versa

Portugal

In Portugal, in-company trainers can become VET teachers by obtaining a dedicated certificate. The National Agency for Qualification and VET (ANQEP) and the Institute for Employment and Vocational Training developed a set of standards for the training of tutors, in order to give these professionals access to a Certificate of Pedagogical Competencies. Tutors can also obtain the certificate through a process of Recognition, Validation and Certification of Competencies of Trainers, in order to recognise, validate and certify the pedagogical competences associated with the trainer activity. Upon obtaining this certificate, these professionals can apply to VET schools to teach vocational subjects, namely the Short Term Training Units in VET Education (ANQEP responses to OECD questions).

Germany: Certified initial and continuing education pedagogue

In Germany, in-company VET trainers or employees who are active in in-company continuing VET, can obtain an Initial and Continuing Education Trainer certificate (*geprüfter Aus- und Weiterbildungspädagoge*). These trainers are qualified to support their company in finding and selecting new apprentices and developing training provision and are also involved in organising examinations and quality management.

A more advanced qualification is the Certification of Vocational Education Trainers (*geprüfter Berufspädagoge*), which is targeted at certified initial and continuing education trainers, industrial master craftsmen, crafts and trades master craftsmen, and administration specialists but also university graduates. It aims to prepare them to work in a pedagogic managerial position with strategic educational tasks. These trainers plan, organise and implement educational processes and provide advice to and mentor learners and everyone else involved in the learning process. In addition, they shape educational processes beyond the individual environment of the learners.

Source: Hensen-Reifgens & Hippach-Schnei, (2015[78]), *Supporting teachers and trainers for successful reforms and quality of VET – Germany*, https://www.refernet.de/dokumente/pdf/Artikel_DE_Teachers%20and%20trainers.pdf.

Conclusion and policy recommendations

Many countries struggle to attract and retain VET teachers with relevant skills, which has translated into significant shortages. Despite a lack of comparative data, evidence suggests that many OECD countries are facing VET teacher shortages. An ageing VET teacher population could reinforce existing shortages in coming years if the supply of new teachers does not increase. Teacher shortages may hamper the sustainable provision of VETs, especially if they result in an increased reliance on teachers who are not well prepared for their role or a reduced VET offer.

The limited supply of VET teachers is driven by many factors, most of which are related to the limited attractiveness of the VET teaching profession in terms of salaries, workload and availability of financial incentives and career support compared to other occupations. Targeted financial incentives and support to encourage participation in initial teacher education and training could help attract new VET teachers, while offering career development support, in particular to new teachers, can help retain VET teachers.

Attracting industry professionals to teach in VET is another strategy to avoid or overcome VET teacher shortages. These industry professionals can bring practical skills and up-to-date industry knowledge to the classroom and strengthen co-operation between VET systems and the world of work. However, they often lack the necessary teaching qualifications and pedagogical skills, and therefore need access to flexible qualification and training opportunities. Countries may benefit from relaxing entry qualification requirements for industry professionals, and providing flexible alternatives to gaining required teaching qualifications. Moreover, flexible working arrangements could also make it easier for industry professionals to combine their job in industry with teaching responsibilities in VET.

Policy pointers for tackling VET teacher shortages

1.1. Increasing the attractiveness of teaching careers in VET by:

- ***Providing targeted financial incentives and support for attracting and retaining VET teachers****:* Financial incentives and support can be used to attract individuals to initial teacher education and training (ITET), encourage industry professionals to enter the VET teaching workforce, and motivate VET teachers to stay in the profession. Effective incentives and support include bonus and wage incentives for VET teacher recruitment and retention as well as financial support for ITET, and these can be targeted at shortage subjects or sectors.
- ***Offering career development support to improve the retention of VET teachers****:* VET teachers receiving targeted career development support are more likely to stay in the profession. Attrition among new VET teachers can be reduced by assigning them to less challenging working environments and reducing their workload and providing mentoring opportunities and structured induction programmes. Attractive career pathways with targeted career support encourages more experienced teachers to stay in the profession while allowing them to move into a senior or management-level position.

1.2. Providing flexible pathways into VET teaching by:

- ***Relaxing entry requirements of teaching qualifications for industry professionals***: Relaxed entry qualification requirements can smooth the path from industry into teaching in VET but should not come at the expense of quality. Several countries attract industry professionals to enter the teaching profession without the required teaching qualification, but still require or encourage them to obtain the qualification afterwards. Relaxing entry qualification requirements for industry professionals can be particularly helpful in fields for which no relevant teaching qualification or training for VET teachers exist yet, to meet rapidly changing labour market demand.
- ***Providing flexible pathways to obtain necessary teaching qualifications****:* Flexibility and support to help industry professionals obtain necessary teaching qualifications is crucial. For example, countries can provide flexible, modular initial teacher education and training (ITET), which allows prospective VET teachers to focus on skills and knowledge gaps without having to go through a full ITET programme.

1.3. Attracting more industry professionals to teach in VET by:

- ***Facilitating flexible VET teaching that can be combined with working in industry***: Flexible arrangements such as part-time teaching and co-teaching with fully qualified teachers (e.g. guest lectures or practical demonstrations) can help industry professionals to combine working in industry and teaching in VET. To fully take advantage of the benefits of these flexible arrangements, the teaching quality and job quality of these industry professionals with teaching roles need be ensured.
- ***Increasing collaboration between VET providers and industry****:* Flexible work arrangements for industry professionals to teach in VET can also be further promoted and facilitated through close collaboration between VET institutions and industry. Industry and the VET sector can co-ordinate in terms of exchanging personnel between industry and the VET sector, and this can be facilitated, for example, by making it easier for in-company trainers to become VET teachers and vice versa.

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Annex 2.A. Technical information

Annex Table 2.A.1. Minimum qualification requirements for VET teachers by regulation

	Vocational qualification/ experience	Pedagogical qualification	Converted full-time training years necessary to become VET teachers
Australia	Industry qualifications is at or above the level of the qualification which the VET teacher is teaching. VET teachers are normally required to have substantial industry experience.	Certificate IV in Training and Assessment (a competency-based qualification). A substantial minority of VET teachers have a higher level pedagogical qualification.	-
Austria	Proof of completion of several years of professional practice	A bachelor's degree from a university college for teacher training. A master's degree for VET teachers of general subjects.	-
Belgium (French Community)	-	For upper secondary level, short type courses (Haute Ecole): associate bachelor's of lower secondary education (with vocational orientation)	-
Canada	For instructors of trades, completion of apprenticeship training and industry or trade certification are required. Additional courses in teaching or a provincial teaching certificate may be required.	Employment requirements for college and other vocational instructors[23] include a bachelor's degree, a college diploma or demonstrated expertise in the field of instruction (a master's degree in the field of instruction or a certificate, diploma or degree in adult education may be required).	-
Denmark	The minimum length of work experience is not specified by law but VET teachers are required to have relevant professional experience (e.g. general teachers cannot become VET teachers). In general, industry professionals with five years of relevant experience can teach in VET programmes.	No requirements for teachers to have a pedagogical qualification prior to starting employment. They must gain knowledge at secondary level in two or three general subjects within three years of being hired. They must have passed a pedagogical education at bachelor's level/diploma level (60 ECTS at EQF Level 6) within four years of being hired. They must have begun the *vocational pedagogical diploma education* (DEP) within one year after being hired and complete within six years.	-
England (UK)	No specific requirement, but 64% of FE teachers and 62% of ITP teachers had industry experience (CSS 2018; ETP 2018). Generally, employers expect teachers to have educational attainment one or two ISCED levels higher than the vocational level at which they teach.	No specific requirement but in general ISCED Level 5 qualification (120 credits) is recommended. Professional status, such as Qualified Teacher Learning and Skills (professional certification for post-16 education and training) and Qualified Teacher Status (professional certification for school teachers)' is available on a voluntary basis.	-
Finland (OECD Questionnaire)	ISCED Levels 6-7 in the vocational sector or highest possible other qualification in the sector. At least three years' work experience in a relevant field after their higher education qualification. Then they can apply for pedagogical studies.	A minimum of 60 ECTS of pedagogical studies at EQF Level 6 (equals one year of full-time study).	8 years
Germany	Vocational qualifications not required, but vocational subject knowledge is well integrated into pedagogical qualification. Two years through preparatory service (followed by the second exam) after ITET (followed by the first exam) and recruitment.	Bachelor's/master's.	6 years

	Vocational qualification/ experience	Pedagogical qualification	Converted full-time training years necessary to become VET teachers
Hungary	Relevant higher education degree and/or VET qualification may replace the pedagogical qualification requirements.	Relevant teacher qualification (bachelor or master degree depending on the type of VET providers and subjects)	- General subjects: 3-5 years - Vocational subjects: 5-8 years
		Not required for VET teachers of practical subjects.	1-3 years
Japan[24]	Not required. - Subject-related bachelor's degree with additional credit related to teaching can also lead to teachers' licence; - Industry professionals with relevant experiences may acquire the special or temporary teachers' licence. - Special part-time lecturers do not need a licence.	*Specialised upper secondary schools:* bachelor's in teacher training with subject certification in universities or by passing the accreditation exam, leading to teachers' licence.	4 years
Korea	Not required.	Bachelor's in teacher training and/or by passing the accreditation exam, leading to a teacher license.	4 years
Netherlands	-	Bachelor's degree in subject area (2nd degree qualification), of which ¼ includes practical training. Pedagogical didactic certificate (PDG)	4 years
Northern Ireland (UK)	-	FE college teachers are required to hold an approved teaching qualification (can be obtained through pre-service or in-service training).	-
Norway	For a vocational teacher education: minimum 2 years of relevant work experience prior to the pedagogical studies. For a vocational practical pedagogical education: minimum 4 years of relevant work experience and 2 years of vocational college education or similar.	Either a vocational practical pedagogical education (60 ECTS) or a vocational teacher education (180 ECTS), depending on prior qualifications.	5-7 years
Slovenia	Teachers of VET practice: must have technical upper secondary education, pedagogical training, have passed the state professional exam, and have three years of relevant work experience.	Teachers of VET theory: must complete at least a three-year qualification at bachelor's level (as opposed to five years of initial teacher education at master's level for other teachers except pre-school teachers); have passed the state professional exam [25]	3 years
Spain (ISCED Levels 3 and 5)	Bachelor's degree (EQF level 6) or Diploma of Higher Technician (EQF level 5); competitive exam in the specialty.	Master's degree in Pedagogy (EQF level 7) or specific pedagogic training for teachers who do not hold a university degree	5-6 years
Sweden	To enter into a teacher education programme, the professional's knowledge and experience should be validated on Level 5.	Teacher certificate is required, which requires a Level 6 degree in teacher education, specifying the subject to teach (not required for teachers in higher VET). Non-certified VET teachers can be hired if the provider is unable to find a certified teacher. In that case, the teacher can obtain his or her degree while working.	4 years
Turkey	Professional bachelor's degree should be followed by pedagogical training through a two semester programme.	Level 6 in teacher education with subject specialty.	4 years
Wales (UK)	-	Depending on the post, but Level 3-5 or above (e.g. PGCE), which requires bachelor's degree	-
United States	Varies across states (business/industry CTE route). Work experience and tests. Alternative teacher certification allows those with a degree/diploma below a bachelor's degree and work experience to enter the profession.	Varies across the states (university CTE route): usually bachelor's degree in a state-approved programme followed by gaining state certification or licensing (which may require work experience and tests).	-

Source: OECD Questionnaire and other sources. Australia: inputs from ACDEVEG. Austria: Austrian Federal Ministry of Education and Women's Affairs (2015[79]), VET schools and colleges in Austria: Information brochure of the General Directorate for Vocational Education and Training, Adult Education and School Sports. Canada: Statistics Canada (2018[80]), National Occupational Classification (NOC) 2011, www23.statcan.gc.ca; Northern Ireland (UK): Eurydice (2020[63]), Teachers and Education Staff, https://eacea.ec.europa.eu/national-policies/eurydice/content/teachers-and-education-staff-91_en; United States: (AdvanceCTE, 2013[81]), CTE Teacher Licensure Requirements: 50 States and District of Columbia, https://careertech.org/resource/CTE-teacher-licensure-requirements; Finland: Finnish National Agency for Education (2019[82]), Key Figures on Vocational Education and Training in Finland, www.oph.fi/sites/default/files/documents/key_figures_on_vocational_education_and_training_in_finland.pdf; Slovenia: OECD, (2016[56]), *Education Policy Outlook: Slovenia*, www.oecd.org/education/policyoutlook.htm and Lenič, Mali and Šlander (2016[83]), Supporting teachers and trainers for successful reforms and quality of vocational education and training: mapping their professional development in the EU – Slovenia; and Turkey: Akyildirim and Durgun (2019[25]), Continuing Professional Development for Vocational Teachers and Trainers and Principals in Turkey 2018, www.etf.europa.eu/sites/default/files/2019-11/turkey_cpd18_22_october_2019_25-10.pdf.

Annex Table 2.A.2. Link between VET teacher's (job) characteristics and their probability of working part-time, having a temporary contract, looking for another job and having a second job

Probit regression results (VET teachers)

	Part-time		Temporary				Looking for other job				Having a second job	
			(i)		(ii)		(i)		(ii)			
Working time arrangement (reference group: full-time)												
Part-time, no other job	..				0.146	***			0.057	***	..	
Part-time and other job	..				0.221	***			0.065	***	..	
Education level (reference group: ISCED 6+)												
ISCED 3 or below	0.048		0.062	**	0.049	*	-0.012		-0.014		-0.043	***
ISCED 4	0.026		0.005		0.002		-0.015		-0.017		0.011	
ISCED 5	-0.058		-0.011		-0.013		0.059		0.067	*	-0.036	
Age (reference group: 20-29)												
<20	-0.148		-0.111		-0.061		0.067		0.076		.	
30-39	-0.169	***	-0.276	***	-0.247	***	-0.044	*	-0.031		-0.008	
40-49	-0.158	***	-0.315	***	-0.284	***	-0.022		-0.009		-0.005	
50-59	-0.174	***	-0.354	***	-0.325	***	-0.016		-0.002		-0.040	
60+	0.062		-0.270	***	-0.269	***	-0.071	***	-0.062	***	-0.073	***
Gender (reference group: male)												
Female	0.211	***	0.019		-0.011		0.003		-0.010		-0.006	
Number of obs.	4 611		4 076		4 076		4 346		4 346		4 541	

Note: ***Significant at 1%, ** 5%, * 10%. Country fixed effects included. All EU-LFS countries included except Norway, Bulgaria, Malta, Slovenia and Poland. Columns (ii) add controls for working time arrangement and multiple jobholders.
Source: Calculations using Eurostat (2020[21]), European Union Labour Force Survey (EU-LFS) 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey.

Annex Table 2.A.3. Difference between VET and general education teachers in the probability of working part-time, having a temporary contract, looking for another job and having a second job

Probit regression results (VET and general education teachers)

	Part-time		Temporary		Looking for other job		Having a second job	
Teacher type (reference: general education teachers)								
Vocational education teachers	0.088	***	0.075	***	0.020	***	0.041	***
Age (reference group: 20-29)								
<20	0.061		0.008		0.015		-0.045	
30-39	-0.031	*	-0.196	***	-0.010		-0.015	
40-49	-0.042	**	-0.290	***	-0.012		-0.005	
50-59	-0.071	***	-0.338	***	-0.020	**	-0.022	
60+	0.046	**	-0.325	***	-0.038	***	-0.041	***
Gender (reference group: male)								
Female	0.122	***	-0.004		-0.006		-0.032	***
Education level (reference group: ISCED 6+)								
ISCED 3 or below	0.091	***	0.049	***	-0.010	*	-0.014	
ISCED 4	0.007		0.026		-0.006		0.006	
ISCED 5	-0.011		-0.007		0.024		-0.010	
Number of observations	26 616		25 843		24 659		26 616	

Note: ***Significant at 1%, ** 5%, * 10%. Country fixed effects included. All EU-LFS countries included except Norway, Bulgaria, Malta, Slovenia and Poland.
Source: Calculations using Eurostat (2020[21]), European Union Labour Force Survey (EU-LFS) 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey.

Annex Table 2.A.4. Difference between VET teachers, general education teachers, and tertiary educated workers in the probability of working part-time, having a temporary contract, looking for another job and having a second job

Probit regression results (VET teachers, general education teachers and tertiary educated workers)

	Part-time		Temporary		Looking for other job		Having a second job	
Worker type (reference: tertiary educated workers)								
General education teachers	-0.017	***	0.017	***	-0.031	***	0.012	***
Vocational education teachers	0.073	***	0.066	***	0.010		0.040	***
Age (reference group: 20-29)								
<20	0.254	***	0.155	***	0.024		0.003	
30-39	-0.007	**	-0.145	***	-0.018	***	0.004	**
40-49	-0.006	*	-0.194	***	-0.034	***	0.008	***
50-59	-0.017	***	-0.212	***	-0.046	***	0.007	***
60+	0.176	***	-0.176	***	-0.064	***	0.006	***
Gender (reference group: male)								
Female	0.188	***	0.020	***	0.003	**	0.002	

	Part-time		Temporary		Looking for other job		Having a second job	
Education level (reference group: ISCED 6+)								
ISCED 3 or below	0.108	***	0.053	***	-0.017	*	-0.005	
ISCED 4	0.017		0.011		-0.015		-0.007	
ISCED 5	0.024	***	0.002		-0.001		-0.009	***
Number of observations	462 180		392 198		462 033		462 152	

Note: ***Significant at 1%, ** 5%, * 10%. Country fixed effects included. All EU-LFS countries included except Norway, Bulgaria, Malta, Slovenia and Poland. The group of tertiary educated workers includes as workers whose highest educational attainment is at ISCED level 5 or above and who do not work as VET or general education teacher.
Source: Calculations using Eurostat (2020[21]), European Union Labour Force Survey (EU-LFS) 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey. Effectively preparing and developing teachers in vocational education and training.

Notes

[1] In Denmark, enrolment of all age students in upper secondary VET has decreased from 43% in 2013 (134 687) to 38% in 2018 (109 573).

[2] While most countries collect data on the school workforce (e.g. the School Workforce Census in England), data collection on the VET workforce is currently limited.

[3] In Australia, there are general education teacher shortages as well in specific geographic or subject areas.

[4] "Examination need" indicates the number of people who need to be examined in order for the estimated recruitment need to be met with newly graduated qualified teachers.

[5] e.g. due to limited capacity for training "which might need to start with the work being done within schools and colleges"; "the location of training providers in relation to employers, particularly in rural areas, meaning that employers had to either develop their own training programme" and " the cost and duration of training".

[6] For ITPs, 23% and 8% had at least one vacancy in construction courses and engineering and manufacturing courses respectively. For further education colleges, the total reported vacancy numbers, including vacancies temporarily filled by supply staff, were reported relatively high in construction (260 or 5%), engineering and manufacturing (240 or 5%), legal, finance and accounting (40 or 5%), business and administrative (120 or 4%) and digital / IT (80 or 4%) (Thornton et al., 2018[4]; IFF Research, 2020[6]).

[7] In Australia, the Australian Council of Deans of Education Vocational Education Group recognises this.

[8] The follow up survey covered 3 694 teachers and leaders from general FE and specialist FE colleges (excluding sixth form colleges and other types of FE provider) between April and June 2019, approximately 12 months after the 2018 survey.

[9] RTOs include public providers of VET, known collectively as TAFE (Technical and Further Education) and around 500 other training providers including industry-based and private providers.

[10] Exploratory research in England confirmed that secondary education teaching professionals are the most representative comparator group for FE teachers as a whole. However, it could not provide fully

robust estimates of the pay levels for FE teachers or pay differentials between FE teachers and comparators due to limited data (Lake et al., 2018[19]).

[11] Results from an OLS regression analysis among VET teachers and general education teachers across countries in 2014 SES data. The logarithm of monthly wages (of full-time teachers) is regressed on a dummy of teacher type, contract type (permanent, temporary and apprenticeship), gender, education level (4 groups), age (6 groups), tenure (5 groups), ownership (public versus private) and country fixed effects. The results show that vocational education teachers earn 3.8% lower wages than general education teachers per month, with this differences being statically significant at the 1% level. The regression includes 77 379 observations. Similar results are obtained when looking at hourly wages (and controlling for whether they work full time or part time) or annual wages (full-time teachers working at least 50 weeks in the reference year).

[12] Results from an OLS regression of the logarithm of monthly wages (of full-time VET teachers) on contract type (permanent, temporary and apprenticeship), gender, education level (4 groups), age (6 groups), tenure (5 groups), ownership (public versus private) and country fixed effects. The regression includes all VET teachers in countries with available data in SES 2014 (21 771 observations). The results show that male VET teachers earn more than female VET teachers, and those with a permanent contract more than those with a temporary contract. Wages also increase with age and tenure. Higher educated teachers (ISCED 5 or above) have higher wages than those with an upper secondary or post-secondary non-tertiary degree.

[13] The reasons why VET teachers in France have a higher level of salaries need to be further analysed.

[14] Full-time teachers/tutors and leaders in sixth form colleges (SFCs) had higher salaries on average, than full-time teaching staff and leaders working in adult and community learning (ACL) providers and independent training providers (ITPs). This difference is driven by the level of qualifications, orientation of teaching subjects and work experience. For example, teachers/tutors in SFCs (which tend to teach more academic subjects) were the most likely to hold qualified teacher status and a teaching qualification at International Standard Classification in Education (ISCED) Level 7, or master's level (86%). In contrast, the majority (64%) of teaching staff in ITPs (which tend to teach more VET subjects) had a teaching qualification at ISCED Levels 3 or 4 (upper secondary or post-secondary non-tertiary), and these teaching staff had a greater amount of industry experience. The most common highest teaching qualification among ACL teachers/tutors was at ISCED Level 7 (38%) (IFF Research, 2020[6]).

[15] In ITPs, 31% of teaching staff were not satisfied with opportunities for career development, while this was the case for 48% of teaching staff in ACLs and 63% in SFCs. (IFF Research, 2020[6]).

[16] Analysis by VET and general education teachers was limited. However, the analysis of three countries show the positive relationship between the desire to stay in the teaching profession and satisfaction with salary and the terms of the employment contract.

[17] This used to only be offered to VET teachers, but has now been expanded to some subjects in general education track too.

[18] Working in multiple schools could be the result of teachers taking advantage of opportunities for horizontal diversification in teaching careers, as they take on specific responsibilities across a number of schools in some education systems. However, working in more than one school increases the demands on teachers and takes time from class preparation, building long-term relationships with colleagues outside the classroom, collaboration with other teachers and other valuable activities. In addition, teachers working

in multiple schools may not be doing so voluntarily, but because they are in a less senior and more precarious position.

[19] As there are no specific national criteria for teacher quality, teachers' appraisals are based on legislation that applies to all public servants and school leaders' professional judgement.

[20] In FE colleges, 93% of teachers held a teaching qualification, with 45% having an ISCED Level 7 qualification; 41% of teachers held teaching professional status; 64% of teachers had relevant industry experience (Thornton et al., 2018[4]). In SFCs, 81% of teachers/tutors held a teaching status, 86% were qualified to Level 7 and 36% had work experience outside of education. In contrast, 15% of teaching staff in ITPs held a teaching status, 64% were qualified to Level 3-4, and 62% had work experience outside of education (IFF Research, 2020[6]).

[21] According to the career structures for civil servants, teachers are classified under either the higher service (gehobener Dienst) [Grundschulen and Hauptschulen as well as at Realschulen] or the senior service (höherer Dienst) [Gymnasien and vocational schools].

[22] State (Perkins) approved and elective VET programmes and industrial technology programmes.

[23] College and other vocational instructors include instructors who teach applied arts, academic, technical and vocational subjects to students at community colleges, CEGEPs, agricultural colleges, technical and vocational institutes, language schools and other college level schools. This unit group also includes trainers who are employed by private training establishments, companies, community agencies and governments to deliver internal training or development courses. College teachers who are heads of departments are included in this group (Statistics Canada, 2018[80]).

[24] *Regular license* is awarded by the prefectural board of education with a national validity of 10 years. It can be obtained by completion of training by the university faculty of education or designated teacher training institutions or by passing the educational staff examination conducted by the prefectural board of education. It has two types at high school levels: a special training license (master degree with some years of teaching experience) and a first-class license (bachelor degree with extra credits or teaching experience for the teaching subject area or passed high school teacher qualification examination). 19.2% of high school teachers hold special training license and 79.8% a first-class license (0.3% second-class) in 2016.

Special license is valid only within a prefecture for 10 years. Teaching certification is given to those who have specialised knowledge, experience or skills related to the subject they are in charge of. 0.1% of high school teachers hold this license in 2016.

Temporary license is valid only within a prefecture for 3-6 years. It is awarded when they pass the education staff examination of the prefectural board of education, which is conducted only when it is not possible to hire a person with a regular license. 0.4% of high school teachers hold this license in 2016.

[25] A general pedagogical course (mostly of one year) is intended for teachers whose initial education did not include any pedagogical content. Before entering the profession, teachers can follow a ten-month induction programme (a traineeship), with a mentor assigned to them, or they can apply for open-recruitment job positions where beginning teachers receive mentoring support. The induction phase prepares them to take the state professional examination to become fully qualified teachers (OECD, 2016[56]).

3 Effectively preparing and developing teachers in vocational education and training

This chapter explores effective ways to provide high-quality initial teacher education and training (ITET) and professional development (PD) opportunities for teachers in vocational education and training (VET). It examines the skills and training needs of VET teachers. It then highlights promising practice and policies in ITET and PD, including how countries manage to help VET teachers build, develop and maintain dual competences – industry experience and knowledge, as well as pedagogical skills.

Key messages for effectively preparing and developing teachers in VET

Teacher training is crucial to preparing and developing vocational education and training (VET) teachers in the face of changing learning and teaching environments. However, existing training arrangements do not seem to develop the full mix of skills VET teachers require. Moreover, teachers face barriers to participating in training due to lack of support or incentives and conflicts with their work schedule.

Initial teacher education and training (ITET) programmes should provide the opportunity for (future) VET teachers to develop their required pedagogical and vocational skills, along with basic, digital and soft skills. Many initiatives exist to impart strong pedagogical skills among VET teachers. Several countries provide targeted financial support to help future VET teachers benefit from ITET. Education and training institutions need to keep the ITET curriculum for VET teachers up to date, collaborate with VET institutions to offer practical teacher training, and develop research and innovation in pedagogical approaches. Offering work-based learning opportunities in industry as part of ITET is particularly helpful for those with no industry background.

VET teachers also need access to training after entering the teaching profession, to ensure that their skills and knowledge remain up to date. In order to increase participation in professional development (PD), countries need to consider engaging and co-ordinating with multiple stakeholders to foster training provision and participation, including VET institutions, teachers' and school networks, local companies, universities and other relevant associations. In order to make PD more accessible, several countries give VET teachers the means to participate in it. To reinforce the effectiveness of these training opportunities, countries also need to identify VET teachers' training needs to ensure they offer relevant, customised and engaging PD opportunities.

Policy pointers

- 2.1. Designing effective and flexible initial teacher education and training programmes for VET teachers to develop industry knowledge and pedagogical skills.
- 2.2. Increasing participation in relevant professional development opportunities.

Skills and training needs for VET teachers

Compared to teachers in general education programmes, teachers in vocational education and training (VET) require additional layers of skills and experience. VET teachers need to have not only theoretical and practical knowledge and relevant experience of the broad package of skills required for the profession they teach, but also knowledge of and experience in effective teaching for learners who often struggle with academic study. Moreover, they also need to continuously update their knowledge and expertise in response to changes in technology and working practices, as well as innovations in pedagogical approaches (OECD, 2014[1]; OECD, 2010[2]).

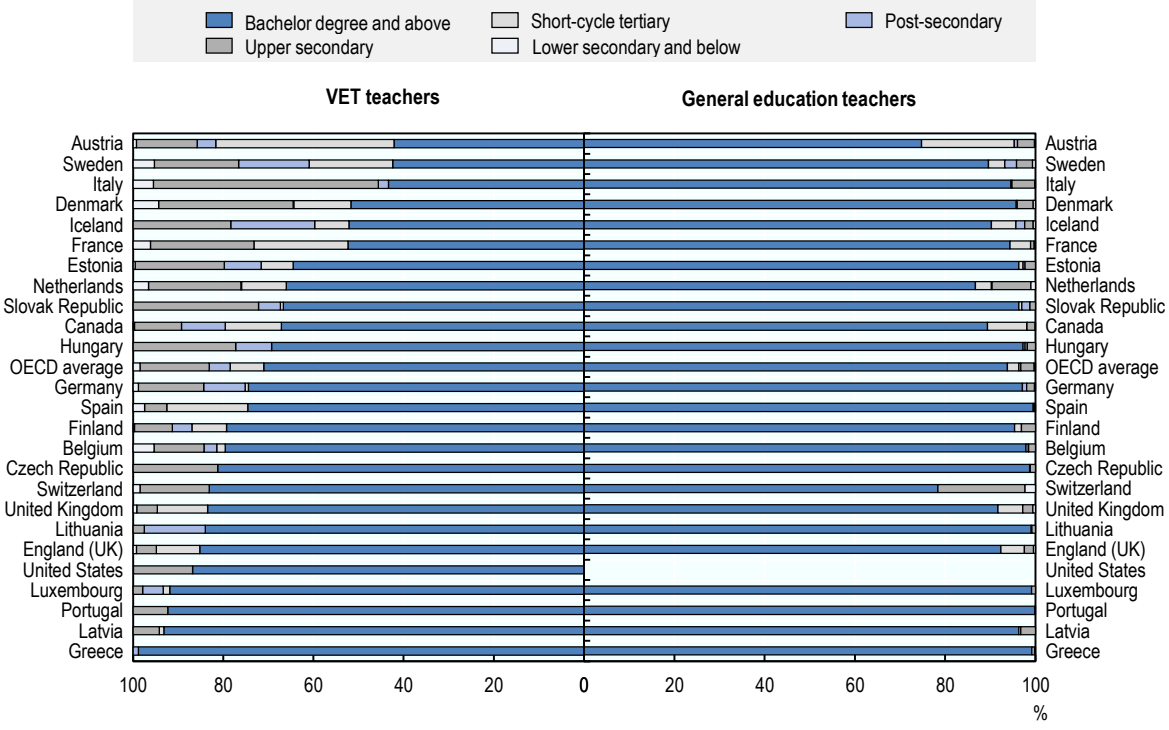
VET teachers have diverse educational backgrounds

The education level attained by VET teachers varies across countries, and is often quite different from that of general education teachers (Figure 3.1). Differences in the levels of qualifications between VET and general education teachers are not surprising given their very different skill requirements and the more widespread use of alternative entry pathways into VET teaching. It is more common for general education

teachers to have a bachelor's or master's degree, i.e. International Standard Classification of Education (ISCED) Level 6 or 7, compared to VET teachers. On average across 24 OECD countries, 72% of VET teachers had attained a bachelor's degree or higher while 94% of general education teachers did. Less than half of VET teachers had a bachelor's degree in Austria (42%), Italy (43%) and Sweden (42%). Only in Switzerland were VET teachers more likely than general education teachers to have a bachelor's degree (83% versus 78%), although the difference was less than 10 percentage points in England (United Kingdom), Latvia, Luxembourg and Portugal. VET teachers' level of education may also differ depending on the type of VET institution and the level or subject they teach (see Box 3.1 for the situation in England, for example).[1]

Figure 3.1. The educational attainment of VET teachers varies greatly across countries

Share of teachers by highest qualification attained



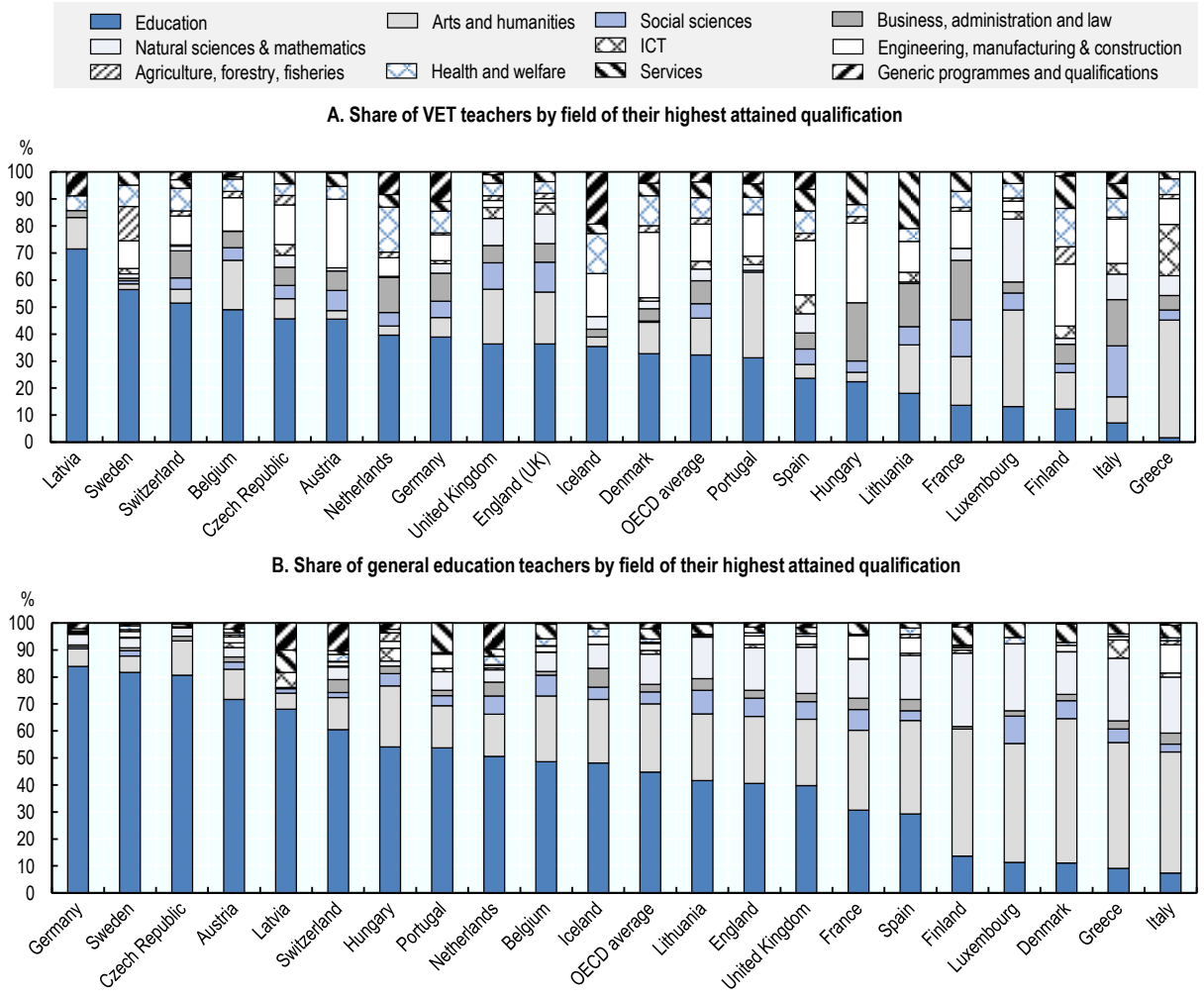
Note: The OECD average does not include the United States and England. The data for the United States refer to teachers who teach career and technical education (CTE) at the secondary education level. In other countries, VET teachers refer "vocational education teachers who teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges" (see Box 1.2).

Source: Eurostat (2020[3]), European Union Labour Force Survey (EU-LFS) 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey; the United States: OECD questionnaire; and Canada: OECD (2012[4]), Survey of Adult Skills (PIAAC) (2012), www.oecd.org/skills/piaac.

In terms of fields of study, VET teachers show more diversity than secondary education teachers (Figure 3.2). In all countries with available data, general education teachers are more likely to have specialised in education-related fields than VET teachers (45% versus 32% on average). Among those general education teachers with a different specialisation, the most common broad fields are arts and humanities (25%) and natural sciences, mathematics and statistics (11%). Among VET teachers, engineering, manufacturing and construction was as the most common broad field (14% on average).

Figure 3.2. VET teachers studied more diverse fields for their highest qualification

Share of teachers by field of their highest attained qualification



Note: Only those who are younger than 35 (or who obtained their qualification less than 15 years ago if over 35) were included in the sample. Vocational teachers teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges while general education teachers teach one or more subjects at secondary education level (whether their schools or programmes are vocationally oriented or not), excluding subjects intended to prepare students for employment in specific occupational areas – thus including general subject teachers in both VET and general education programmes (see Box 1.2 in Chapter 1).
Source: Eurostat (2020[3]), European Union Labour Force Survey 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey.

One of the main limitations of the data source used for these statistics is that it only records the field of study for the highest attained qualification. A person with an engineering degree might also have an education degree at the same or a lower level, but this would not show up. Hence, the lower share of VET teachers with a specialisation in education-related fields does not necessarily imply that they do not have such a degree, nor that they provide low-quality teaching. Nonetheless, evidence from Sweden confirms that VET teachers may be less likely to have a pedagogical degree: more than 90% of general education teachers in Sweden had a pedagogical higher education degree in 2018-19, but only 60% of VET teachers, according to the Swedish National Agency for Education. However, the share varies depending on years of experience and teaching subjects: among senior-level teachers of vocational subjects 97% have a

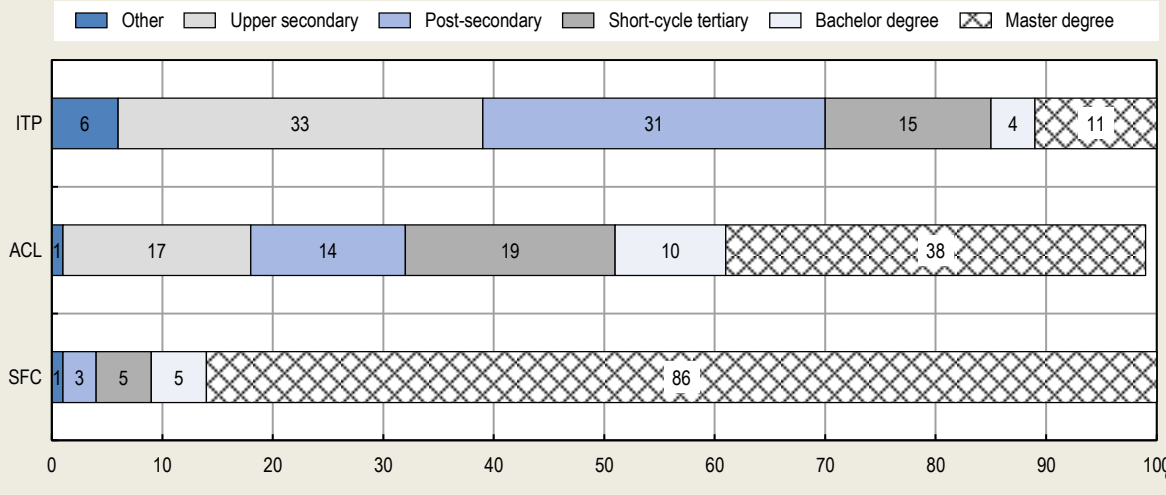
pedagogical degree, and teachers of vocational subjects with a large share of female teachers, such as child care and treatment, are more likely to have one.

Box 3.1. Differences in VET teacher qualification levels by type of provider in England

VET teachers' qualifications may differ depending on the type of VET institution they teach in as well as the level (and the subject) they teach. In England, the highest level of teaching, training or assessment qualification held by teachers in individual training providers (ITPs) is typically at ISCED Level 3 or 4 (upper secondary or post-secondary non-tertiary; 64% of teachers), while the figures are 31% of teachers for adult and community learning (ACL) providers, and 3% for sixth form colleges (SFCs) (Figure 3.3). In contrast, 86% of SFC staff had a teaching qualification at ISCED Level 7 (master degree level), such as a Postgraduate Certificate in Education (PGCE), compared with 38% of ACL providers and 11% in SFCs. While only 3% and 4% of teaching staff in ACL and SFC providers, respectively, did not hold a teaching qualification, this was the case for 15% of ITP teaching staff (but two-thirds of them were working towards obtaining one).

Figure 3.3. VET teachers' level of teaching qualification vary across institutions in England

Share (%) of VET teachers by type of institution and level of teaching qualification



Note: VET teachers include teachers of both general and vocational subjects. 'Other' refers to another qualification. Excludes teachers who do not hold a teaching or training qualification.

Source: IFF Research (2020[5]), The Education and Training Professionals Survey, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/917879/The_ETP_survey_-_research_report_Sep_2020.pdf.

The College Staff Survey allowed multiple reporting on teaching qualifications: 15% of teaching staff in further education colleges held a teaching qualification at Level 3, 19% at Level 4, 22% at Level 5 (short-cycle tertiary level), 10% at Level 6 and 45% at Level 7. About 7% reported that they did not have a teaching qualification (Thornton et al., 2018[6]).

The differences between VET teachers and general education teachers in education levels and fields of study is also largely due to the fact that vocational teachers may instead have non-academic qualifications or hands-on experience (so-called "industry currency"), depending on countries' recruitment routes and requirements. Nonetheless, this indicates that some VET teachers might need to increase their skills,

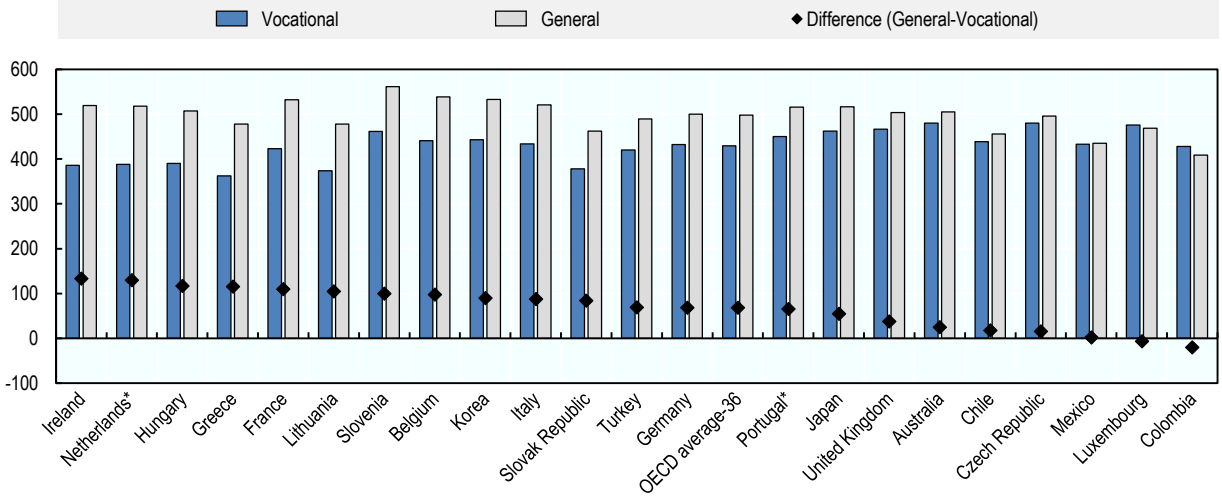
particularly their pedagogical skills or qualifications. In contrast, VET teachers who do not have relevant industry experience might lack practical skills or up-to-date industry knowledge and might therefore be in need of training in these areas.

VET teachers need to be able to support their students' development of basic, digital and soft skills

While upper secondary VET graduates are highly employable compared to those with a general upper secondary education, they tend to have lower levels of the basic skills – literacy, numeracy and digital skills – that are indispensable in adapting to changing labour market needs (OECD, 2020[7]; Vandeweyer and Verhagen, 2020[8]). Differences in skill levels between VET and general education students and graduates could reflect differences in the importance of general subjects in VET curricula, but could also reflect selection issues if students with weak skills in the early years of education disproportionately enrol in VET programmes. The share of low performers in mathematics is twice as large among 15-year-old students enrolled in VET programmes (pre-vocational, vocational and modular programmes) than among those in general education programmes. On average across OECD countries, 41% of students pursuing VET were low performers in mathematics in 2012, whereas 21% of students in a general academic programme were. Students in vocational tracks are five times more likely to perform below the baseline level of proficiency in mathematics than those in academic tracks, before accounting for other student characteristics, and are 4.4 times more likely after accounting for those characteristics. In most countries, 15-year-old students who were enrolled in VET appeared to have a lower mean reading score in the 2018 Programme for International Student Assessment (PISA), compared with students in general education. For students in France, Greece, Hungary, Ireland, Lithuania and the Netherlands the difference was more than 100 points (Figure 3.4). Although 15-year-old students may be different from those studying at ISCED Levels 3, 4 and 5, their characteristics provide some useful insights into the skills needs of VET teachers.

Figure 3.4. More VET students are lower achievers in reading than general education students

Mean reading score in PISA among 15-year-old students, by type of programme



Note: This graph refers to 15-year old students enrolled in VET programmes (pre-vocational, vocational and modular programmes).
* Netherlands and Portugal: data did not meet the PISA technical standards but were accepted as largely comparable.
The differences are all statistically significant, except those for Mexico and the United Kingdom.
Source: OECD (2019[9]), *PISA 2018 Results (Volume II): Where All Students Can Succeed*, https://dx.doi.org/10.1787/b5fd1b8f-en

In light of VET students' weaker basic skills and the importance of such skills for their working lives, VET teachers need to be able to work on improving their students' basic skills as well as equipping them with occupation-specific skills. For example, in England a large share of young people who did not gain any GCSEs (ISCED Level 3) enter further education (FE), many in VET programmes, including apprenticeships. Therefore, teachers of both general and vocational subjects in FE colleges have to adapt and develop specific skills for teaching low-attaining students in the FE context, especially given that apprentices have to achieve certain levels of English and maths (Noyes and Dalby, 2020[10]). Similarly, in Sweden lower-performing students tend to enter upper secondary VET programmes and so VET teachers need to be able to develop basic skills among their students (Kuczera and Jeon, 2019[11]).

Although the OECD Survey of Adult Skills, a product of the Programme for the International Assessment of Adult Competencies (PIAAC), does not allow the analysis of vocational teachers by country, an analysis using PIAAC and the Adult Literacy and Lifeskills (ALL) Survey shows that teachers on average have better literacy and numeracy skills than other respondents in almost all of the 15 countries in the samples (Golsteyn, Vermeulen and Wolf, 2016[12]). Among OECD countries participating in PIAAC (2011-12, 2014-15 and 2017), VET teachers' literacy and numeracy skills were lower than general education teachers, however. While a smaller share of VET teachers have low numeracy skills (PIAAC Level 1 or below) than for workers overall (8% versus 23%), the share is slightly larger than among general education teachers (7%). Moreover, while 26% of general education teachers have high numeracy proficiency (Levels 4 or 5), this is only the case for 10% of VET teachers. The findings for literacy skills and for digital problem-solving skills (see Chapter 4) are similar.

As discussed in detail in Chapter 4, VET teachers also increasingly need to develop the digital and soft skills of their students, as these are increasingly in demand in the labour market. To do this, teachers need to have knowledge of innovative pedagogical approaches that foster the development of these skills. They also need to have strong digital skills themselves, to be able to use new technologies in teaching and remain up to speed with technological innovations in the workplace.

Initial teacher education and training for VET teachers

Initial teacher education and training (ITET), which allows future teachers to obtain necessary teaching qualifications, is a vital element of teaching quality and career development for teachers (OECD, 2019[13]). Designing appropriate ITET programmes for VET teachers is important to ensure a good mix of pedagogical skills, vocational competence and industry knowledge (Musset, Kuczera and Field, 2014[14]). VET teachers' level of educational attainment, together with work experience and continuous learning opportunities,[2] have a significant effect on their teaching competence, as confirmed in the case of Korea (Kim and Phang, 2018[15]). In particular, training in pedagogical skills is essential for VET teachers who used to work in other sectors, while developing industry-relevant hands-on skills and knowledge is key for VET teachers who only undertook academic study. In Australia, a national study (2015-17) found that higher qualifications in VET teaching, especially at degree level, made a significant difference to VET teachers' skills, confidence and quality (Smith, 2019[16]).

Initial teacher education and training for the VET sector is highly variable

Entry requirements for initial teacher education and training vary from country to country

ITET is organised differently across OECD countries. It usually takes place in a university teacher-training degree course, and in some cases, it is followed by a more practical teacher-training course and ends with a national or sub-national examination(s). It also depends on the academic and professional backgrounds of VET teachers and on national or sub-national qualification requirements.

For example, in Japan, Korea and Sweden, students usually enter ITET straight from upper secondary education. In Japan, ITET leads into an ISCED Level 6 qualification in education, with a vocational subject specialty for VET teachers. VET teachers in Japan[3] are usually required to pass a teaching qualification exam before starting to teach in a VET school although other ways of certifying exist (see Chapter 2).

In contrast, direct access from upper secondary education to ITET is relatively less common in England and Finland. In England, no specific teaching qualification is required for teachers in the further education (FE) sector, but they are encouraged to start a course to obtain a teacher certificate in education (in general ISCED Level 5 or above). In order to access ITET, candidates may need to prove that they have a certain level of basic skills (either by qualification or tests) and are qualified and/or experienced in the subject although this may vary by ITET provider (Education and Training Foundation, 2016[17]). In Finland, those who apply for a place in vocational teacher education are older on average than applicants to other forms of teacher education, because applicants to VET teacher education are required to have prior work experience.

Initial teacher education and training provision also vary widely

Initial teacher education and training is often provided by institutions of higher education or a public agency specialising in ITET, but could consist of multiple components that are provided by different institutions. Different organisations may provide training in vocational subjects or pedagogical knowledge while certification of knowledge and skills may be awarded by other organisations. For example, in England, ITET is provided by universities, but further education (FE) providers can also deliver their own ITET in partnership with universities or awarding organisations (England's response to the OECD questionnaire).

In Germany, ITET is lengthy compared to other countries: after completing a bachelor's or master's degree in teacher education in two subjects, trainee teachers need to go through a preparatory service whereby they combine teaching practice with reflection and training for 2-3 years, before becoming a fully qualified teacher. The first stage of ITET for VET teachers is provided by universities or teacher training colleges. The preparatory service stage, including introductory seminars, sitting in on lessons, and accompanied and independent teaching, is provided by state seminar institutes. All ITET courses are modularised and provided with a credit point system in accordance with the European Credit Transfer System (ECTS). For example, depending on regulations under Land law, up to 60 ECTS credits from the preparatory service can be credited towards a master's degree. Credits which are acquired at universities of applied sciences as part of an accredited bachelor's or master's study course can be used as part of the requirements for all teacher training courses (KMK, 2017[18]).

Teacher educators who train VET teacher trainees in ITET normally have at least an advanced degree (master's or doctorate) in the areas they teach. In several European countries/regions,[4] ITET providers have significant autonomy in determining the exact qualifications required of their teaching staff, provided they meet minimum standards (European Commission/EACEA/Eurydice, 2013[19]). For example, the Dutch association of teacher educators (VELON) has established a register and professional standards for teacher educators at all levels including VET. In order to register (which is not obligatory), teacher educators need to fulfil the requirements of the professional standards, including didactical, interpersonal and organisational competences (European Commission/EACEA/Eurydice, 2013[19]). In Belgium (French Community), supervision of ITET units is provided by staff members with various profiles but with a master's degree in teacher training or a doctorate (which must be obtained within six years after the first appointment in a function), whose pedagogical interventions are co-ordinated and articulated between them (FWB, 2019[20]).

Experienced, incumbent VET teachers often train future VET teachers in France and Germany. In Germany, such teachers (often with a master's degree or higher) are hired either full time or part time by state seminar institutes, which offer preparatory services (practical training after teacher training at university) for future VET teachers. In France, master trainers (carrying out ITET or professional

development and supporting internships) are VET teachers who have acquired a certificate of aptitude for the functions of a teacher (Cafi-PEMF) (French Ministry of Education, 2020[21]). In England, teacher educators must have a teaching qualification equivalent to ISCED Level 5 or above, teaching experience and be engaged in further studies at ISCED Level 7 (Education and Training Foundation, 2016[17]).

Designing effective initial teacher education and training programmes for VET teachers

VET teachers need stronger pedagogical skills from their initial training

Initial teacher education and training programmes are designed to train future teachers to deliver high-quality teaching to their future students (OECD, 2019[13]). For incumbent teachers who have no teaching qualification but do have industry experience, which is often the case for VET teachers in some countries, ITET's added value is in developing their pedagogical skills.

However, ITET for VET teachers appears to be weaker at developing the required pedagogical skills than ITET for general education teachers according to data from the 2018 Teaching and Learning International Survey (TALIS; see Figure 3.5).[5] On average across countries and regions with available data, upper secondary VET teachers were less likely to report that certain elements were included in their ITET than their general education peers. This was the case for general pedagogy (86% of VET teachers reported that general pedagogy was included, compared to 91% of general education teachers), pedagogy in the subjects they teach (78% versus 86%) and classroom practice in the subjects they teach (73% versus 82%). The difference was particularly wide in Sweden: a gap of 17 percentage points for subject-specific pedagogy, 18 percentage points for classroom practice and 11 percentage points for general pedagogy. In contrast, VET teachers in Turkey were slightly more likely to have had these pedagogy elements included in their ITET than general education teachers.

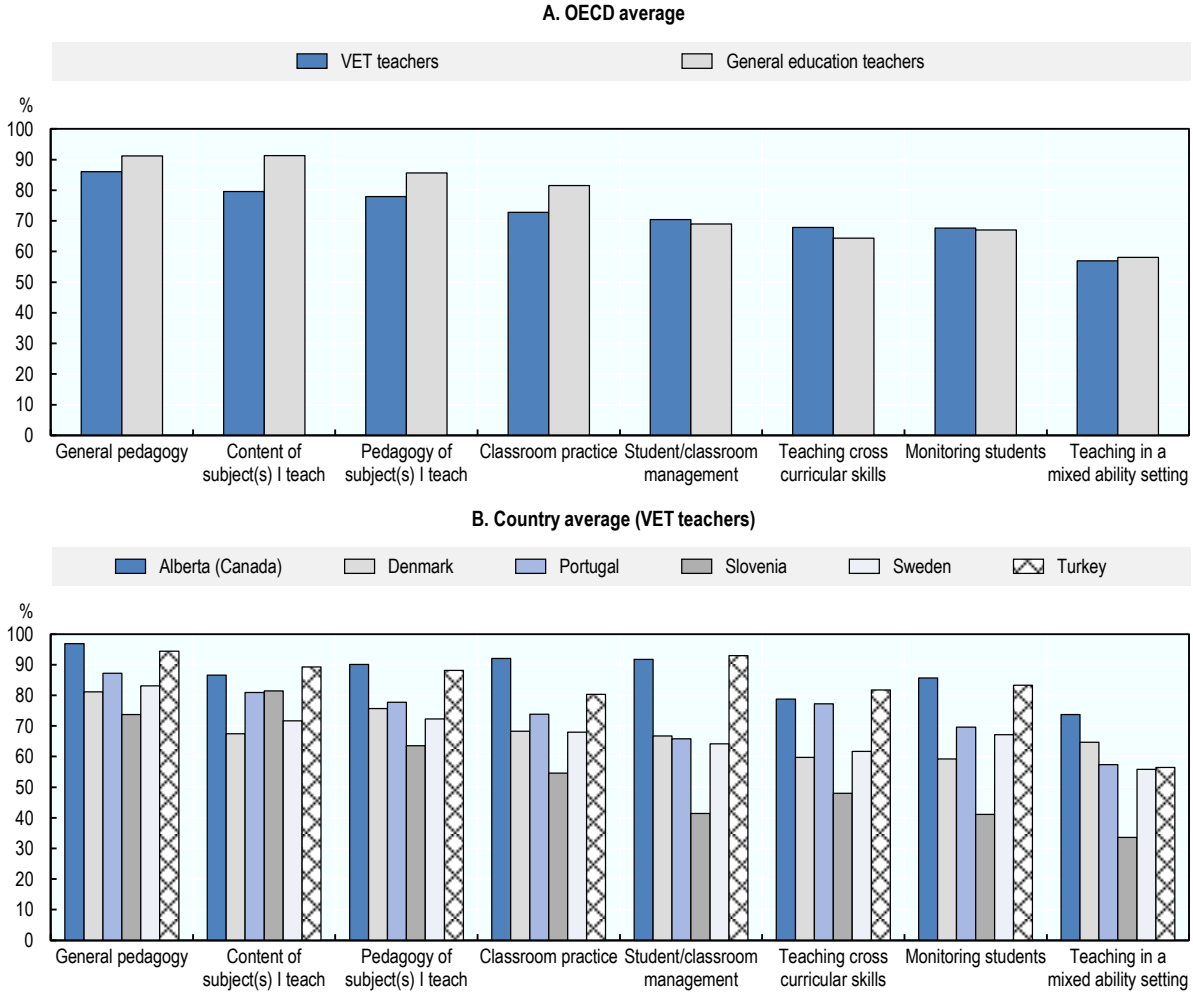
The effectiveness of ITET is well evidenced. VET teachers who benefitted from training in specific teaching responsibilities or tasks in their ITET (e.g. general pedagogy, subject-specific pedagogy, subject content and classroom practice) felt more prepared for taking up these responsibilities in their teaching (Figure 3.6, Panels A-D). However, a non-negligible share of VET teachers still felt unprepared in general pedagogy (16%) and subject-specific pedagogy (17%) even if they had undertaken ITET in those areas. The shares were particularly high in Portugal and Sweden.

Having strong pedagogical skills will also support teachers when engaging with a diverse group of students. As discussed above, VET teachers teach more diverse groups of students with different abilities and different aspirations. According to TALIS 2018, 57% of VET teachers in countries with available data reported that their ITET prepared them for teaching in a mixed-ability setting, which is roughly the same share as for general education teachers (Figure 3.5). Having this type of training makes VET teachers better prepared for diverse classrooms; on average, 71% of VET teachers whose ITET covered teaching in a mixed-ability setting felt prepared for this responsibility by the time they completed their initial training (Figure 3.6 Panel E). This falls to 31% among VET teachers who had not been trained in this area. In Alberta (Canada), only 58% of teachers who had training in mixed-ability teaching felt prepared in that area. In Slovenia and Sweden, almost one-third of VET teachers who undertook ITET in this area did not feel prepared when they completed the training.

As Chapter 4 discusses, soft skills are playing an increasingly important role in the labour market, and VET teachers need to develop these skills among their students. TALIS 2018 data show that 68% of VET teachers were prepared for teaching cross-curricular skills in ITET, which is slightly higher than for general education teachers (64%). Among the VET teachers who had ITET in teaching cross-curricular skills, 75% felt prepared by the time they completed their ITET. This compares with 36% of those who had not been trained in this area (Figure 3.6 Panel F).

Figure 3.5. ITET for VET teachers appears to be weaker at developing pedagogical skills than ITET for general education

Share of upper secondary teachers who reported that the following elements were included in ITET



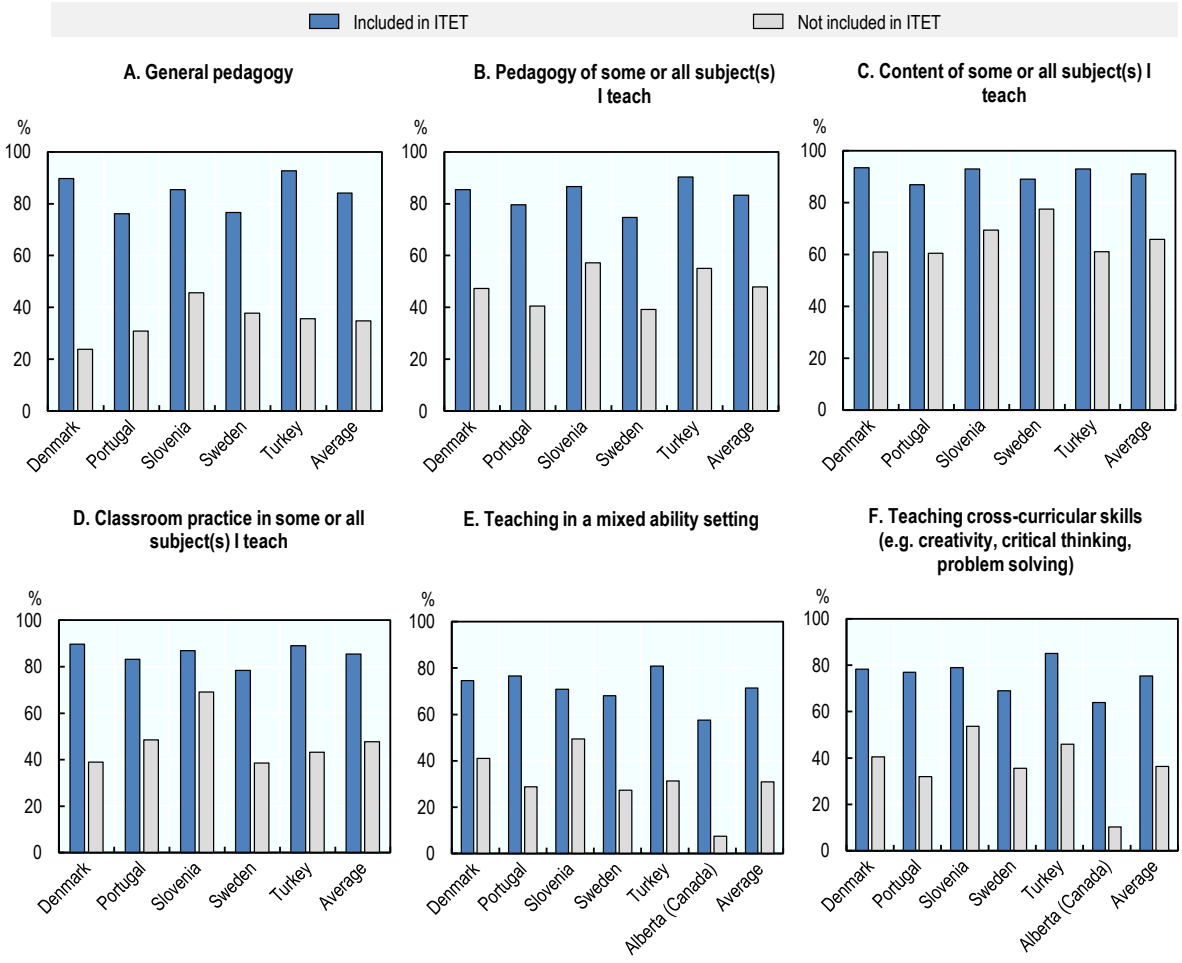
Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). The OECD average represents the unweighted average of the six countries/regions. Data for the individual countries refer to VET teachers only.
Source: OECD (2019[22]), TALIS 2018 database, http://www.oecd.org/education/talis/talis-2018-data.htm.

The TALIS data clearly highlight the benefits of preparing VET teachers for their diverse responsibilities through ITET. However, the data also show that for a significant proportion of VET teachers, ITET programmes do not sufficiently develop the broad range of skills that are important for future VET teachers, especially pedagogical skills. Therefore, ITET needs to be strengthened to provide course elements to develop such skills, and more future teachers need to be encouraged to participate in it. There are several strategies that could help strengthen ITET for VET teachers; in particular, the education and training institutions that provide it should keep their curricula up to date, collaborate with VET institutions to offer practical teacher training, and develop research and innovation in pedagogical approaches. For example, in Bavaria (Germany), "university VET schools" combine theoretical and academic teacher training at the university and the practical aspects of teaching training in university schools through close connections between these two types of institutions throughout the ITET phase. Moreover, trainee teachers in Germany

usually teach in VET schools during their preparatory service while also participating in training and seminars provided by Länder-level teacher training institutes. These help prepare trainee teachers for teaching and help them reflect on their learning and practice in their early careers. In the United States, the Teaching to Lead programme, which provides both ITET and professional development (PD), helps career and technical education (CTE) teachers build their pedagogical skills (see Chapter 2).

Figure 3.6. VET teachers whose ITET covered key elements of teaching practice felt more prepared

Share of upper secondary VET teachers who felt prepared by the time they completed their education or training, by whether or not the item was included in ITET



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). "Included in ITET" refers to teachers who reported that the item was included in their formal education and training. "Not included in ITET" refers to teachers who reported that the item was not included. The OECD average is an unweighted average of included countries. Alberta (Canada) was omitted from Panels A-D due to insufficient sample sizes for comparison.
Source: OECD (2019[22]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm

Flexible ITET provision and providing financial support could encourage prospective VET teachers to take up ITET

Faced with the relatively limited attractiveness of VET teaching as a profession and persistent VET teacher shortages (Chapter 2), many countries have provided multiple and flexible ways to recruit and qualify VET teachers while strengthening their pedagogical skills. In some countries, VET teachers can undertake ITET after recruitment, often with a focus on pedagogical training in the subjects they teach. Therefore, for VET teachers, many of whom enter the profession after working for many years in industry, the distinction between ITET and PD may be less rigid than it is for general education teachers. Indeed, providers of ITET and PD overlap in most countries. For industry professionals who have years of work experience, ITET that focuses on pedagogical training may be shorter (Sweden) or function more like professional development while they are already teaching (Denmark and England). Similarly, for VET teachers who have been teaching for many years without pedagogical qualifications, professional development may cover pedagogical training to give them an opportunity to renew or update pedagogical approaches.

There are many barriers to training participation, often related to time constraints or scheduling difficulties (see the next section for more details). To overcome such barriers to ITET participation, flexibility is crucial. Some countries provide ITET through weekend and evening classes. For example, in Australia, training courses for VET teachers at universities are part time and offered flexibly, as most students are working full-time in VET or in industry and may not live close to their university. In addition, many countries offer online ITET and this has become more widespread due to the COVID-19 pandemic.

Financial barriers can also be important, in which case financial support can be helpful for prospective ITET participants. As discussed in Chapter 2, financial incentives to attend ITET can also help make teaching a more attractive career choice and therefore contribute to reducing or avoiding VET teacher shortages, especially if these incentives are targeted at fields of study for which it is hard to find qualified VET teachers. In Sweden, state grants, administrated by the Swedish National Agency of Education, are available for VET teachers to combine work and studies to obtain a vocational teacher degree. This grant addresses training needs for VET teachers who lack pedagogical training, since most VET teachers are recruited from the relevant industries. To receive the grant, the principal must reduce the teacher's working hours by at least 25% to facilitate the teacher training (Swedish National Agency of Education, 2020[23]).

In England, ITET for VET teachers is fee-based, which can be a disincentive to enrol in ITET given that it is not mandatory for them. Moreover, very few bursaries are attached to ITET training in the VET sector compared to the compulsory education sector. According to the 2018 College Staff Survey (CSS), only 15% of teachers had accessed any financial support for ITET whilst working in FE, and more experienced teachers were more likely to have accessed any funding, as the most widely used funding scheme (the FE training bursary) ended in 2012 (Thornton et al., 2018[6]). In recognition of the financial barriers, new funding schemes have been introduced in England for those obtaining formal FE teaching qualifications, including the Taking Teaching Further programme, as discussed in Chapter 2 (Box 2.2). In Wales (United Kingdom), where a teaching qualification is required to become an FE teacher, teacher training incentive grants of up to GBP 1 000 are available (2019-20) for eligible students who start full-time pre-service Professional or Post-Graduate Certificate in Education (PGCE) initial teacher education courses leading to a qualification to teach further education (ISCED Level 5 or above). The incentives for specific subjects are higher, with grants of up to GBP 3 000 per student for subjects such as science, technology, engineering and mathematics (STEM); Welsh; and literacy and numeracy (Welsh Government, 2019[24]).

Work-based learning in VET institutions and in industry is important for VET teachers

Work-based learning (WBL) is as important for VET teachers as it is for their students. There are two aspects to WBL in the context of training VET teachers. First, part of their initial teacher training can take place in a VET institution to give them direct experience of teaching students in a classroom. Second, part of their ITET could be organised as an internship, externship or secondment to a company to equip future

teachers with industry-relevant skills. Both forms are equally important as VET teachers need to be well prepared not just in terms of pedagogy in VET, but also in terms of industry knowledge and experience related to the subjects they teach. In countries that have minimum industry experience requirements, the need for internships or other forms of work-based learning in industry is less pressing.

Box 3.2. Teacher training practicum and practice schools

Austria: Practice schools

Practice schools are incorporated into universities of teacher education, and have a special position in the school system. They are intended to act as an example of a model that promotes research and innovation. There are currently 11 practical schools at the secondary education level. These schools function as normal schools, but also as centres of pedagogical-practical studies for new teacher training. In addition, practising teaching in a real school environment offers students and lecturers at the universities of teacher education an ideal field for research projects. The practical schools provide opportunity for all students to gain their first teaching experience and also identify the needs for further practical training.

Germany (Bavaria): University vocational schools and preparatory service

"University schools" (Universitätsschule) refer to public vocational schools in Bavaria that work particularly closely with universities on pedagogical training for teachers. The combination of theoretical and academic training at the university and training in the practical aspects in university schools helps student teachers to become well-prepared teachers. University schools promote regular contact between student teachers, new teachers and experienced teachers through school internships or practical projects.

In addition, Bavaria's "teachers' seminar" institutes offer preparatory services, co-ordinate curricula and co-develop teacher education with the university. They also transfer innovations to teachers and schools by the head of seminar teachers and vice versa. They offer student teachers and teachers in their early years opportunities to reflect upon their learning and practice. In some cases, school principals and the seminar teachers also teach future teachers at the university.

Source: BMBWF (2018[25]), Universities of teacher education in Austria, www.bmbwf.gv.at/Themen/schule/fpp/ph.html; Bader, Lehner and Wilbers (2019[26]), *The Training of Vocational Teachers in University Schools,* www.wipaed.rw.fau.de/files/2017/05/N%C3%BCrnberger-Universit%C3%A4tsschule_Bader-Lehner-Wilbers.pdf.

In many countries, ITET concludes with a teacher practicum or internship in VET schools. In Belgium (French Community), both bachelor's and master's level ITET involves internships which are supervised by staff members in charge of theoretical training, teacher practitioners from the institutions in which the internship takes place and the internship supervisor. The higher education institutions organise training courses for internship supervisors, preparing them to interact with student teachers and observe, analyse and evaluate elements of their professional teaching practice in order to advise and help readjust these practices (FWB, 2019[20]). In England, a minimum of 100 hours of teaching practice is required to obtain Level 5 Diploma in Education and Training, ideally in a variety of settings (e.g. different locations/settings/contexts; teaching subject levels; a variety of learners, individuals and groups; and workplace mentoring) (Education and Training Foundation, 2016[17]). In Austria, practice schools are incorporated into universities of teacher education and provide a place for pedagogical practice for both trainee teachers and their ITET teachers (Box 3.2). In Germany, practical activity related to the vocational subject area is required as part of the first ITET stage and generally lasts 12 months. Preparatory service

also includes teaching practice in a VET school for 2-3 days a week and reflection/theory and practical training in state seminar institute for the remaining days (Box 3.2).

In order to ensure that future VET teachers build their industry knowledge, partnerships between ITET providers and employers are crucial. Through such partnerships, trainee teachers can spend time in industry (and industry practitioners can teach in ITET; see Chapter 2). For example, in 2014-15, Denmark initiated VET teacher traineeships in enterprises with 25 participating VET colleges, as part of its VET reform to strengthen the links between school-based and work-based learning. This initiative provided VET teachers with the opportunity to have a short period of in-company training to develop relevant teaching skills (Andersen, Gottlieb and Kruse, 2016[27]).

Professional development opportunities to keep VET teachers' skills up to date

Professional development (PD) is critical in the face of change. Not only are the skills that need to be taught in VET changing, but so too are the pedagogical approaches and technology used in the classroom (Chapter 4). Therefore, VET teachers need to continuously develop a diverse set of skills and update their pedagogical and industry knowledge. In this context, PD can be a tool for improving their skills, changing how they teach or putting research results (such as proven pedagogies aimed at making VET schools more competence-based) into practice (Cedefop, 2015[28]). Across the six countries/regions with available TALIS data, 78% of VET teachers perceived PD as having a positive impact, similar to general education teachers (80%).

Countries use various methods to encourage teachers in VET to acquire and improve their qualifications as part of PD. This is important given that higher qualifications in VET teaching make a significant difference to VET teachers' skills and confidence, as mentioned above (Smith, 2019[16]; Kim and Phang, 2018[15]). PD also contributes to increasing teachers' satisfaction with their profession. Career development through PD is often correlated with teachers' job satisfaction and retention rates. However, PD is important not just for individual teachers but also collectively. Skills developed by individual teachers contribute to the development of the teaching staff as a whole and their VET institution, and more broadly to the quality of the VET sector overall, as the Mixed Commission on Teacher Education (Gemischte Kommission Lehrerbildung) in Germany recognised (KMK, 2017[18]).

The forms of professional development range from relatively long programmes leading to qualifications (formal), to one-day seminars and short online courses (non-formal).[6] Formal training for teachers usually extends over a longer period than non-formal training, and includes various courses. In some cases, it can open up new career prospects such as teaching a new subject or in an additional field or possibly result in a promotion. It also offers opportunities to acquire qualifications for other careers in the education sector, such as counselling teacher. Non-formal or in-service training courses can have many different formats including seminars, study groups, conferences, study trips, colloquia and distance learning courses. Some countries explicitly distinguish the more formal programmes from others. For example, Germany refers to formal training as further training for teachers, and to non-formal one as in-service teacher training (KMK, 2017[18]).

Professional career development is key to improving VET teaching quality

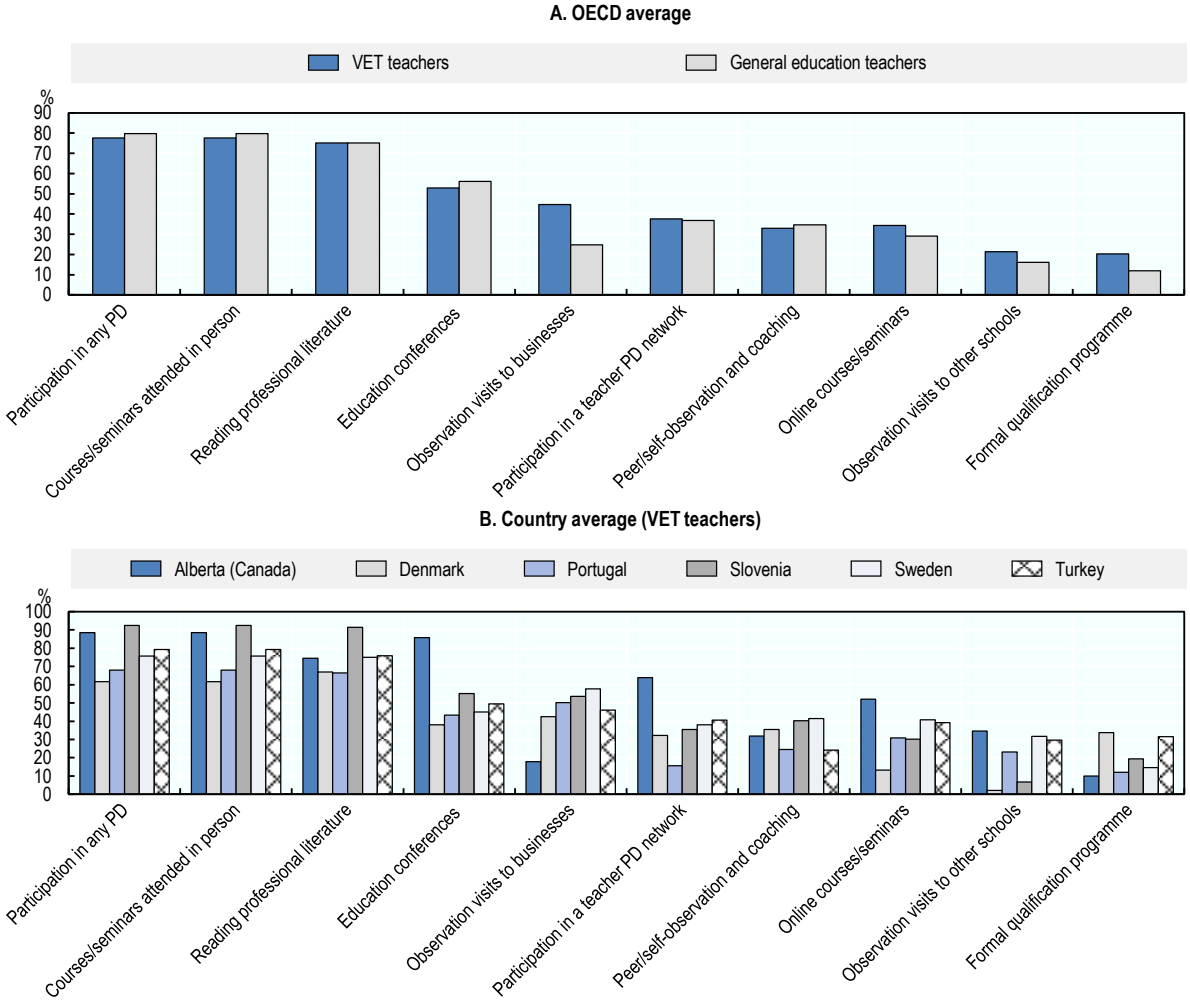
Participation in professional development is comparable with general education teachers

Participation in professional development among teachers in VET varies across countries. Various factors could explain cross-country differences, including differences in regulation, financial support and learning culture. According to TALIS 2018 data (OECD, 2019[13]), about eight out of ten upper-secondary teachers across the six OECD countries/regions with available data responded that they had participated in any type of PD activities during the last 12 months, including attending qualification courses or online seminars, taking part in teacher networks and reading professional literature (Figure 3.7). The differences in

participation rates between VET and general education teachers are small (78% of VET teachers and 80% of general education teachers), except in Denmark where the participation rate of general education teachers is 17 percentage points higher than among VET teachers. The most popular type of PD was attending courses or seminars, for both VET teachers (78% on average across countries) and general education teachers (80%). However, VET teachers were more likely to undertake visits to business premises (45%, compared to 25% for general education teachers), visit other schools (21% versus 16%), follow online courses (34% versus 29%) and attend formal education (22% versus 16%). Although VET teachers and general education teachers have similar overall participation rates, the intensity was higher among VET teachers: on average, VET teachers across the six OECD countries/regions reported having spent about 2.5 hours on PD activities during the most recent complete calendar week in their job, which is more than for general education teachers (1.9 hours on average) (Figure 3.8). Only in Sweden was the intensity slightly lower for VET teachers than for general education teachers.

Figure 3.7. VET teachers are more likely to visit business premises as part of their professional development, than general education teachers

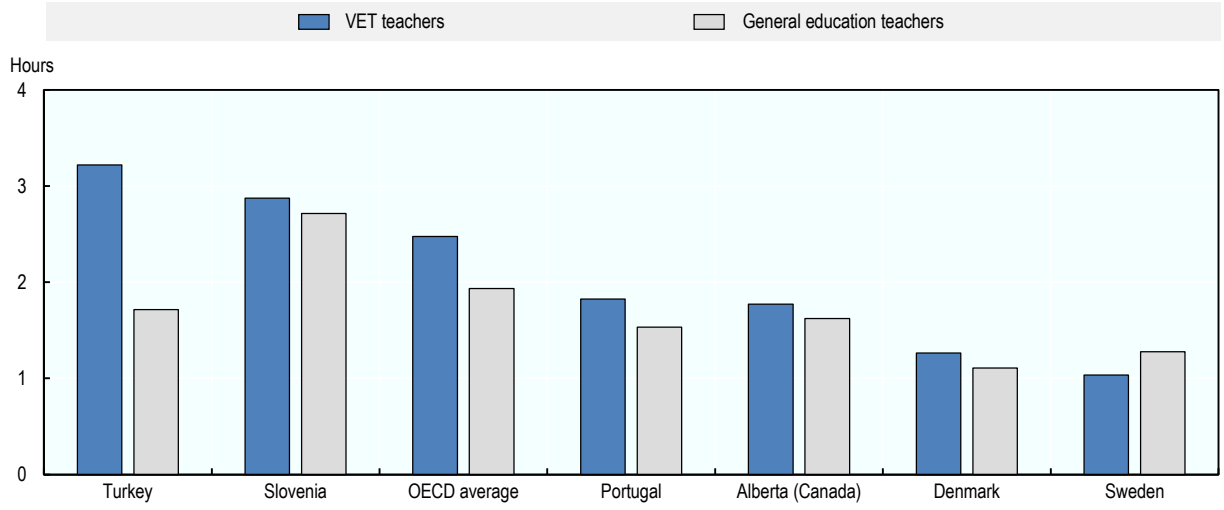
Share of upper secondary teachers by type of professional development participation during the last 12 months



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). The OECD average represents an unweighted average of the six OECD countries/regions.
Source: OECD (2019[22]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm

Figure 3.8. VET teachers tend to spend more time on professional development than general education teachers

Average reported number of hours spent on professional development during teachers' most recent complete calendar week in their job at the current school where they work



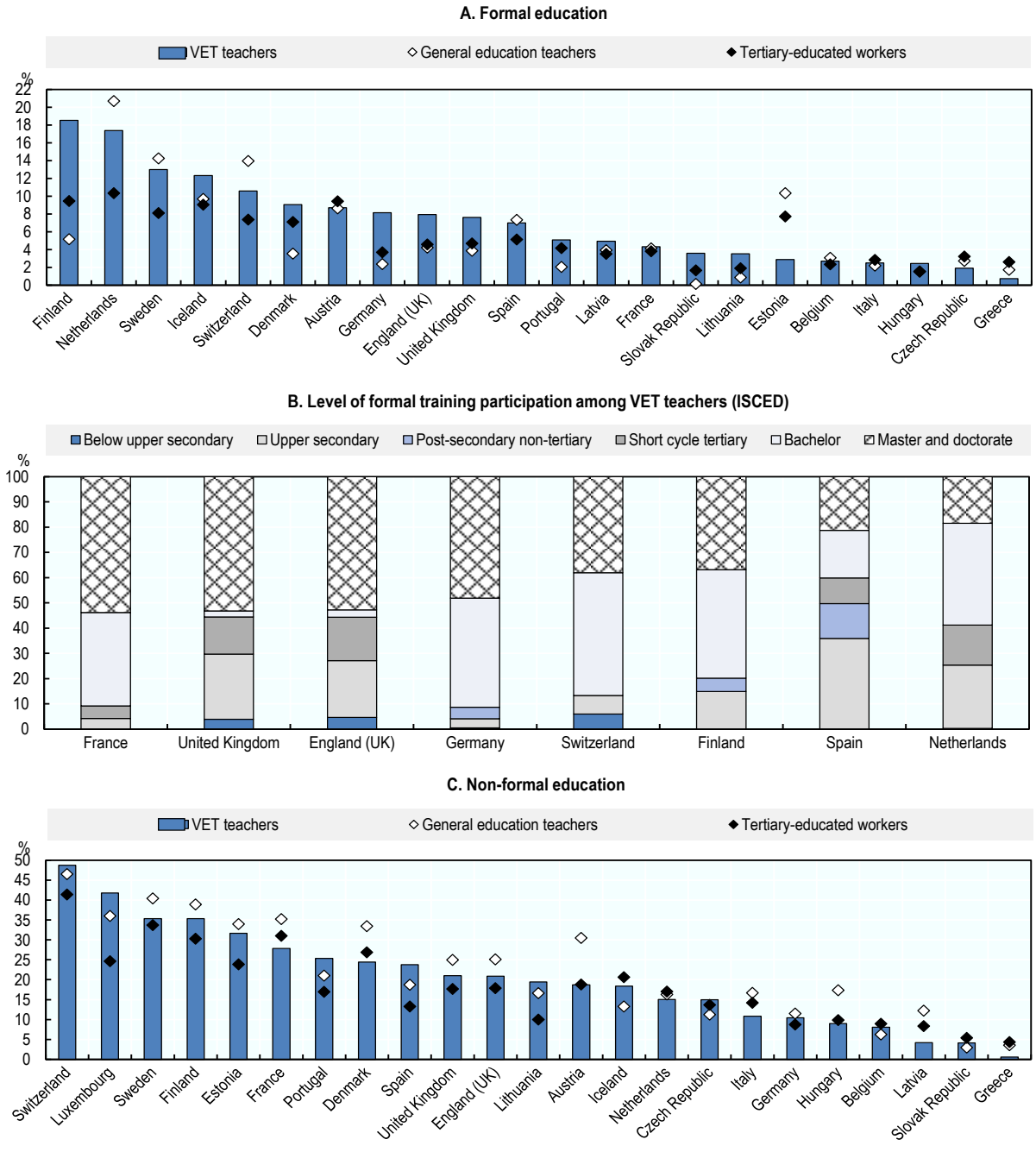
Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). Professional development is defined as activities that aim to develop an individual's skills, knowledge, expertise and other characteristics as a teacher. OECD average refers to the unweighted average of the six countries/regions.
Source: OECD (2019[22]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm

Other data tell a similar story. According to the EU Labour Force Survey (EU-LFS), on average 7% of VET teachers across countries report having participated in formal education in the past four weeks, which is higher than among general education teachers (5.8%). It is also higher than among all tertiary-educated workers (5.2%) on average. VET teachers in Finland (19%) and the Netherlands (17%) show a relatively high level of participation in formal education. Countries also differ widely in the level of formal training attended by VET teachers. More than 80% of formal training participation among VET teachers in Finland, France, Germany and Switzerland was ISCED Level 6 or above, compared to only 40% in Spain (Figure 3.9). Although it is not directly comparable with the EU-LFS, according to the OECD Survey of Adult Skills (2011-12), 24% of VET teachers in Canada reported having participated in formal education in the past 12 months, which was much higher than both general education teachers (4%) and tertiary-educated workers (10%). These data do not tell us if the participation in formal training constituted PD for VET teachers who already have a formal teaching qualification or if it was ITET for those who entered the teaching profession without the required qualification and were seeking to obtain it.

Participation in non-formal training is generally more common than formal training, and this is also the case among VET teachers. While not leading to a formal qualification, non-formal learning can play an important role in providing relevant and flexible training opportunities to improve skills, and can include valuable work-based learning opportunities such as industry internships. EU-LFS 2017-19 data show that 20% of VET teachers on average across countries reported having participated in such training in the previous four weeks,[7] which is slightly lower than among general education teachers (22%). The differences between countries are large, with more than 40% of VET teachers participating in non-formal training in a given month in Luxembourg and Switzerland, but less than 5% in Greece, Latvia and the Slovak Republic.

Figure 3.9. VET teachers are active in professional development

Share of teachers/workers by type of learning activities in the last 4 weeks, 2017-19



Note: VET teachers are those who teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges (see Box 1.2 in Chapter 1). Formal education indicates a status of student or apprentice in regular education during the last 4 weeks while non-formal education indicates attendance at any courses, seminars, conferences or receive private lessons or instructions outside the regular education system within the last 4 weeks.
Source: Eurostat (2020[3]), European Union Labour Force Survey 2017-19, https://ec.europa.eu/eurostat/web/microdata/labour-force-survey .

National surveys focused on teachers report higher estimates, but this could be largely because of the longer reference period (i.e. the previous month in the EU-LFS compared to a year in many national

surveys). In Finland, 69% of VET teachers participated in PD in the year 2019. Among those who had participated in PD, 41% had taken part in education leading to a degree (24%) or another qualification (17%), 23% in staff training, 4% in expert exchange programmes and 33% in other types of training (Education Statistics Finland, 2020[29]). In England, 91% of staff in colleges (including sixth form colleges) reported that they received some form of training or development activity in the past academic year (2017/18); on average this totalled 38 hours of PD per person trained (Education and Training Foundation, 2018[30]).

In general, the main providers of PD for VET teachers can be classified into three groups: (1) national or sub national-level government institutions or agencies; (2) VET institutions or higher education institutions; and (3) industry/professional organisations. In most countries, VET colleges and/or universities play a key role in providing professional development, while government institutions or agencies are the providers in Austria, Germany, Japan, Slovenia and Switzerland. In Australia, both public and private VET providers deliver PD programmes on regulatory compliance and pedagogy; and some government-owned and operated VET institutions (technical and further education or TAFE Institutes) base their offerings around a standards framework (ACDEVEG's response to the OECD questionnaire). Box 3.3 provides examples from Australia and Germany of how government-supported PD can be provided at different levels and delivered by different institutions.

Box 3.3. Examples of professional development frameworks for VET teachers

Germany

While in-service training is the responsibility of teachers in all Länder by law or ordinance, it is also the duty of the employers (usually the Ministries of Education and Cultural Affairs) to ensure that suitable training programmes are provided. In each Land, the Ministry of Education and Cultural Affairs is responsible for delivering in-service teacher training, as the highest school supervisory authority and usually the employer of teachers. State-run in-service teacher training is delivered in the Länder by central, regional and local institutions, but also by schools. The cooperation between these levels varies across Länder.

- Central level: All Länder have established state-run in-service training institutions which for the most part are subordinate to the Ministries of Education and Cultural Affairs as dependent Länder institutions. Central in-service training institutions (a Land can have several such institutions) have various names such as state academy (*staatliche Akademie*) or academic institute for in-service teacher training (*wissenschaftliches Institut für Lehrerfortbildung*). In some Länder, the organisation of the central training for teachers is the responsibility of the Land institute for school development, which also goes under a different name depending on the Land.
- Regional level: This level of training is conducted differently in each Land by the institutes responsible for in-service teacher training and their branches and by middle- and lower-level school supervisory authorities.
- Local level: Lower-level school supervisory authorities (*Schulämter*) are usually responsible for organising in-service training at local level.
- School level: In-service teacher training within schools is carried out by schools for their own teaching staff. Such training is essentially organised by individual schools, although assistance with its preparation, execution and subsequent evaluation is available in some Länder from in-service training institutions and advisers from the school supervisory authorities.

Australia

In Australia, state-level non-formal professional development opportunities are offered for VET teachers. For example,

- In Sydney and the state of New South Wales, TAFE colleges offer forums or conferences on pedagogical issues for teachers in the foundation skills programmes (English language, literacy, numeracy, career pathways and youth). Teachers in this field also have access to conferences and seminars organised by relevant national and state professional associations.
- In the state of Victoria, the state-funded VET Development Centre offers workshops and webinars to VET teachers, and has switched solely to on-line delivery during the COVID-19 pandemic.

Source: ACDEVEG's response to the OECD questionnaire and Germany from interviews and KMK (2017[18]), *The Education System in the Federal Republic of Germany 2016/2017*, www.kmk.org/fileadmin/Dateien/pdf/Eurydice/Bildungswesen-engl-pdfs/teachers.pdf.

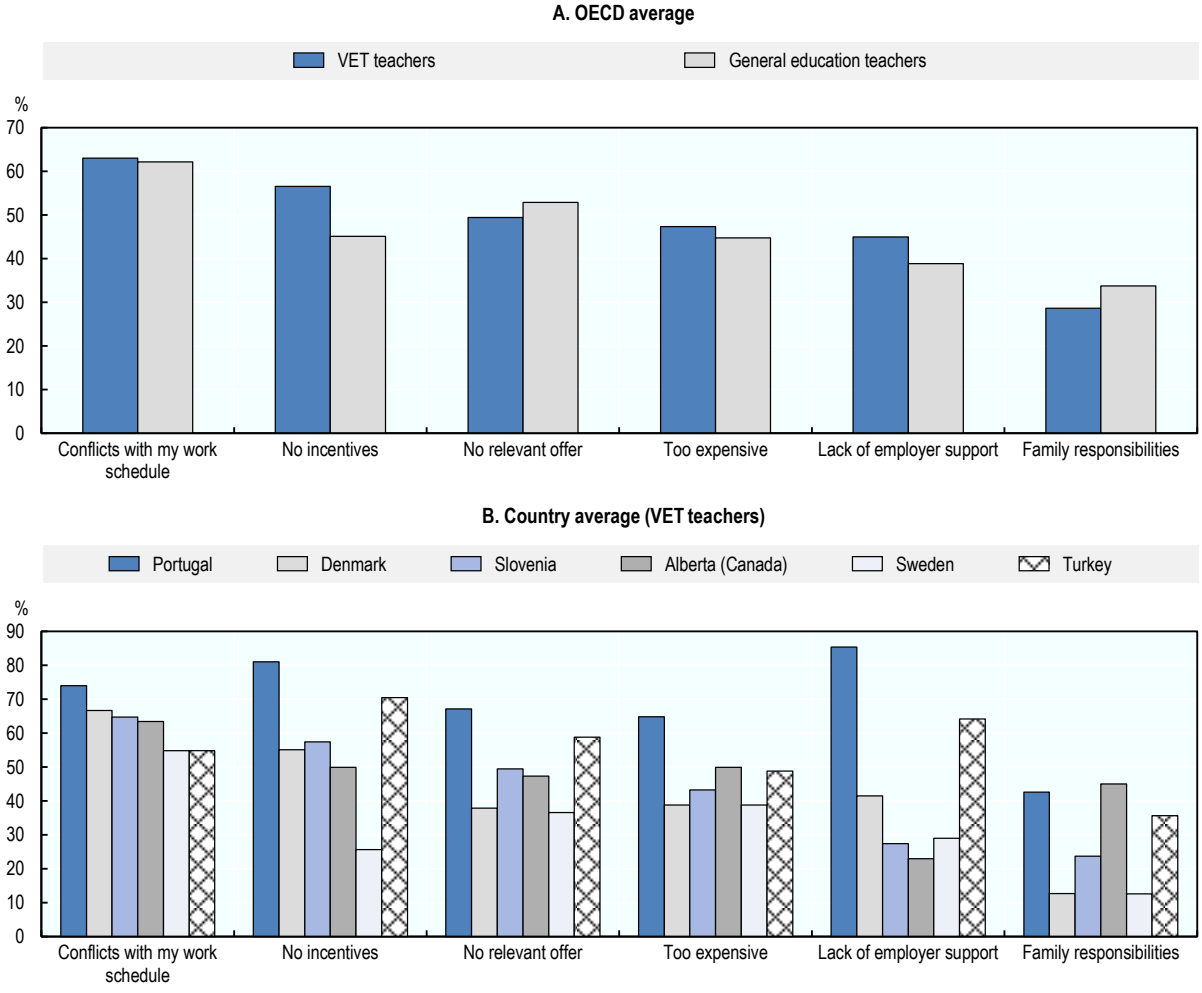
VET teachers face barriers to participating in professional development

Teachers face a variety of barriers when it comes to participation in PD. Across the six OECD countries and regions with TALIS 2018 data available, a significant share of VET teachers declared they faced barriers to accessing professional development, mostly due to conflicts with their work schedule (63%) and a lack of incentives (57%) (Figure 3.10). The lack of incentives is more common among VET teachers than among general education teachers, although more general education teachers reported lack of incentives than VET teachers in Sweden (by 7 percentage points) and in Portugal (4 percentage points). VET teachers in Portugal are most likely to report barriers, with the most important one being a lack of employer support.

Among those VET teachers who did not participate in PD, 63% felt that they were too busy to update their skills and knowledge and 65% reported financial barriers – both higher than for general education teachers. Even in Slovenia where professional development is both a right and a duty for teachers by law, a slightly higher share of VET teachers report they faced barriers than general education teachers: VET teachers were more likely than general education teachers to report that cost, conflicting work schedules and lack of employer support were barriers, by 5-6 percentage points. Even VET teachers who were able to participate in PD still felt that there were strong barriers to accessing those opportunities.

Figure 3.10. VET teachers face barriers to professional development

Percentage of teachers who responded that they face the following barriers to participation in professional development



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). Teachers include both those who participated in professional development and those who did not. The bars represent the unweighted average of the six countries/regions. Data for the individual countries refer to VET teachers only.
Source: OECD (2019[22]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm

VET teachers might particularly struggle to access training opportunities to develop their vocational skills and knowledge. Given that PD activities in England are often funded by VET institutions, teachers have little control over the content of those activities, which are mostly focused around other organisational needs and less around industry-relevant skills – this frequently leaves them with few opportunities to update their subject-specific knowledge (Broad, 2013[31]; Broad, 2015[32]). In Sweden, VET institutions are in charge of determining the content of teacher professional development as it is not regulated, it is often teachers who are responsible for updating their skills relevant to industry (Andersson, Hellgren and Köpsén, 2018[33]; Fejes and Köpsen, 2014[34]). Even where industry-relevant activities are regarded as legitimate by VET institutions, existing PD opportunities may lack quality and relevance, as has been seen in Australia (Schmidt, 2019[35]).

Compared to general education teachers, VET teachers can particularly benefit from work-based learning (WBL) or other non-formal training in their corresponding industry. Given this is an extra element to VET teachers' PD, time-related barriers can be even stronger for VET teachers than for other teachers. Timetables have a crucial impact on their ability to move between school and workplaces (Andersson and Köpsén, 2018[36]). In England, research on the development of teachers' occupational knowledge in further education colleges (Broad, 2013[31]; Broad, 2015[32]) found that despite the need for VET teachers to engage with the industry and improve their industry knowledge, many of them reported facing barriers to WBL, due to lack of funding and time. While most VET teachers found WBL to be important, they perceived that it was less important to their employers. Only 10% of those teachers had secured an industry placement in an attempt to keep their industry skills and knowledge up to date. Unless employers offer support and time off work for PD activities, it is hard for teachers to dedicate time to them, and thus might face more difficulty participating in WBL.

Increasing participation in relevant professional development opportunities can be challenging

Impactful professional development opportunities for VET teachers have various characteristics and can take many forms (Box 3.4). They build on teachers' prior knowledge and provide teachers with opportunities to practise and apply new ideas in their own classrooms (OECD, 2019[13]). Literature shows that impactful PD for VET teachers include developing dual competencies, incorporating work-based learning, setting requirements for quality assurance and ensuring teachers' rights to participate in PD (Andersson, Hellgren and Köpsén, 2018[33]). A national strategy for upgrading teachers' qualifications and skills is also important (Cedefop, 2015[28]), particularly reskilling VET teachers teaching whose subjects are related to sectors or occupations that are being restructured due to automation or other labour-market changes. The success of PD activities depends on the engagement of institutional leaders, especially in countries where VET institutions are responsible for teachers' PD and where VET teachers do not have a clearly established right or duty to participate in PD.

Promoting professional development and providing opportunities to participate can be challenging, and research shows that there remains room for improvement in the provision of PD for VET teachers. TALIS 2018 data show that many aspects of the provision of professional development does not meet their needs (OECD, 2019[13]). As seen in Figure 3.10, the lack of relevant PD is a barrier to participation for many VET teachers. In England, evidence suggests that FE teacher training is lacking in the areas of leadership and management skills, maths and English teaching skills, and competence in the use of digital and other new technology in teaching programmes (Education and Training Foundation, 2018[30]). Moreover, learner-centred pedagogies, such as group work, project work and enquiry-based learning, that have been proven to result in better student outcomes have been often advocated in many VET systems (see Chapter 4), but have not been implemented or have not been judged as successful (Cedefop, 2015[28]). This is partly because competences in these new pedagogies are not strongly developed in initial teacher education and training or teachers' professional development (Cedefop, 2015[28]).

Box 3.4. Models of VET teacher professional development

VET teachers' professional development can be organised in a number of different ways.

- *Training model* is the dominant form of professional development, involving lectures, workshops and seminars. This model may be ineffective in improving teachers' practical skills due to the large number of participants and repetitive content. Despite its drawbacks, the training model is acknowledged as an effective way to introduce new knowledge. Formal training leading to a qualification may be further categorised as an *award-bearing model.*

- *Deficit model* is designed to address perceived deficits in teachers' performance. The deficit may come not just from an individual teacher's weaknesses but also from organisational and management practices. Therefore, this model can be used to address both individual and collective responsibility of professional development.
- *Cascade model* involves teachers gathering and disseminating professional information to their colleagues. Usually this information focuses on skills and knowledge and it is a means of sharing own learning. Teachers can gain information by visiting educational exhibitions and fairs. Methodological activities by groups of teachers are a good means for teachers both to share their own knowledge and skills and to learn from others.
- *Coaching/mentoring model* is a one-to-one relationship, designed to support CPD activities. Coaching is more skills based while mentoring involves an element of counselling and professional friendship. Dialogues or discussions with colleagues on professional themes, peer counselling and observing peer lessons can support skills-based or coaching activities.
- *Community of practice model* involves a group of practitioners who seek to deepen their professional knowledge and expertise. Learning within such a community could be either a positive and proactive experience or a passive one, where the collective wisdom of dominant members of the group shapes other individuals' understanding of the community and its roles. Members of a community of practice form networks at different levels.
- *Action research model* refers to research-based professional development. Teachers conduct research to improve their performance. Action research has greater impact on practice when teachers help each other by working collaboratively.

Source: Kennedy (2014[37]), "Models of continuing professional development", http://dx.doi.org/10.1080/19415257.2014.929293; Mičiulienė (2019[38]), Evaluation of vocational teachers' continuing professional development models, www.vdu.lt/cris/handle/20.500.12259/102129# .

Effective professional development for VET involves a wide range of stakeholders

Making sure that VET teachers receive the necessary training – whether it be on pedagogical, industry or technological aspects of teaching – requires collaboration and co-ordination of multiple stakeholders at different levels, from VET institutions to teachers' and school networks, local companies, universities and relevant associations.

- ***VET institutions and relevant associations*** play a key role in facilitating access to PD for their teaching staff. Institutional leadership is often a key factor in the provision of and participation in PD and enables institutions to take a systemic approach to teachers' PD. In Denmark, large VET schools often have a department dedicated to PD for teachers and offer PD services while connecting key stakeholders. Such services include improving the skills and performance of middle-level leaders in assessing teaching quality and providing additional coaching support for underperforming teachers.
- ***Teachers' and school networks*** can be an effective means of sharing experiences and encouraging participation in PD. In England, collaborative forms of PD such as peer observations, formal and informal networks, coaching and mentoring, and action research, are most valued by teachers in further education colleges (Greatbatch and Tate, 2018[39]; Education and Training Foundation, 2018[30]). Japan uses the cascade model whereby trained teachers disseminate professional skills and knowledge to colleagues (Box 3.4).
- ***Local companies and industry associations*** can provide and encourage PD. They can provide industry placements for VET teachers, just as they do for students from VET programmes. They may already be in close communication with VET teachers through setting up and improving

students' apprenticeships. In Denmark and Germany, VET teachers participate in work placements in industry to update their knowledge. Companies in these countries are interested in offering work placements to VET teachers to help improve how they train their apprentices under the dual VET system. England, Spain and the United States (Box 3.5) also have several initiatives to foster this type of work-based PD. There are also other more indirect ways VET can benefit from exchanges with industry, including VET teachers shadowing workplace trainers for periods of time and in-company trainers teaching in VET institutions.

- ***Local universities and relevant associations*** can provide PD for VET teachers, but can also improve the quality of PD by sustaining the connections between practice and research. Partnerships with VET institutions can lead to joint research, for example action research by VET teachers with support from university research mentors (Box 3.4). Partnerships may also be critical for informing universities about areas of need as well as changes in practice that need to be reflected in VET teacher education courses, and allow the development of coherent work-integrated teacher education programmes. In countries where universities provide PD, such as Austria and Germany, universities often have a strong connection with VET institutions and their practice.

Box 3.5. Industry placements and industry involvement in professional development for VET teachers

Denmark: Industry involvement in developing relevant skills for VET teachers

The 'Horizontal Innovation through Competence Development project' was started by a partnership between four VET schools (secondary and post-secondary), a university research centre, and the Danish Federation of Small and Medium-sized Enterprises. This project aimed to deliver entrepreneurial and innovation competences to small and medium-sized enterprises (SMEs). The project develops VET teachers' competences to deliver entrepreneurial skills in close co-operation with the SMEs. In the context of the project, VET schools can offer targeted advice to SMEs within their field of specialisation.

Social partners in the form of professional committees have initiated a number of teacher training initiatives aimed at increasing VET teachers' professional competencies. VET teachers of carpenters, electricians and other professional groups are given the option to participate in week-long workshops primarily to develop specific competencies in their professional areas, but also to support them in delivering more attractive and engaging teaching and training (Andersen, Gottlieb and Kruse, 2016[27]).

England: FE teacher secondments into industry

The Taking Teaching Further (TTF) programme (2018-19), covered in Box 2.2 in Chapter 2, also supported industry-provider innovation projects (up to 40 projects). These projects promoted and facilitated industry secondments into FE, FE teacher secondments into industry, and collaboration between providers to successfully engage industry.

Industry Insight by the Education and Training Foundation offers work shadowing and immersive workplace placements to teachers in FE colleges, to raise their awareness of current industry practices. Examples of training opportunities include one-day work shadowing, 2-5 day placements and industry workshops for teachers to meet as a group with employers or industry specialists. Completing an online course to understand the industry and employer partnerships is a prerequisite for undertaking a placement.

Slovak Republic: Automotive Innovation & Teacher Training Academy

The 'Step Ahead' project was initiated by the Erasmus+ programme (2015-17 and 2018-20) with transnational cooperation between VET schools, private companies and non-governmental organisations. It aimed at providing training programmes for VET teachers in the automotive industry. Training for Slovak VET teachers of automotive and technical subjects was carried out in the Czech Republic and Finland in 2019 and in Spain in 2020. An online conference was held in 2020 to ensure smooth project progress (Step Ahead, 2020[40]). The feedback from teachers who participated in the first phase of training indicated that the VET teachers have started to actively use their new knowledge and skills concerning innovative teaching approaches and the topics of innovation in their practice (European Union, 2017[41]).

Spain: In-company training for VET teachers

In Spain, VET teachers in publicly funded centres have the opportunity to take part in professional training in companies with a maximum duration of 5 days, which can be funded by the Spanish Ministry of Education. Moreover, most regions in Spain offer subsidies for in-company training for teachers. Teachers are also offered two-week stays at educational centres in different European countries (Spain's response to the OECD questionnaire).

United States: Externships

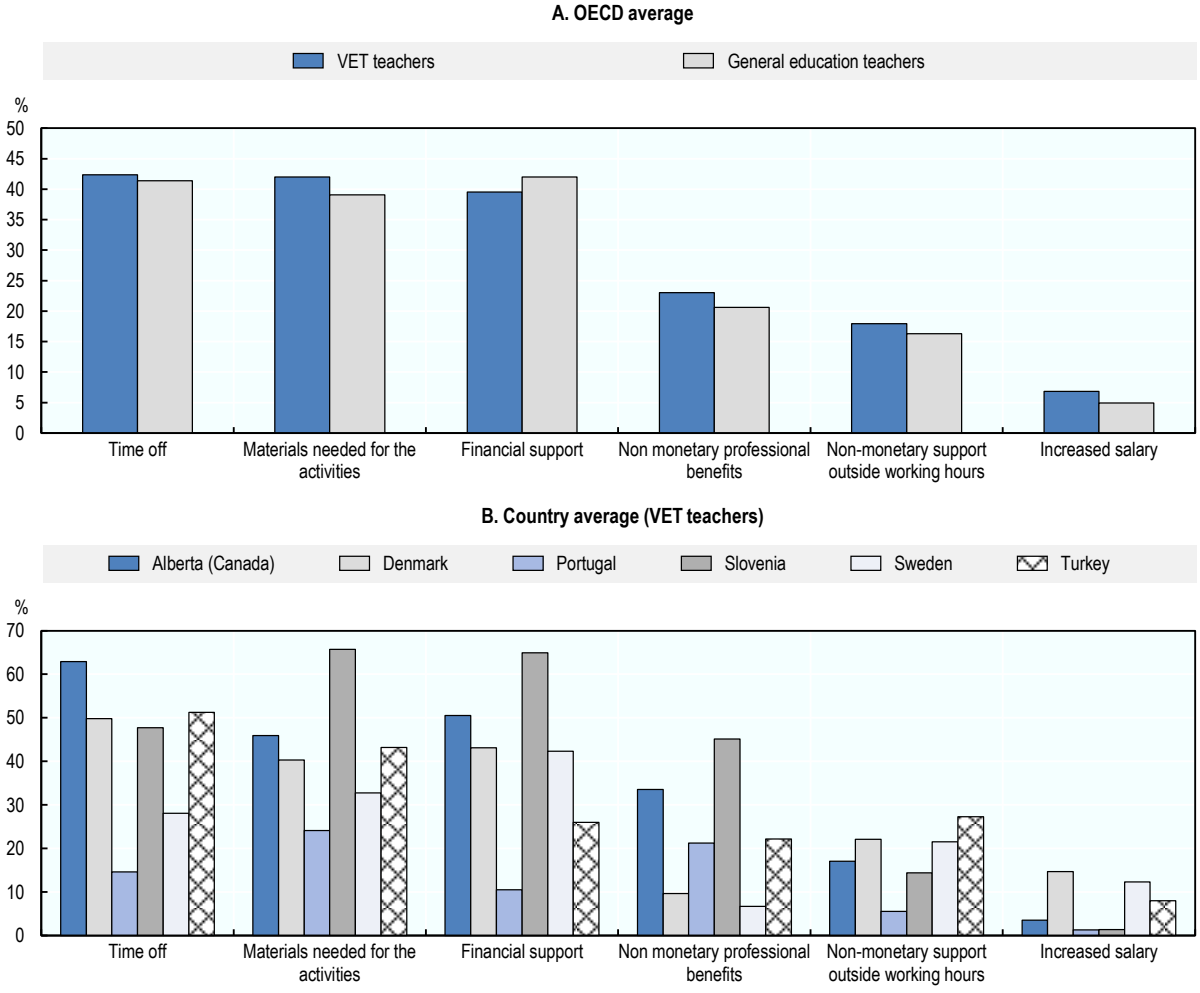
In Missouri (United States), a recent law allows VET teachers to count "externships" hours with local businesses as professional development hours (ACTE and Advance CTE, 2019[42]). Teacher externship means "an experience in which a teacher, supervised by his or her school or school district, gains practical experience at a local business through observation and interaction with employers and employees". Teacher externships can be considered the equivalent of the completion of credit hours in graduate-level courses, which may result in salary increase (Missouri State, 2019[43]).

VET teachers need the right, the support and the resources to participate in professional development

In many countries, participation in professional development is voluntary or dependent on senior management decisions. However, some countries give teachers the right to PD or make it mandatory by law in order to ensure their participation. In Slovenia, for example, PD is both a right and a duty for teachers by law and each teacher is entitled to five days of it per year. Teachers who participate in specific programmes, receive points which are necessary for career advancement (OECD, 2016[44]). In Finland, participation in in-service training is compulsory for teachers in most VET fields and funded by the National Board of Education. In Bavaria (Germany), teachers are obliged to undertake regular, formal training, which is considered as part of their regular teacher assessment. In Italy, the 2015 reform of teacher training established compulsory, structured continuing in-service training for all teachers, including those in VET. Following this, the 2016-19 plan for the professional development of teachers identifies the motives, principles, governance mechanisms, quality aspects, ICT-based information systems, and – more importantly – content, priorities and financial resources for teachers continuing PD. To further enhance their professional development, the plan provides for skills needs analysis, incentives, more flexible training arrangements and a substantial increase in financial resources. Funding was increased from EUR 18.5 million in 2013-16 to EUR 270 million in the period 2016-19.

Figure 3.11. Not many VET teachers are supported in or rewarded for participating in professional development

Share (%) of teachers who reported receiving support for their professional development during the last 12 months



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). The bars represent the unweighted average of the six countries/regions. Data for the individual countries refer to VET teachers only. Time off indicates the percentage of teachers who reported being released from teaching duties for activities during regular working hours for their professional development. Financial support indicates the percentage of teachers who reported receiving reimbursement or payment of costs for their professional development. Non-monetary support for activities outside working hours include reduced teaching time, days off and study leave.
Source: OECD (2019[22]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm

Even in countries where training rights or duties are not included in legislation, mechanisms can be put in place to foster access to PD. In Nordic countries, for example, PD is often personalised and based on negotiations between teachers and their employers. In Sweden, the time allowed for PD is regulated in collective agreements between unions and employers. The current agreement concerning teachers employed by municipalities grants them 102 hours of training per year. Providers (in practice, school leaders) and teachers plan what content should be included in the training. In Denmark, VET schools map the present levels of their teachers' pedagogical and vocational competence, evaluate their need for skills improvement, and provide the relevant professional development opportunities. A large VET school may

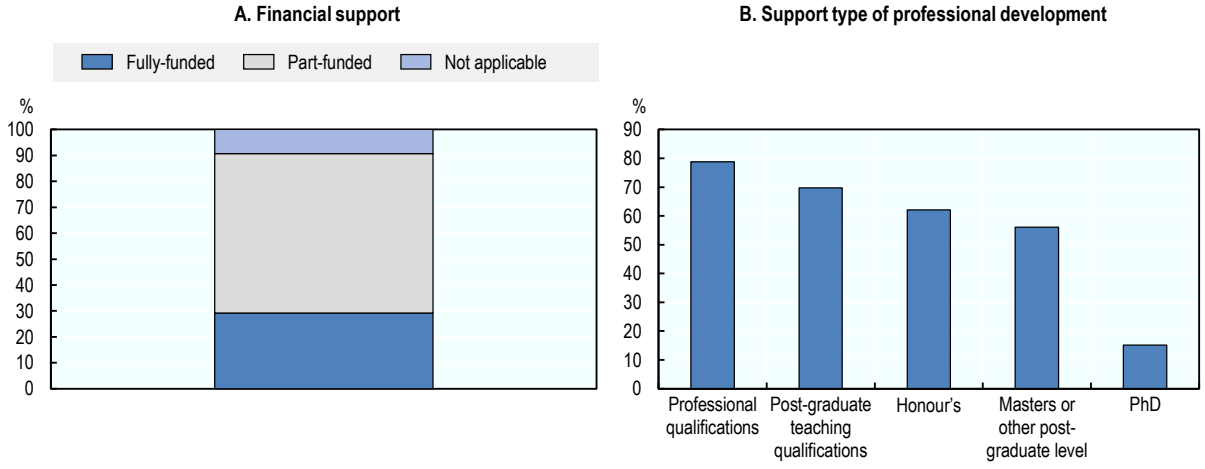
have a department working on this. In Finland, schools and teachers generally draw up a professional development plan whereby teachers can plan and seek training opportunities; 43% of VET teachers have such a professional development plan, which is a larger share than for teachers in other levels of education in Finland (Finnish Board of Education, 2020[45]).

Employer support is crucial for teachers' participation in professional development. TALIS 2018 data include information about the proportion of VET teachers who reported receiving time off and/or financial support for their PD (Figure 3.11). Across the six OECD countries/regions with available data, the most common support measures for PD activities are time off from work (42%), access to materials needed for the activities (42%) and/or financial support (40%). Differences between countries are large. For example, 63% of VET teachers in Alberta (Canada) report receiving time off for PD activities, compared to only 15% in Portugal. In Slovenia, a large share of VET teachers report receiving access to materials and/or financial support (65% for both), while this is much lower in Portugal (24% and 10%, respectively). Differences between VET and general education teachers are small on average across countries, but VET teachers were less likely to report that they received financial support than general education teachers in Denmark (21 percentage points) and Alberta (Canada) (10 percentage points).

Financial support and incentives are important tools to facilitate access to PD. In Denmark, funds are set aside to enable teachers to participate in short occupational courses to acquire the most recent vocational knowledge in their subject and industry (Danish Ministry of Education, 2014[46]). In England, according to the 2020 Association of Colleges Innovation in Further Education Colleges survey (AoC, 2020[47]), nine in ten FE colleges financially support or sponsor their staff to take formal professional development courses (62% partly funded and 29% fully funded, Figure 3.12, Panel A). They mostly fund courses leading to professional qualifications (79% of colleges) or teaching qualifications (70% of colleges), but also degree programmes (Figure 3.12, Panel B). At the national level, England launched the Strategic College Improvement Fund pilot, which provided financial support to colleges to either pay, or make time in the timetable, to enable training for FE teaching staff that would not be provided otherwise. This included improving advanced practitioners' skills, and hiring external experts to identify areas for improvement for teaching quality and provide training or toolkits (CooperGibson Research, 2019[48]).

Figure 3.12. In England, VET providers fund formal professional development for their staff

Share of FE colleges



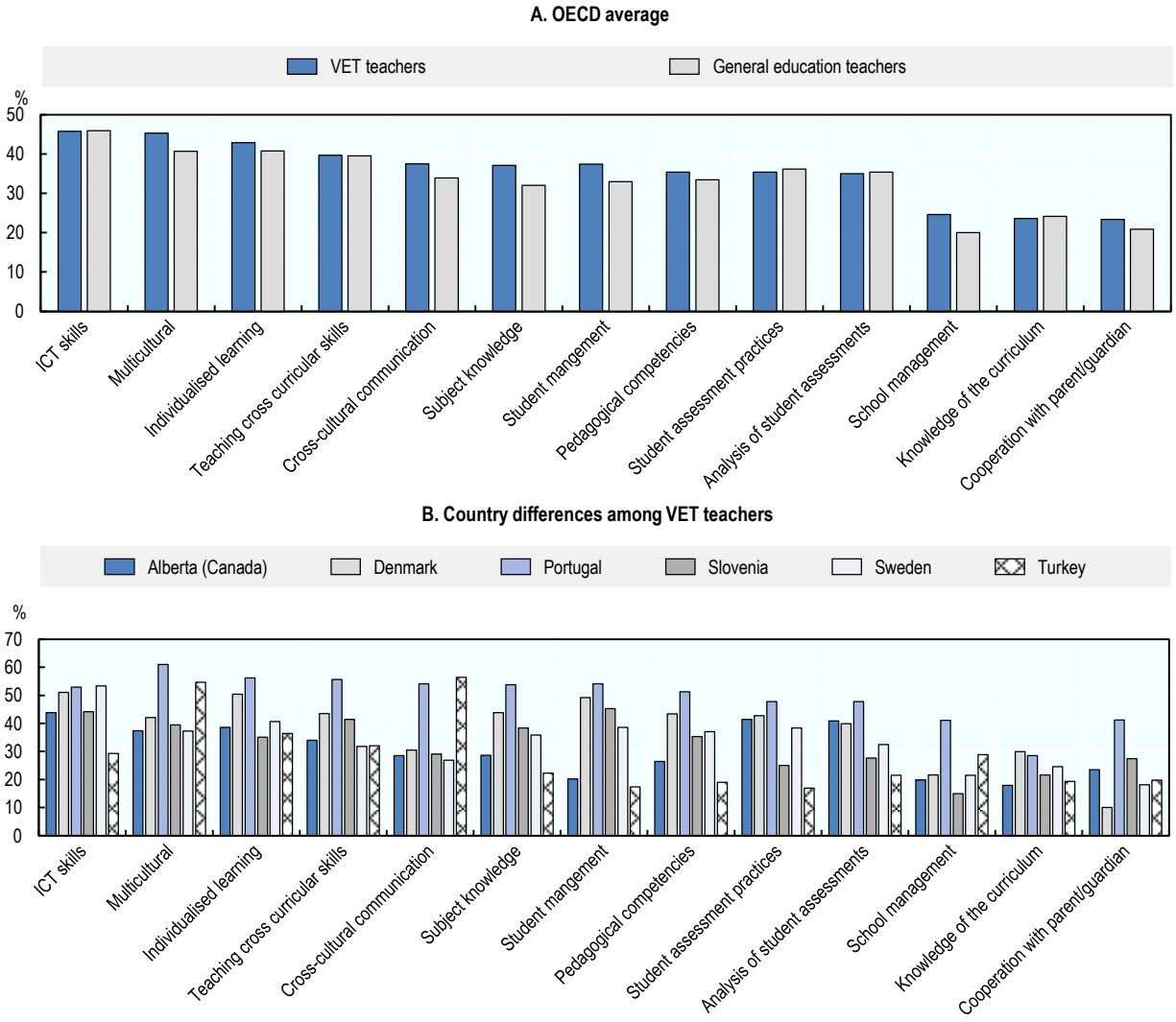
Note: Respondents include 65 FE colleges in England and 1 independent specialist college. Professional qualifications include Chartered Institute of Personnel and Development (CIPD) and Chartered Institute of Marketing (CIM) qualifications, etc.
Source: AoC (2020[47]), Innovation in Further Education Colleges survey 2020, www.aoc.co.uk/system/files/AoC%20Innovation%20in%20Further%20Education%20Colleges%20survey%20summer%202020%20final.pdf

Identifying VET teachers' training needs enables relevant, customised and engaging professional development to be provided

Teachers are more engaged in professional development when it is relevant to their teaching practice, curriculum and subjects. Linking professional development programmes directly to the planning of VET programmes for coming terms and years can be useful for teachers. Customising PD to teachers' needs may require a training needs analysis. To keep their programmes relevant and up to date, PD providers should regularly seek inputs from industry, VET institutions, teachers and leaders.

Figure 3.13. VET teachers have a wide variety of professional development needs

Share of teachers who reported moderate or high level of need of professional development, by area

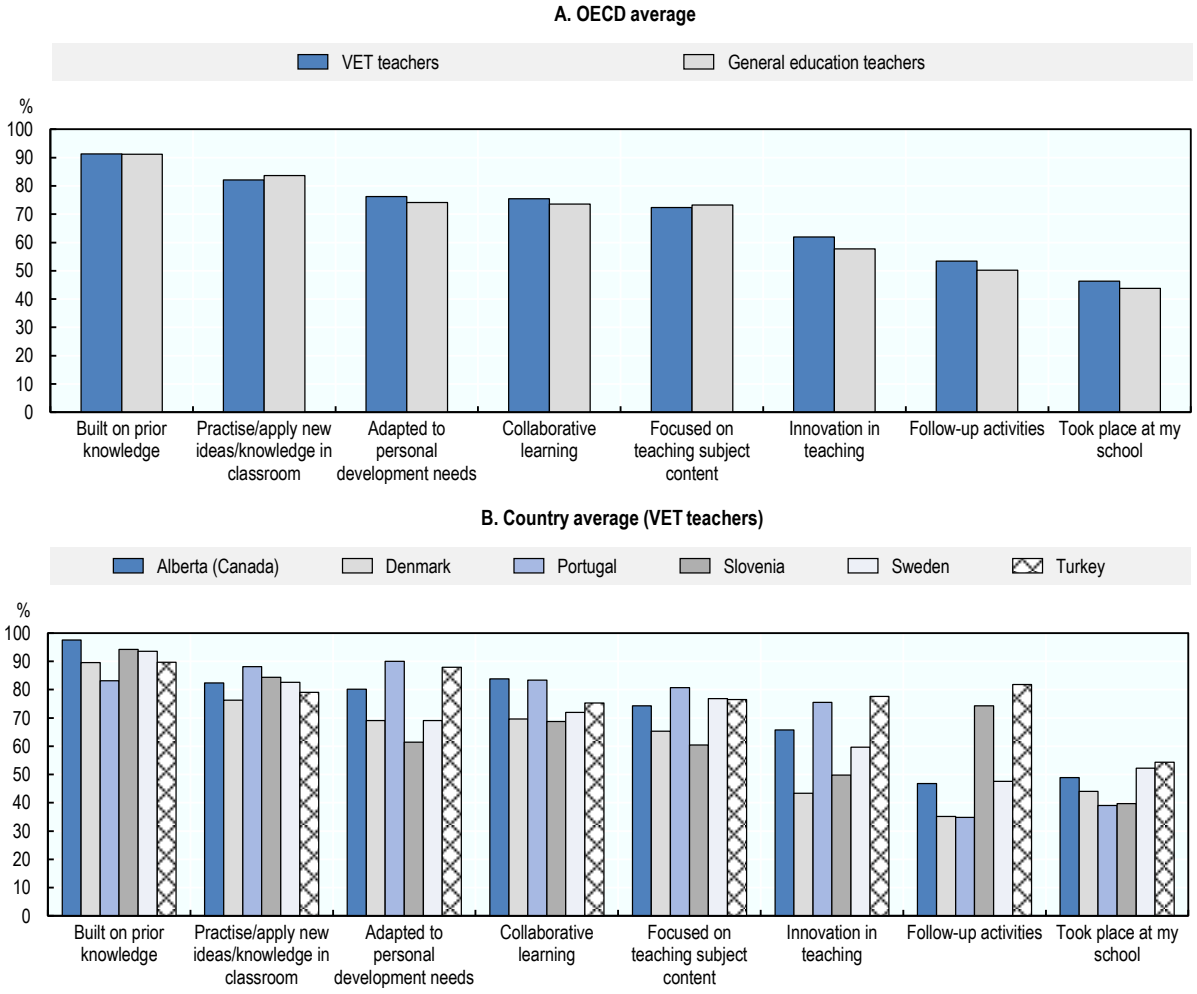


Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). The bars represent the unweighted average of the six countries/regions. Data for the individual countries refer to VET teachers only.
Source: OECD (2019[22]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm

According to TALIS 2018 data, VET teachers feel they need professional development in a variety of areas, including vocational, pedagogical and transversal skills (Figure 3.13). On average across the six OECD countries/regions with available data, the most pressing training needs for VET teachers are information and communications technology (ICT) skills (46% of VET teachers), teaching in a multicultural learning environment (45%), and individualised learning (43%), but there are substantial differences between countries. Therefore, it is necessary to identify the diverse and changing training needs of individual VET teachers, and tailor professional development opportunities to fill their skills gaps. In England, training needs analysis is used to identify skill gaps and professional development needs at both VET institution (FE colleges) and teacher level, as part of the T Level Professional Development offer. Based on this analysis, those teachers who are involved in delivering T Levels are given a tailored plan for training and wider PD opportunities, including subject-specific training that focuses on practical skills development (Education and Training Foundation, 2020[49]).

Figure 3.14. Impactful professional development is personalised and allows for practice and co-operation

Share of teachers who reported positive impact of PD on teaching during the last 12 months, by characteristic of PD



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). The OECD average represents the unweighted average of the six countries/regions.
Source: OECD (2019[22]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm

TALIS data confirm that teachers consider personalised approaches to training to be helpful. Across TALIS countries/regions with available data, 91% of VET teachers who considered a positive impact of their PD on their teaching reported that PD built on their prior knowledge, while 76% reported that PD was adapted to their personal development needs (Figure 3.14). Practical and collaborative learning (82% and 75%, respectively) were also identified as a characteristic of PD by a large share of VET teachers who reported that their PD had a positive impact on their teaching. Collaborative learning can have many benefits, as involving teachers within the same VET institution or across different VET institutions can motivate them to learn new practices, and plan and implement putting their newly learned techniques into practice. Collaborative approaches to PD enhance motivation, responsibility and professionalism. Teacher networks or unions are an important source for self-organising professional development activities. Chapter 4 discusses collaboration networks for supporting the development of VET teachers' skills to use new technologies.

Conclusion and policy recommendations

The VET teaching profession is unique as it lies at the intersection of the world of work and the education sector. On the one hand, VET teachers must keep abreast of the changes in industry to ensure that what they are passing on to their students is up to date and relevant. On the other hand, they are educators who must be able to effectively pass on their theoretical and practical knowledge to their students using modern and proven pedagogical approaches.

Finding VET teachers with this complex set of skills is challenging, and so is ensuring that VET teachers' skills remain relevant and up to date. In many cases, VET teachers are not developing the same level of pedagogical skills as their counterparts in general education. Although many of them may wish to improve their teaching skills, existing training arrangements are not always designed in a way that takes into account the unique situation of VET teachers. At the same time, VET teachers face barriers to participating in training, often due to conflicting work schedules and a lack of financial incentives or support to enable them to take part.

To ensure that VET teachers have the right skills and are not faced with barriers to training participation, actions from a wide range of stakeholders are needed. Governments and training providers can use financial support to motivate VET teachers to participate in training, and can facilitate the provision of flexible and relevant training programmes. Industry and VET institutions also have a responsibility to support VET teachers' skills development, as they are ultimately going to benefit from VET teachers who can better train and support VET students. All stakeholders must therefore work together towards ensuring that VET teachers have access to higher quality training that is more effective.

Policy pointers for preparing and developing VET teachers

2.1. Designing effective initial teacher education and training programmes for VET teachers by:

- ***Developing and strengthening VET teachers' pedagogical skills***: In order to build strong pedagogical skills for VET teachers, ITET institutions need to keep their curricula up-to-date, collaborate with VET institutions to offer practical teacher training, and develop research and innovation in pedagogical approaches.
- ***Providing work-based learning opportunities in industry***: Internships, externships or secondments to industry can equip future teachers with industry-relevant skills. In order to ensure that future VET teachers can develop their industry knowledge, building partnerships between ITET providers and employers is crucial.

- ***Promoting flexible training and providing financial support***: In countries where entry qualification requirements are flexible or teachers can obtain the required qualification while teaching, flexible training provision is crucial to overcome barriers to participation, for example online ITET, weekend and evening classes, or part-time training.

2.2. Increasing participation in relevant professional development opportunities by:

- ***Engaging and co-ordinating with stakeholders to ensure that VET teachers receive the training they need***: Making sure that VET teachers receive the necessary training – whether it is on pedagogical, industry or technological aspects – requires the collaboration and co-ordination of multiple stakeholders at different levels, from VET institutions to teachers and school networks, local companies and universities. All these actors play different, but crucial roles in facilitating access to, encouraging, and providing professional development for VET teachers.
- ***Giving teachers the right to participate in professional development and the support and resources they need to do so*:** In order to foster participation in professional development, countries can give VET teachers the right to professional development or make it mandatory by law. Other mechanisms to ensure access to professional development include collective agreements between unions and employers or professional development plans. Support measures for VET teachers' professional development activities include time off work, access to materials needed to participate in the activities, financial support and career incentives.
- ***Identifying VET teachers' training needs to offer relevant, customised and engaging professional development opportunities***: Teachers are more engaged in professional development when it is relevant to their teaching practice, curriculum and subject; customised to their needs. Identifying skill gaps and associated training needs is key to developing and improving VET teachers' professional development.

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Notes

[1] According to a survey conducted by the European Training Foundation, more than 95% of the teaching workforce in VET schools in Turkey have a bachelor's or a higher degree, and more than 95% of the teaching workforce had attended an initial educational or training programme; 98% of the teaching workforce is formally qualified as a teacher, instructor or a co-ordinator of practice (Akyildirim and Durgun, 2019[50]).

[2] This is measured based on existing questionnaires from earlier literature, see Kim and Phang (2018[15]) for more details.

[3] VET teachers of specialised training colleges do not have to have a specific licence, but the quality of colleges is ensured by the standards for establishment.

[4] The Flemish Community in Belgium, the Czech Republic, Lithuania, the Netherlands, Sweden and the United Kingdom.

[5] TALIS results are confirmed in survey conducted in Turkey by the European Training Foundation, which found that 84% VET teaching staff declared that they completed pedagogical training as part of their degree studies. One out of 10 reported that they completed a separate pedagogical training which was not part of a degree programme. 71% reported that pedagogy (or didactics) of the subjects they teach was included in their formal education. 70% declared that classroom practice in the subject they teach included as part of their formal education. Two-thirds of VET teachers declared that content of the subject they teach was included as part of their formal education for all subjects they teach. One fourth of the VET teachers stated that content of the subject, pedagogy or classroom practices they teach was included in their formal education only for some subjects (Akyildirim and Durgun, 2019[50]).

[6] Formal training is a programme of instruction in an educational institution, adult training centre or in the workplace which generally leads to a qualification or certificate. Non-formal training involves programmes or training courses that are not usually evaluated and do not lead to certification, for example courses through open and distance education, organised sessions for on-the-job training or training by supervisors or co-workers, seminars, workshops or private lessons. Informal learning refers to typically unstructured learning resulting from daily work-related, family or leisure activities, for example learning by doing a task, learning from colleagues and supervisors, or learning new things to keep up with one's occupation.

[7] This comprises both job-related and non-job-related training. In countries with available data, most of the training was job related, except in France where 60% was not job-related.

4 Promoting innovative pedagogical approaches in vocational education and training

This chapter discusses the increasing demand for digital and soft skills in the workplace, and how this creates a need for innovative teaching in vocational education and training (VET). It details existing innovative pedagogical approaches and provides concrete examples of how professional development opportunities and other support mechanisms can prepare VET teachers to innovate in their teaching practices.

Key messages for promoting innovative pedagogical approaches in VET

As automation and digitalisation in the workplace rapidly change job requirements, today's vocational education and training (VET) teachers need to equip their students not just with vocational skills, but also with strong digital and soft skills. These skills are today crucial in the workplace and essential for the use of technology. Policy makers need to highlight the importance of these skills and promote their incorporation into VET teaching and learning, to guarantee a smooth transition of VET graduates into the labour force and increase their adaptability.

Pedagogical approaches such as inquiry-based, project-based and collaborative learning can help develop fundamental soft skills such as critical thinking, creativity, team work and communication. These pedagogical approaches can incorporate innovative elements such as gamification, blended learning and experiential learning. The use of innovative technology such as robots, virtual reality (VR), augmented reality (AR) and simulators allows teachers to develop students' vocational skills while also fostering their digital and soft skills. These technologies are likely to become more common in VET in the years to come, as they have advantages in terms of flexibility, cost and safety. They are also well suited to facing the challenges imposed by digitalisation and industry 4.0.

VET teachers will need to know how to adapt their teaching to incorporate the development of soft skills. This can prove challenging for many VET teachers, since in several countries they have limited training in pedagogy. Moreover, in order to use technology to incorporate innovative pedagogies into their teaching, they need to have solid digital skills themselves. However, a large proportion of VET teachers are currently not well equipped with the skills required to teach in digital environments. In order to address these issues, high-quality initial teacher education training and continuous professional development are crucial to update teachers' pedagogical knowledge and digital skills. Keeping VET teachers up to date with the latest technological developments in industry will also require close collaboration with employers.

Policy pointers

- 3.1. Fostering the capacity of VET teachers to use innovative pedagogical approaches.
- 3.2. Providing VET teachers with strategic guidance and institutional support for the integration of new technologies in VET.
- 3.3. Foster innovation through partnerships between the VET sector, industry and research institutions.
- 3.4. Raising awareness about the importance of innovation, ICT and soft skills in teaching in VET.

The increasing need for digital and soft skills

The demand for digital and soft skills in the labour market is rising

Digital skills have become a fundamental part of the workplace today, increasing the need for VET systems to develop those skills alongside more occupation-specific ones (see Box 4.2 for a definition of digital skills). The use of advanced technology in the workplace has increased in recent years for workers in all sectors and occupations, including elementary occupations that generally require lower levels of cognitive skills. Today, craft and trade workers – who often have a VET qualification – make more intensive use of

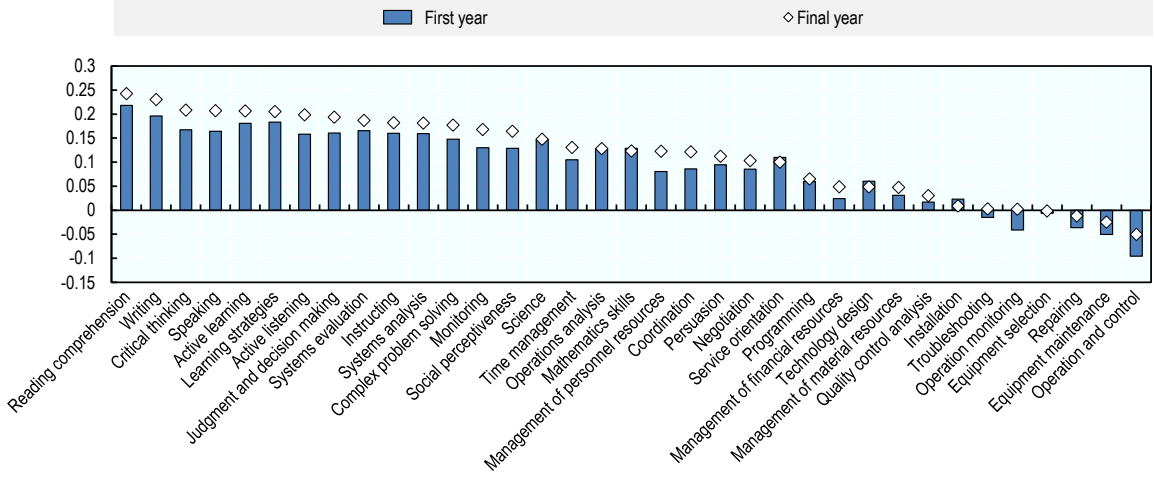
their digital skills, as their workplaces adopt electronic devices, complex machinery or robots. For example, professionals in the logistics sector make frequent use of tablet computers and specialised software to report on, administer and control cargo; automotive mechanics use sophisticated digital devices to test the correct functioning of engines; welders in some manufacturing companies use software to manage soldering robots; and employees in high-risk environments such as power plants use simulation tools or virtual reality (VR) to assess physical risks. In the health sector, which also employs many VET graduates, dentistry, medical and optical assistants make use of sophisticated digital imaging technologies, while medical laboratory technicians make use of digital laboratory testing equipment.

Digitalisation in the workplace has also increased the need for strong basic skills (e.g. literacy, numeracy and digital skills) and soft skills (e.g. critical thinking, communication, collaboration and team work) in all industries. As robotics and automation will become more widespread, this will affect the skills needed to succeed in the workplace in all industries. In OECD countries, skills traditionally linked to trade occupations, such as control and monitoring of industrial operations or maintenance of equipment, are already experiencing surpluses (Figure 4.1). At the same time, cognitive and soft skills, such as reading, writing, critical thinking and active learning, are increasingly in short supply.

Strong soft and digital skills allow workers to be more flexible in meeting labour-market demands. In a dynamic labour market, workers are unlikely to remain in the same profession during their entire careers. As existing occupations change and new ones are created, workers will need to be flexible enough to adapt to regular job changes. Cross-cutting skills facilitate those job transitions and allow individuals to be more employable in the long term.

Figure 4.1. OECD countries face widening skills imbalances

Shortage (+) or surplus (-) intensity in selected skills (OECD average)



Note: Average values for 33 OECD countries. “First year” represents the initial application of the respective survey, whereas “Final year” represents its latest application. Positive values represent shortages (e.g. unsatisfied demand in the labour market for the analysed skills). Negative values represent surpluses (supply exceeds demand in the labour market for the analysed skill). Results are presented on a scale that ranges from -1 to +1. The maximum value represents the strongest shortage observed across OECD (33) countries and skill areas.
Source: OECD (2018[1]), Skills for Jobs database, https://stats.oecd.org/Index.aspx?DataSetCode=SKILLS_2018_TOTAL.

Digitalisation and automation have fundamentally changed the skills needed from VET graduates, and further changes are expected (ILO, 2020[5]). For example, sectors such as the automotive industry (Box 4.1), the energy and utilities industry, and the consumer products industry, are likely to increasingly implement smart factories or other forms of automation in their manufacturing processes (Capgemini Research Institute, 2020[3]). Given that occupations involving routine tasks are being transformed, restructured or disappearing due to increasing levels of automation[1] (see Figure 1.3 in Chapter 1), VET will need to focus more on those tasks and occupations that demand higher levels of autonomy, planning, team work, communication and customer service skills and are less likely to be automated (OECD, 2019[6]). This growing need for digital and soft skills in the labour market will induce a pedagogical shift in VET, which has traditionally focused largely on developing technical occupation-specific skills.

Box 4.1. Smart factories in the automotive industry: Industry 4.0

Smart factories are an application of Industry 4.0,[1] which use intelligent production systems and processes as well as suitable engineering methods and tools to successfully implement distributed and interconnected production facilities (Shrouf, Ordieres and Miragliotta, 2014[2]). In smart factories, workers, machines and robots, logistic systems and products communicate and co-operate directly with one another, and a large number of processes are completely automated.

The automotive industry has been one of the most advanced in implementing automation by making use of artificial intelligence (AI) and robotics in smart factories. According to a survey[2] conducted by the Capgemini Research Institute, three out of ten automotive factories had been made smart between 2017 and 2019 (Capgemini Research Institute, 2020[3]). Automotive smart factories show high levels of connectivity and automation. Smart devices, robots and machinery, manufacturing processes, and logistical systems are all interconnected and can be flexible if there are new production requirements. Data analytics and real-time information management support production processes and achieve higher productivity, shorter manufacturing times, decreased defect rates and lower physical prototyping and testing costs.

Operating these plants requires highly complex engineering processes at all levels. Plant operators make use of their digital skills in several processes: tele-operated motion processes (e.g. use of collaborative robots, automated guided vehicles or drones), virtual testing of parts and packaging from suppliers through virtual reality, and troubleshooting through augmented reality. Smart factories also need workers to have strong analytical and AI capabilities to make intensive use of Internet of Things (IoT) applications, perform real-time analytics for edge computing, or operate self-triggered order placement systems based on inventory levels.

1. In Industry 4.0, with intelligent and digitally networked systems available, a largely self-organised production process is possible. Industry 4.0 relates to production processes where the flexibility that exists in value-creating networks is increased by the application of cyber-physical production systems. This enables machines and plants to adapt their behaviour to changing orders and operating conditions through self-optimisation and reconfiguration. Systems can perceive information, derive findings from it and change their behaviour accordingly (Shrouf, Ordieres and Miragliotta, 2014[2]).
2. Capgemini Research Institute, Smart factory survey, April–May 2019. One thousand manufacturers responded to the survey (Capgemini Research Institute, 2019[4]).
Source: Capgemini Research Institute (2020[3]), How Automotive Organizations Can Maximize the Smart Factory Potential, https://www.capgemini.com/se-en/wp-content/uploads/sites/29/2020/02/Report-—-Auto-Smart-Factories-22.pdf

The demand for higher-level digital skills is on the rise

VET systems will need to provide the stronger digital skills their graduates will need to succeed in future occupations. In many occupations VET graduates will need more than basic digital skills to succeed in highly automated work environments (for information on digital skills levels see Box 4.2).

Box 4.2. The three levels of digital skills

Basic functional digital skills

Basic functional digital skills enable an individual to access and engage with digital technologies. These are the entry-level skills required to make rudimentary use of digital devices and applications. They can be seen as the essential skills needed to access and begin to use digital technology. Users with basic digital skills are able to connect to the Internet, set up accounts and profiles, and access information and resources. These users are able to understand basic information and communications technology (ICT) concepts, adjust settings and manage files. There are a number of foundational skills that allow an individual to operate devices and implement these basic activities: psychomotor skills, basic numeracy and literacy skills.[1] These "basic skills" are continuously changing, as new devices and interfaces are made available.[2]

In the Survey of Adult Skills (PIAAC) (OECD, 2016[7]), "basic functional digital skills" refer to the skills of those who are familiar enough with computers to use them to perform basic information-processing tasks (adults with computer experience). They are enough to pass the PIAAC ICT core test, which assesses the basic ICT skills, such as the capacity to use a mouse or scroll through a web page, needed to take the computer-based assessment. However, they are not sufficient to solve basic problems making use of these technologies (performing at proficiency levels at or below Level 1[3]).

Generic digital skills

Generic digital skills enable an individual to use digital technologies in meaningful and beneficial ways. These require a wide range of intermediate skills and competences which are included and expanded in frameworks including the *European Digital Competence Framework for Citizens* (Carretero, Vuorikari and Punie, 2017[8]) or the *UK Standards for Essential Digital Skills* (UK Department for Education, 2019[9]). While these frameworks vary in how they describe these types of skills, they share a number of skill and competence areas:

1. **Information literacy** and **data literacy** are the ability to use information and data. For example, the *European Digital Competence Framework* identifies several aspects of information use, such as an individual's awareness of their information needs; the ability to locate and retrieve digital information and content, to evaluate and judge the relevance and reliability of information sources, and to store, manage, and organise digital information and content.
2. **Digital communication** and **collaboration** are the ability to use digital technologies to interact and share with others. These digital citizenship and digital participation skills range from the capacity to participate of online communities and groups to contributing to a collective understanding of the responsibilities that digital users have towards each other.
3. **Digital content creation** refers to the skill and confidence needed to publish content, contribute to existing platforms and build digital environments, emphasising collaborative co-creation and re-creation of existing content, as well as the individual authoring of original content.[4]

In the Programme for the International Assessment of Adult Competencies (PIAAC), "generic digital skills" refer to the ability to perform tasks that typically require the use of widely available and familiar technology applications, such as e-mail software or a web browser, and who are also able to use both generic and more specific technology applications. They are also capable, at least to some extent, of solving problems making use of these technologies (performing at proficiency levels above Level 1). These generic digital skills are measured in the survey at three different levels.

Higher-level digital skills

Higher-level digital skills enable an individual to use digital technologies to empower and transform. This includes those advanced skills that form the basis of specialist ICT occupations and professions:[5] proficiency in programming languages, data analysis, processing and modelling skills. They include the specialist skills needed to program or develop applications and manage networks (Spiezia and Sabadash, 2018[10]). These are high-level technical skills that are not developed through everyday technology use, but are usually result of advanced education and training, as well as extensive self-tuition and practical experience.

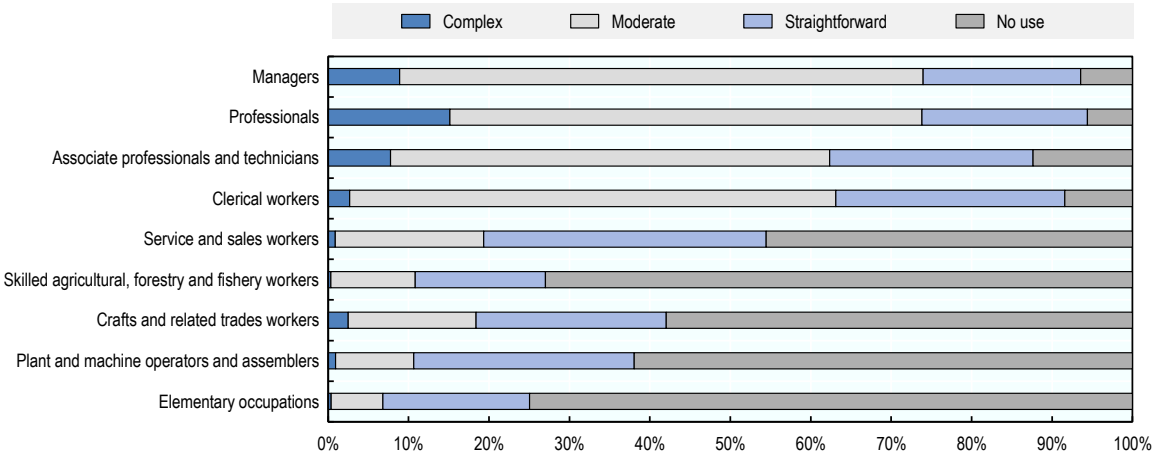
1. All these basic skills are integral to progressing from being a non-user of digital technology to a user. Psychomotor skills such as manual dexterity and gestural skills are required to use keypads and operate touch-screen technologies. Basic numeracy and literacy allow users to make sense of and respond to visual cues and representations embedded in software and applications, as well as content created by other users.
2. For instance, the use of digital devices and systems over the next decade are likely to involve a range of different modes of engagement and interaction. Devices are increasingly tactile in terms of input and output, requiring a range of interactional skills involving touch, gesture and other psychomotor competencies. The use of voice-initiated commands will also make possible a change in operating systems moving away from traditional desktop interfaces or text-based and icon-based interactions. All of these features will change the nature of what is considered to be the entry-level digital skills required to access and make functional use of digital technologies.
3. Individuals performing at PIAAC Level 1 can make use of widely available and familiar technology applications, such as e-mail software or a web browser. At this level there is little or no navigation required to access the information or commands required to solve the problem that individuals are presented with. See OECD (2016[7]) for more information.
4. The European framework highlights the capability to "edit", "improve" and "integrate information and content into an existing body of knowledge" (European Commission, 2017[11])
5. Although most of these skills remain within the domain of professional ICT occupations, in recent years there has been an increased promotion of computer programming skills (or "coding") as a higher-level digital skill that is relevant to all citizens, regardless of their professional role.

Source: Adapted from Broadband Commission for Sustainable Development (2017[12]), Working Group on Education: Digital Skills for Life and Work, https://broadbandcommission.org/workinggroups/Pages/wgeducation.aspx.

According to the Survey of Adult Skills, a product of the Programme for the International Assessment of Adult Competencies (PIAAC),[2] a large proportion of professionals in medium-skilled and low-skilled occupations already needed more than basic digital skills during the period 2011-2017 (Figure 4.2). For example, across OECD countries with data available, just under 20% of craft and related trades workers and sales and services workers reported moderate or complex computer use. In manufacturing, it has become common for plant and machine operators to programme machines or robots to do the tasks that they need to perform. This increasingly complex computer use implies that VET graduates will need to be able to learn how to use new machinery and digital devices, setting them up to a desired specification while working in highly digitalised work environments.

Figure 4.2. Digital skills are in high demand in the labour market

Percentage of workers reporting different levels of computer use, by type of occupation (OECD average)

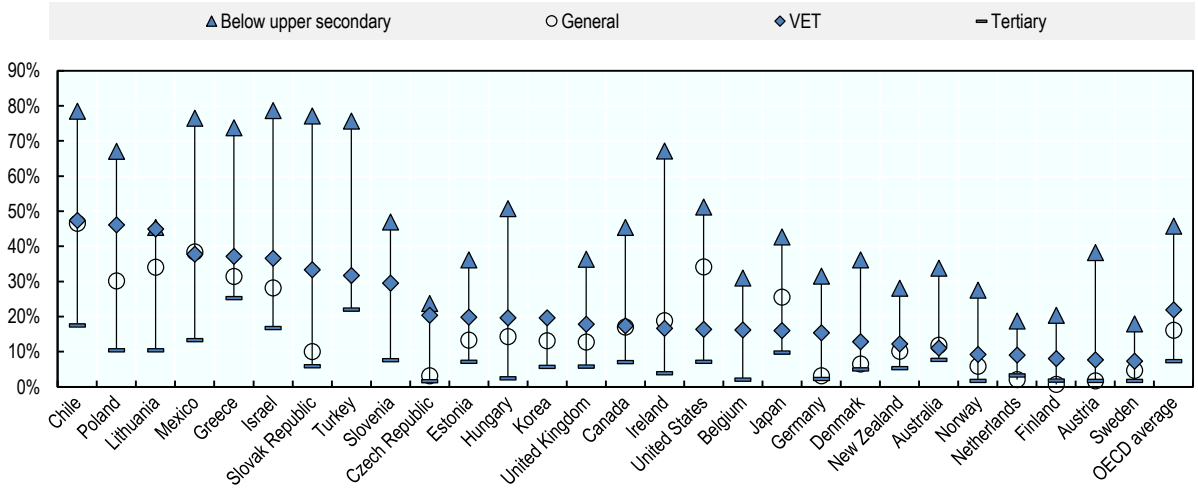


Note: Includes employed individuals aged 16 to 65 from OECD countries participating in the Survey of Adult Skills (PIAAC).
Source: Calculations using OECD (2017[13]), OECD Survey of Adult Skills (PIAAC) (Database 2011/12, 2014/15, 2017), http://www.oecd.org/skills/piaac/publicdataandanalysis/.

Despite the increasing need for digital skills in different occupations, during the time period 2011-2017 most OECD countries had a large proportion of workers who did not have the basic digital skills needed to solve simple problems making use of ICT. According to the OECD Survey of Adult Skills (PIAAC) (OECD, 2019[14]), more than one-third of adults did not achieve Level 1 proficiency level in problem-solving skills making use of ICT, and the proportion of adults with high proficiency in these skills was fairly low in many countries. This is confirmed by other research, such as the research carried out by Ipsos MORI (2018[15]) in the United Kingdom, which estimates that over 10% of its employed population lacked basic digital skills. The OECD Skills Outlook (OECD, 2019[6]), shows that workers of all ages, and especially those from older generations, will need to upskill or reskill to be able to master these digital technologies in the workplace. The problem is less pressing among young adults, but while a large proportion of young adults today can operate a computer or use a smartphone or a tablet, in some countries a significant share still has weak digital problem-solving skills (Vandeweyer and Verhagen, 2020[16]). According to the Survey of Adult Skills (PIAAC), on average across OECD countries around 80% of young VET graduates are able to at least solve basic problems making use of ICT (PIAAC Level 2 and above, see Figure 4.3). This is lower than the share of young adults with a general educational qualification (at the same level) and those with a tertiary education. Interestingly, in the Unites States and Japan VET graduates perform significantly better than graduates from general education programmes in PIAAC problem solving tasks using ICT. In Chile, Poland and Lithuania, only around 60% of young VET graduates reached PIAAC Level 2.

Figure 4.3. Young VET graduates have weaker digital problem-solving skills than those with a general upper secondary education

Percentage of individuals performing at PIAAC Level 1 or below in problem-solving tasks in technology-rich environments, by level of educational attainment



Note: Includes individuals aged 16 to 34 not in formal education. At or below Level 1 in problem-solving includes adults with no computer experience and adults who failed the ICT core test. VET refers to individuals whose highest qualification was vocational at ISCED Level 3 (upper secondary) and 4 (post-secondary non-tertiary). Similarly, "general" refers to general non-VET programmes at ISCED Levels 3 and 4. Belgium refers to Flanders only. Information for the United Kingdom refers to England and Northern Ireland only.
Source: Vandeweyer and Verhagen (2020[16]), "The changing labour market for graduates from medium-level vocational education and training", https://doi.org/10.1787/503bcecb-en; Calculations using OECD (2017[13]), OECD Survey of Adult Skills (PIAAC) (Database 2011/12, 2014/15, 2017), http://www.oecd.org/skills/piaac/publicdataandanalysis/.

Among the most fundamental changes in workplaces are the implementation of smart factories (Box 4.1) and the Internet of Things (IoT), which suggest a greater need for higher-level digital skills among workers. A recent survey shows that IoT and other hyper-connectivity solutions are likely to have a strong impact on occupations not only in the manufacturing and automotive sectors, but also in the agriculture, health, consumer, financial and engineering sectors (World Economic Forum, 2020[17]). In the short term VET teachers will have to prepare their students to use these technologies in the workplace. Initiatives like the Learning Factory 4.0 in the State of Baden-Württemberg in Germany (Box 4.3) could prove a good strategy for training both teachers and students on the practical implications of Industry 4.0 and the use of new technology in industry.

To overcome digital skill shortages in the workforce, VET teachers should be developing these skills among their students, ideally making use of the new digital technologies available in the workplace. This implies that teachers themselves will need to have strong digital skills and be able to integrate new technologies into their teaching.

Box 4.3. Preparing for Industry 4.0: A learning factory in a VET school (Baden-Württemberg State, Germany)

The Ministry of Economy, Labour and Housing in the State of Baden-Württemberg is promoting the establishment of smart learning factories in VET schools. Preparing for future challenges imposed by changes in industrial manufacturing – driven by Industry 4.0 and the Internet of Things – the State of Baden-Württemberg founded the Allianz Industrie 4.0 in 2015, involving key players in the state. As part of this alliance, the state government developed a "learning factory 4.0" at the vocational school *BSZ Bietigheim-Bissingen* (Lernfabrik Bietigheim-Bissingen, 2020[18]), with support from the Ludwigsburg district.

The learning factory incorporates an interlinked machine system, a production system that produces model cars fully automatically, making use of real industrial components. It was developed by the company *teamtechnik Maschinen und Anlagen GmbH,* together with the learning factory team of the BSZ vocational school centre. Original Industry 4.0 components were installed: a manufacturing execution system computer, a Quick Response (QR) Code scanner, a marking laser and a collaborative robot. The basic laboratory includes 16 workstations where the students work in pairs on training modules.

As part of their training, students can program training modules with programmable logic controllers. They can analyse the functionality of each individual component and evaluate their suitability for Industry 4.0 manufacturing processes. All training modules are mounted on mobile units that can be connected to the IT network, the power supply and the pneumatic system at each of the stationary workstations.

Many students from full-time VET courses at the BSZ and the Carl Schaefer School benefit from the learning factory, in particular students of mechatronics and industrial mechanics, IT specialists, technicians, and students at the technical high school. Students from commercial courses such as industrial clerks and the business school also benefit from the learning factory. VET teachers and industry professionals have access to these facilities as well. They are introduced to the learning factory and its technologies usually through training courses and seminars.

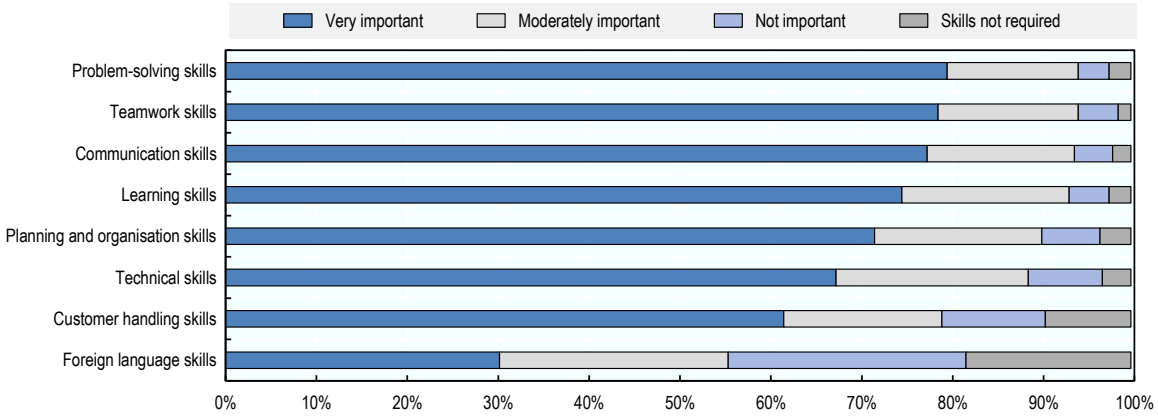
Source: Lernfabrik Bietigheim-Bissingen (2020[18]), Programmiert auf Lernerfolg!, www.lernfabrik-bietigheim.de/anlage/.

Automation increases the importance of soft skills in the workplace

Since soft skills complement the use of digital technologies (OECD, 2019[19]), they have also become key skills for VET graduates (ILO, 2020[5]). For instance, a recent survey in the United States showed that employers consider soft skills such as problem solving, team work, verbal communication, leadership and interpersonal relations to be among the most valuable skills for workers joining industry (NACE, 2019[20]). In 2014, the European Centre for the Development of Vocational Training (CEDEFOP) Employer Survey showed that problem-solving skills, team-working skills and communication skills were the most important transversal skills in the workplace in European countries (Figure 4.4), with over three-quarters of employees reporting these skills as very important for doing their job. According to the World Economic Forum's *Future of Jobs 2020 Report* the top skills and skill groups which employers see as increasing in importance in the next five years include critical thinking and analysis, problem solving, and self-management skills such as active learning, resilience, stress tolerance and flexibility (World Economic Forum, 2020[17]).

Figure 4.4. Problem-solving, team-working and communication skills are among the most important skills in the workplace

Share of employees declaring level of importance of selected skills



Note. Percentage of all respondents (48 676). Responses to the question: "On a scale from zero to ten, where zero means not at all important, five means moderately important and ten means essential, how important are the following six skills for doing your job?". Responses in the interval seven to ten of the importance scale were classified as "very important", four to six as "moderately important", and zero to three "not important". "Skills not required" is a separate category (not shown), for those answering "Don't know/no answer".
Source: Cedefop (2015[21]), Skills, qualifications and jobs in the EU: the making of a perfect match? Evidence from Cedefop's European skills and jobs survey, http://dx.doi.org/10.2801/606129.

The increasing need for soft skills in the workplace represents an important challenge for VET teachers. Although these skills have always been considered a valuable asset for VET graduates in the workplace, the introduction of new technology and the automation of many tasks in the workplace will change the nature of many typical VET occupations (see Box 4.5 for an example from the logistics sector). As soft skills become more prominent, VET teachers should gain deeper knowledge about how to develop them among their students, and how they can be effectively developed in practical settings. Teachers will increasingly have to teach their students how to think creatively, solve complex problems making use of technology and collaborate with colleagues in highly technological environments, while developing good relationships with their peers.

One might argue that the development of soft skills is inherent to VET, as they would be produced as a natural consequence of vocational practice. Some practitioners believe that the practical nature of VET programmes, and work experience in industry is enough to develop the soft skills needed to successfully adapt to the workplace. However, this ignores the complexity and diversity of soft skills, many of which are not automatically developed on the job. Among soft skills, socio-emotional skills play a fundamental role in the workplace. According to the OECD's Study on Social and Emotional Skills (OECD, 2017[22]), skills – such as persistence, empathy and optimism – are just as important as basic skills. These skills do not only help students succeed in the workplace, they also allow them to perform better academically and to play more positive roles in their communities (see Box 4.4 for more information about socio-emotional skills).

Box 4.4. What are socio-emotional skills?

Social and emotional skills are a set of individual capacities that can be manifested in consistent patterns of thoughts, feelings and behaviours (Chernyshenko, Kankaraš and Drasgow, 2018[23]). These skills differ from cognitive abilities such as literacy or numeracy because they mainly concern how people manage their emotions, perceive themselves and engage with others, rather than their raw ability to process information. However, some socio-emotional skills are also fundamentally dependent on cognitive skills, such as perception, memory, and reasoning. Some components of cognitive skills are so closely linked with socio-emotional skills that it is difficult to tell them apart and attribute the acquisition of these skills to one category or another. For example, the socio-emotional skill "empathy" also requires cognitive skills such as perspective taking (OECD, 2017[22]).

Among several conceptual frameworks to describe socio-emotional skills, one of the most used is the so called Big Five framework (Gosling, Rentfrow and Swann, 2003[24]). Social and emotional skills in this framework are arranged hierarchically, with five domains (conscientiousness, emotional stability, agreeableness, openness to experience and extraversion) that can be split into narrower, lower-order skills. The OECD Study on Social and Emotional Skills (OECD, 2017[22]) includes the following skills under those domains:

- **Conscientiousness** (task performance) includes achievement orientation, responsibility, self-control and persistence.
- **Emotional stability** includes stress resistance, optimism and emotional control.
- **Agreeableness** (collaboration) includes empathy, trust and co-operation.
- **Openness to experience** (open-mindedness) includes creativity, curiosity and tolerance.
- **Engaging with others** (extraversion) includes sociability, assertiveness and energy.

In addition to these skills, the framework for the OECD *Study on Social and Emotional Skills* (2017[22]) includes a group of three compound skills, representing combinations of two or more individual skills:

- **Critical thinking** (a mix of cognitive capacities and open-mindedness skills such as independence) is the ability to evaluate information and interpret it through independent and unconstrained analysis.
- **Meta-cognition** (a result of self-awareness, openness to experience and self-control) is the awareness of inner processes and subjective experiences, such as thoughts and feelings, and the ability to reflect on and articulate such experiences.
- **Self-efficacy** (a result of conscientiousness, emotional stability and extraversion) is the strength of individuals' beliefs in their ability to execute tasks and achieve goals.

The 21st century skills framework, broadly used as a reference in educational contexts (Scott, 2015[25]), argues that there is a group of four soft skills that are fundamental to prepare individuals for adult life (the so called 4C's)**: communication, collaboration, creativity and critical thinking**. Communication and collaboration skills, including empathy and sociability, enable people to interact respectfully with each other. Creative thinking skills, such as curiosity, allow people to think unconventionally and imagine new scenarios. Finally, critical thinking is a crucial component in judging information, identifying problems and reacting to them (Erdoğan, 2019[26]).

Source: OECD (2017[22]), Social and Emotional Skills: Well-being, Connectedness and Success, http://www.oecd.org/education/ceri/social-emotional-skills-study; Scott (2015[25]), The futures of learning 2: What kind of learning for the 21st century? UNESCO Education Research and Foresight Working Papers, http://unesdoc.unesco.org/images/0024/002429/242996e.pdf.

Box 4.5. Soft skills in digital supply chains

Supply chains are undergoing major changes due to the automation and digitalisation of many processes (I-SCOOP, 2020[27]). The most obvious example is the way automated warehouses – making use of robots, information systems powered by machine learning and real-time data to process customer orders – are gradually replacing traditional warehouses. In order to meet the demands of Industry 4.0, it is key to have an automated, intelligent and increasingly autonomous flow of goods, materials and information between the point of origin, the point of consumption and the various points in between (I-SCOOP, 2020[27]).

In the short term these trends in supply-chain management will create more jobs for data scientists, analytics engineers and IT and big-data specialists who bring their digital knowledge to the enterprise (Mckinsey, 2017[28]). However, to produce long-lasting results, these specialists will need the support of supply-chain managers and operators to translate their expertise into real supply-chain applications.

All of these changes imply that most employees in the supply-chain sector will not only need to have strong digital skills, but also strong communication and collaboration skills. Team leadership, creativity and strategic thinking will also be in high demand. Overall, better cross-functional communication and leadership skills will strengthen supply chain management collaboration with both the research and development (R&D) and the sales and marketing functions, facilitating an integrated execution from idea to market (Mckinsey, 2017[28]). According to McKinsey (2017[28]), new roles in digital supply chains will be created once automation has been implemented, with different skill profiles and knowledge requirements in each function:

- **Planning functions** will need people to be able to work with complex datasets, applying algorithms (such as predictive analysis and machine learning) to exploit supply and demand information.
- **Physical flow and logistics roles** will require logistics experts who can provide relevant insights to the design process when automating processes in real settings, like warehouses. Their knowledge will contribute to practical applications of automation in supply-chains. Cross-functional teams of experts and operators in logistics, purchasing and transport will co-develop tailored solutions to company-specific requirements.
- **Customer service roles** will increase as customer engagement levels grow. As automated order- and customer-management processes take place, a more customer-centric supply-chain design will be implemented. Customer interaction and engagement are likely to move into digital channels.
- **Supply-chain strategists** will take advantage of the existing platforms for data sharing, analysis, collaboration and logistics services. This is likely to push organisations to create new revenue streams through the supply chain.

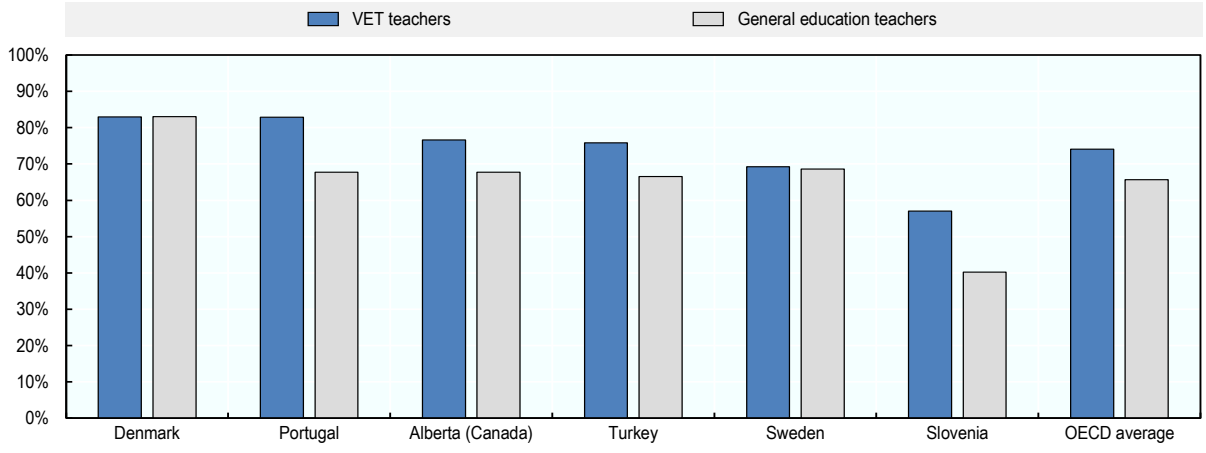
Source: I-SCOOP (2020[27]), Logistics 4.0 and smart supply chain management in Industry 4.0, https://www.i-scoop.eu/industry-4-0/supply-chain-management-scm-logistics; Mckinsey (2017[28]), Digital supply chains: Do you have the skills to run them?, https://www.mckinsey.com/business-functions/operations/our-insights/digital-supply-chains-do-you-have-the-skills-to-run-them.

Digital technology is increasingly used in VET teaching

The importance of digital skills in VET teaching has undeniably increased in recent years. In the OECD countries and regions with available data from the 2018 Teaching and Learning International Survey (TALIS), 74% of upper secondary VET teachers worked with digital technology with their students, compared to 66% of general education teachers (Figure 4.5). Data from the European Commission's SELFIE tool also confirms that VET teachers are slightly more likely than teachers in general education to use digital tools for teaching (see Box 4.6). In Denmark, 83% of VET teachers reported that they regularly let their students use ICT for projects and classwork. Research from the Netherlands also shows a widespread use of a range of technology among VET teachers, including virtual reality and robotics (Box 4.7). However, some countries lag behind in the incorporation of digital technology into VET. As digitalisation takes place in industry, and digital technologies in education improve, the use of digital resources for learning in VET is expected to become widespread in the coming years. The COVID-19 pandemic forced many teachers to swiftly adopt online learning strategies, and this is likely to accelerate the adoption of technology in the education sector. Future VET teaching and learning are likely to comprise a mixture of face-to-face interactions making use of physical equipment and digital devices, and online interactions making use of digital technology.

Figure 4.5. VET teachers are more likely to let their students use ICT than general education teachers

Percentage of teachers who let their students use ICT for projects and classwork "frequently" or "always"

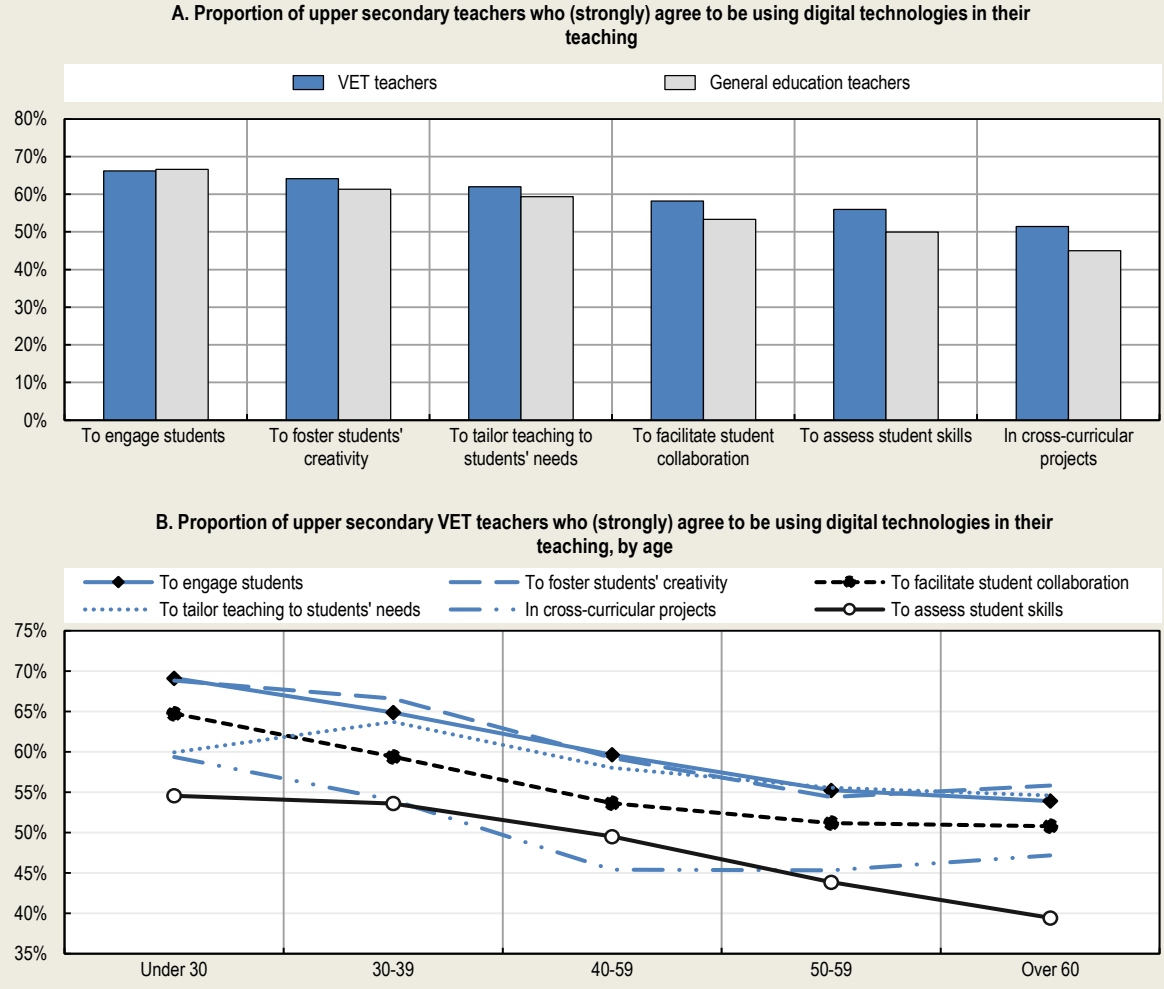


Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). The reported average corresponds to the unweighted average for the six OECD member countries/regions in the sample.
Source: Elaboration based on OECD (2019[29]), TALIS 2018 database, http://www.oecd.org/education/talis/talis-2018-data.htm

Box 4.6. SELFIE tool- Use of technology by VET teachers

Recently as part of the SELFIE project, the European Commission gathered information about the use of digital technologies in upper secondary VET institutions. SELFIE is a tool for digital capacity building in schools (see Box 4.15). According to aggregated data from SELFIE users in OECD countries, VET teachers in upper secondary education use digital technologies slightly more than general education teachers (see Figure 4.6, Panel A). However, a large proportion of them do not use these technologies as a tool to improve the quality of their teaching. For instance, only 66% of VET teachers incorporate digital technologies in their daily practice to engage students during their lessons, and a similar share use it to assist students in developing their soft skills, by fostering creativity or collaboration (64% and 58%, respectively), or to tailor teaching to students' needs (62%). Moreover, only around half of VET teachers using the SELFIE tool use digital technologies for assessment purposes (56%), or as part of cross-curricular projects (52%).

Figure 4.6. Not all VET teachers in OECD countries use digital technologies in their teaching



Note: All percentages refer to the share of high responses (i.e., 4 and 5 on a 5-point-scale). Participation in SELFIE is anonymous and voluntary, thus the data are not representative. Not all OECD countries are available and included in the dataset.
Source: SELFIE database (extraction October 2018-December 2020); Hippe, R., Pokropek, A. and P. Costa (2021[30]), Cross-country validation of the SELFIE tool for digital capacity building of Vocational Education and Training schools, in preparation.

When looking at the adoption of digital technologies according to teachers' age, younger VET teachers are more prone to use digital resources than their older peers (see Figure 4.6, Panel B). For instance, almost 70% of teachers under the age of 30 use digital technologies as part of their teaching to engage their students or to foster their creativity, whereas only slightly more than 50% of VET teachers over 60 do so.

Box 4.7. Technology use in Dutch upper secondary VET schools

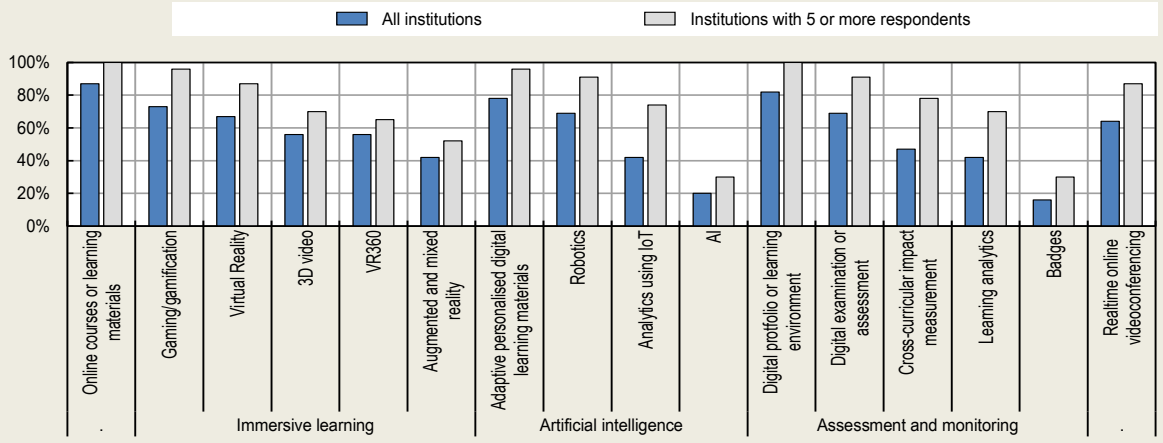
A recent survey (2019) in the Netherlands found that the use of digital tools and innovative technologies for teaching is widespread among upper secondary VET institutions, but that there are large differences depending on the type of technology. The survey asked teachers, leaders and other staff from Dutch VET institutions about the use of digital tools and innovative technologies in schools, the maturity of their use, barriers faced and enabling factors. It collected responses from 307 individuals in 53 different VET institutions, representing 83% of all Dutch upper secondary VET institutions.

The survey found that the most commonly used digital tools are online courses or learning materials and digital portfolios or learning environments (Figure 4.7). Other commonly used tools and technologies include gamification, adaptive personalised digital learning materials (APDLM), digital examinations or assessments, real-time online videoconferencing, robotics and virtual reality. In contrast, few institutions are using AI and badges[1]. The survey also found that not all of those tools and technologies are used widely within the programmes provided by the institution. For example, gamification and VR are generally only used in a few programmes or by a few teachers, whereas online courses or learning materials, digital portfolios or learning environments, and APDLM are used in around half of the programmes.

The benefits from the use of digital tools and innovative technologies differ according to the types. For example, the main benefit of real-time online videoconferencing and online courses was found to be the option of providing learning at any time or place. The main reported benefit from digital assessment and monitoring and artificial intelligence was having a better overview of students' learning process. In contrast, immersive learning was found to mostly be beneficial for motivating students. The main barriers to the use of innovative technology in Dutch VET institutions were teachers' lack of ICT skills, time and ownership, and institutions' lack of vision and objectives (ECBO, 2019[31]).

Figure 4.7. Many Dutch VET institutions use innovative digital tools and technologies

Share of institutions using a specific type of digital tool or technology



Note: "All institutions" refers to the 53 participating VET institutions (i.e. 83% of all Dutch VET institutions). Restricting the sample to those institutions that have at least 5 respondents in the survey reduces the number of institutions covered to 23.
Source: ECBO (2019[31]), *Onderwijsinnovaties met moderne ICT in het mbo*, https://ecbo.nl/wp-content/uploads/sites/3/Rapport-Onderwijsinnovaties-met-moderne-ICT.pdf.
1. A digital badge is an online-based visual representation that uses detailed metadata to signify learners' specific achievements and credentials in a variety of subjects across K-12 classrooms, higher education, and workplace learning (Muilenburg and Berge, 2016[32]).

For most industries and occupations today, face-to-face VET delivery incorporates lectures, practical workshops, apprenticeships or other forms of work-based learning that allow for high-quality training. However, VR, AR and simulators are becoming more common in VET for many industries, and will be more prevalent in the coming years (see Box 4.8 for examples of VET teaching with new technology). In some cases, these technologies are safer, they can be cheaper to implement when sophisticated physical equipment is needed, and they allow occupational skills to be developed remotely or as a complement to on-site training. As many students learn in different ways, resources such as such as VR, simulators, explanatory videos and animations can complement traditional teaching based on lectures and presentations. For instance, a visual learner is more likely to understand applied physics by seeing objects in motion in an animation than by attending a lecture on the topic.

As simulators and VR and AR solutions are developed, they will often be implemented in VET using online tools where possible. Given the benefits that online education poses in terms of flexibility, distance-learning activities are expected to be much more common in VET in the near future. Recent developments during the COVID-19 crisis have shown that digital tools and technologies such as online teaching platforms, simulators and other ad-hoc educational software for different occupations can help teachers develop their students' vocational and practical skills effectively. For instance in the United Kingdom, the availability of online software and simulators in automotive mechanics enabled VET teachers in some further education colleges to deliver training on line, allowing students to continue their studies, and complementing their on-site training. These tools and technologies represent valuable learning resources for VET, and have the potential to improve VET teachers' teaching practice.

In recent years, schools and local governments have established partnerships with education technology (EdTech) companies to produce teaching materials that can be used in VET learning environments. Many companies have started producing applications tailored to teachers' needs in different fields, such as simulators and VR (Box 4.8). VET teachers and industry experts are usually involved in the design of new

applications, as they can make a big contribution towards developing materials that are relevant, insightful and easy to use in the classroom. Although there are already a vast number of applications for AR, VR and simulators, a large number of occupations could still benefit from additional resources. For instance, there have been important advances in developing these resources for occupations in the medical sector, but VR applications still do not cover most routine tasks performed by radiology or medical laboratory assistants. The development of digital resources for a wide range of vocational subjects will enable online learning in many fields and also improve the quality of face-to-face teaching in VET. While VR, AR and simulators are mostly used for the development of technical or occupation-specific skills, there are also applications that aim to develop soft skills, like communication skills (Box 4.9).

Box 4.8. Examples of the use of simulators, robotics and virtual and augmented reality in VET teaching

Welding

VET teachers use welding robots to introduce students to automatic welding. Teachers show how welding robotic arms can be programmed using specialised software. They also demonstrate how car parts, metallic structures or industrial equipment can be welded using this technology. Automated welding can be more efficient than manual welding for repetitive tasks. In automated contexts the welder's role involves handling some of the parts to be welded, programming, operating and troubleshooting the welding robot, and inspecting the quality of the final product.

Logistics and transportation sector

In the logistics sector, students can use simulators to learn how to drive a truck or operate a loader vehicle facing real-life issues. For instance, the company Simula Games produced *Truck & Logistics Simulator*, a vehicle simulation game where users perform logistics tasks from beginning to end. Users can operate more than 20 different vehicles to perform complex loading tasks and deliver a variety of cargo directly to customers.

Maritime sector

The maritime sector benefits widely from the use of simulators. For instance, the Humber Maritime College in the United Kingdom uses simulators to train VET students in the navigation and operation of vessels, both at sea and in ports. It also trains engineering students on the operation and control of engine rooms using simulation software. Simulators allow students to develop their ability to confront real-life challenging scenarios, including health and safety emergencies. The company Kongsberg has created ship bridge simulators that can be flexibly configured for different training needs, selecting instrumentation, consoles, ship models and exercise areas. It has also produced simulated engine rooms for training.

Energy sector

In the energy sector, VR and simulators are widely used in VET for both industrial electric power applications and applied electronics. Power plant operator students can make use of virtual reality to simulate electrical failures, finding ways to solve technical issues in a virtual power plant designed following industry standards. Electronics students can use simulation software to make prototypes of electronic circuits to test their properties in industrial applications.

Aerospace industry

Because of the limited supply of equipment in the aerospace industry, industrial maintenance students usually have a limited amount of time to learn how to make use of physical equipment. VR applications can foster remote education and allow VET teachers to explain technical concepts without the need for continuous access to actual equipment, enhancing the overall learning experience. In Singapore the Temasek Polytechnic and the VR company EON Reality partnered to create a series of applications designed to enhance training for Temasek's aerospace students. Students use a virtual reality gas turbine engine to learn the fundamentals of their operation and other more advanced procedures. Instructors and students have the freedom to access these modules anywhere, at any time through Temasek's Learning Management System, fostering a remote education environment.

Automotive mechanics

Making use of simulators, students can diagnose technical problems in cars and make repairs. For instance, an engine simulator allows students to monitor the normal functioning of the different components of a vehicle, identifying an engine mechanical breakdown or an electronic failure. The company Electude, offers a series of digital resources for automotive programmes, both for online learning and to guide and complement practical work in face-to-face environments.

Health sector

Labster Labs promotes scientific learning by making online education modules available to VET teachers using desktop simulations and VR. These labs give students the chance to implement their own experiments in a simulated environment. Through desktop simulations, they can experiment with and understand a wide range of theoretical concepts in biology, chemistry, physiology and anatomy. Labster has produced dozens of virtual biotechnology and biochemistry labs with important applications for medical sciences.

Sources: Lincoln Electric (2020[33]), Lincoln Electric Education Solutions, https://education.lincolnelectric.com/leeps/; Simula Games (2021[34]), Simula Games Truck and Logistics Simulator, https://simulagames.com/; Humber Maritime College (2021[35]), Simulator based training, https://humbermaritimecollege.ac.uk/simulator-based-training; EON Reality (2021[36]), ExxonMobil Awards License to EON Reality For Immersive 3D Operator Training Simulator Technology, https://eonreality.com/exxonmobil-awards-license-to-eon-reality-for-immersive-3d-operator-training-simulator-technology/?lang=es; EON Reality (2021[37]), EON Based Modules for Aerospace Training Developed by Temasek Polytechnic, https://eonreality.com/eon-based-modules-aerospace-training-developed-temasek-polytechnic/; Electude (2020[38]) Welcome to Classroom, https://www.electude.com/classroom/; Labster (2021[39]), Labster website, https://www.labster.com.

To help VET systems adopt new technology for teaching, policy makers can establish partnerships with the private sector, or stimulate the production of new learning resources through innovation funds for specific industries. For instance, the US Department for Education established the Small Business Innovation Research programme, to give small enterprises access to funding to produce EdTech applications that could be later commercialised. The fund promotes the use of education technology to improve teaching practices and student learning outcomes (Small Business Innovation Research, 2020[40]). In England, an EdTech Innovation Fund was established by the Nesta Foundation and the Department for Education. The Fund supports EdTech organisations in England aiming to improve their products, carry out research about the impact that the use of their tools have, and grow their reach to more schools and colleges in England (Nesta, 2019[41]). A first round of funding has already benefitted more than a dozen EdTech companies.

Moving from VET teaching using traditional equipment to teaching using newer more complex equipment and advanced digital technologies requires VET teachers to update their teaching skills and knowledge so they can effectively teach in digital learning environments.

Box 4.9. Soft skills training using virtual reality: VirtualSpeech

VirtualSpeech is a VR training company offering courses combining e-learning with VR technologies to help students improve a set of important soft skills. It also offers specific courses for teachers and trainers who wish to improve their teaching and presentation skills. Its training platforms use realistic immersive scenarios, allowing users to improve their communication and collaboration skills while interacting with colleagues, leading a team or selling a product to a client. Students can practise these skills in realistic VR environments – e.g. seminar rooms, classrooms and lecture theatres – and gain valuable feedback from each other, regardless of geographical distance.

The VR functionality assesses verbal and non-verbal communication skills by using AI-powered features, giving students meaningful feedback on their performance, from use of eye contact to speech analysis. For instance, the app records and analyses the user's visual contact patterns and head movements, and the content, speed, volume and rhythm of their speech. Users can save and upload their speeches to the learning portal, where trainers can also listen back and assess a students' performance.

Source: Virtualspeech (2020[42]), Virtualspeech website, https://virtualspeech.com.

Developing the skills needed to use new technology in VET

Many VET teachers are not prepared for digital teaching and learning

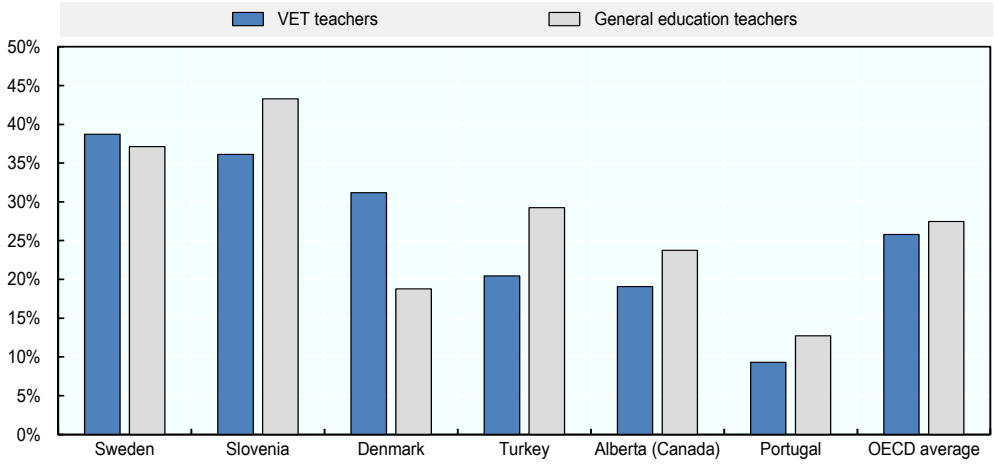
Despite the importance of digital skills in VET teaching, the evidence suggests that a large proportion of VET teachers are not well prepared to teach using advanced technology in digital environments (Paniagua and Istance, 2018[43]). According to TALIS 2018 data, 26% of VET teachers in six OECD countries/regions still do not feel well prepared to support their students' learning through the use of digital technologies (Figure 4.8). For example, in Sweden and Slovenia more than one in three VET teachers reported only being able to provide such support to a limited extent or not at all. In contrast, in Portugal only 9% of VET teachers reported having limited ability to support their students' learning through digital technology use.

The COVID-19 pandemic exposed the extent to which teachers in upper secondary VET struggled to teach vocational subjects online. This was not only due to the lack of online teaching resources, or the difficulty of teaching some practical skills online, but also because of their lack of experience using online teaching methods (UNEVOC, 2020[44]). Many teachers faced difficulties adopting digital platforms for their teaching. However, some VET teachers and institutions had already incorporated a number of innovative strategies for VET delivery before the pandemic. For instance, those VET institutions that participated in the Blend4VET project, funded by the European Commission, had already implemented online teaching platforms and integrated blended learning delivery as part of their curricula, at least in some of their teaching modules (Blend4VET, 2018[45]). Well-prepared VET teachers and institutions, which had already transformed their systems and pedagogical approaches for more innovative delivery, had a smoother transition to the new teaching environment during the pandemic.

The use of new digital technologies in teaching requires teachers to have at least basic digital skills. Yet, according to TALIS 2018, 30-60% of upper secondary VET teachers in the six OECD countries and regions with available data reported a moderate or high need for training in ICT skills[3] for teaching (Figure 4.9). While innovative teaching methods making use of digital technology are available for many subjects and occupations, many VET teachers, particularly those who lack ICT skills, are not aware of them (Paniagua and Istance, 2018[43]).

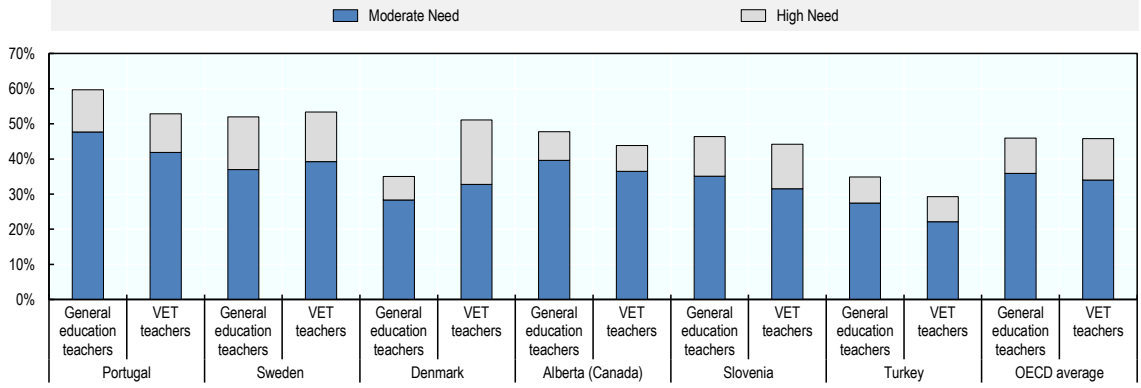
Figure 4.8. Not all VET teachers are well prepared for the use of digital technology

Percentage of ISCED3 teachers who are able to support their students learning through the use of digital technology "to some extent" or "not at all"



Note: VET teachers in TALIS are those who reported that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). The reported average corresponds to the unweighted average for the six OECD member countries/regions in the sample – Alberta (Canada), Denmark, Portugal, Slovenia, Sweden and Turkey.
Source: Elaboration based on OECD (2019[29]), TALIS 2018 database, www.oecd.org/education/talis/talis-2018-data.htm.

Figure 4.9. Significant shares of VET teachers need training in ICT skills for teaching

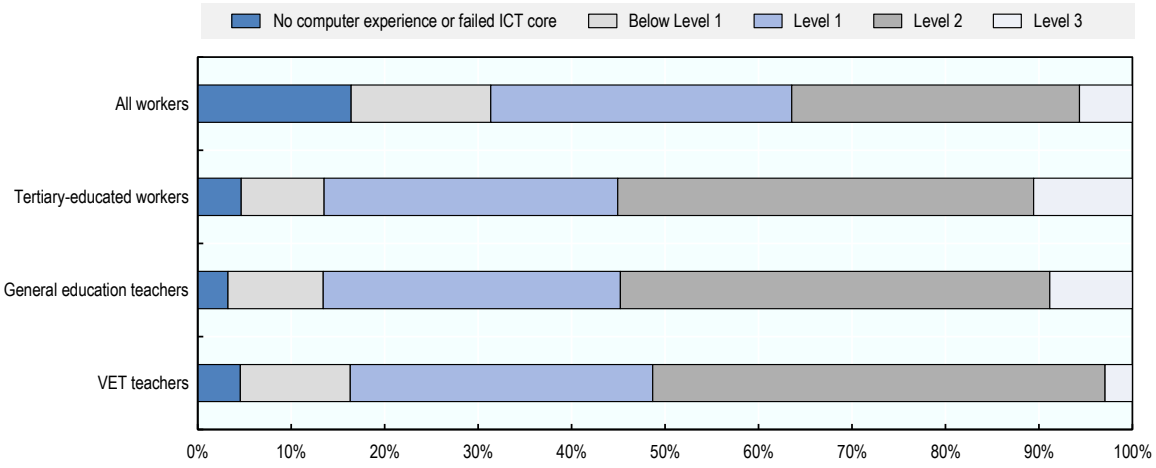


Note: Percentage of VET teachers reporting moderate or high need of training in ICT skills for teaching. VET teachers in TALIS are those who reported that they teach were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). The reported average corresponds to the unweighted average for the six OECD member countries/regions in the sample – Alberta (Canada), Denmark, Portugal, Slovenia, Sweden and Turkey.
Source: Elaboration based on OECD (2019[29]), TALIS 2018 database, http://www.oecd.org/education/talis/talis-2018-data.htm.

Data from the OECD Survey of Adult Skills (PIAAC) (OECD, 2019[14]) confirm that there is room for improvement in VET teachers' digital problem-solving skills (Figure 4.10). Across the OECD countries participating in the survey, 16% of VET teachers lack basic computer skills or have poor digital problem-solving skills. This is slightly higher than among general education teachers and all tertiary-educated workers (13%). Only 51% of VET teachers have digital problem-solving proficiency at Levels 2 or 3 (see OECD (2019[14]) for more details on PIAAC skill levels).

Figure 4.10. VET teachers have relatively weak problem-solving skills using ICTs

Percentage of workers by level of performance in problem-solving skills and type of worker



Note: Includes individuals aged 16 to 65 from OECD countries participating in the OECD Survey of Adult Skills (PIAAC). VET teachers are defined as "vocational education teachers teach or instruct vocational or occupational subjects in adult and further education institutions and to senior students in secondary schools and colleges (i.e. ISCO-08 occupation 232)" (see Box 1.2 in Chapter 1).
Source: Calculations using OECD (2017[13]), OECD Survey of Adult Skills (PIAAC) (Database 2011/12, 2014/15, 2017), http://www.oecd.org/skills/piaac/publicdataandanalysis/.

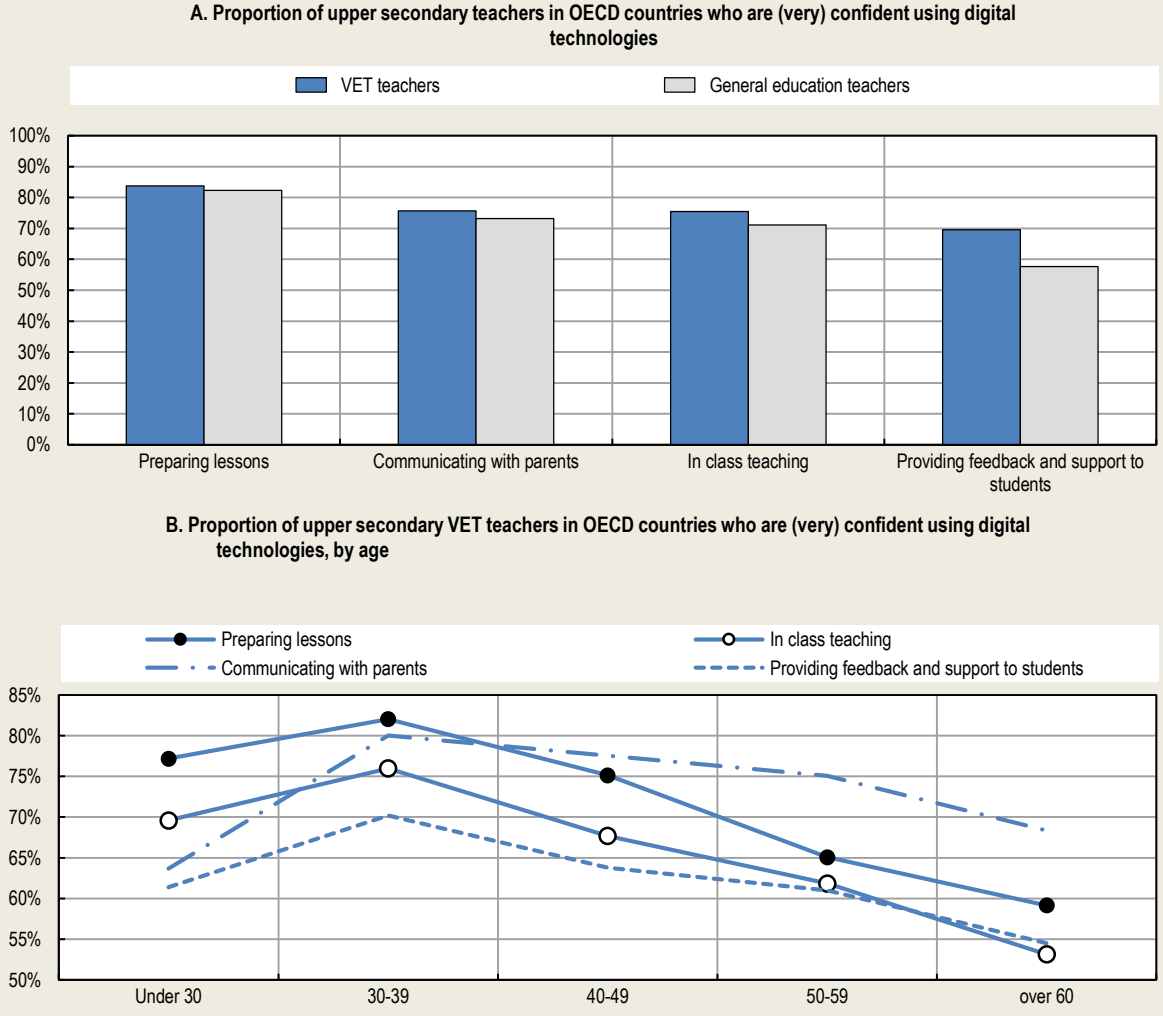
Given the important benefits of digital learning tools for VET, those VET teachers who do not regularly update their digital skills, or their pedagogical knowledge and practice to make effective use of digital tools, may lack the knowledge and competences needed to foster the development of the skills their students will need. Evidence collected through the SELFIE tool suggest that many VET teachers have relatively low confidence in the use of digital technologies for varies aspects of the teaching job (see Box 4.10). Moreover, those VET teachers who are rarely in contact with industry may find it more difficult to identify changing digital skill needs. When VET teachers limit their teaching to traditional approaches and do not make use of the variety of new digital teaching and learning resources and workplace technologies available, this may have implications on the quality of VET provision, as well as on the preparedness of VET students to enter the labour market. Hence, updating teachers' knowledge on new pedagogies as well as in the use of ICT and new technology in industry is crucial. However, as discussed in Chapter 3, a significant share of VET teachers lack access to professional development opportunities to update their pedagogical and industry knowledge.

Box 4.10. SELFIE Tool- Confidence in the use of technology

One of the likely reasons why many VET teachers do not use digital technologies as part of their teaching, is that they do not feel confident enough to use them. For example, according to SELFIE data (Figure 4.11 Panel A), around one in four VET teachers using the SELFIE tool in OECD countries do not feel confident to use digital technologies in classroom teaching, or to provide feedback to their students. However, VET teachers are more confident using these technologies for class preparation (83%) (see Box 4.15 for more information about the SELFIE tool).

Confidence using technology is higher for young VET teachers (Figure 4.11, Panel B). Around 82% of VET teachers aged 30 to 39 feel confident preparing lessons using digital technologies, and 76% of them feel confident using technology in class teaching. Those figures reduce to 59% and 53% respectively for teachers over 60. Interestingly, younger teachers under 30 show less confidence than those aged 30 to 39, and have lower confidence in using technology to communicate with parents than any other age group.

Figure 4.11. A large proportion of VET teachers do not feel confident using digital technologies in their teaching



Note: All percentages refer to the share of high responses (i.e., 4 and 5 on a 5-point-scale). Participation in SELFIE is anonymous and voluntary, thus the data are not representative. Not all OECD countries are available and included in the dataset.
Source: SELFIE database (extraction October 2018-December 2020); Hippe, R., Pokropek, A. and P. Costa (2021[30]), Cross-country validation of the SELFIE tool for digital capacity building of Vocational Education and Training schools, in preparation.
Disclaimer: This aggregated and anonymised data is extracted by the European Commission from SELFIE and does not necessarily reflect an official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this document. Neither the Commission nor any person acting on the Commission's behalf may be held responsible for the use which may be made of the information contained therein.

VET teachers need support to adopt the use of new technology

In order to integrate new technologies into their teaching, VET teachers need to receive continuous support to further develop their digital skills, and update their pedagogical and industry knowledge. It is therefore crucial that governments have robust professional development (PD) programmes for VET teachers in place, particularly in this area. Ideally these programmes should give VET teachers access to industry internships, high-quality online courses and face-to-face training, teacher mentoring and other learning resources, so they can develop their teaching skills and improve their practice in the use of ICT. Governments should roll out these training courses on a large scale, with the goal of ensuring all VET teachers are well-prepared and confident in making use of digital platforms and other advanced teaching technology. Other support measures can complement PD opportunities, including peer-learning networks and strategic guidance from institutions' leaders on how to integrate new technology into teaching.

VET teachers need strong digital skills to effectively incorporate new technology into their teaching

When acquiring new technology for teaching, schools need to ensure that teachers have access to training on how to use or operate it. It might not always be easy for teachers to see how they can effectively integrate new technology into their lessons, and they may need additional support or training to do so. As discussed in Chapter 3, digital skills is one of the areas where VET teachers report the highest need for further professional development. Ensuring that relevant and flexible formal and non-formal training opportunities are available to develop and update their digital skills is therefore crucial. This could be done, for instance, through micro-credential programmes or digital badges[4] certifying their proficiency in the use of specific technologies. A framework for assessing digital skill gaps and training needs can be helpful in this respect, as the Digital Teaching Professional Framework in England (United Kingdom) (Box 4.11).

Box 4.11. Digital skills for the VET teaching profession: The Digital Teaching Professional Framework (England)

Teachers need more than basic digital skills to incorporate digital technology into their practice. The *Digital Teaching Professional Framework* is a competence framework for teaching and training practitioners in the further education and training sector. The framework has been developed by the Education and Training Foundation in collaboration with the not-for-profit company Jisc. It has been designed to focus on the benefits of good pedagogy supported by technology to enhance learning.

The framework lists seven key elements of teaching using digital technologies: (1) planning your teaching; (2) approaches to teaching; (3) supporting learners to develop employability skills; (4) subject-specific and industry-specific teaching; (5) assessment; (6) accessibility and inclusion; and (7) self-development. Each of these elements contains a group of up to four key activities (components). For each key activity the framework includes a group of observable practices and standards.

The framework sets out three stages of competence for each of the activities. These three levels are adapted from the European Framework for Digital Competence of Educators, and defined as:

- **Stage 1: Exploring:** practitioners assimilate new information and develop basic digital practices.
- **Stage 2: Adopting:** practitioners apply their digital practices and expand them further.
- **Stage 3: Leading:** practitioners pass on their knowledge, critique existing practice and develop new practices.

Each element of the framework details the associated activities and digital competences practitioners would need to achieve in order to successfully progress through the three stages of personal development mapped out above.

The framework is accompanied by free, online, bite-size training modules with certification. Used alongside the Jisc Discovery Tool (JISC, 2020[46]), a self-assessment tool that teaching staff can use to assess their digital capabilities, it enables practitioners to identify their training needs in order to help develop their teaching practice.

Source: Education and Training Foundation (2018[47]), *Taking Learning to the Next Level: Digital Teaching Professional Framework*, www.et-foundation.co.uk/wp-content/uploads/2018/11/181101-RGB-Spreads-ETF-Digital-Teaching-Professional-Framework-Full-v2.pdf.

Learning by doing is an important aspect of the use of digital technology. Early access to new technology such as digital devices or high-tech industry equipment allows teachers to experiment and reflect on their own practice. By making use of such technology teachers can prepare lessons and pilot them with a small group of students following a trial-and-error method. Students' feedback and classroom observations enable teachers to systematically improve their lessons. Teachers can also learn from each other's experience with digital technology. Interaction, mentoring, collaboration and frequent communication with colleagues can also help them acquire the skills they need to incorporate new technology into their own practice.

Box 4.12. Specialised centres to promote and facilitate technology use in VET (Denmark)

Denmark has several initiatives to foster the use of technology in VET teaching. The Knowledge Centre for IT in Teaching promotes the use of advanced digital technology in VET. It focuses on supporting teachers in the use of IT for teaching across all subjects with a special focus on the pedagogical aspects of teaching practice making use of innovative technology. The centre provides professional development opportunities on IT issues for teachers in VET. Their PD courses include both theoretical and practical elements to support teaching and learning. The centre has also established a network of pedagogical staff and a network of leaders to facilitate the exchange of ideas and share their practical and technical knowledge, creating new solutions to common challenges (Center for IT i Undervisningen, 2020[48]).

In parallel, the Danish Government created two Knowledge Centres for Automation and Robot Technology (north and south). These promote innovation in education and industry, supporting the work of VET schools making use of advanced technology such as universal robots, collaborative robots or VR applications for VET teaching. Each centre works with more than a dozen VET schools within their geographical area. They provide VET teachers with teaching material, such as teaching tutorials or short courses in Industry 4.0, VR equipment and robots. Additionally, their specialised facilities provide demonstrations to teachers and students on how robots can be used in the workplace (Videnscenter for Automation og Robotteknologi (Nord), 2020[49]; Videnscenter for Automation og Robotteknologi (South), 2020[50]).

The centres lend VR headsets and/or robots to VET teachers, providing them with training materials and face-to-face technical support, so they can operate these technologies and incorporate them into their teaching practice independently. VET teachers receive continuous support until they are fully able to set up and operate the new equipment. The centres provide these technological resources for VET programmes in the areas of industrial automation, mechanics, electronics, welding, data and communication, and education.[1]

1. Some of these teaching resources can be found on the teaching courses page of the centre's website: https://videnscenterportalen.dk/forloeb.

Policy makers must ensure that both equipment and technical support are available to teachers, so they can master the use of new technology before it is adopted in the classroom. This support should include access to adequate technological infrastructure and professional development opportunities, and being given time to plan and design lessons that make use of new technologies. Moreover, VET teachers should also have the opportunity to share their experience using digital technologies in the classroom with their colleagues, for example trough peer-learning activities that promote best practices in the use of technology in VET teaching. Initiatives such as the Knowledge Centres for Automation and Robot Technology in Denmark (see Box 4.12) show how external institutions can support teachers in the use of new technology such as VR or AR in the VET sector.

VET teachers need to stay current with the use of advanced technology in the workplace

As new technologies continue to be adopted in the workplace, teachers will need access to continuous in-service professional development to keep their knowledge and skills up to date with the realities of the workplace. As VET teachers need to be aware of the latest technological advancements in industry, they should have access to workplaces and/or the new equipment being used by employers. VET teachers can acquire hands-on experience of the use of new technologies either directly through work-based learning opportunities, or by participating in training delivered by technology providers and/or research institutions.[5]

Work-based learning activities allow teachers to learn about the latest technological developments in real contexts, facing real practical and technical issues (Stephens, 2011[51]). This can inform their daily practice, in VET schools. For instance, teachers and trainers in the welding sector will be better able to teach robotic welding techniques making use of new equipment if they have had the opportunity to use it in a real manufacturing environment, learning about its advantages and limitations. This means it is fundamental that schools have strong ties with industry. Initiatives such as *Entr'Apprendre* in the French Community of Belgium (Box 4.13) seek to create work-based learning opportunities for VET teachers in industry.

Box 4.13. Teacher industry placements for the use of new technologies in VET: Entr'Apprendre (French Community of Belgium)

Entr'Apprendre is an initiative by the Foundation for Education (*Fondation pour l'Enseignement*) established by the French Community of Belgium. One of its goals is to upgrade VET by making information available about work opportunities and future jobs, and to stimulate companies' social responsibility to encourage skills transfers between businesses and schools.

The foundation actively promotes placements in industry for teachers. The ultimate objective of *Entr'Apprendre* is to set up internship programmes for teachers/ trainers in companies. The placements consist of short internships for teachers (two to four days). The foundation creates bridges between schools and companies, promoting teachers' confidence and building co-operation. It offers opportunities in industry, agriculture, services and the business sector.

For instance, in the energy sector, the energy company ENGIE provided on-site training for teachers on energy-efficient and more environmentally friendly energy solutions. Internships in electro-mechanic maintenance provide opportunities for teachers to learn on site about new technologies being used in the workplace, the skills needed by the various actors in the field, the issues that those actors encounter in their professional practice, and the typical approaches to solving them.

Source: Entr'Apprendre (2020[52]), Entr'Apprendre website, https://entrapprendre.be/.

In some countries, government-funded centres that have been established to strengthen the quality of teaching in VET also provide high-quality PD to VET teachers on the latest technology in industry. These types of centres have strong ties with local companies and make equipment available to VET schools when it would be otherwise too expensive or technically difficult to operate. They foster formal collaboration among VET institutions, but also informal networking opportunities for VET teachers working in similar fields. They host the technical expertise needed to master new technologies, which is usually equivalent to that used by the companies with the highest technological standards in industry. One key aspect of these centres is their technical expertise, and the availability of cutting-edge equipment for professional training. In order to acquire this equipment, they usually need support from local governments and industry. Initiatives such as the Knowledge Centres for Automation and Robot Technology in Denmark (Box 4.12), and the Centre for Innovation in VET in Aragon in Spain (Box 4.14) show that public-private partnerships can be beneficial to both VET institutions and employers.

Box 4.14. Cutting-edge technology supporting VET teachers' training: The Centre for Innovation in VET in Aragón (Spain)

The Centre for Innovation for Professional Training in Aragón in Spain is a professional training centre for VET teachers, businesses and the general public. It also acts as a hub to promote innovation across VET providers, universities and industry.

The centre provides cutting-edge infrastructure to foster technological and methodological innovation in the professional training system in the Autonomous Community of Aragón. Advanced technology and equipment are available for VET teachers in the logistics, transport and manufacturing sectors. These include VR forklift simulators, heavy-goods vehicle simulators, cutting-edge hydraulics and pneumatics training equipment, and an automated logistics chain which reproduces the processes of a manufacturing company. The centre offers a wide variety of professional development activities, including courses on learner-centred methodologies and problem-based co-operative learning models in VET. Training is delivered through online and face-to-face seminars and courses.

Source: CIFPA (2020[53]), Centro de Innovación para la Formación Profesional de Aragón website, https://cifpa.aragon.es/en/el-centro.

Collaboration networks among teachers, schools, industry and research institutions can benefit VET

Teacher networks for professional support are an increasingly important way to foster information sharing and informal learning in VET. They are an important asset for all teachers, but they are especially valuable to those looking to acquire pedagogical knowledge and skills making use of digital technology. For instance, during the COVID-19 pandemic many VET teachers relied heavily on professional online networks to strengthen and support their use of online teaching technology (ILO, 2021[54]). Virtual and non-virtual networks also provide support for troubleshooting the technical aspects of using new technologies in VET, such as VR and AR. These networks usually provide teachers with free content and teaching materials on a wide diversity of topics, best practice examples and advice from experts in different technologies and subjects mainly through web forums. Online and live activities in these networks also motivate teachers to support innovation in their own teaching communities. Where necessary, policy makers should support these networks, for instance by promoting their use, providing free resources to their users or contributing to the improvement of their digital platforms.

Wider collaboration between VET institutions and industry is also crucial. Industry plays an important role in supporting VET provision, innovation and teaching practice. As changes are continually taking place in industry, collaboration between VET schools and industry should not just be about providing work-based

learning opportunities for teachers and students, but a wider set of activities through which industry can support the quality of VET provision, and schools can adjust their practice to meet employers' needs. For instance, when designing and setting up new VET facilities, it is helpful if employers engage with VET teachers and leaders over decisions about what type of equipment will be needed, and how students and teachers could have access to it. Industry experts can also bring their experience to workshops and classrooms, running live demonstrations of technological innovations, or talking about the latest developments in industry and how the world of work is changing. Industry experts play a crucial role building bridges between schools and the labour market, while also providing crucial information about skills needs for VET graduates. Some examples of collaboration between industry and VET institutions can be found in Chapter 3, Box 3.5.

Similarly, collaborations between VET schools and universities and other research centres can be beneficial to VET teachers. When a particular emerging technology has not yet been adopted by local businesses, research institutions can provide VET teachers with relevant information about the latest developments. Research institutions have access to cutting-edge equipment, which can be used for demonstrations to teach students about new technologies or encourage them to study different subjects. On-site training of students in research institutions or VET schools can also be facilitated by researchers from academia, research institutes or R&D companies. Researchers' expertise has also been intensively used to build educational resources such as AR and VR applications for VET. As researchers usually have a thorough understanding of the theoretical and technical issues related to specific technologies, they are well placed to provide technical advice on the software production process.

Teachers need strategic guidance and support to integrate new technology into VET

Given the opportunities that newly available technologies offer for effective innovative pedagogy, VET teachers should be given support and incentives to integrate them into their teaching. Pedagogical innovations usually need systemic efforts from school providers, and particularly VET leaders, to foster their use in classrooms. Data from the European Commission's SELFIE tool show that VET teachers do not always get the support they need for using digital technologies in the classroom (Hippe, Pokropek and Costa, 2021[30]). For example, across OECD countries, only 52% of VET teachers using the SELFIE tool agree that they receive support from school leaders in trying out new ways of teaching with digital technologies, and 45% say that school leaders discuss with teachers their professional development needs for teaching with digital technologies. Moreover, only 31% of VET teachers agree that they have time to explore how to improve their teaching with digital technologies, and 51% say that school leaders support them in sharing experiences within their school about teaching with digital technologies.

Those VET schools that are able to set up a consistent plan, in a collaborative and participatory way, are more likely to see pedagogical innovation. A survey among staff in Dutch VET schools showed that the most important enabling factors for the successful adoption of digital technology in teaching and learning were having a vision and goals that integrated digital technology adoption (ECBO, 2019[31]). A digital transformation plan should have concrete short- and long-term goals for the implementation of new technology. Currently, many VET schools do not carry out a systematic review of progress made on the use of digital technologies, with only 37% of VET teachers in OECD countries using the SELFIE tool agreeing that progress in teaching and learning with digital technologies is reviewed in their school.

To sustain those collective efforts, VET teachers should have the opportunity for continuous high-quality PD in these topics, as well as on-site technical support in the use of technology to facilitate their practice. Most importantly, teachers must be given the time to experiment, reflect, learn and implement new technology in their teaching. A well-designed strategy for the digital transformation of VET institutions starts with an assessment of the current use of technology, the support measures available and any identified challenges, as the examples of the SELFIE tool and Digi-Check in Switzerland show (Box 4.15).

Box 4.15. Tools to foster digital transformation in VET schools

SELFIE (European Commission)

SELFIE (Self-reflection on Effective Learning by Fostering the Use of Innovative Educational technologies) is a free online tool designed to help schools embed digital technology into teaching, learning and assessment. It was developed based on the European Commission Framework for Digitally-Competent Educational Organisations (DigCompOrg) (Kampylis, Punie and Devine, 2015[55]). The tool was developed with a team of experts from schools, education ministries and research institutes across Europe.

SELFIE anonymously gathers the views of students, teachers and school leaders on how technology is used in their school. The tool is based on a simple questionnaire using short statements and questions answered on a scale of 1 to 5. It takes around 20 minutes to complete for students. Based on this input, the tool generates a report that offers a snapshot of the school's strengths and weaknesses in its use of technology. The findings can be used by schools to formulate an action plan and set priorities to implement changes to support teaching, learning and student assessment.

SELFIE is available for primary, secondary and vocational schools in over 30 languages. It can be used by any school, regardless of their levels of infrastructure, equipment and technology use. In 2020, SELFIE for work-based learning, which also involves in-company trainers, was piloted in nine European countries with 35 000 participants. It will become available by mid-2021 (Hippe, Brolpito and Broek, 2021[56]).

Digi-Check (Switzerland)

Digi-Check is a tailor-made assessment for the management and staff in VET institutions to self-assess the need for digital transformation, such as the design of media-based teaching or the digital skills of teachers and learners. The assessment with workshops (one-day) and coaching is led by the Swiss Federal Institute for Vocational Education and Training (SFIVET), with the following objectives:

- Taking stock of digitalisation in the vocational school, from a strategic, organisational and pedagogical point of view.
- Determining the potential for improvement.
- Determining the potential for change in teaching (teaching and learning process, didactic scenarios, and use of digital media).
- Defining measures for the further development of teachers' digital skills: how should teachers be prepared and supported to use digital media in their lessons?
- Getting an overview of other developments in digitisation.

Source: European Commission (2020[57]), About SELFIE, https://ec.europa.eu/education/schools-go-digital/about-selfie_en; Hippe, Brolpito and Broek (2021[56]), SELFIE for work-based learning, in preparation; SFIVET (2020[58]), Le Digi-Check pour les écoles professionnelles, www.iffp.swiss/digi-check-pour-les-ecoles-professionnelles.

Adequate teaching methods for soft skills development

Developing soft skills requires specific pedagogical approaches

In a world where routine task are automated, soft skills become increasingly important and VET teaching needs to address this broader set of skills. In this context, teaching must deliberately be designed to foster these skills (Paniagua and Istance, 2018[43]).

High-quality VET often implies a blend of teaching methods. In contrast to general education, VET students need to be taught in practical settings. Vocational subjects are different from academic ones, and this has implications for the way they are organised, planned, taught and assessed. Effective VET teaching involves a clear identification of the desired learning goals and outcomes for vocational subjects. Those goals and outcomes must be made explicit and pedagogical approaches should be carefully chosen based on them (Lucas, Spencer and Claxton, 2012[59]).

Until recently, teaching practices in VET mainly involved traditional face-to face lectures and tutorials, with a strong emphasis on vocational practice. Today, there is a need for pedagogical approaches to be learner centred, workplace oriented and inquiry based (see Box 4.16 for examples of some of these approaches). To foster soft skills, pedagogy should emphasise active and experiential learning and collaborative learning, often using ICT as a key facilitator (Barron and Darling-Hammond, 2010[60]; Paniagua and Istance, 2018[43]; Järvelä, 2006[61]). For instance, experiential and collaborative learning can be easily implemented through the use of digital technology (Järvelä, 2006[61]).

To apply these pedagogical approaches effectively, teachers need to be familiar with the theoretical foundations underpinning them, as well as proficient in the use of ICT and specific teaching techniques. In-service formal training can provide the fundamental concepts, as well as ways to incorporate them into teaching practice. For instance, one common practice in teacher training to develop such pedagogical skills is to present groups of teachers with a complex technical problem, making available to them elements that can be used to solve it (tools, components, digital devices, access to the Internet, etc.). By experiencing problem solving themselves, teachers are able to understand how elements of collaborative learning and experiential learning can be used to teach vocational skills. By reflecting on their own practice and sharing their views with others, teachers see how they can make use of new technology to teach vocational subjects while developing students' soft skills.

Box 4.16. Emerging pedagogical approaches in VET

Although there are many pedagogical approaches to VET teaching available (Lucas, Spencer and Claxton, 2012[59]), some of them have particular importance today, as they allow the development of soft skills and digital skills. Three pedagogical approaches that have been successfully used for this purpose are:

- **Collaborative learning** is one of the most meaningful ways to support individual learning mechanisms. Through high-quality interactions this approach allows students to arrive at complex and conceptual understanding rather than simple answers. Technology can be designed to enhance personalised learning environments in ways that increase the possibility that those rich interactions occur (Järvelä, 2006[61]).

- **Inquiry-based learning** is an educational approach that focuses on investigation and problem solving. It prioritises problems that require critical and creative thinking so students can develop their **ability** to ask questions, design investigations, interpret evidence, form explanations and arguments, and communicate findings. Inquiry-based learning is different from traditional teaching approaches because it reverses the order of learning. Instead of presenting information, or "the answer", up front, teachers start with a range of scenarios, questions and problems for students to navigate. In inquiry-based learning, time and activities are organised around inquiry using different modalities such as world reading, individual research, projects and workshops (Australian Government, 2016[62]; Paniagua and Istance, 2018[43]).
- **Active learning** is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing. The core elements of active learning are student activity and engagement in the learning process. Active learning is often contrasted to the traditional lecture where students passively receive information from the instructor (Prince, 2004[63]).

According to Paniagua and Instance (2018[43]), there are six clusters of innovative pedagogies that can complement – or be integrated into – these traditional approaches:

- **Embodied learning** refers to pedagogical approaches that focus on the non-mental factors involved in learning, and that signal the importance of the body and feelings, such as the physical, emotional and social aspect (Paniagua and Istance, 2018[43]).
- **Computational thinking** intersects with mathematics, sciences and digital literacy to offer a unified framework to develop a wide range of transversal skills through ICT. It is about using problem-solving skills and computer-based techniques to tackle problems (Paniagua and Istance, 2018[43]).
- **Experiential learning** is defined as approaches where learners are brought directly in contact with the realities being studied. It is based on the idea that human experience is a central source of learning, and therefore the design of learning environments should make use of human experience as part of the learning process (Paniagua and Istance, 2018[43]; Celio, Durlak and Dymnicki, 2011[64]).
- **Gamification** refers to the introduction of game design elements and game-like experiences in the design of learning processes. It has been adopted to support learning in a variety of subject areas integrating exploratory approaches to learning, and strengthening student creativity and retention. This is supported by the belief that incorporating game mechanics into the design of a learning process means learners will engage in a productive learning experience (Dichev and Dicheva, 2017[65]).
- **Blended learning** seeks to use the potential of new technology to offer more individualised teaching and direct instruction. The main goal of blended learning is to maximise the benefits of technology and digital resources, to improve the differentiation of instruction according to students' needs, as well as fostering classroom interaction. This approach assumes that the active involvement of students can best be achieved through group dynamics and intense face-to-face interactions. Computer technology then can offer direct instruction through individual, highly planned and structured sequences of skills. When computers provide the relevant information, teachers can then be free to spend more time on concept application, using more interactive and complex classroom activities or providing one-to-one instruction (Paniagua and Istance, 2018[43]).

- **Multi-literacies and discussion-based teaching** focus on students' active engagement and the availability of a multiplicity of texts, narratives and sources of information. Discussion-based teaching allows students to share, discuss and give sense to the implicit power relations and become aware of and value multiple modes of literacy. This is particularly relevant given how the Internet shapes the way people become informed and make sense of the world. Discussion-based teaching works as a pedagogical lever to teach rational thinking, affective judgements, and higher-order thinking skills (Paniagua and Istance, 2018[43]).

Some of these approaches are becoming increasingly important, as they use digital technology and allow students to develop soft skills, digital skills and other skills in high demand in the workplace.

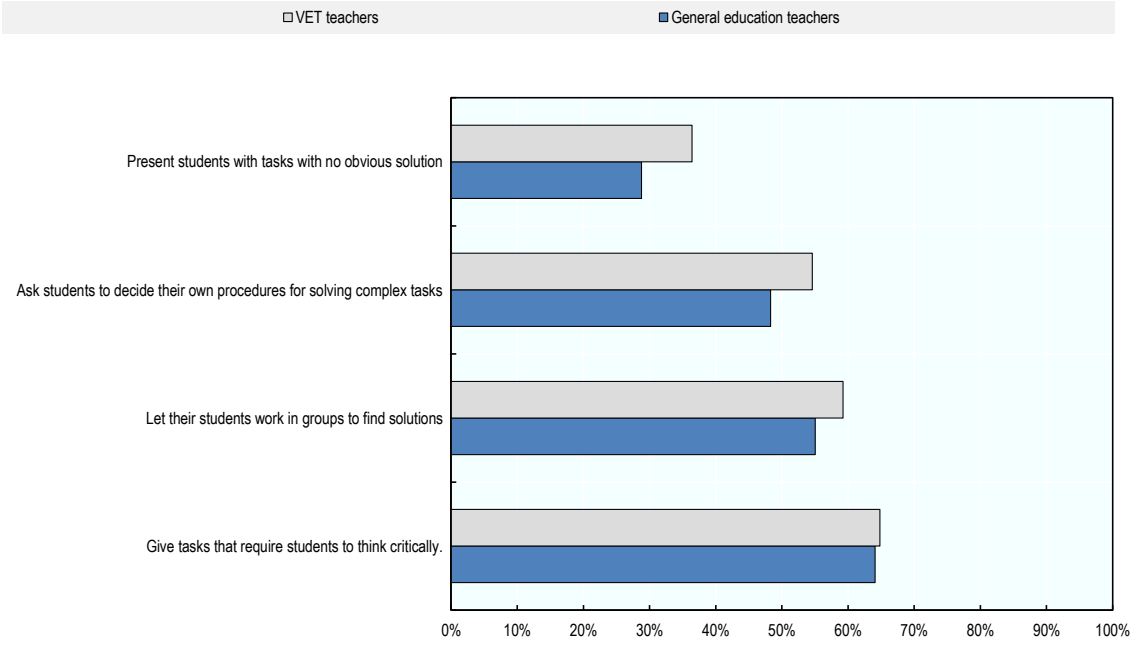
Source: Paniagua and Istance (2018[66]), *Teachers as Designers of Learning Environments: The Importance of innovative pedagogies*, https://doi.org/10.1787/9789264085374-en.

Many teachers lack the pedagogical skills to develop students' soft skills

The applied nature of VET facilitates the use of practical real-life situations for learning, which implies a greater use of learner-centred pedagogies than in general education programmes. Nonetheless many VET teachers do not make use of these pedagogies as part of their practice (Figure 4.12). For instance, only 36% of VET teachers in the six OECD countries and regions with available TALIS data report presenting students with tasks with no obvious solutions, and only just over half let their students solve complex problems making use of their own approaches.

Figure 4.12. VET teachers use learner-centred techniques more than general education teachers

Percentage of teachers who "frequently" or "always" use the following practices in their class (sample average)



Note: VET teachers are those who reported in TALIS that they were teaching practical and vocational skills in the survey year in upper secondary programmes (ISCED 3), regardless of the type of school where they teach (see Box 1.2 in Chapter 1). These data are reported by teachers and refer to a randomly chosen class they currently teach from their weekly timetable. Unweighted average of six OECD countries/regions with ISCED 3 programmes (i.e. Alberta (Canada), Denmark, Slovenia, Sweden, Portugal and Turkey).
Source: OECD (2019[29]), TALIS 2018 database, http://www.oecd.org/education/talis/talis-2018-data.htm.

One of the main issues that VET teachers face is the fact that in many countries their pedagogical preparation is more limited than for teachers in general education (Serafini, 2018[67]; Smith, 2020[68]). As discussed in Chapter 3, their initial training usually includes fewer elements of general pedagogy, subject-specific pedagogy and cross-curricular skills development (see Figure 3.5 in Chapter 3). This implies that VET teachers often have insufficient pedagogical knowledge to be able to effectively adapt their teaching strategies according to the desired learning outcomes (Paniagua and Istance, 2018[43]). An additional problem in this regard is the mistaken perception in some countries that teachers' vocational expertise is in itself an adequate basis for teaching (Lucas and Unwin, 2009[69]). VET programmes usually provide a mix of theoretical and practical knowledge, and VET teachers must be able to master different pedagogical approaches (Lucas, Spencer and Claxton, 2012[59]).

VET teachers need support to choose the appropriate pedagogical approaches

Mastering the teaching methods needed to meet the current demand for vocational, digital and soft skills represents an important challenge for VET teachers. In several countries, classrooms are being redesigned to foster learner-centred pedagogies, and technology is usually regarded as an important tool to facilitate teaching and learning (Paniagua and Istance, 2018[43]). There are a number of examples of how VET teachers can choose effective teaching methods to foster vocational skills and soft skills among their students, as well as resources to support VET teachers in adapting their practice to changing learning environments.

Different skills require different teaching methods

To effectively foster soft skills, digital and vocational skills, VET teachers must choose the correct pedagogical approaches (see Box 4.16 for a list of emerging approaches). For instance, inquiry-based learning (Box 4.16), embodied learning and experiential learning approaches have been shown to foster the development of soft skills (Barron and Darling-Hammond, 2010[60]; Paniagua and Istance, 2018[43]; Celio, Durlak and Dymnicki, 2011[64]). Collaborative learning models, such as inquiry-based or problem-based approaches, foster productive task-related interactions and enhance student motivation in general (Järvelä, 2006[61]). Collaborative learning initiatives such as Japan's school competitions allow students to develop soft skills in VET environments (see Box 4.18 for details of this initiative and another example from Spain). In other circumstances, vocational skills might be better developed using experiential learning. For digital skills, pedagogical approaches such as gamification and computational thinking have been shown to be effective (Paniagua and Istance, 2018[43]; Abdul Jabbar and Felicia, 2015[70]; Bower et al., 2017[71]).

Box 4.17. Project-based learning for soft skill development: PBLWorks (the United States)

Project-based learning (PBL) represents a unique opportunity to develop students' soft skills (Barron and Darling-Hammond, 2010[60]), with problem-solving at its heart. In PBL students are usually divided into groups and presented with a problem that they are supposed to study and solve. Based on their knowledge, students try to generate hypothesis of the problem by discussing with each other. After clarifying the problem, students engage in self-directed learning to gather information from many different sources. After this individual study phase, the students meet again in their groups. They evaluate the information that they found while gathering the essential pieces needed to solve the problem. This social negotiation of meaning is an important part of the learning process. Students begin to work on the problem and again reconceptualise their problem to more specific sub-problems. At the end of the process peer- and self-evaluation is usually used (Järvelä, 2006[61]). In the United States, PBLWorks by the Buck Institute for Education, has been working with this approach for several years, offering project-based learning training services and resources for educators.

PBLWorks provides educational resources, including manuals on how to develop a plan and ideas on how to implement projects for students of different ages, including Career Technical Education (i.e. VET). The project's website has a wealth of materials, including research and evidence about the impact of PBL, practical books, and examples of projects that teachers can use. PBLWorks also offers teacher training in these methodologies, as well as materials that describe step by step how to develop a project-based learning methodology.

PBLWorks developed a specific methodology for project-based learning called Gold Standard PBL. This methodology supports teachers in improving and assessing their teaching practice. When using this model, projects are focused on students acquiring key knowledge, understanding, and success skills. According to this model, any PBL activity must incorporate the following elements in their design:

- **A challenging problem or question**: the project is framed by a meaningful problem to be solved or a question to answer, at the appropriate level of challenge.
- **Sustained inquiry**: students engage in a rigorous, extended process of posing questions, finding resources and applying information.
- **Authenticity**: the project involves real-world context, tasks and tools, quality standards, or impact, or the project speaks to students' personal concerns, interests and issues.
- **Student voice and choice**: students make some decisions about the project, including how they work and what they create, and express their own ideas in their own voices.
- **Reflection**: students and teachers reflect on the learning, the effectiveness of their inquiry and project activities, the quality of students' work, and the obstacles that arise and strategies for overcoming them.
- **Critique and revision**: students give, receive and apply feedback to improve their process and products.
- **Public product**: students make their project work public by sharing it with and explaining or presenting it to people beyond the classroom.

Source: PBLWorks (2020[72]), PBLWorks website, www.pblworks.org.

In practice, teachers combine different pedagogical approaches in their teaching. For instance, gamification, embodied learning and computational thinking can easily be used together and programming languages can be used to design videogames which students can then use to play and learn at the same time. This creates a powerful artefact with creativity and designing skills at its core, while making use of computational thinking (programming skills) and gamification (gaming) (Paniagua and Istance, 2018[43]).

Box 4.18. Examples of innovative pedagogies in VET schools

Inter-school competitions (Japan)

Japanese vocational high schools often have strong ties with industry, universities and professional training colleges, leading to curriculum innovations. As well as gaining practical experience in industry, students participate in inter-school competitions in a wide range of subjects. These competitions are usually held and sponsored by the association of vocational high school principals and local companies. To prepare for these competitions, students develop critical thinking, collaboration and communication skills and present the results of their work to their class, collaborating on team projects. For instance, as part of the "Super Professional High Schools[1]" initiative, the Kyoto Subaru High School conducted a competition about artificial intelligence programming and cyber security in cooperation with the Kyoto Prefectural Police Department and other vocational high schools. Students from the Field of Intelligence Science worked together in research teams to prepare for this competition.

Service-based training (Spain)

Experiential learning approaches have been widely used for teaching in VET, where they have proved effective. In Spain, service-based learning – a type of experiential learning – is attracting increasing interest across VET schools. For example, in the Basque Country, students from some programmes (e.g. intermediate welding and maintenance, basic trade) built public facilities such as an outdoor recreation site and bicycle parking lots. The service-based learning project involved 32 students from different educational levels and different areas, and 9 teachers from vocational and general education.

[1.] In 2014, the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) launched an initiative called "Super Professional High Schools", providing special funding for 3-5 years to 48 vocational high schools offering advanced curriculums in agriculture, industry, business, fisheries, home economics, nursing, information and welfare. These schools were chosen to develop those curriculums to train "frontier professionals" who are well equipped to face the challenges required by tomorrow's technology industry.
Source: Kyoto Subaru High School (2020[73]), Kyoto Subaru High School website, www.kyoto-be.ne.jp/subaru-hs/mt/; REDAPS (2020[74]), REDAPS website, https://aprendizajeservicio.net/finalistas-formacion-profesional.

As in general education, learning outcomes and competences in VET subjects may have different degrees of complexity and sophistication. Vocational subjects vary in the balance needed between subject content knowledge and workplace procedural knowledge (Lucas, Spencer and Claxton, 2012[59]). For instance, web designers usually perform creative tasks while working in an office. They learn how to design digital platforms using a mix of programming theory and software-based practice. On the other hand, automotive mechanics must have some theoretical knowledge about mechanical engineering and electronics, but also strong procedural knowledge. These students are likely to learn through trial and error, by working in teams, or while they are being coached by an experienced colleague. Some vocational subjects have a well-established body of content and procedural knowledge, whereas other more recent subjects have fewer sources of expertise. Vocational subjects also vary in the extent to which a competence or an outcomes approach is appropriate for assessing both vocational skills and knowledge. Subjects also vary according to the relative value assigned to generic pedagogical skills, and the ease with which they can be transferred into a formal curriculum. They also vary according to the balance between general pedagogy and specific vocational pedagogy in training programmes (Lucas, Spencer and Claxton, 2012[59]).

Differences exist not only between subjects, but also within subjects as students advance through the stages of learning. For instance, students in some occupational fields could benefit from an expert demonstration, or learning by trial and error, but only after they have some prior theoretical knowledge of key concepts in their field. Alternatively, they could learn a specific skill through coaching or their own inquiry, but only after they have had substantive practical hands-on experience (Lucas, Spencer and Claxton, 2012[59]). For instance, aircraft mechanics work intensively in practical settings but they also need to know about the theoretical elements that explain the functioning of an aircraft engine. Before students are given hands-on experience trying to fix a mechanical failure (inquiry-based learning), they need to know about the different components of an aircraft engine, and how they relate to each other to make it work.

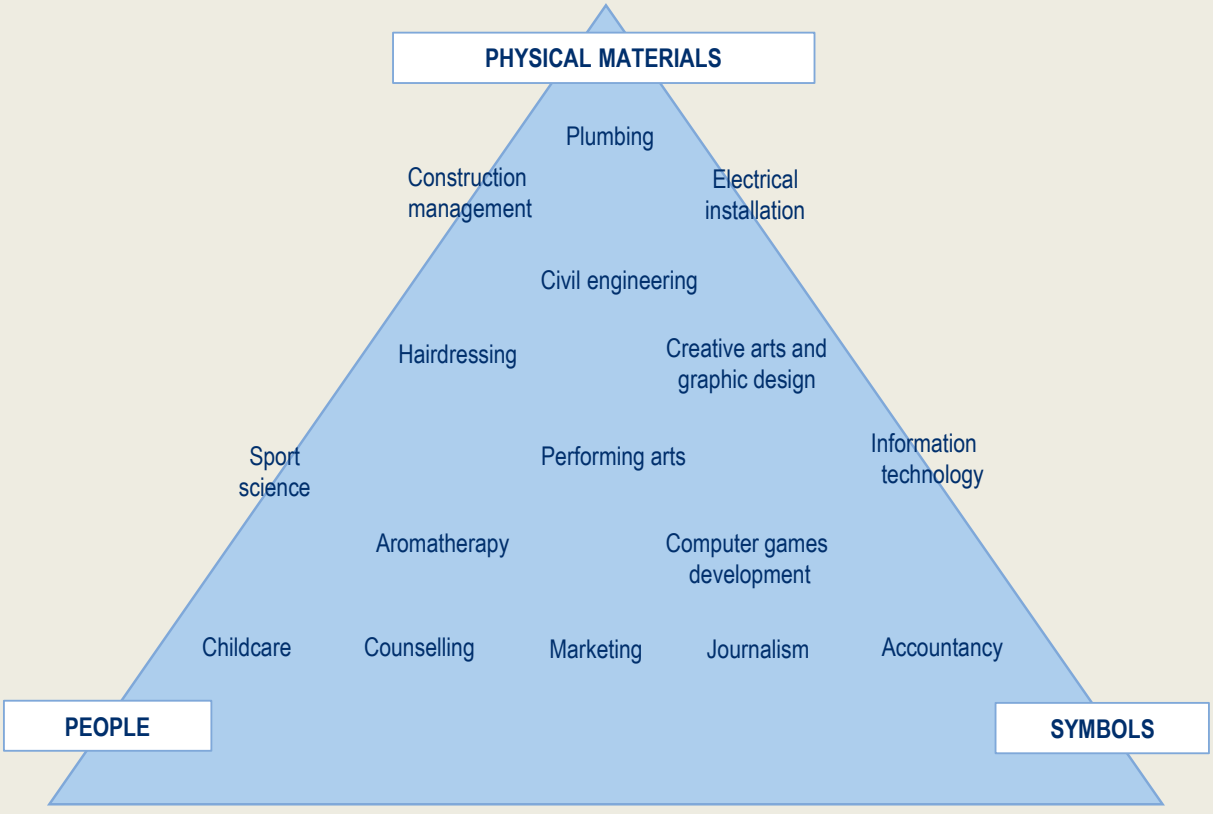
In order to choose the best type of pedagogy to be used in a specific context, teachers must be very clear about the specific learning goals they want to achieve. Once those goals have been defined, a series of activities using a specific pedagogical approach can then be planned, depending on the subject. Box 4.19 describes the Three Media Framework of Lucas et al. (2012[59]). This framework provides examples of how different expected learning outcomes in vocational subjects match different pedagogical approaches. When assessing possible teaching methods, teachers must also take into account their students' learning skills, attitudes and beliefs, while also bearing in mind the resources that are available to them in the environments and settings in which teaching is taking place (Lucas, Spencer and Claxton, 2012[59]; Vaughan, 2017[75]).

Box 4.19. The Three Media Framework

Given the complexity and diversity of vocational subjects, and in order to produce a generalisation that allows a better understanding of the variety of pedagogies available in vocational education and their suitability, Lucas et al. (2012[59]) distinguished vocational subjects according to the intensity of the use of three "media": physical materials, people and symbols (words, numbers and images). They suggest that all vocations work with the same three media, but to different extents. For instance, occupations such as plumbing work intensively with physical materials, whereas hairdressing works mostly with both physical materials and people. On the other hand, subjects such as information technology and graphical design work mostly with symbols and physical materials (see Figure 4.13).

Lucas et al. (2012[59]) argue that these differences in vocational subjects also mean that some pedagogies are more suitable than others. For instance, for those fields where working with people is critical, simulations or role playing could prove beneficial; whereas problem solving or experiential learning could work for those occupations where individuals mainly make use of physical materials. In the case of fields that mostly work with symbols, games and visual models could be suitable (Table 4.1).

Figure 4.13. Vocational subjects all work with the same three media, but to different degree



Source: Lucas, Spencer and Claxton (2012[59]), How to Teach Vocational Education: A Theory of Vocational Pedagogy, https://doi.org/10.13140/2.1.3424.5928.

Table 4.1. Teaching and learning methods for vocational subjects according to the Three Media Framework

	People	Physical materials	Symbols
Vocational subjects	Childcare, marketing, nursing, travel and tourism.	Plumbing, construction management, hairdressing, electrical installations.	Web design, accountancy.
Teaching and learning methods	Virtual learning environments, simulation, role playing.	Learning by watching, imitating, being coached, drafting and sketching, problem solving, team-based learning.	Learning through games, visual models and worked examples.

Table 4.2. Learning outcome examples for different occupations according to the Three Media Framework

	People	Physical materials	Symbols
Occupation	Sales manager	Automotive mechanic	Web graphic designer
Example of learning outcome and/or desired skill	Business-like attitude	Learn the names and function of automotive components.	Produce a web page for a commercial marketing campaign.

Professional development can support teachers in fostering students' soft skills

VET teachers need access to professional development opportunities to develop their skills in new pedagogies. This will allow them to make informed choices about which teaching strategies to choose and what technology and tools to use in their teaching. These training opportunities are particularly important, since, as previously discussed, VET teachers often lack pedagogical preparedness to adapt their teaching to new requirements. This might be especially the case for industry professionals entering the teaching profession with limited training. Moreover, as pedagogical strategies evolve, teachers need to remain up to date with these new methods. The new technology currently available for VET teaching increases the variety of teaching approaches that can be used in VET to develop students' soft skills, and professional development opportunities should therefore also support VET teachers in the use of technology, while strengthening their digital skills.

For instance, initiatives such as Passport to Success in the United States (Box 4.20) or the Enhance Digital Teaching Platform in the United Kingdom (Box 4.21), show that online learning modules can effectively support the professional development of those VET teachers looking to innovate in their practice making use of new technologies both on line and in workshops and classrooms.

Box 4.20. Integrating soft skills into teaching: Passport to Success (United States)

Passport to Success (PTS) is an innovative life skills development programme led by the International Youth Foundation. By implementing impactful curriculum and pedagogical innovations, its main goal is to promote the acquisition of soft skills among upper secondary students to prepare them for apprenticeships, further studies and the world of work.

To achieve this goal, the PTS professional development programme was designed to enhance teachers' competence in curriculum management and pedagogical knowledge about how to foster soft skills. The main goal of the programme is for teachers to understand the core soft skills and recognise their importance, and be able to design high-impact learning experiences that enable students to develop those skills in real contexts.

The standard training for teachers on PTS consists of a three week online programme (or four days of face-to-face training), where teachers can learn how to integrate soft skills into the regular curriculum. The training integrates self-paced online modules, live classes and discussion boards, assignments and feedback sessions. As part of the face-to-face component, teachers discuss the main benefits of soft skills in life and particularly in the workplace, the challenges of implementing activities enhancing these skills, and the type of activities and teaching practices that facilitate the development of soft skills in their students. The training programme incorporates access to online resources available to support the delivery of the PTS curriculum in schools. As part of this programme teachers also learn about effective ways to assess soft skills, with the ultimate goal of enhancing learning and employment outcomes for VET college students.

South Africa developed a pilot to equip VET colleges to deliver the PTS life skills curriculum within existing qualification timetables. The overall goal of the initiative was to develop and demonstrate a sustainable and scalable approach to implementing PTS. The technical support included:

- **Curriculum integration**: technical support to VET trainers in integrating the PTS curriculum within course timetables and using their existing lecturers, making the model more sustainable and easier to scale.
- **Training-of-trainer workshops** for VET teachers to equip them to deliver the PTS curriculum to students.
- **Lecturer observation and coaching:** PTS "Master Trainers" observed newly trained teachers' classroom practice and provided individualised coaching to ensure that they were delivering the curriculum using a learner-centred approach.

Source: Passport to Success (2020[76]), Passport to Success website, www.passporttosuccess.org.

Box 4.21. Online training to support teachers' use of technology: Enhance Digital Teaching Platform (England)

The Enhance Digital Teaching Platform – developed by the Education and Training Foundation in 2019 and funded by the Department for Education – supports teachers in England to use technology in their classrooms across the further education and training sector. The platform hosts free, bite-size, certified online self-learning training modules that support innovation in teaching and training to improve learners' outcomes.

Some of the modules are specifically designed to help teachers organise activities aimed at developing student soft skills making use of technology:

- Promoting collaboration and communication between learners incorporating learning activities which require learners to use digital technologies for collaborative processes, and for co-construction and co-creation of resources and knowledge.
- Promoting active learning, by allowing learners to actively engage with subject matter using digital technologies (e.g. using different senses, manipulating virtual objects, varying the problem set up to enquire into its structure, etc.).
- Encouraging the development of learner groups for peer learning and discussion, remotely monitored with intervention when needed, while allowing for student self-regulation.

Modules are mapped to the seven elements of the Digital Teaching Professional Framework, which promotes a set of professional standards for supporting learning through technology with the aim to establish a common understanding of digital skills development (see Box 4.11).

Source: Education and Training Foundation (2020[77]), Enhance Digital Teaching Platform, http://www.et-foundation.co.uk/supporting/edtech-support/enhance-digital-teaching-platform.

Raising awareness about the importance of innovation, ICT and soft-emotional skills in VET education

One of the key barriers to the systemic development of a more innovative approach to VET teaching is the lack of an agenda for policy change in this area in many countries. Changes in policy will only be implemented if there is a shared belief among VET stakeholders (especially teachers) about the importance of developing soft skills and digital skills and adopting new technology in VET, in response to digitalisation and automation in the workplace. Even in general programmes, soft skills still have a secondary place on the skills agenda: according to a survey in five countries[6] (World Economic Forum, 2016[78]), parents and teachers in the general education sector do not assign the same priority to soft skills as to other skills, such as foundational skills. This has had implications on curricula and teachers' practice. A similar situation is found in the VET sector.

In order for reform to take place, policy makers, VET teachers, industry, researchers and education technology providers need to make a co-ordinated effort to further expand the use of technology and innovative pedagogical approaches in VET. Only if all stakeholders work together will it be possible to produce systematic reform in VET, changing perceptions and behaviour around these skills. This will be crucial in the current context, as most countries urgently need systematic policies to fully incorporate soft skills and digital skills into VET students' education and development.

Conclusion and policy recommendations

The need for VET graduates to have strong digital and soft skills is increasing, as automation and digitalisation become more widespread in the workplace. However, VET teachers do not always have the skill to teach in digital environments, and their pedagogical preparation is quite limited in many countries. As digital technologies become more prevalent, it is crucial that VET teachers gain the skills needed to update their practice to meet the new requirements set by employers and make the most of innovative technologies and pedagogical strategies in the classroom.

A number of emerging pedagogical approaches and technologies are available for VET teachers, which facilitate developing their students' digital and soft skills while teaching vocational skills. To use those teaching tools and methods, VET teachers need access to high quality professional development opportunities, as well as peer learning opportunities, so they can update their practice and increase their confidence in the use of technology. Moreover, strong ties between VET institutions and employers allows teachers to learn about new technology developments as well as labour market demands.

Furthermore, the adoption of new technology and innovative pedagogical approaches in VET is more likely to take place when there is a shared belief among VET stakeholders about the importance of developing soft skills and digital skills and adopting new technology in VET. Close cooperation between VET institutions and employers can foster innovation. At the same time, governments also play a crucial role as facilitators of innovation in teaching practice, for example by investing in infrastructure and technical support.

Policy pointers for promoting innovative pedagogical approaches in VET

3.1. Fostering the capacity of VET teachers to use innovative pedagogical approaches by:

- Developing VET teachers' digital skills through professional development opportunities: For example, work-based learning opportunities for VET teachers allow them to learn about new technologies in the workplace which fosters their teaching skills using digital technologies.
- Providing support and guidance to VET teachers on how to choose effective innovative teaching methods: Both face-to-face and online learning modules can effectively support those VET teachers looking to innovate in their teaching practice. Innovative pedagogies should also be incorporated into initial teacher education and training for VET teachers.

3.2. Providing VET teachers with strategic guidance and institutional support for the integration of new technologies in VET by:

- Providing VET teachers with relevant technical support and technological infrastructure: In order to increase the use of technology in VET, access to digital devices, high-tech equipment and technical support needs to be improved.
- Establishing high-tech training centres: Training centres can have a special focus on strengthening the quality of teaching in VET provision, providing high-quality professional development to VET teachers on the latest technology in industry. These centres benefit both VET institutions and employers.
- Promoting and facilitating the use of effective and innovative teaching strategies in VET: For instance, by providing VET teachers with the time and resources to experiment with the use of new technology in their teaching.
- Establishing a shared vision and goals in VET institutions to integrate digital technology for teaching and learning in VET: Initial assessments can be a good starting point to produce a shared strategy across relevant stakeholders to support digital transformation in VET schools.

3.3. Fostering innovation through partnerships between the VET sector, industry and research institutions by:

- Promoting exchanges between industry professionals and VET teachers: For example by giving VET teachers the opportunity to visit industry facilities or providing VET teachers with work-based learning opportunities.

- Encouraging the development and adoption of digital technologies in VET teaching for different industries: For example, governments could establish innovation funds to support EdTech companies in the production of digital resources for teaching, such as VR applications and simulators.

3.4. Raising awareness about the importance of innovation, ICT and soft skills in teaching in VET by:

- Establishing an agenda for policy change that calls for a coordinated effort from policy makers, VET teachers, industry, researchers and education technology providers to expand the use of technology and promote innovative pedagogical approaches in VET.

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Notes

[1] As discussed in Chapter 1, in many countries a large proportion of VET graduates have jobs at high risk of automation.

[2] The *Programme for the International Assessment of Adult Competencies* (*PIAAC*) is a worldwide study by the OECD measuring cognitive and workplace skills in the adult population.

[3] In this context ICT skills may be broadly defined as "the interest, attitude, and ability of individuals to appropriately use digital technology and communication tools" (OECD, 2012[80]).

[4] A micro-credential is a proof of the learning outcomes that a learner has acquired following a short, transparently-assessed learning experience. They are awarded upon the completion of short stand-alone courses (or modules) done on-site or online (or in a blended format) (European Commission, 2020[79]) A digital badge is an indicator of accomplishment or skill that can be displayed, accessed, and verified online.

[5] Research institutions in this context refers to private or public research centres, universities, companies and specialised training centres that provide advanced training in VET subjects using the latest technologies in industry.

[6] The People's Republic of China, Kenya, Korea, the United Kingdom and the United States.

5 Strengthening leadership in vocational education and training

This chapter looks at institutional leaders in vocational education and training (VET), and discusses their often multi-dimensional roles. It analyses leaders' skills and training needs and provides avenues to foster skills development. This chapter also looks at the attractiveness of the VET leadership role and highlights how working conditions and support could be improved.

Key messages for strengthening strategic leadership in VET

VET institutions need well-prepared leaders. VET leaders have to understand both the VET sector and the labour market, and its changing needs, while at the same time have organisational and pedagogical leadership skills as they seek to improve teaching and learning.

To ensure that VET leaders can effectively carry out their complex and varied roles, countries should make sure all leaders are equipped with the right skills. A first step will be to clarify their roles and tasks to act as a key point of reference for those considering a leadership role, and for those organising their selection and training. Access to initial training and professional development opportunities is crucial if VET leaders are to develop the right skills and keep them up to date, and these opportunities need to be flexible and aligned with the expected requirements for their role. Initial training and professional development need to be part of a coherent skills development strategy for VET leaders.

It is also important to ensure that the VET leadership role is attractive. Many VET leaders struggle with the difficult workload and the diverse responsibilities their role brings. The creation of middle-management roles and leadership teams can assist leaders with their responsibilities. VET leaders should be able to access support measures, such as mentoring, induction and peer-learning opportunities, especially at the start of their careers.

Policy pointers

- 4.1. Clarifying the roles and tasks of VET leaders
- 4.2. Equipping VET leaders with the right skills
- 4.3. Increasing the attractiveness of VET leadership roles

The roles and tasks of VET leaders

Leaders have a multidimensional role

Institutional leaders in vocational education and training (VET) refer to those who are appointed or employed in a recognised leadership position to oversee VET programmes and institutions and who have responsibility for the goals set by the organisation that offers VET programmes. VET leaders manage "complex and knowledge-intensive organisations" – both in the short and long-term (Ruiz-Valenzuela, Terrier and Effenterre, 2017[1]). They set core values and a strategic vision for their institution, and support other staff members to deliver on the objectives. Depending on the country' context, VET leaders might hire teachers; decide how they are remunerated, provide support and encouragement to their staff; determine the appropriateness of the institution's core activities; ensure the retention and progression of students; and represent the institution in its contacts with education boards, the relevant ministries and agencies, social partners, and parents. VET leaders manage the central community position that their institution holds, and are linked with other education institutions, universities, employers and local authorities. They need to be aware of new guidance and regulations around the provision of VET programmes. Leaders are also responsible for all aspects of their institution's performance, including its financial health, and may be accountable for achieving the institution's goals and efficiently managing its resources (Ruiz-Valenzuela, Terrier and Effenterre, 2017[1]; Greatbatch and Tate, 2018[2]; Böhlmark, Grönqvist and Vlachos, 2016[3]).

VET leaders have different responsibilities in different countries and types of institutions. They could be leaders of a single- or multi-field vocational institution, or head a public or private VET institution providing

adult learning programmes. They might also be responsible for VET programmes within comprehensive education institutions (that may have also general education programmes). These institutions include upper secondary VET schools in Denmark and Germany; further education colleges, independent training providers and adult community centres in England (United Kingdom); vocational high schools, colleges of technology and specialised training colleges in Japan; or Career Tech Education programmes in high schools and community colleges in the United States. There may be more than one person in charge of a VET institution (Frimodt, Volmari and Helakorpi, 2009[4]). According to the OECD's *Education at a Glance*, upper secondary vocational leaders in ten OECD countries have to meet certain requirements regarding teaching hours, while in others it is voluntary (OECD, 2020[5]).

The management of VET institutions and the division of responsibilities vary greatly depending on the type and size of the institution. In Finland, for instance, a VET leader (principal) can be head of a single-field vocational school (e.g. the Finnish School of Watch Making with 70 students), a principal of a large multi-field vocational institution (e.g. Omnia, a VET institution with 3 000 students), or a director of an education and training consortium in a municipality (Cedefop, 2011[6]). The United States has about 1 100 community colleges, ranging in size from 500 students to over 30 000, and as a result, they have varying requirements for leaders (Eddy and Garza Mitchell, 2017[7]). In England, the median number of learners is around 6 700 students per VET institution (Greatbatch and Tate, 2018[2]). In the Netherlands, there are around 70 VET institutions with on average 7 704 students each, but some have as many as 20 000 students (Thomsen, Karsten and Oort, 2014[8]). VET institutions operate quite autonomously from the central government with a lot of decision-making delegated to the institution level.

It is generally acknowledged across OECD countries that institutional leadership is complex with multiple, and at times competing, pressures. This is particularly the case for institutions providing courses at multiple levels such as FE colleges in England or community colleges in the United States. Ruiz-Valenzuela, Terrier and Effenterre (2017[1]) put the management of FE colleges in England at the same level as managing large and complex public institutions such as universities and hospitals. In Australia, a survey of post-secondary VET leaders showed that strong leadership requires acknowledging the complexity of the relationships involved in simultaneous membership of different cultures (e.g. corporate, collegial, managerial and professional) (Mulcahy, 2004[9]). This complexity has required new skills and a different way of looking at the activities and functions leaders carry out. Complex tasks involve many challenges that require input from different perspectives and areas of expertise (Bouwmans et al., 2017[10]).

In many countries and systems, some of these functions are distributed amongst different individuals and middle management roles are created, such as principals, deputies, team managers and heads of units and teachers (Frimodt, Volmari and Helakorpi, 2009[4]). For instance, due to their size, Dutch VET institutions usually have three management layers: supervisors or middle managers at the first level, who usually manage between one and four teams of teachers; a middle level of location directors or sector directors, who either manage one of the schools' locations or are responsible for one branch of VET; and the institution's director(s) at the top level (Thomsen, Karsten and Oort, 2014[8]).

As highlighted in previous chapters, VET is distinguished from the rest of the education sector by its strong connection to the world of work and the need to keep abreast of changes in the labour market. This means VET leaders have additional roles compared to their peers in general education, such as:

- Ensuring a strong connection to the labour market. This means leaders need to have a strong understanding of the local economy and business.
- Engaging with a wide range of stakeholders, in particular social partners and employers.
- Managing sophisticated business operations, including innovating, adapting learning contents and dynamically changing staff composition in order to keep up with the pace of technological development and changing labour market needs.

- Handling a particular responsibility for social inclusion, with VET often having a large number of disadvantaged students struggling with learning and social difficulties, a high rate of students dropping out and a great diversity of students and training programmes (Cedefop, 2011[6]).

This means that VET institutions and their leaders play an essential role in supporting local and sectoral skills development, and the labour markets in which they feed in. They can engage with employers and trade unions, and other stakeholders, at these different levels, including the national one. In the context of the COVID-19 pandemic this means that they can open up lines of communication to assess how each sector is affected by the pandemic, leading to greater stakeholder engagement in the future (OECD, 2020[11]).

Pedagogical leadership, and tasks such as preparation of learning support materials, can be more complex in VET than in general education (UNESCO, 2017[12]). VET institutions often offer more diverse courses than general education ones, and this has an impact on the leadership role. For example, the teaching staff in a VET institution come from more heterogeneous backgrounds than in a general education institution, which may poses particular challenges for human resource management – hiring them, supporting them in their induction, and ensuring relevant professional development opportunities exist. Quality assurance mechanisms might also need to be more sophisticated, since it has to take into account labour market outcomes (Cedefop, 2011[6]).

The global COVID-19 pandemic has forced countries to create and use alternative forms of learning, including digital platforms. However, vocational programmes, including apprenticeships, are often much more difficult to provide and assess at a distance. This has created additional roles and responsibilities for VET leaders, as leaders are crucial to adapt the operation of VET institutions to increasing use of online and virtual platforms, which allow the continuity of learning, and support teachers in their use. When online learning is not possible, training breaks or extension can also be steered by VET leaders (OECD, 2020[11]).

The activities and skills of leaders have an impact on teachers and students

The OECD has done extensive work in the past looking at institutional leadership mainly in general education. The OECD *Improving School Leadership* publications (Pont, Nusche and Moorman, 2008[13]; Pont, Nusche and Moorman, 2008[14]) highlighted four core responsibilities of school leadership: 1) supporting, evaluating and developing teacher quality, 2) goal-setting, assessment and accountability, 3) strategic financial and human resource management, and 4) collaborating with other schools. There are strong linkages between institutional leadership, and teachers' motivation[1], students' well-being[2] and the quality of teaching and learning. Looking at leaders in FE colleges in England, Ruiz-Valenzuela, Terrier and Van Effenterre (2017[1]) found that principals matter for the educational performance of their students, but also that they differ in their ability to enable students to progress[3]. In general, the work of leaders often involved providing specific feedback and direction to individual teachers about their practice, as well as managing the resources to create conditions within the institution that support improved learning and teaching (Bush, 2018[15]).

Institutional leaders can drive organisational changes to build strong, effective and flexible VET programmes and institutions that can adapt to emerging challenges. Today's institutional leaders are not only expected to strategically plan and administer their institutions, but also to lead pedagogical innovation, build collaboration networks with multiple organisations, and keep abreast of new technological developments in industry (Coates et al., 2013[16]; Cedefop, 2011[6]). As discussed in Chapter 4, fostering innovation in VET requires strong institutional leadership to develop organisational change and collaboration.

Long-standing research and policy discourse in general education have also stressed the importance of pedagogical leadership, i.e. creating the environments in which teachers continuously improve their ability to support student learning[4] (OECD, 2016[17]; Pont, Nusche and Moorman, 2008[13]; Robinson, Lloyd and

Rowe, 2008[18]; OECD, 2019[19]). Principals also play a critical role in attracting and retaining talented teachers. Teachers cite their principals' support as one of the most important factors in their decisions to stay in a particular education institution or in the profession (Espinoza and Cardichon, 2017[20]). Pedagogical leadership from institutional leaders is required to sustain changes and improvements in teaching practice over time (UNESCO, 2017[12]). Among different management tasks, the most important for quality are professional development of teachers and trainers, ensuring adequate facilities and equipment for teaching and learning, and last but not least, efficient management of financial resources (Cedefop, 2015[21]).

In order to improve teaching and learning within their institutions, leaders in VET need to be actively involved in their teachers' professional development process. VET leaders provide teachers with structured autonomy and productive feedback on their career development so that teachers can identify and target their own professional needs and drive improvements (O'Leary et al., 2019[22]). A study of VET institutions[5] in the Netherlands found that teachers' engagement in learning activities (e.g. self-reflection, asking for feedback and sharing information) is influenced by their leaders' attitudes and perceived interdependence. The study also showed that leaders who provide individual support and intellectual stimulation to teachers contribute to their collaboration (Oude Groote Beverborg, Sleegers and van Veen, 2015[23]). In Slovenia, principals receive training from the National School for Leadership to carry out teacher appraisal processes (OECD, 2016[24]). Teacher appraisal is especially important in a context in which teachers may not receive much professional development or where teachers are ageing and therefore may have issues keeping up with innovation (Radinger, 2014[25]).

The role of VET leaders varies depending on the degree of institutional autonomy

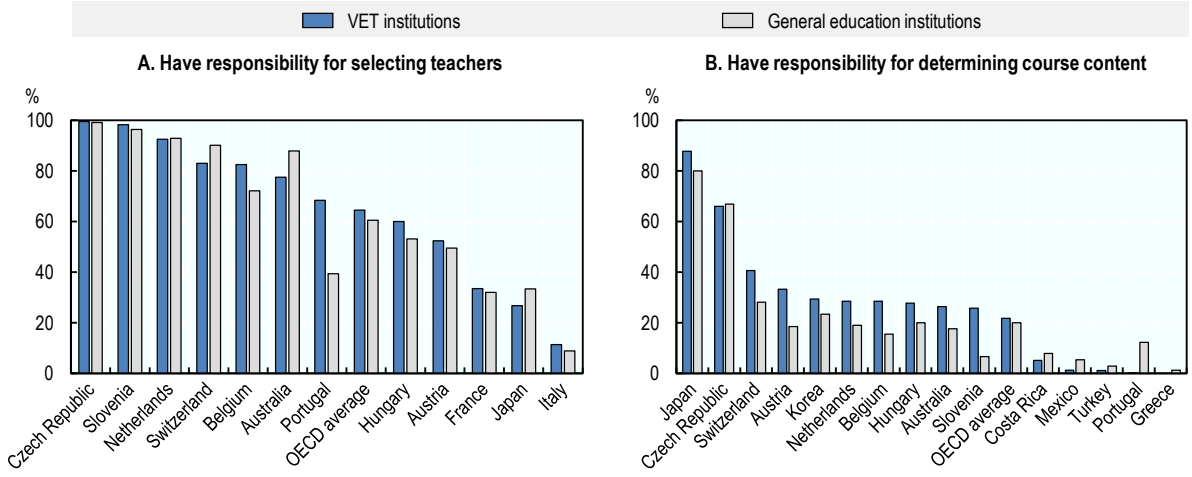
Leadership roles are contingent on local context, and therefore a multiplicity of possible leadership approaches are used by VET providers across OECD countries (see (Greatbatch and Tate, 2018[2]) for England, (Aidla and Vadi, 2008[26]) for Estonia, (Brauckmann, Pashiardis and Ärlestig, 2020[27]) for Sweden). Concretely, this means that leaders need to adapt generic leadership practices (e.g. goal setting, or supporting teachers) to meet the needs and constraints of each institution's context. The governance of VET institutions, and how much autonomy and accountability VET leaders have, define their roles (Hallinger, 2016[28]). The argument to decentralise decision-making is that local actors at all levels, professors, teachers, parents, students, -if well prepared and supported-, are often best able to judge how to achieve learning goals in the light of local circumstances, and to align educational goals with different student and school needs. Many OECD countries are moving towards decentralisation and increased autonomy for education institutions coupled with greater accountability. In countries where institutions are held to account for their results through publication of achievement data, institutions that enjoy greater autonomy in management tend to do better than those with less autonomy; but in countries where there are no accountability arrangements, the reverse is true (Wossmann, 2003[29]; OECD, 2013[30]). It is therefore widely accepted that autonomy has to go together with accountability mechanisms, and even more importantly, with support structures that help institutional leaders to use newly devolved powers. Education systems should hold institutions for realising learning outcomes, and build leadership capacity and a strong culture of evaluation and transparency (OECD, 2018[31]).

Data from the Programme for International Student Assessment (PISA) shed light on the responsibilities of upper-secondary institutions in two areas: (1) resource allocation; and (2) curriculum and instructional assessment within the institution. The first area includes elements such as the appointment and dismissal of teachers, the determination of teachers' salaries, and the formulation of budgets and their allocation within the institution. For example, PISA data show that in many countries, leaders of upper-secondary educational institutions are responsible for the hiring policies of their institutions, which means they need to have the human resources capacity to carry them out (Figure 5.1, Panel A). In most countries, the share of VET and general education leaders who report having these responsibilities is similar. When VET leaders have responsibilities for hiring policies, they need to have the human resources capacity to do so.

The second area includes the establishment of student-assessment policies, textbook choice and the decisions about which courses to offer and the content of those courses. PISA data show that the extent to which principals in upper secondary institutions have the responsibility for determining course content differs widely between countries (Figure 5.1, Panel B), but also that in many countries these responsibilities are more common in VET institutions than they are in general education ones.

Figure 5.1. Leaders have a broad range of responsibilities

Percentage of upper secondary principals, by type of institution and reporting item



Note: VET institutions are those where at least 50% of students are enrolled in upper secondary vocational programmes. Institutional leaders in VET refer to individuals who are appointed or employed in a recognised leadership position to oversee VET programmes and institutions and have responsibility for the goals set by an organisation that offers VET programmes.
Source: Elaboration based on OECD (2015[32]), PISA 2015 database, https://www.oecd.org/pisa/data/2015database/.

Clarifying the roles and tasks of leaders

In many countries, there is a lack of clarity about VET leaders' core tasks and responsibilities, which could contribute to reducing preparedness among VET leaders taking up the role. Improved and updated definitions of VET leadership responsibilities would constitute a key point of reference for those considering becoming a leader, and for those organising their selection and training (Pont, Nusche and Moorman, 2008[13]). In the French Community of Belgium, for example, a reform of VET leadership clarified the roles of institution leaders (Box 5.1). In Austria, the 2017 education reform gave VET institutions more autonomy and therefore also increased the competences and responsibilities of head teachers. These tasks included administrative tasks, staff management, selection of teachers, monitoring of the teaching process, development of an institutional profile, quality management, organisation of teaching processes and co-operation with the regional quality managers from the school boards in the nine Austrian provinces. Training programmes for VET leaders have been developed according to the roles determined by standards, and to link learning activities and candidate assessments to the set of shared values, beliefs, and knowledge defined by the standards (BMBWF, 2020[33]).

Box 5.1. A holistic approach to leader development in Belgium (French Community)

The French Community (Belgium), made a significant reform to leadership in all education institutions (up to the upper secondary level), including those delivering VET, in 2008 (Fédération Wallonie-Bruxelles, 2020[34]), acknowledging that, although experience working in an educational institution remained essential, the leadership function was very different from teaching. The reform had several aspects:

1. enumeration of the principals' missions: clarifying their role (in relation to the students, the regulator, the network which the institution is part of, and external stakeholders in general)
2. implementation of initial training for principals, including pedagogical, educational, administrative, financial and stakeholder participation components
3. an induction period ("principal's internship"), designed to allow them to get familiar with their new role and to assess their aptitude to exercising it.

In 2018-19, more than 1 300 participants completed at least 75% of the modules of the training programme.

Source: ICF (2020[35]), Rapport d'évaluation des formations initiales des directions (volet commun à l'ensemble des réseaux) organisées en 2018-2019, www.ifc.cfwb.be/documents/multi/rapportEval/DIR_Rapport_18.pdf.

Building on such a definition of leadership in VET, professional standards can provide a clear statement of the core elements of successful leadership. This can act as a first step towards a shared understanding of what counts as effective leadership, and be used for the appraisal of leaders. However, considering the importance of context for institution leadership, the appraisal of a core set of leadership practices needs to be balanced with flexibility to allow for local adaptation (Radinger, 2014[25]).

Clarifying the roles and responsibilities of VET leaders could also help make the career more transparent to potential external candidates, who might have the right organisational and management skills without necessarily having a background in the education sector. In the changing world of work, VET leaders are having to increasingly focus on establishing relationships with employers and other stakeholders, and, to some extent, focus less on pedagogy. This may conflict with the background of VET leaders, who come mainly from the teaching profession (Savours and Keohane, 2019[36]). As discussed above, this argues for the need to support teachers to build a well-rounded set of skills as they develop into leaders. However, it also makes the case for creating other routes into these leadership roles, from a private sector business background or a public service career. Evidence from England on recruiting from outside the FE sector found that it has often brought a "more commercial edge" and stimulates new thinking (Savours and Keohane, 2019[36]). One interesting approach can be to attract outside candidates through alternative recruitment and initial training programmes at the local level, as is done in some part of the United States (Eddy and Garza Mitchell, 2017[7]).

The preparation and development of leaders

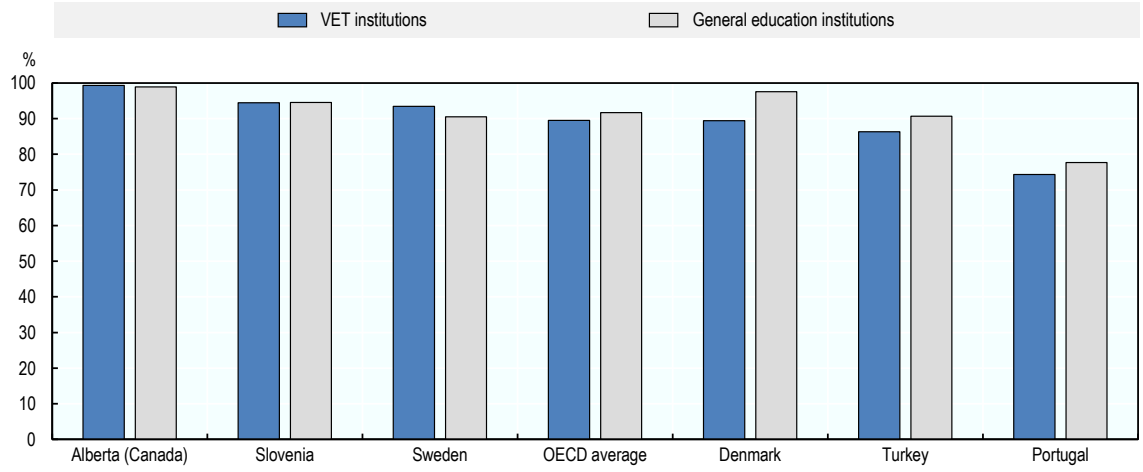
VET leaders have not always undergone relevant training before they start in their role

Traditionally, the career path to becoming an institutional VET leader is very clear, taking candidates from the teaching profession and selecting them into middle management and senior leadership roles. This means that they gradually spend less time on what they are trained for – teaching –, and more time on what they may not be prepared for – leadership (Bush, 2018[15]).

Analysis of data from the Teaching and Learning International Survey (TALIS) shows that VET principals commonly have a teaching background, as shown by the fact that they have received teacher training. Figure 5.2 shows that in Alberta (Canada), Slovenia and Sweden, more than 90% of principals in upper secondary VET institutions are trained as teachers, although in Portugal, this is the case for only around three quarters of principals. In England too, the predominant progression route into the role of FE institution leaders appears to be via teaching and middle-management leadership roles in FE. Around two thirds of FE leaders have a background in education and training (Savours and Keohane, 2019[36]).

Figure 5.2. Many VET leaders have received teacher training

Percentage of upper secondary principals who have received teacher training, by type of institution



Note: VET leaders are those who reported in TALIS that they work as principals in education institutions with vocational upper secondary programmes (ISCED 3). The reported average corresponds to the unweighted average for the six OECD countries/regions.
Source: Elaboration based on OECD (2019[37]), TALIS 2018 database, http://www.oecd.org/education/talis/talis-2018-data.htm.

However, as mentioned above, VET institutions can be very sophisticated business operations which leaders need a complex set of skills to run, including competence in business and financial management. Therefore, leaders need to not just be teaching and learning specialists but also have a broad range of entrepreneurial and commercial skills. Some studies signal an emerging divergence between the teaching background of many VET leaders and the commercial aspects of the emerging leadership role (see Savours and Keohane (2019[36]) for an English example).

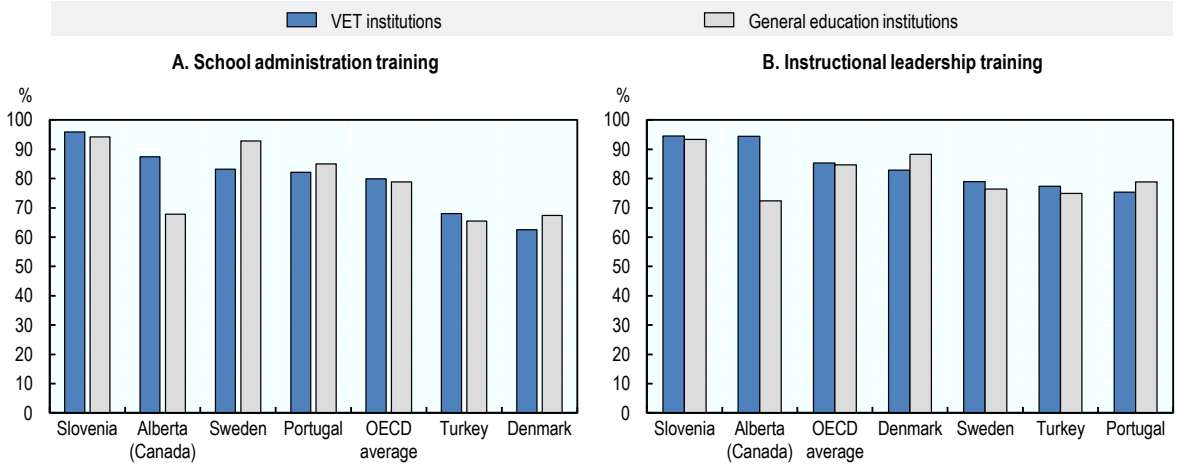
VET leaders often come into their roles with limited preparation. TALIS asks leaders of upper-secondary education institutions if they had received different types of training in order to take up their role. The results, which allow those leading VET institutions to be compared to those in general education, highlight some interesting differences between countries or regions and between types of institutions. In Denmark, for example, almost 40% of leaders in upper secondary VET institutions reported they had not participated in school administration training, compared to less than 5% in Slovenia. There is no clear pattern with regards to differences between VET and general institutions: in Denmark, Portugal, and Sweden principals in VET institutions are less likely than those in general education institutions to have participated in dedicated training programmes, whether at the start of their career or while in service, while the opposite holds in Alberta (Canada), Slovenia and Turkey (Figure 5.3, Panel A).

Similar patterns can be observed for pedagogical leadership training, although this type of training is more common in most countries. TALIS data show that 15% of VET leaders on average did not participate in instructional leadership training across the countries with available data (Figure 5.3, Panel B). This type of

training is common for VET leaders in Alberta (Canada) and Slovenia, where only around 5% of VET leaders report not having received such training. Moreover, VET leaders in Alberta (Canada) are much more likely to have participated in instructional leadership training than leader of general education institutions.

Figure 5.3. Not all leaders have received formal training related to their position

Percentage of upper secondary principals reporting that they received training (either before, or after taking up a position as principal), by type of institution



Notes: VET leaders are those who reported in TALIS that they work as principals in education institutions with vocational upper secondary programmes (ISCED 3). The OECD average represents to the unweighted average of the six OECD countries/regions.
Source: OECD (2019[37]), TALIS 2018 database, http://www.oecd.org/education/talis/talis-2018-data.htm.

While VET leaders require multiple competences in order to meet the demands discussed above, many of them are not well prepared before taking up their role, and might not receive the support they need throughout their career, such as mentoring and professional development. Ensuring that relevant training programmes are offered, aligned with the expected requirements for VET leaders, and that they are accessible to all prospective VET leaders is crucial. The countries with greater levels of autonomy for education institutions are the ones where leadership training programmes are the most developed, while those where education institutions have traditionally been given little autonomy have fewer programmes on leadership (Huber, 2004[38]). The differences between countries in access to preparatory leadership training is also linked to the fact that the formal requirements for being a principal vary between countries. Analysis of the country answers to the OECD questionnaire on VET teachers and leaders confirms that the preparation requirements for leaders of vocational institutions vary widely between countries, with formal requirements ranging from higher education degrees, such as a master's degree, to no specific qualification requirements (although typically teaching experience is required). There are no specific requirements in Japan and Finland at all. In addition, a study by the European Centre for the Development of Vocational Training (Cedefop) looking at preparation for VET leaders found that only in a few cases were they required to have studied in a VET related field (Cedefop, 2011[6]).

In Spain, VET leaders are required[6] to have five years of teaching experience and have completed the training course for school leaders. This training course can be offered by the Ministry of Education and VET or by any of the regional education governments. The training has a minimum duration of 120 hours and needs to be updated after eight years. With a modular structure (comprising six different modules), it

is divided into two parts, theoretical and practical. In Israel, leaders of VET institutions are required to have at least five years of teaching experience and hold a master's degree. In addition, leaders need to possess leadership skills and some educational providers require them to go through an external professional screening process. While this screening process is thorough, there are no specific training programmes to prepare leaders for their new role.

The lack of access to preparatory training may be more of a concern for VET institutions than for general education institutions, as VET leaders' roles are often more complex. In some cases, there may be a lack of suitable courses for prospective principals. A study on the requirements for institutional leaders in the United States showed that few states are offering coursework specific to VET programmes, and that the availability of such courses is on a continued decline over time. This is linked to that fact that fewer states are imposing specific requirements for training participation, and as a consequence, fewer colleges/universities are offering these training opportunities (Zirkle and Jeffery, 2017[39]). Moreover, there is evidence that training programmes in institutional leadership in the United States are falling short in a few key areas: budgeting and finance, and communication with teachers and administrative staff (Inside Higher Ed, 2013[40]).

Leaders may not have access to sufficient professional development opportunities

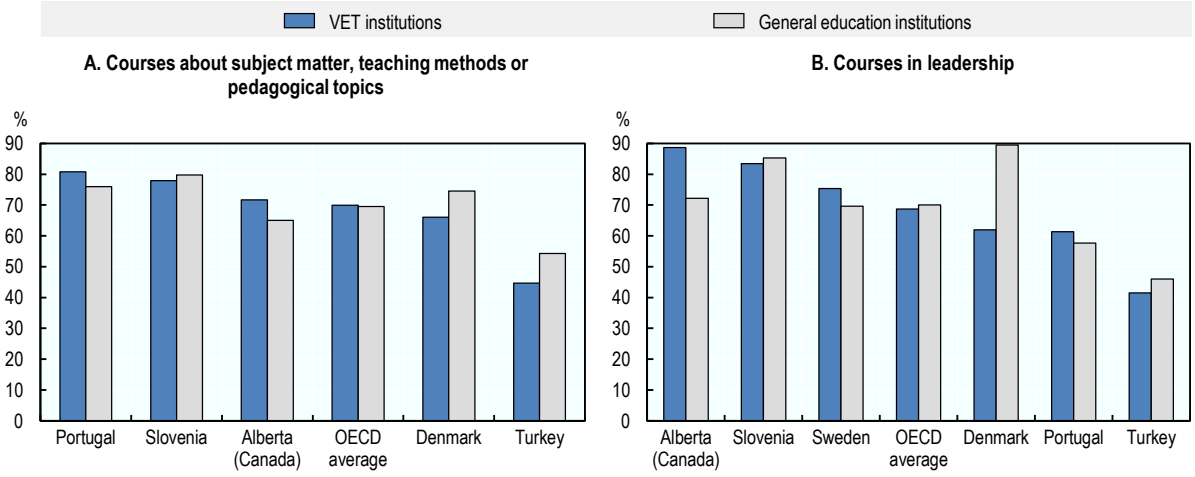
In response to their complex and changing roles, institutional leaders should have access to professional development, especially when they have taken up their role without initial preparation. However, TALIS data show that in the six OECD countries/regions with available data, leaders have limited access to professional development opportunities around developing institutional management and pedagogical leadership (Figure 5.4, Panel A). In Turkey, less than half of VET leaders report having had access to courses about subject matter, teaching matters or pedagogical topics as part of their professional development over the year prior to the survey – a lower share than their counter-part in general education institutions. Similarly, only around 40% of VET leaders report having participated in courses on leadership in Turkey, and around 60% of VET leaders in Portugal and Denmark (Figure 5.4, Panel B). The differences between VET and general education leaders were generally small, except in Denmark where leaders from VET institutions reported much lower access to management training than those from general education institutions, and in Alberta (Canada), where the opposite held.

Aside from the TALIS survey, which only covers VET institutions in a handful of countries, data on this topic are scarce. In England, for example, Greatbatch and Tate (2018[2]) note that there are few studies that systematically examine how leadership quality is assessed, improved and rewarded in further education (FE).

According to the TALIS data, VET leaders are more often lack support from their employers to engage in professional development than leaders of general education institutions (Figure 5.5, Panel A). This is the case for more than half of VET leaders in Portugal and Turkey but for less than 20% of those in Slovenia and Sweden. Other common barriers include a lack of incentives and a lack of relevant training opportunities, with 38% and 30% of VET leaders, respectively, reporting these as barriers to professional development across the six OECD countries/regions with available data (Figure 5.5, Panels B and C). These barriers are again highest for VET leaders in Portugal and Turkey, and generally more common than for leaders in general education institutions.

Figure 5.4. Many VET leaders do not participate in professional development opportunities

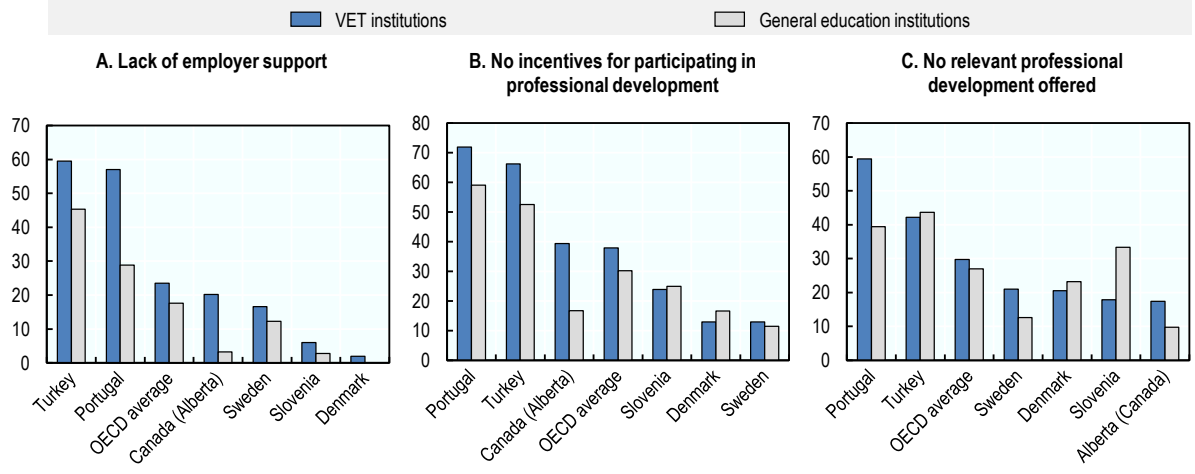
Percentage of upper secondary principals reporting having participated in professional development during the last 12 months, by type of institution



Notes: VET leaders are those who reported in TALIS that they work as principals in education institutions with vocational upper secondary programmes (ISCED 3). The OECD average corresponds to the unweighted average of the six OECD countries/regions.
Source: OECD (2019[37]), TALIS 2018 database, http://www.oecd.org/education/talis/talis-2018-data.htm.

Figure 5.5. Many leaders report insufficient institutional support to engage in professional development

Percentage of upper secondary principals declaring a certain barrier to participation in professional development, by type of institution



Notes: VET leaders are those who reported in TALIS that they work as principals in education institutions with vocational upper secondary programmes (ISCED 3). The reported average corresponds to the unweighted average for the six OECD countries/regions.
Source: OECD (2019[37]), TALIS 2018 database, http://www.oecd.org/education/talis/talis-2018-data.htm.

Equipping VET leaders with the right skills

Initial training and professional development for VET leaders is important

Across education sectors, there is a consensus among practitioners and experts on the importance of training for leaders (Davis et al., 2005[41]), even if there are some methodological difficulties in assessing the impact of such programmes for leaders. Most of the empirical evidence for training programmes consists of candidates' self-reported perceptions and experiences (Levine, 2005[42]; Pont, Nusche and Moorman, 2008[13]; Day et al., 2009[43]). A Swedish longitudinal study of 35 comprehensive schools measuring the effects of training for school leaders (Blossing and Ekholm, 2008[44]), found that it improved their skills, knowledge and dispositions.

The design of a skills development programme for institutional leaders can be understood as involving different elements: initial training, recruitment and selection, induction, mentoring, and professional development. In order to design an effective programme, initial training, recruitment and selection, induction, mentoring and professional development have to be thought of as a continuum (Bush, 2018[15]). It is crucial that any initial training programmes on offer are relevant, aligned with the expected requirements for VET leaders, the specific context and further opportunities for professional development, and that they are accessible to all prospective VET leaders.

Box 5.2 Leadership preparation as a continuum in Portugal

A recent reform in Portugal, the National Programme for School Success Promotion (2015-17), aimed at transforming schools into learning organisations, involving all staff and students, parents and the external community. In Portugal, principals are accountable for every dimension of the school's management: administrative, financial and pedagogical. School leadership is understood as an extension of the professional responsibility of a teacher, rather than a separate profession: only teachers can become principals, after going through training in school administration and management. Candidates must also have at least a minimum experience of four years as a principal assistant, president or vice-president of the administrative council of the school, and present a project to the council, which elects the principals. The distribution of leadership was pivotal, through the following steps:

- defining broad guidelines by a task force at central government level;
- training for trainers;
- training for school leaders, including head teachers and others;
- identifying areas for priority action within the framework for the autonomy of each school/cluster of schools;
- design of strategic plans in association with the mission and purposes of each school/cluster of schools;
- implementing, monitoring, evaluating, and redesign of the strategic plans;
- external evaluation.

The programmes trained over 70 000 teachers. A recent evaluation of leadership training found that principals would like more training opportunities in pedagogical and distributed leadership practices.

Source: European Commission (2017[45]), *Teachers and School Leaders in Schools as Learning Organisations*, www.schooleducationgateway.eu/downloads/Governance/2018-wgs4-learning-organisations_en.pdf; Serrão Cunha (2020[46]). Portuguese *Principals' Professional Development Needs and Preferred Learning Methods*.

Since the mid-1990s, many OECD countries have introduced training and development for basic and general secondary education institution leaders, either as preparation for entry to the post or to further develop the skills of leaders already in place. The courses offered to actual or prospective leaders may vary from short certificate courses to post-graduate or even in some cases doctoral programmes (Pont, Nusche and Moorman, 2008[13]). Box 5.3 describes some characteristics of exemplary programmes for educational institution leadership training.

Box 5.3. Characteristics of exemplary programmes for training leaders

A study by the Stanford Educational Leadership Institute examined eight exemplary initial education and professional development programmes for leaders in the United States. The programmes were chosen because they provided evidence of strong outcomes in preparing leaders and also because, in combination, they represent a variety of approaches with respect to their design, policy context, and the nature of partnerships between universities and local authorities. All of the exemplary initial training programmes share the following characteristics:

- A comprehensive and coherent curriculum aligned with state and professional standards, which emphasise instructional leadership.
- A philosophy and curriculum emphasising instructional leadership and school improvement.
- Active, student-centred instruction that integrates theory and practice and stimulates reflection. Instructional strategies include problem-based learning; action research; field-based projects; journal writing; and portfolios that feature substantial use of feedback and assessment by peers, faculty, and the candidates themselves.
- Faculty who are knowledgeable in their subject areas, including both university professors and practitioners experienced in school administration.
- Social and professional support in the form of a cohort structure and formalised mentoring and advice from expert principals.
- Vigorous, targeted recruitment and selection to seek out expert teachers with leadership potential.
- Well-designed and supervised administrative internships that allow candidates to engage in leadership responsibilities for substantial periods of time under the tutelage of expert veterans.

Source: Darling-Hammond, L. et al. (2007[47])), Preparing School Leaders for a Changing World: Lessons from Exemplary Leadership Development Programs, https://www.wallacefoundation.org/knowledge-center/pages/preparing-school-leaders.aspx.

For all types of training programmes, the content has to be strongly connected to the characteristics of the institutions and their environment (Levine, 2005[42]; Kelly and Hess, 2007[48]). In Denmark, there are no specific general requirements for institutional leaders in VET, but the boards of VET institutions decide what specific standards they want for the selection of leaders. There are some optional courses available, such as a six-month applied course for management staff in VET, specifically designed to strengthen their skills and knowledge in three aspects: management, education and industry 4.0, and learning data (Center for IT Undervisningen, 2020[49]).

The inclusion of practical field experience in initial training allows trainees to establish linkages between the theoretical content learned during the course, and the practical problems they will face in their education institutions. It gives prospective leaders the opportunity to apply the curriculum's content in real settings (Davis et al., 2005[41]; Darling-Hammond et al., 2007[47]).

Online distance education is becoming an increasingly popular way to provide access to training programmes and courses to leaders and future leaders, including in remote rural areas. In

the United States, such programmes may be the only viable means of attaining institutional leader certification for many teachers working in such areas (Perrone et al., 2020[50]).

Professional development for VET leaders can be linked to different training and practice elements

Once they have begun their leadership role, leaders need to have access to professional development opportunities to keep their skills up to date. Research on professional development for VET leaders shows that it works better when it is local, generated from within the institution and its immediate network. The emphasis on flexibility and diversity is noteworthy (European Commission, 2017[45]). Access to professional development opportunities could arise, linked to the appraisal process, but also based on voluntary approaches, focusing on the areas in which leaders feel less prepared. A survey across 15 European countries showed that professional development is compulsory for VET leaders in only about half of the countries surveyed (Cedefop, 2011[6]).This resonates with the findings from TALIS (presented above) that show that many VET leaders did not participate in professional development opportunities in the year prior to the survey.

Professional development may be closely linked to career progression, in order to motivate participants to attend. It is considered a success factor for the implementation of VET reforms in Europe, ensuring the relevance of VET provision for the labour market (Cedefop, 2011[6]). In England, the Strategic Leadership Programme funded by the Department for Education provides FE college leaders with a deeper understanding of their role as change agents. The programme supports them in the critical part they have to play in delivering the ambitious plans for the FE sector, raising its capability and prestige. The programme applies thinking about leadership in the context of themselves as individuals, their organisation and the sector as a whole. Six cohorts of over 147 leaders have gone through the programme since it was launched in 2017 (Education and Training Foundation, 2020[51]) (see Box 5.2 for an example from Portugal).

Professional development for VET leaders needs to cover all aspects of the leadership role. For example, the Danish Evaluation Institute found in a 2014 survey of VET leaders (EVA, 2014[52]) that because the focus of their professional development was on financial management, leaders felt less prepared for pedagogical leadership. Teachers also indicated that they would like to receive more support from leaders in that area. This area of expertise is seen as becoming increasingly important, as a result of increased heterogeneity among students, posing significant challenges to teaching. One increasingly important area for professional development is to ensure that VET leaders are aware of innovative pedagogical approaches and new technological developments in the industry for different occupations (UNESCO, 2017[12]) as discussed in Chapter 4. Being up to speed with innovative technologies can also help leaders administer human and financial resources to foster teaching quality and innovation. In England, for example, the Education Training Foundation offers an online training programme in digital technology for leaders and teachers in the FE sector to maximise learning outcomes (Education Training Foundation, 2018[53]).

The attractiveness of leadership

Leaders' salaries are often relatively generous

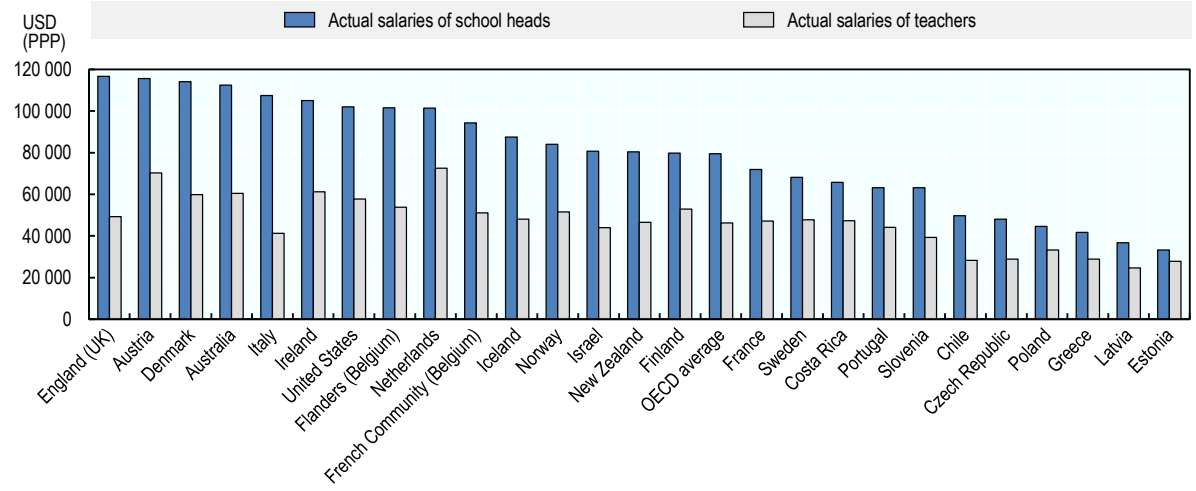
The salaries of teachers and leaders represent the largest single cost in formal education. These salaries have a direct impact on the attractiveness of becoming both a teacher and a leader (see Chapter 2).

Leaders of secondary and post-secondary education and training institutions enjoy a higher salary than teachers. Consequently a leadership role is considered an attractive position. Data from OECD Education at a Glance show that the actual salaries of education institution leaders are higher than those of teachers,

and the premium increases with the level of education taught. On average across OECD countries and economies, leaders' actual salaries in 2019 were 60% higher than those of teachers at upper secondary level (Figure 5.6), but the gap varies widely between countries. High salaries for leadership positions provide an incentive for teachers to apply for these roles. The career prospects of institutional leaders and their relative salaries are a signal of the career progression available to teachers and the compensation they can expect in the longer term (OECD, 2020[5]). Comparative data distinguishing between VET and other institutions are not readily available.

Figure 5.6. Leaders typically earn more than teachers in upper secondary education

Annual average salaries in public institutions, in equivalent USD converted using purchasing power parity (PPP) for private consumption



Note: Year of reference differs from 2019 for Chile, Czech Republic, Estonia, France, New Zealand, Poland, Portugal, Slovenia and Sweden. Comparative data distinguishing VET institutions are not available.
Source: OECD (2020[5]), *Education at a Glance 2020: OECD Indicators*, https://dx.doi.org/10.1787/69096873-en.

To assess the overall attractiveness of educational institution leaders' salaries, it is interesting to look at their salary relative to the earning of other similarly educated professionals. The data show that on average in OECD countries education, leaders of educational institutions typically earn more than similarly educated workers, which is generally not the case for teachers. The difference between leaders and similarly educated workers in other occupations tends to increase with the level of education taught at the leader's institution. Among the 18 OECD countries and economies with available data, only upper-secondary education institution leaders in the United States have actual salaries that are at least 5% lower than the earnings of similarly educated workers on average (no information is collected regarding post-secondary institutions, nor specifically on vocational institutions). In contrast, leaders' salaries are at least 40% higher than similarly educated workers in England (United Kingdom), the Flemish Community of Belgium and New Zealand (OECD, 2020[5]).

While salaries can be important in attracting qualified leaders to the profession, higher salaries are not always associated with better performance. An empirical study of leaders in FE colleges in England found no significant correlations between principals' characteristics, including salaries, and their effectiveness (based on students' educational outcomes) (Ruiz-Valenzuela, Terrier and Effenterre, 2017[1]). This evidence suggests that leaders' performance might be driven by other characteristics that are not observable and are most likely to be related to their skills and other quality aspects. It also highlights that: (1) given the impact of individual leaders' on student performance, it is important to invest time and

resources in finding ways to improve the effectiveness of leadership amongst FE principals; and (2) it is essential to attract and retain high quality principals to FE colleges. Whereas the recruitment of a new high-performing teacher can affect a few classes, the recruitment (or the training) of a high-performing principal directly impacts thousands of students in a college (Ruiz-Valenzuela, Terrier and Effenterre, 2017[1]).

Difficult working conditions contribute to high attrition rates

Different studies show that newly appointed leaders in VET institutions face many challenges. For example, Barnett, Shoho, and Oleszewski (2012[54]), found that the most commonly mentioned challenges for novice leaders were workload and task management, conflicts with teachers and students, and curriculum and instruction issues. In a Turkish study (Sincar, 2013[55]), beginner principals identified bureaucracy, insufficient resources, resistance to innovation and lack of professional development as major challenges. Looking at high school leaders in the United States, Beam, Claxton and Smith (2016[56]) found that novice leaders (during their first three years) expressed difficulties in managing interactions with school boards, other teachers, and parents, and gaining a sense of credibility.

Difficult working conditions in the early years could lead to high attrition among education institution leaders which in turn could contribute to shortages of VET leaders. In England, one-third of leaders in FE colleges (33%) said they were likely to leave FE in the next 12 months (DfE, 2018[57]) but this falls to just one-quarter among senior leaders (Savours and Keohane, 2019[36]). This comes on top of other factors that can create shortages, such as an ageing workforce. A report from the United States found that more than 40% of current community college presidents would retire within the next five years (Inside Higher Ed, 2013[40]),. In FE colleges in England, one-third of FE college principals are aged 55 and over (Savours and Keohane, 2019[36]).

Evidence shows that the turnover rate for leaders in VET institutions is higher than in general education institutions. In the United States, a study in California highlighted that community college presidential tenures averaged 3.5 years compared to 7 years for leaders of comparable general education institutions. The reasons mentioned for this higher turnover include a harsh working environment, declining finances and the increased complexity of managing and leading these institutions. Intensifying pressures due to increasing accountability measures combined with decreases in funding make leading these institutions and maintaining their missions both challenging and rewarding (Eddy and Garza Mitchell, 2017[7]). VET leaders in Lithuania mentioned similar reasons for leaving the profession: the number of “restrictive” regulations, instructions and orders that stifle the initiative of leaders (Cedefop, 2011[6]).

Attrition rates also depend on the specific context of the institution. Evidence from the United States shows that leaders of rural education institutions have a higher turnover rate than those of non-rural ones (Fuller, Pendola and Young, 2018[58]), and that rural education institutions experience difficulties recruiting and retaining new principals (Browne-Ferrigno and Maynard, 2018[59]).

Research shows that it is important to reduce attrition rates, as committed and effective leaders who remain in their education institutions are associated with improved institution-wide student achievement. Greater leader turnover is associated with lower gains in student achievement. Leader turnover has a more significantly negative effect in high-poverty, low-achieving education institutions – the very institutions in which students most rely on their education for future success. The negative effect of high turnover in leaders suggests that they need time to make meaningful improvements in their institutions (OECD, 2019[19]). One study on VET institutions found that it takes, on average, five years after a new leader for the institution’s performance to rebound to the pre-turnover level (Espinoza and Cardichon, 2017[20]).

Increasing the attractiveness of VET leadership roles and positions

As discussed above, managing and leading VET institutions is challenging and requires a complex set of skills for their leaders. Different policy levers can be used to ensure that VET leadership is an attractive profession with high-quality working conditions.

Middle management positions help share the burden of VET leadership

In order to make the VET leader role less complex and demanding, countries promote the role of middle leaders, especially within large institutions such as FE colleges in England (Greatbatch and Tate, 2018[2]) or community colleges in the United States. The literature on distributed leadership argues that formal leaders cannot single-handedly lead others when demands are high, because complex tasks involve many challenges that require input from different perspectives and areas of expertise (Bouwmans et al., 2017[10]) VET institutions can promote distributed leadership in different ways. Leaders can introduce new members with specific expertise and resources in teams to fulfil specific leadership tasks. Formal leaders can also increase the responsibilities of teachers as they demonstrate their ability to lead, and show willingness to take on more responsibilities (Bouwmans et al., 2017[10]). Distributed leadership can help to improve the communication between teachers, team leaders and middle managers as shown in a study on VET institutions in the Netherlands (Bouwmans et al., 2017[10]) .Middle management positions also provide teachers with opportunities for career progression into leadership roles, which can contribute to making the teaching profession more attractive for potential teachers (as discussed in Chapter 2). In Norway, a new function, "teacher specialist" was created – for teachers who have in-depth knowledge about a discipline or subject area and who contribute to the collective professional development at a school (see Box 5.4). In England, several further education institutions have introduced the status of "advanced practitioner", which is associated with career progression and some level of salary increase (Tyler et al., 2017[60]).

These positions are typically used as conveyor belts to allow teachers to enter leadership roles, and consequently pursue other training opportunities to become VET leaders. In the United States, Maryland launched the Promising Principal's Academy in 2014 to widen access to additional candidates and expand support for assistant principals who are often overlooked for professional development. Superintendents from every school district nominate two promising assistant principals to the programme, who are then prepared to take over as principals. The Academy, reflecting evidence-based practices around effective programme structure, makes use of cohorts and networks to support assistant principal learning (Eddy and Garza Mitchell, 2017[7]).

Box 5.4. Senior teaching positions

Norway: Teacher specialists, a new professional career path for teachers

In 2015, Norway piloted a new professional career path for teachers which aims to offer them new challenges and professional development. It provides teachers with opportunities for academic development to increase their motivation for teaching and help strengthen the professional community. Teacher specialists' main function is teaching, but they can carry out other tasks related to their field of specialisation depending on their school's needs and decisions and local initiatives, such as co-operating with universities and university colleges in development projects. Initially, the initiative was aimed at Norwegian language and mathematics teachers. Since 2019, the scheme has been expanded to include teachers in VET. The schools' owners (counties or municipalities) cover one third of the costs (prior to that, half of the costs were covered). They are responsible for developing suitable plans for the assignments of teacher specialists and clarifying their roles and responsibilities. In 2020/21 there are 102 teacher specialists in VET.

There is also a specific continuing education programme to qualify as a teacher specialist. The courses last two years and give 60 European Credit Transfer System (ECTS) credits at master's level. The school owners receive grants to provide substitute teachers, so that teachers can attend these specialist courses.

Sweden: Lead teachers and senior subject teachers

In Sweden, first/lead teacher "lektor" or "senior subject teacher" (licentiate or doctorate degree) can be obtained after at least four years of service, for those demonstrating excellent quality of teaching. Teachers receive a pay raise. It is the institution that appoints the position.

Source: Cedefop (2019[61]), Norway: Teacher specialist: A new career path for teachers, http://www.cedefop.europa.eu/en/news-and-press/news/norway-teacher-specialist-new-career-path-teachers, Sweden's response to the OECD questionnaire.

VET leaders need to be supported in their roles, especially at the start of their careers

Evidence on leader preparation programmes in general education shows that efforts should concentrate on supporting institutional leaders early in their careers, and an induction period with intensive coaching for newly appointed leaders should be implemented (Pont, Nusche and Moorman, 2008[13]). Induction, and leadership coaching, allows novice leaders to ask questions, share concerns, or seek advice with an experienced practitioner, in a confidential and trusting relationship (Lochmiller, 2013[62]). Effective induction programme need to take into account the nature of the governance process and institutions. If induction is provided by a local administrator, often the leader's immediate superior within a hierarchy, it is likely to be confined to administrative procedures and reporting processes. A more effective approach is for induction to be provided by a professional mentor, for example an experienced and successful institution leader (Bush, 2018[15]).

Given the difficulties that leaders might face in their role, support mechanisms that allow for peer-learning, including mentoring, can be valuable. In Chile, the Education Quality Agency has a mentoring programme for management teams, which usually take place through institution visits, but done remotely during the COVID-19 outbreak. The Agency conducts three video calls with participants. The first is to identify the main needs in areas such as learning assessment, socio-emotional support, or adapting pedagogical resources. Based on this, the second call covers specific tools and guidance. Finally, the third call is used to share experiences and analyse results. After the first two months of the implementation of the remote-version of the programme, the Education Quality Agency had conducted more than 700 distance mentoring sessions in establishments across the country (Education Quality Agency of Chile (Agencia de Calidad de la Educación), 2020[63]). In England, the Department for Education launched the National Leaders of Further Education programme in 2017, to recruit a team of high-performing leaders, with a track record of delivering improvement both in their own colleges and in working with others, to provide specialist support to struggling FE colleges (based on their most recent official inspection report). Leaders in these institutions are mentored and supported to develop their skills by leaders recruited by the programme. More recently, in 2020, the Department also launched the College Collaboration Fund, which supports colleges to work together to share their knowledge, expertise and best practice, with an approach based on peer-to-peer support – where stronger colleges help weaker ones improve (European Commission, 2020[64]).

Conclusion and policy recommendations

Leaders of VET institutions have a multidimensional role and juggle a wide range of responsibilities. Depending on their country's context, they determine the institution's core activities and ensure the retention and progression of students. They need to have a strong understanding of the local labour market and work closely with relevant stakeholders, including education boards, relevant ministries and agencies, other education institutions, and social partners. VET leaders also often have to manage a greater diversity

of students and training programmes than in general education, and have to recruit and support teachers who come from heterogeneous backgrounds. Many countries struggle with a lack of clarity about VET leaders' core tasks and responsibilities, which can make it hard to recruit and train effective leaders. Clear definitions of VET leadership responsibilities can constitute a key point of reference for the selection and initial education and professional development of prospective leaders, and for their appraisal.

Traditionally, the career path to becoming a VET leader is very clear, taking candidates from the teaching profession and selecting them into middle management and senior leadership roles. Many countries have screening processes to select teachers, but no specific education or training programmes to prepare them for their new post of leaders. TALIS data show that VET leaders sometimes come into their roles with limited preparation in leadership, especially in entrepreneurial and commercial skills. Providing relevant training opportunities to VET leaders is therefore of crucial importance, and the content of training has to be tightly linked with the context of the VET institution.

The VET leadership role is generally considered an attractive position, but newly appointed leaders often face challenges, including heavy workload and difficult interactions with teachers and other stakeholders. Difficult working conditions in the first years may lead to high attrition among leaders, which could contribute to shortages. In order to make the VET leadership role more manageable, countries can promote middle management roles, especially within large institutions, and provide induction, and leadership coaching, for novice leaders.

Policy pointers for strengthening leadership in VET

4.1. Clarifying the roles and tasks of leaders

- ***Clarifying the roles and tasks of VET leaders,*** to act as a key point of reference for those considering a leadership role, and for those organising their selection and training.
- ***Opening pathways into VET leadership for those outside the teaching profession***, who might bring in relevant organisational and management skills even if they do not have a pedagogical background. Clarity about the roles and responsibilities of VET leaders can help attract more external candidates.

4.2. Developing VET leaders' skills

- ***Ensuring that relevant initial training programmes are available, and that the content of these programmes is aligned with the expected requirements for VET leaders***. Work-based learning in initial training can help future VET leaders establish linkages between the theoretical content learned in their courses and the practical problems they will be faced with in educational institutions.
- ***Providing professional development opportunities that allow VET leaders to further develop their skills and knowledge needed for the different aspects of the leadership role***. Such training opportunities need to be part of a coherent skills development strategy for VET leaders.

4.3. Increasing the attractiveness of VET leadership roles

- ***Creating middle-management positions to make the leadership roles more manageable*** while at the same time offering career progression opportunities for teachers and other staff in VET institutions.
- ***Supporting VET leaders in handling the many responsibilities in the leadership role, especially at the start of their career***. This can be done by providing induction, mentoring and peer-learning opportunities.

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Notes

[1] Evidence shows that motivated school leaders are more passionate about their work and highly committed emotionally, and their high energy levels are likely to be motivational to others (Leithwood et al., 2006[66]; Day et al., 2009[43]). Research from Finland showed that teacher enthusiasm has an influence on the quality of teaching as well as students' performance and motivation, and that in VET institutions, leaders have an impact on VET teachers' enthusiasm (Wenström, Uusiautti and Määttä, 2019[65]).

[2] A study of school leaders in Estonia, looking at the link between teachers' attitudes and national examination results found that prioritising the wellbeing of both students and teachers, rather than focusing on academic performance, had a positive effect on national examination results (Aidla and Vadi, 2008[26]).

[3] Ruiz-Valenzuela, Terrier and Van Effenterre (2017[1]) used a panel dataset of principals in FE institutions in England over the period 2003-15 to look at whether principals make a difference to students' educational performance. The findings are that principals do matter for the educational performance of their students: switching from a principal who is in the bottom 25th percentile to one who is in the top 25th percentile significantly increases students' probability of achieving a higher-level qualification. But there was no correlation between principals' age, gender, teacher qualification status or and salary and educational outcomes, which means that the characteristics which explain such differences are not observable in the study.

[4] Robinson, Lloyd and Rowe (2008[18]) examined the findings from 27 studies into the relationship between school leadership and student outcomes. They highlight very strong effects on student performance for leadership responsibilities involving promoting and participating in teacher learning and development, and more moderate effects for the dimensions concerning school management (goal setting and planning and co-ordinating).

[5] The study looked at 447 VET teachers working in 66 teams.

[6] Another requirement is drafting a management project including objectives, guidelines and assessment.

OECD Reviews of Vocational Education and Training

Teachers and Leaders in Vocational Education and Training

Vocational education and training (VET) plays a central role in preparing young people for work, developing the skills of adults and responding to the labour-market needs of the economy. Teachers and leaders in VET can have an immediate and positive influence on learners' skills, employability and career development. However, when compared to general academic programmes, there is limited evidence on the characteristics of teachers and institutional leaders in VET and the policies and practices of attracting and preparing them. VET teachers require a mix of pedagogical skills and occupational knowledge and experience, and need to keep these up to date to reflect changing skill needs in the labour market and evolving teaching and learning environments. This report fills the knowledge gap on teachers and leaders in VET, and produces new insights into what strategies and policies can help develop and maintain a well-prepared workforce. It zooms in on VET teacher shortages; strategies for attracting and retaining teachers; initial training and professional development opportunities for teachers; the use of innovative technologies and pedagogical strategies; and the important role of institutional leaders and strategies for better preparing and supporting them.

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