UNESCO
United Nations
Educational, Scientific and
Cultural Organization

UNEVOC
International Centre
for Technical and Vocational
Education and Training

BILT
Bridging Innovation and
Learning in TVET

Trends in New Qualifications and Competencies for TVET

Perspectives of the European UNEVOC Network

Education
2030

Trends in New Qualifications and Competencies for TVET

Perspectives of the European UNEVOC Network

Authors

UNESCO-UNEVOC:
Jan Peter G. de Otero
Jens Liebe
Tristan Cole

BIBB:
Vera Hark
Michael Schwarz

Design
Christiane Marwecki
Photo cover
pexels / thisisengineering

Contents

Abbreviations

BIBB	Federal Institute for Vocational Education and Training, Germany
BILT	Bridging Innovation and Learning in TVET
BMBF	Federal Ministry of Education and Research, Germany
Cedefop	European Centre for the Development of Vocational Training
EntreComp	Entrepreneurship Competence Framework
ESD	Education for sustainable development
EU	European Union
Fab Lab	Fabrication Laboratory
IBW	Institute for Economic Research in Education, Austria
ICT	Information communication technology
ILO	International Labour Organization
NQC	New qualifications and competencies
NQF	National qualifications framework
OECD	Organisation for Economic Co-operation and Development
OER	Open educational resources
TMS	Trends Mapping Study
TVET	Technical and vocational education and training
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEVOC	International Centre for Technical and Vocational Education and Training

Glossary of terms

Terms	Definitions	Sources
Competencies	Ability to apply learning outcomes adequately in a defined context (education, work, personal or professional development).	Cedefop
	The proven ability to use knowledge, skills and personal, social and/or methodological abilities, in work or study situations and in professional and personal development.	European Parliament and Council of EU
	Ability of a person - facing new situations and unforeseen challenges - to use and apply knowledge and skills in an independent and self-directed way.	European Qualifications Framework
Learning Environments	Physical locations, contexts, and cultures in which students learn.	Edglossary
	TVET can be delivered in a number of distinct learning environments, for example workplace settings and/or vocational schools with learning spaces such as classrooms, workshops, and laboratories. VET programmes may sometimes be taught in hybrid learning environments, for example, centres of practical education on the same site, but separate from the rest of the school, including the use of virtual learning environments.	Cedefop
Learning Outcomes	Learning outcomes are statements of what a learner knows, understands and is able to do on completion of a learning process, defined in terms of knowledge, skills and competences.	Cedefop
	The totality of information, knowledge, understanding, attitudes, values, skills, competencies or behaviours an individual is expected to master upon successful completion of an educational programme.	UNESCO UIS
	Results of what a learner knows, understands and is able to do upon completion of a learning process.	UNESCO
Occupations and jobs	An occupation is a grouping of jobs involving similar tasks and which require a similar skill set.	European Qualifications Framework
	Occupations should not be confused with jobs or job titles. While a job is bound to a specific work context and executed by one person, occupations group jobs by common characteristics.	

Terms	Definitions	Sources
Occupations and jobs	Job is defined as a set of tasks and duties executed, or meant to be executed, by one person; an occupation is a set of jobs whose main tasks and duties are characterised by a high degree of similarity.	ILO
Qualification	An official record (certificate, diploma) of achievement which recognises successful completion of education or training, or satisfactory performance in a test or examination; and/or other requirements for an individual to enter, or progress within an occupation.	Cedefop
	The formal outcome of an assessment and validation process which is obtained when a competent body determines that an individual has achieved learning outcomes to a given standard.	European Qualifications Framework
Macro Level	Governance: addressing needs and interests of ministries and umbrella organisations (meta-organisations encompassing several organisations, including trade unions or employer organisations)	BILT Project
Meso Level	Development: addressing needs and interests of national bodies, associations (including individual trade unions and individual employer organisations), and sectorial chambers.	BILT Project
Micro Level	Implementation: addressing needs and interests of TVET schools, companies, and other TVET providers.	BILT Project
Skills	Ability to apply knowledge and use know-how to compete tasks and solve problems.	European Parliament and Council of EU
	The term skill refers typically to the use of methods or instruments in a particular setting and in relation to defined tasks.	European Qualifications Framework
Teachers	A person whose function is to impart knowledge, know-how or skills to learners in an education or training institution.	Cedefop
	Persons employed full-time or part-time in an official capacity to guide and direct the learning experience of pupils and students, irrespective of their qualifications or the delivery mechanism, i.e. face-to-face and/or at a distance.	UNESCO UIS

Terms	Definitions	Sources
Trainers	Anyone who fulfils one or more activities linked to the (theoretical or practical) training function, either in an institution for education or training, or at the workplace.	Cedefop
Training regulations	Contain minimum standards for the in-company part of initial vocational education and training, including the designation of training occupation, duration of training, description of skills, knowledge and capabilities of the profession in summary form; guide to how teaching must be structured in terms of content and time, and the examination requirements.	BIBB
TVET curricula	Inventory of activities related to the design, organisation, and planning of an education or training activities, including the definition of learning objectives, content, methods (including assessment) and material, as well as arrangements for training teachers and trainers.	Cedefop
	A detailed description of the objectives, content, duration, expected outcomes, learning, and training methods of an education or training programme.	ILO
Units, Modules and Modularization	Units are a set of learning outcomes (knowledge, skills and/or competences) which constitute a coherent part of a qualification. A unit can be the smallest part of a qualification that can be assessed, transferred, validated and, possibly, certified. A unit can be specific to a single qualification or common to several qualifications.	Cedefop
	Modules: a course or part of a course in the context of a modular programme. A module may be taken singularly or combined with other modules offered.	UNESCO UIS
	Modularization refers to "the breaking down of whole educational qualifications into useful sub-units (a module), each of which has measurable outcomes that are assessed (and in some instances certified) in their own right, as well as contributing to a larger overall educational outcome (primarily a qualification).	Cedefop

1. Executive Summary

This Trends Mapping Study (TMS) on New Qualifications and Competencies (NQC) in Technical and Vocational Education and Training (TVET) is part of the 'Bridging Innovation and Learning in TVET' (BILT) project. This project is carried out in collaboration with members of the UNEVOC Network. It is coordinated by UNESCO-UNEVOC with support of the German Federal Institute for Vocational Education and Training (BIBB) and sponsored by the German Federal Ministry of Education and Research (BMBF). BILT aims to support TVET institutions in their efforts to address challenges arising from current global trends. These include the digitalization of the workplace and the training cycle, the transition to green and sustainable economies, a growing focus on the benefits of entrepreneurial learning, and the increase in migration which is putting a greater demand on TVET stakeholders to provide relevant training solutions. The COVID-19 pandemic poses additional challenges for TVET and the world of work.

Against this background, the TMS aims to:

1. Identify trends in NQC for relevant TVET sectors and occupations.

2. Compare and discuss different ways in which TVET systems introduce NQC in TVET curricula and training regulations, including the responsiveness of such processes and the flexibility of curricula.

3. Discuss teaching and learning approaches, methods, and technologies, as well as teacher and trainer training.

4. Present successful examples, such as projects, initiatives, and modules of NQC in the BILT themes of greening, digitalization, entrepreneurship, and migration.

The study uses BILT's NQC Ecosystem as a basis, which pays special attention to the different levels of stakeholders in a TVET system and their specific demands:

- **Macro-level**: ministries and umbrella organizations (meta-organizations representing several organizations, including trade unions or employer organizations)

- **Meso-level**: national bodies, associations (including individual trade unions and individual employer organizations), and sectorial chambers

- **Micro-level**: TVET schools, companies, and other TVET providers

The results revealed by the TMS mostly reflect the priorities and interests of UNEVOC Centres and other TVET stakeholders who participated in the study activities.

The TMS furthermore draws on a selection of relevant literature, the data collected from the UNEVOC network using an online survey and focus group activities, as well as on information obtained from a virtual conference hosted by the UNESCO-UNEVOC TVET Online-Forum.

Based on the evidence gathered, the study identifies nine trends related to NQC in TVET, which may inform future BILT activities. Trends one to four bring insights into the identification of NQC for relevant sectors and occupations; trends five and six concern the implementation of NQC in curricula and training regulations of different occupational profiles; and, finally, trends seven to nine bear upon the implementation of NQC in teaching and training.

UNDERSTAND NEW QUALIFICATIONS AND COMPETENCIES

Trend 1:
A broad range of stakeholders are involved in the identification of NQC, but NGOs, civil society organizations, youth organizations and individual experts should be more involved (see Section 3.3)

Ministries and national bodies have the highest level of influence on the identification of NQC, while TVET stakeholders such as non-governmental organizations (NGOs), civil society organizations, youth organizations and individual experts are underrepresented in this process. As complex themes such as digitalization and greening become more relevant, specialised knowledge is needed for the identification of NQC in TVET. According to the survey respondents, the NQC identification process would benefit substantially from greater involvement of these underrepresented stakeholders, allowing to build on their expertise and specialised knowledge in a more direct manner.

Trend 2:
Recently introduced or reformed TVET occupations particularly concern 'digitalization' and 'greening'. ICT and manufacturing are the sectors with the highest demand for NQC (Section 3.4)

The TMS demonstrates how the UNEVOC Centres involved in the study identified a higher demand for NQC in sectors and occupations related to digitalization and greening, as compared to the other BILT themes. Sectors with the highest need for NQC include ICT and manufacturing, while occupations in need of NQC include robot technicians or electric vehicle technicians. The COVID-19 pandemic has further emphasised the need to explore new green and digital competencies in TVET. Other policy initiatives, such as the 'EU Skills Agenda', mirror this priority and equally put forward greening and digitalization as a focus for the future of TVET.

Trend 3:
Each BILT theme requires a particular mix of competencies – basic and advanced-cognitive competencies rank highest across the themes (Section 3.5)

Participating UNEVOC Centres assessed the relevance of different types of competencies for the BILT themes on the basis of OECD's typology of 21st century competencies, including basic, socio-emotional, advanced-cognitive as well as professional and technical competencies (cf. page 24). The results demonstrate how the mix of competencies differs significantly between digitalization, greening, entrepreneurship and migration. Overall, basic and advanced-cognitive competencies are given highest relevance.

Trend 4:
Non-routine competencies are highly meaningful for future-oriented jobs (see Section 3.5)

Participating TVET stakeholders perceive an increasing importance of non-routine and advanced-cognitive competencies, such as problem-solving and analytical skills, self-management critical thinking, for today's learners. These types of vocational action competencies are crucial requirements of modern occupations. As jobs are changing, the self-understanding of TVET learners and professionals might also change, from staff solely executing technical tasks towards more self-determined and pro-active employees with additional and new forms of responsibilities.

INTEGRATION OF NEW QUALIFICATIONS AND COMPETENCIES

Trend 5:
Occupational and cross-cutting approaches are still the most important strategies for integrating NQC in curricula and training regulations (see Section 4.3)

The TMS has recognised occupational and cross-cutting strategies as the most important approaches for the integration of NQC in curricula and training regulations of different occupational

profiles (for a definition of the approaches, cf. page 31). Besides these 'traditional' strategies, BILT proposes the 'sectoral' approach and 'additional/ modular' approach, which might be less common but have advantages such as an increased degree of flexibility. TMS participants viewed a combination of different approaches to be a valuable and flexible strategy for the implementation of NQC in TVET.

Trend 6:
Other strategies for the integration of NQC in TVET can be valuable complements or alternatives (see Section 4.3)

When investigating approaches to the integration of NQC in TVET, participating UNEVOC Centres have shown their interest in innovative strategies that can complement well-proven ways for the implementation of NQC. One strategy, which the BILT project had not considered before, is the local-specific approach. It allows tailoring new training content to local needs, as well as conducting more flexible and quicker tests before proceeding with implementation on a national level.

IMPLEMENTATION OF NEW QUALIFICATIONS AND COMPETENCIES

Trend 7:
Innovative teaching and training methods and technologies help to improve learning significantly (see sections 5.2 and 5.3)

Along with the implementation of NQC in teaching and training there is the need for innovative methods and technologies for TVET. Participating UNEVOC Centres highlighted the usefulness of learner-centred approaches, which significantly improve students' and trainees' motivation and

optimally combine theory and practice. New technologies can equally contribute to improved forms of training; however, they can be costly and are not a prerequisite for successful training.

Trend 8:
The roles and self-understanding of TVET teachers and trainers are changing (see Section 5.4.1)

With new methods and NQC implemented in TVET, teachers and trainers are increasingly assuming new responsibilities in their work. TMS participants revealed how teachers and trainers are becoming 'tutors' -- instead of being solely 'transmitters of skills and knowledge'-- conveying socio-emotional and other competencies relevant in the 21st century and accompanying students and trainees in their personal development. In addition, teachers and trainers must be ready to continuously attend teacher and trainer training to prepare for their new roles.

Trend 9:
Modern forms of teacher and trainer training are necessary to understand and convey NQC (see sections 5.4.2 and 5.4.3)

TVET stakeholders participating in the TMS have underlined how important it still is to explore and share new forms of teacher and trainer training. As new training content, specifically in the fields of digitalization of entrepreneurship, becomes increasingly important and also complex, teachers and trainers must acquire the ability to convey its technical and methodological aspects. The COVID-19 pandemic and the growing importance of distance learning solutions underline the need for improved teacher and trainer training.

2. The BILT Trends Mapping Study on new qualifications and competencies

Globally, TVET systems face similar challenges at different levels: new labour market demands, socio-political issues and accelerated economic trends - such as digitalization, sustainable development, and globalization – that affect the adaptation of existing occupational profiles and the demand for NQC. This challenge reinforces the need to improve the identification and forecasting of NQC with the overall aim to create, reform, and modernise TVET curricula and training regulations of different occupational profiles.
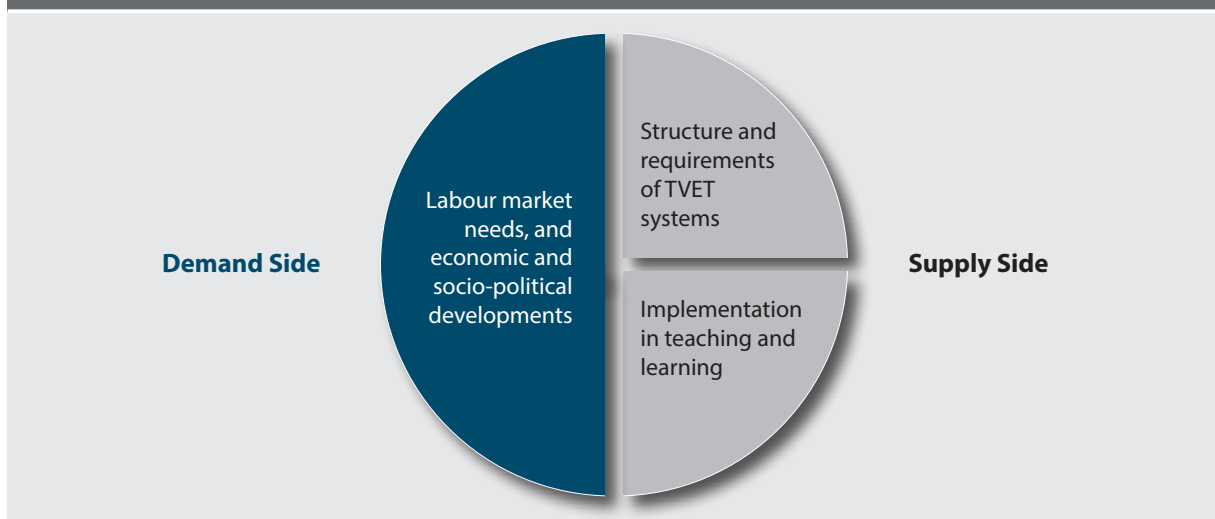
The need to follow and adjust to labour market needs and socio-political demands has always been important to the success of TVET systems. However, the recent acceleration of innovation cycles and ability to respond rapidly   has now emerged as a fundamental concern among policymakers and TVET practitioners. Additionally, despite TVET being a worthy career path, vocational system have suffered from a lower status than other forms of education in many countries. To compete effectively, TVET systems must provide learning pathways that appeal to young people because they provide qualifications for future-oriented careers in the context of rapid and profound changes in job profiles and work practices.

The aim of the TMS: Understanding the NQC Ecosystem

The BILT project focuses on identifying new qualifications and competencies and finding ways to integrate them into TVET practice. In July 2019, during the BILT Kick-Off event in Bonn, Germany, representatives of European UNEVOC Centres and other TVET institutions debated an initial framework to conceptualise how NQC are shaped and implemented by TVET stakeholders at different levels. The resulting theoretical framework identifies different elements that are present in a NQC ecosystem (Figure 1). It focuses on both the demand and supply side:

- On the demand side, NQC are shaped by labour market needs (emerging trends in the private sector) as well as by economic and socio-political paradigms that influence the expectations of individuals, companies, and public actors.

- On the supply side, new and aligned qualifications and competencies need to be integrated into the structures and requirements of TVET systems (for example curricula and

FIGURE 1. **New Qualifications and Competencies Ecosystem**

Structure and requirements of TVET systems

Labour market needs, and economic and socio-political developments

Demand Side

Supply Side

Implementation in teaching and learning

Source: BILT

training regulations) and delivered by TVET providers through, for example, work-based learning and school-based teaching and learning practices. Furthermore, a reliable and credible testing and assessment structure must be in place

Within the NQC ecosystem, the demand and supply sides are connected to each other through different stakeholders, at the macro, meso, and micro levels:

- **Macro-level**: ministries and umbrella organizations (meta-organizations representing several groups, including trade unions or employer organizations).

- **Meso-level**: national bodies, associations (including individual trade unions and individual employer organizations), and sectorial chambers.

- **Micro-level**: TVET schools, companies, and other TVET providers.

Using this initial framework, the TMS focuses on four main objectives. (1) identify trends in NQC for relevant TVET sectors and occupations now and in the future; (2) compare and discuss different ways in which TVET systems introduce NQC in TVET curricula and training regulations, including the responsiveness of such processes and the flexibility of curricula; (3) discuss teaching and learning approaches and methods, practices, and technologies, as well as teacher and trainer training; and (4) present working examples such as projects, initiatives, and modules of NQC featuring the BILT themes of greening, digitalization, entrepreneurship, and TVET access for migrants. With this process completed, the TMS will present an overview of which NQC have been identified, how they are being formalised into TVET systems and implemented in practice.[1]

This study uses data from many sources, including an initial literature review, a virtual conference on NQC, an online survey, and focus groups. (See annex for more detailed information.).

---

1 The trisection is based on Stephen Ball's concept of 'policy cycles' to describe and compare how different NQC systems identify, formalise, and implement NQC in TVET, with a focus on the main issues and challenges faced by TVET institutions. (Bowe, Ball, and Gold (1992).

3. Understanding the demands for NQC in TVET

This chapter will focus on the demands for NQC from different sectors and occupations in the areas of greening, digitalization, entrepreneurship, and migration at the macro, meso and micro levels.

3.1.
What are the challenges of identifying NQC?

In order to better understand the demands for NQC, **TVET stakeholders must develop their capacity to identify labour market needs in the private sector as well as new economic and socio-political paradigms**. However, the analysis is complicated by a rapidly changing socio-economic and political landscape, combined with disruptive forces such as the recent pandemic. What are some of these transformations as identified by European TVET institutions?

- Rapid innovation cycles are the main drivers of change in labour market needs. For example, **digitalization**[2] is creating and reshaping millions of jobs within Europe, with the integration of digital technologies in the workplace.[3] European TVET systems must be able to identify not only these NQC and jobs, but also to adapt and upgrade current qualifications in the face of digitalization.

- New demands for NQC in TVET include the need to promote **sustainable development**[4], as well as a human-centred model of education, focused on strengthening social competencies, beliefs, and attitudes for the 21st century. The need to promote sustainable development and greening[5] is arguably one of the most important contemporary socio-political issues. To support the development of a low-carbon economy, TVET systems must address emerging demands for green competencies.

- In a context of globalization and the internationalization of education and labour markets, worldwide **migration** has reached unprecedented levels.[6] Increased conflict, climate change, and economic crises have contributed also. TVET systems can play an important role in the integration of migrant students into labour markets and society, as well as prepare local students and TVET teachers and trainers to be agents of social and economic inclusion.

---

4 Different international initiatives predict high-level investment in the low-carbon economy in the next decades. The implementation of the Paris Agreement requires great levels of investments in renewable energy (16.5 trillion US dollars by 2030 according to the International Energy Agency) and increasing spending on energy efficiency measures. More recently, the European Commission has launched the European Green Deal. This plan encompasses a comprehensive strategy for a climate-neutral, resource-efficient, and competitive economy. The main goal of the European Green Deal is to transform Europe into a climate-neutral region by 2050. The high level of investment in sustainable development and the green economy has significant potential to create new qualifications and reshape parts of existing job profiles. (European Green Deal: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en)

5 The term 'greening' refers to the 'process of pursuing knowledge and practices with the intention of becoming more environmentally friendly, enhancing decision-making and lifestyle in a more ecologically responsible manner, that can lead to environmental protection and sustainability of natural resources for current and future generations'. (UNESCO-UNEVOC 2017, p. 10)

6 According to the IOM – UN Migration glossary, the term 'migration' refers to 'the movement of persons away from their place of usual residence, either across an international border or within a State'.

---

2 According to Gartner's IT Glossary, 'Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business' (www.gartner.com).

3 UNESCO-UNEVOC (2020).

- TVET systems must also support **entrepreneurship**[7] and promote entrepreneurial competencies in TVET qualifications. Entrepreneurial competencies can contribute to social and economic inclusion and development, as well as improve students' autonomy and capacity to adapt to different labour market circumstances.

- Finally, the **COVID-19 pandemic** has generated large shifts in the economy, social activities, and working practices. While the impacts of the pandemic on the economy are still not fully understood, the crisis may lead to greater investment in new technologies to support social and economic activities, as well as significant changes in working practices (such as remote working and an increasing relevance of sustainable action at the workplace). In this scenario, it is possible that the COVID-19 pandemic will help to accelerate innovation cycles, creating an even greater impact on labour market needs and TVET demand.

3.2.
Trends in demands for NQC in TVET in Europe

According to specialised literature, the challenges outlined above impact economies and labour markets in three main ways: (1) creating new economic sectors and/or occupations; (2) transforming current economic sectors and/or occupations, and (3) making some occupations less relevant. International publications on NQC often analyse these three types of impacts in the light of digitalization and greening in economies and labour markets.

First, the **creation of new sectors and occupations** is demonstrated by the emergence of digitally intensive industries, such as telecommunications, marketing, finance, and IT services,[8] as well as new occupations, such as social media managers, internet of things (IOT) architects, and user-experience (UX) designers. Labour market data and forecasts also suggest a significant trend

towards the creation of new job profiles related to the development, maintenance and upgrading of artificial intelligence technologies and big data infrastructures. Plus, the transition towards a low carbon economy is increasingly generating green occupations in the renewable energy sector, such as solar-panel installers or wind-turbine technicians and agricultural meteorologists.[9]

Accelerated economic trends can also **transform economic sectors and occupations**. The level of the transformation varies according to different local and national realities.[10] In the context of digitalization, the automation of routine work tasks leads to a transformation of job profiles. Occupations involving a wide range of services, as well as machine operators, are facing profound changes. In healthcare and certain traditional sectors, professionals are increasingly required to make use of clinical informatics and new technologies in their work. For this reason, such occupations must concentrate more and more on performing non-routine tasks that require higher-order cognitive and soft skills that are less susceptible to automation.[11] In the context of a low carbon economy, job profiles will increasingly emphasize a broad set of green competencies rather than non-sustainable work practices.

Finally, socio-political issues and accelerated economic trends are **making some occupations less relevant**, depending on time and place. Industrial occupations threatened by automation, for example, would include warehouse, logistics, production line and transport jobs. The most vulnerable jobs are typically held by young people, the main reason being that 'within the same occupation, entry-level jobs held by young people tend to have a greater proportion of automatable tasks,'[12] as do jobs in administrative support, sales, food preparation, and serving.[13] Transition to a low

---

7 According to the Danish Foundation for Entrepreneurship & Young Enterprise, 'entrepreneurship is when you act upon opportunities and ideas and transform them into value for others. The value that is created can be financial, cultural, or social'.
8 Calvino et al. (2018).

9 International Labour Organization (2019).
10 According to the OECD Skills Outlook (2019, p. 40), 'a group of countries (Chile, Greece and Turkey) are lagging behind, suggesting their workers are likely to face major changes to their jobs' task-content in the coming years, in particular a substantially greater use of technology, and may not have the skills required to face this transformation. Conversely, other countries (Denmark, the Netherlands and Sweden) are ahead in the digital transformation of the workplace, with most of their workers intensively using ICTs on the job and predominantly performing non-routine tasks.
11 Nedelkoska and Quintini (2018).
12 Ibid, p. 62.
13 International Labour Organization (2020).

carbon economy will also decrease employment in non-sustainable areas of the economy such as the fossil fuels sector.

The combined effect of these three trends should greatly impact the future of TVET.[14] First, the transformation of occupations is increasing demand for professional capable of performing non-routine tasks that require high cognitive and soft skills that are less conducive to automation. Accordingly, TVET systems need to address school-to-work transitions as well as the re-skilling of young people and adult workers. Second, current forms of TVET need to change educational tracks to equip individuals with competencies for occupations less likely to be automated. TVET learning should offer a broad range of relevant competencies for the 21st century,[15] such as:

- **Basic competencies**, including literacy, numeracy, and digital literacy at a high enough level so that people can adapt to changes in their jobs and society.

- **Advanced cognitive competencies**, such as critical thinking, complex problem solving, creative thinking, learning to learn, and self-regulation.

- **Social and emotional competencies** such as conscientiousness, responsibility, empathy, self-efficacy, and collaboration.

- **Professional, technical, and specialised knowledge and competencies** needed to meet the demands of specific occupations, but also, with the potential to be transferable and applicable in new, yet unknown fields.

Identifying these new competencies has become possible thanks to **labour market observatories and information systems** like the Labour Market Observatory (European Economic and Social Committee), which can provide a broad-based territorial scope (for example, national or regional), or an economic, branch-specific overview.

---

14 (ibid.)
15 OECD (2019)
16 International Labour Organization (2020). ILO monitor: COVID-19 and the world of work, first edition. ILO, Geneva. 30 June 2020.
17 MIT Technology Review Insights (2020).
18 The Guardian (2020).
19 Delloite (2020).
20 ILO/UNECE (2020).

BOX 1 The impacts of the COVID-19 crisis on labour markets and the future of work

Preliminary studies from the International Labour Organization (ILO)[16] indicate that the COVID-19 crisis will generate a substantial increase in global unemployment. In spring 2020, the rise was expected to be between 5.3 million ('low' scenario) and 24.7 million ('high' scenario) from a base level of 188 million in 2019. By comparison, the global financial crisis of 2008-9 increased unemployment by 22 million. According to ILO, the constraints on people's movements are expected to impact more economic sectors, such as food and accommodation, retail and wholesale, business services and administration, and manufacturing. Currently, these economic sectors are responsible for almost 40% percent of global employment.

At the same time, different studies foresee a period of stronger development and deployment of new technologies in social and economic activities. The MIT Technology Review Insights report on *Covid-19 and the workforce*[17] estimates that this crisis will accelerate the pace of innovation in at-risk jobs. Supporting this idea, a recent survey of 2900 business executives in 45 countries developed by the auditing firm EY[18] indicates that 41% of respondents were already investing in ways to accelerate business automation in a post-Covid world. The international consultancy group Deloitte[19] has suggested companies will likely challenge the notion that work should be performed in a specific physical location by diversifying and digitising workplaces through robotics, the IOT, the digital cloud, and other technologies.

Last, international organizations argue that policies for boosting economic and labour market recovery must focus on ways of greening them. For example, the study *Jobs in green and healthy transport*[20] estimates that greening the transport sector alone could create up to 15 million jobs worldwide during the post-Covid period. In other words, future changes in new qualifications and competencies will be accelerated by emphasis on digitalization and greening.

3.2.1.
Competencies for Digitalization

Emerging jobs will increasingly focus on data and artificial intelligence, engineering, and cloud computing, all fields requiring both technical and transversal competencies. A previous study[21] has identified five distinct competency clusters:

- **General competencies** (or cross-functional competencies) are typically non-cognitive capabilities that are needed across all professions. These include communication, negotiation, creativity, and problem-solving skills. General competencies can also include soft skills (attitudinal and behavioural skills, such as leadership).

- **Business competencies** are the set of skills and knowledge required to operate or start an enterprise. These include competencies related to marketing, project management, budgeting, and business development.

- **Specialised industry competencies** are specific to the field in question, such as in cloud computing, video and editing in marketing, sales, and content.

- **Tech baseline competencies** refer to basic computer literacy, such as the ability to use standard word processing applications, alongside industry-specific applications of technology such as web design, online marketing, and social media.

- **Tech disruptive competencies** are related to using and designing technologies, including data science, natural language processing, automation, robotics, cloud computing, and cybersecurity.

3.2.2.
Competencies for greening TVET

The list of changing competencies required by non-specialised occupations includes attitudinal behaviour such as environmental awareness and respect, and willingness to learn about sustainable development, as well as socio-emotional skills,

---

> ### BOX 2 Switzerland: The changing profile of building technology planners
>
> The Swiss State Secretariat for Economic Affairs (SECO) reports that the job of building technology planner is changing significantly with the use of digital 3D drawing, computer-aided design, and PC-based calculation programmes. According to the study, building technology planners must now implement quality assurance using large amounts of data and PC-based plausibility checks to exclude errors. They also need to collaborate with experts on energy optimization. Plus, a new generation of software can help to train technology planners to share and collaborate in real-time with architects when designing building plans. Against this background, the Swiss Federal Institute for Vocational Education and Training aims to better integrate IT competencies into TVET with a focus on computer-aided design and building information modelling.

Source: Aepli et al. (2017).

---

such as teamwork, resilience, and adaptability. General requirements also include communication and negotiation skills, as well as entrepreneurial skills. The most important changes for the green economy, however, are taking place at higher skill levels,[22] as seen in occupations such as energy managers, energy auditors, climate-change analysts, or environmental restoration planners. The list of competencies identified in the literature for highly specialised occupations – wind turbine service technicians, biofuels processing technicians, and water resource specialists are further examples – includes:

- **Analytical thinking** (including risk and systems analysis) to interpret and understand the need for change and the new measures this requires.

- **Coordination, management, and business competencies** that can encompass holistic and interdisciplinary approaches incorporating economic, social, and ecological objectives.

---

21 Ratcheva et. al (2020)

22 International Labour Organization (2019)

- **Innovation competencies**, to identify opportunities and create new strategies to respond to green challenges.

- **Marketing competencies**, to promote greener products and services.

- **Consulting competencies**, to advise consumers about green solutions and to spread the use of green technologies.

- **Networking, IT, and language competencies**, to perform effectively in global markets.

- **Strategic and leadership competencies**, to enable policymakers and business executives to set the right incentives and create policies and opportunities for greening.

While this 'greening' list focuses on advanced cognitive competencies, other studies, like the Spanish Observatory of Occupations, show a need for technical and professional competencies as well (see Box 3).

BOX 3 Spain: Skills gaps in green occupations

Every year, the Spanish Observatory of Occupations brings together several experts to analyse the skills gaps in around 200 occupations that are quickly growing as demonstrated by the number of work contracts they generate. The experts include employers, human resources managers, representatives of trade unions and business associations, skilled workers, and specialists from TVET excellence centres and universities. In its 2017 annual report, for example, the Observatory says qualifications for forest and environment agents need to integrate technical skills related to topography and the prevention of forest fires, together with knowledge of cost and process analysis of forest exploitation, forestry-related legislation, management and planning methodologies, as well as occupational risk prevention, fabrication of biomass, and using specialised equipment and tools. Power plant technicians or electrical technicians are other examples of green occupations that require updated technical and professional competencies on electric cogeneration in small power plants, wind turbines, and energy efficiency.

Source: Cedefop (2018)

3.2.3.
Competencies for entrepreneurship

The development of entrepreneurial capacity is one of the key policy objectives in the 21st century. Entrepreneurship in TVET is a way of preparing learners to be self-reliant, capable of solving social and economic problems while contributing to economic growth and development.[23] In Europe, the Entrepreneurship Competence Framework (EntreComp) presents a set of 15 entrepreneurship competencies that can inform the development of TVET curricula and training regulations. The list comprises three categories:

- **Ideas and opportunities**: using imagination and abilities to identify opportunities for creating value; developing creative and purposeful ideas; working towards a vision of the future; making the most of ideas and opportunities; and assessing the consequences and impact of ideas, opportunities, and actions.

- **Resources**: identifying and assessing individual and group strengths and weaknesses; motivation and perseverance; acquiring and managing the material, non-material and digital resources needed to turn ideas into action; developing financial and economic know-how; as well as inspiring others on board.

- **Action**: acting and working independently to achieve goals, making decisions dealing with uncertainty, ambiguity, and risk; working together and cooperating with others to develop ideas and turn them into action; as well as learning with others, including peers and mentors.

The EntreComp Framework is highly useful in helping projects and organizations to recognise, appraise, and assess levels of entrepreneurship competence. The implementation of this framework in European TVET institutions is also supported by the Entrecomp360 project (see Box 4).

---

23 Ogbaekirigwe and Okolie (2017). CK Not included in References

> **BOX 4   European Union: The Entrecomp360 project**
>
> The Entrecomp360 project, co-funded by the European Commission, is currently developing an online platform to provide guidance, tools, and online training, and to connect those involved with the practical implementation of the EU framework EntreComp into learning and work. The platform aims to improve the quantity and quality of design, implementation, assessment, transparency, and recognition of the key entrepreneurship competencies. It includes partners from a wide network of practitioners and organizations representing formal education, youth groups, employers, and business/start-ups.
>
> For more information: *https://entrecomp360.eu/*

3.2.4.
Competencies for integrating migrants into society and the labour market

In recent times, worldwide migration has reached unprecedented levels. Reasons include the internationalization of higher education and greater freedom of movement, as well as increased conflict, climate change, and economic crises. The BILT project highlights two aspects of the impacts of migration on the demand for new competencies: (1) those needed by the local workforce to help to integrate migrant workers into society and labour markets; and (2) those required by migrant workers to facilitate their integration into society and labour markets.

It further recommends that local students, teachers and trainers, as well as migrant students, acquire the following competencies:

- **Competencies needed by local students, teachers and trainers to promote the integration of migrants into society and labour markets**: awareness of diversity, inclusion, and cultural and socio-economic competencies. In certain cases, TVET teachers and trainers will find it useful to assess prior learning, skills, and qualifications; and to provide career guidance and language teaching.

- **Competencies needed by migrant students to facilitate their integration into society and labour markets**: as with local students, migrant students must develop awareness of diversity, inclusion, and cultural expectations. But language proficiency is arguably the most crucial skill for their successful integration. The development of entrepreneurial competencies among migrant students is also important considering the interest and motivation they may have in generating self-employment. In addition, migrant students must be given the opportunity to learn technical and professional competencies required by specific occupations and jobs.

The category of migrant students embraces a broad range of individuals, with vast differences in terms of socio-economic background, as well as reasons for immigrating. An example from Germany makes the point:

> **BOX 5   Germany: The integration of refugees into the vocational education system**
>
> 'Trainee Data System' (DAZUBI) of the Federal Institute for Vocational Education and Training (BIBB) shows that the number of foreign trainees in the German dual system had increased by almost 100% in 10 years. Many of these trainees are refugees who fled their own country because of serious human rights violations and persecution. Yet the major challenge of how best to integrate them remains. 'Perspectives for young refugees', an initiative of the German Federal Employment Agency, offers a six to eight-month programme that includes identifying previous knowledge and experience, teaching professional language skills, application training, and providing information about addiction and debt prevention, and the basics of healthy living. Plus, the programme also gives migrants the opportunity to participate in work assignments in which the participants gain practical experience inside companies.

Source: BIBB (2018)

'Perspectives for young refugees' highlights the importance of developing competencies for recognising prior learning acquired in formal, non-formal, or informal learning environments. Education and training providers must enable 'front-line' practitioners and professionals[24] (for example, counsellors, facilitators and/or assessors) to implement appropriate assessment methods, taking into account the special situation of migrants. These professionals must not only be able to conduct assessments and validation processes but also be capable of inspiring trust and creating a proper psychological setting for the candidates, especially in the case of migrants.[25]

3.3.
Survey results: TVET stakeholders' involvement in the identification of new qualifications and competencies

The BILT survey asked participants about the level of involvement of TVET stakeholders in the identification of NQC in their national contexts (cf. grey bars in Figure 2). The results show a clear imbalance across different types of TVET stakeholders. According to participants, TVET national bodies (97%), public TVET schools and training centres (87%), ministries or local public authorities (87%), and large enterprises (78%) present high levels of involvement in the identification of NQC. Social partners, including chambers of commerce (80%), employer associations (74%) and trade unions (67%) were also regarded as having a relevant influence. On the other hand, participants suggested that youth organizations (32%) and other associations (36%) present lower levels of involvement in the identification of NQC. These results show that well-established and highly organized or connected stakeholders have a major impact on the identification of NQC in different systems. In a second step, participants were asked to give their opinion of which actors should be more involved in the identification of NQC than they currently are (cf. blue bars in Figure 2). A significant number believes that NGOs, civil

24 International Labour Organization (2018).
25 Cedefop (2015a).
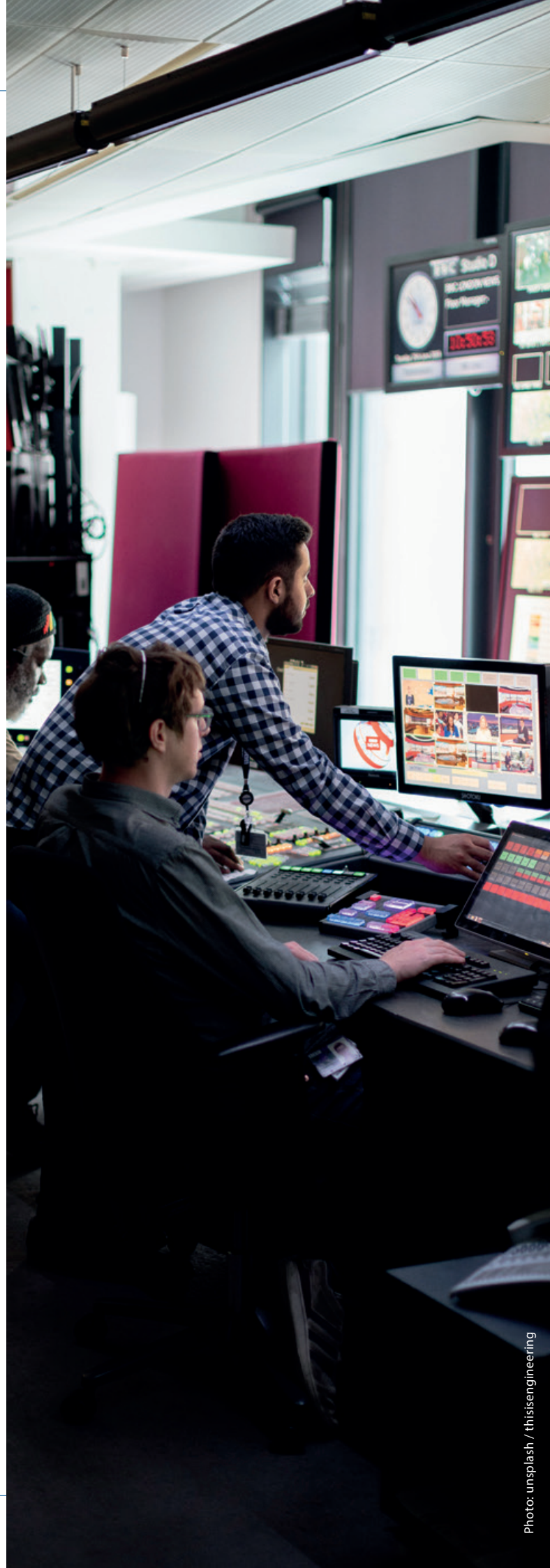
society organization and other associations (84%) and youth organizations (76%) should be more involved. In both cases, there is more than a 40% gap between the perceived participation of these actors in the identification of NQC and the demand for a higher degree of their involvement. Furthermore, more than 50% of participants believe that individual specialists, universities/research institutions, and small and medium-size enterprises (SMEs) should have greater opportunities to participate in the identification of NQC. These results suggest a need for European TVET systems to actively promote the involvement of specific TVET stakeholders in order to better identify not only labour market needs but also the expectations and demands that emerge from society in general and young people including TVET learners – in particular.

It is not surprising that the participants who are already very engaged (ministries) did not request a stronger level of involvement.

FIGURE 2. **Involvement of TVET stakeholders in the identification of NQC (in percentage)**

Currently involved
Should be more involved

Involvement in the identification of NQC (in percentage)
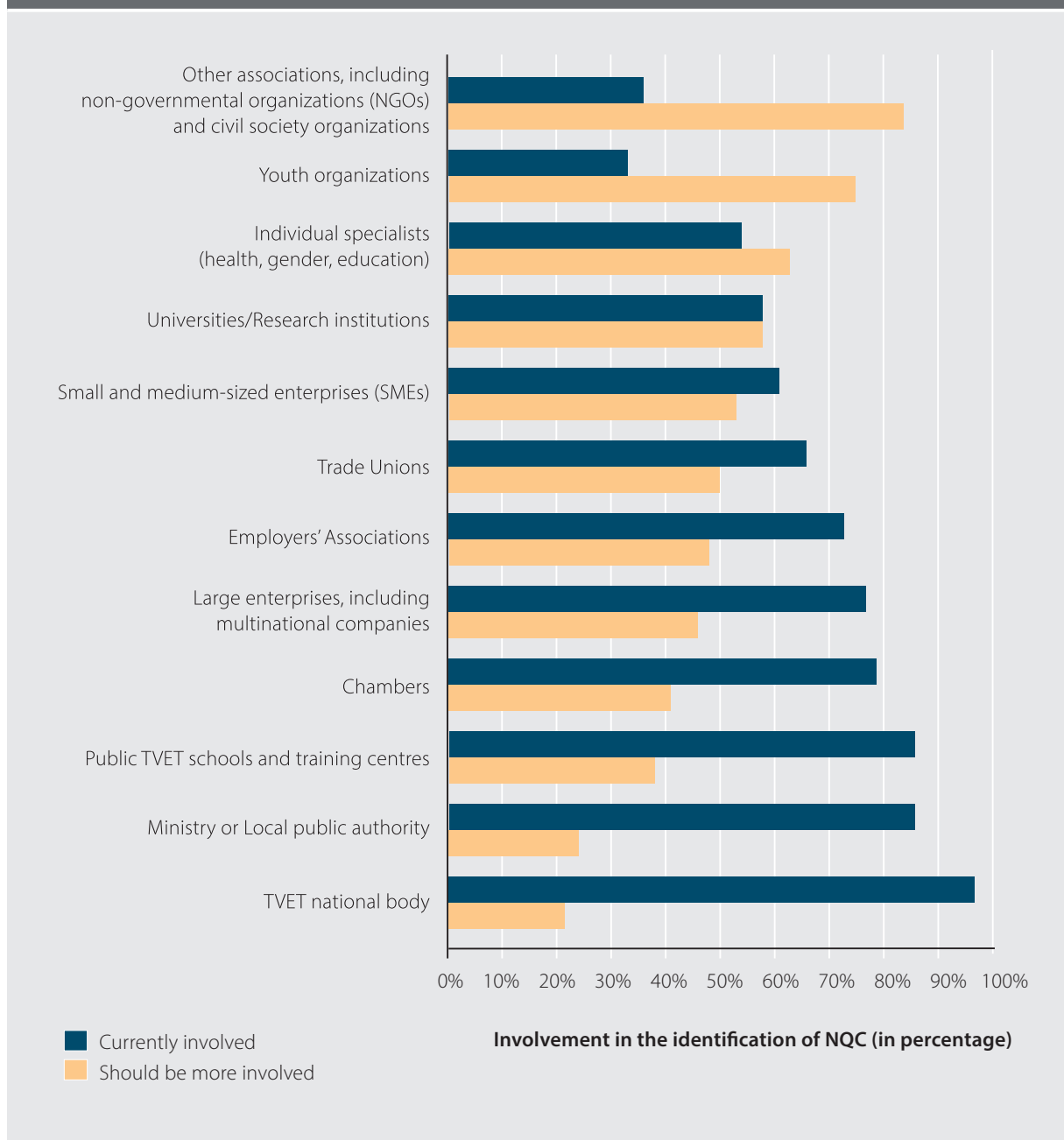
3.4.
BILT survey results: Economic sectors and occupations with high demand for NQC in TVET

SECTORS

Survey respondents were asked to estimate which economic sectors present high demands for NQC, and to distinguish between macro, meso and micro levels of stakeholders.

The highest demand for NQC at the macro level is found in manufacturing (80%) and ICT (60%), followed by education (40%). Survey respondents indicated that at the meso level, the sector with the highest NQC demand is ICT (83%), followed by manufacturing (50%), transportation and storage, as well as construction (both 42%). Survey results at the micro level indicate the sectors with highest NQC demand are again ICT and manufacturing (both 50%), followed by human health and social work activities (39%), and education (33%).

While variations in the perceived demand for NQC in different economic sectors are evident, ICT and manufacturing are clearly revealed as priority sectors across all three levels of stakeholders,

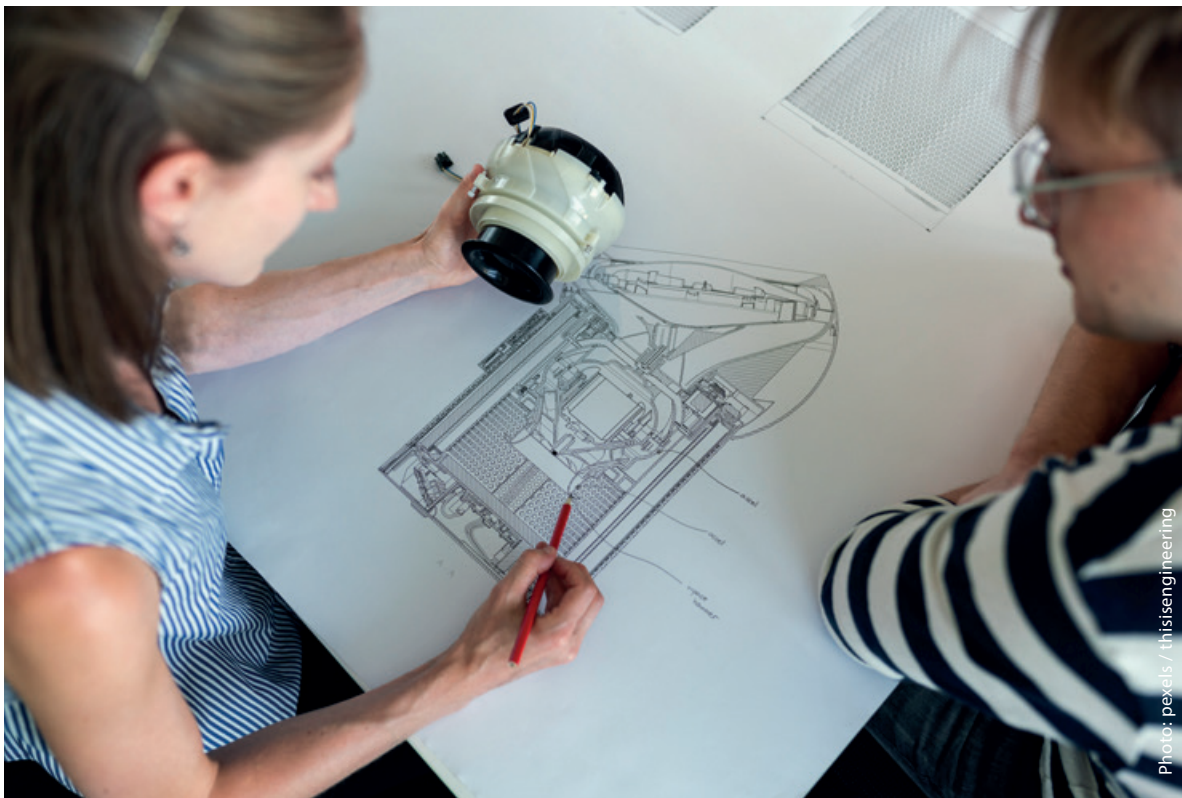| Top sectors with high demand for NQC	
Macro level	• Manufacturing (80%) • ICT (60%) • Education (40%)
Meso level	• ICT (83%) • Manufacturing (50%) • Construction/transportation and storage (both 42%)
Micro level	• ICT and manufacturing (both 50%) • Human health and social work (39%) • Education (33%)
Average	• ICT (64%) • Manufacturing (60%) • Education (30%)

Photo: pexels / thisisengineering

consistently ranked in the top two. The same holds true for average values, where almost two-thirds of respondents (64%) identified ICT as the sector in highest demand for NQC and manufacturing closely follows with 60%. Far behind are education (30%), construction (28%), human health and social work activities (28%), followed by transportation and storage at 21% (see Figure 3).

OCCUPATIONS

Survey respondents were also asked to give examples of occupations where the high demand for NQC has led to updated or newly created occupational profiles. The results identified digitalization and the greening and sustainability of TVET as the prime beneficiaries.

Reform of **digitalization-related occupations**, especially visible in the hiring of technicians who oversee robotics and automation in smart manufacturing, as well as robot or precision machine operators. Another example of a new qualification concerns digitalization managers, who are qualified specialists that manage the digitalization of business processes at an operational level, handling data and processes from a cost-efficient, business management perspective. Several survey participants also cited the creation of occupational profiles for E-salesperson for online commerce. This profile integrates e-business as a specialised TVET subject within the retail trade sector. In the transportation and logistics sector, participants also mentioned the updated occupational profiles for logistics, warehouse and shipping supervisors, as well as for autonomous vehicle technician.

FIGURE 3. **Economic sectors with high demand for NQC in European TVET systems (in percentage)**

Micro-level
Meso-level
Macro-level

Economic sector in high demand of NQC (in percentage)
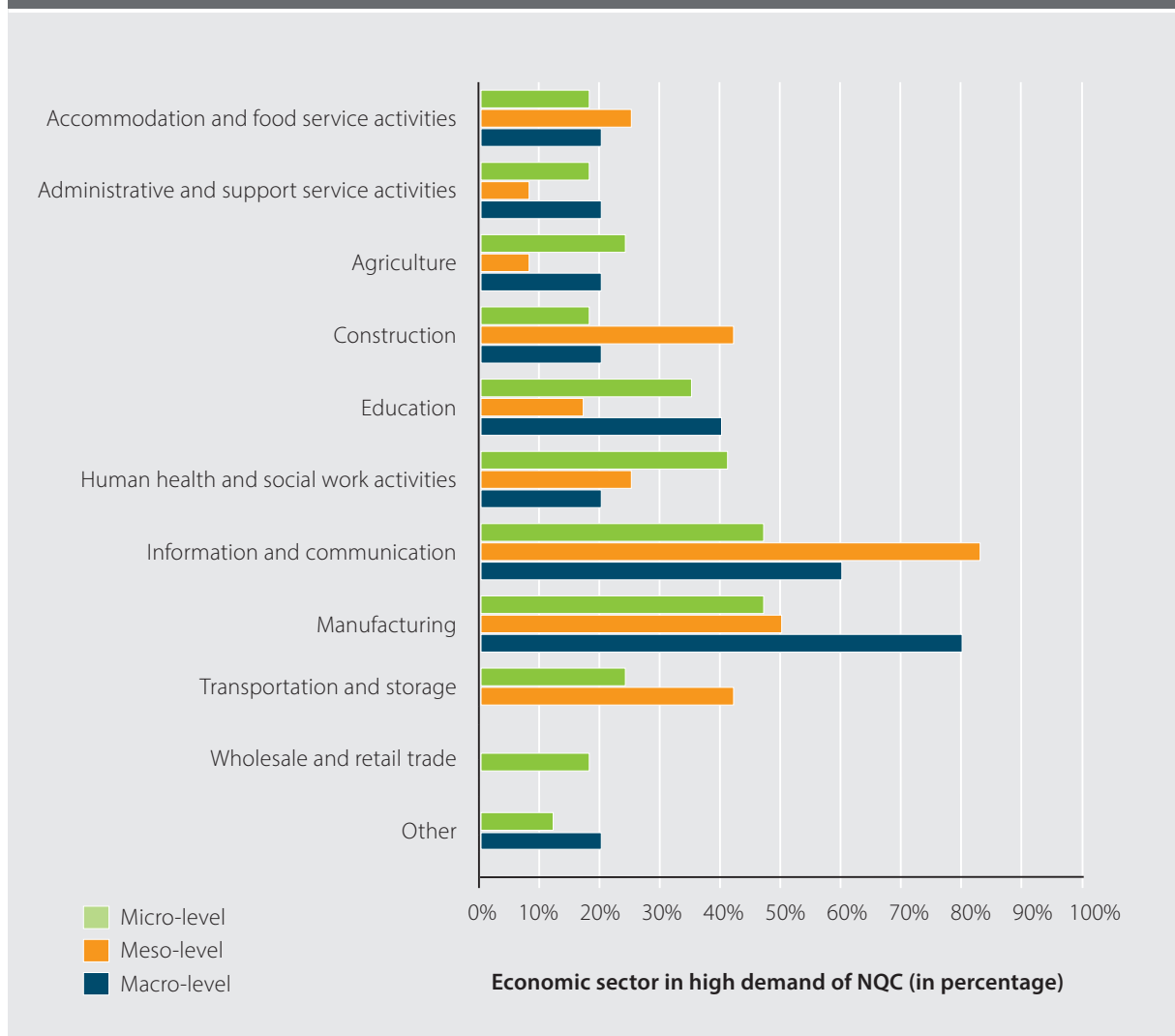
Source: BILT survey.

FIGURE 4. **Examples of recently updated or newly created occupations related to digitalization**

robotic technician

automation technician

autonomous vehicle technician

shipping supervisor

robot or precision machining operator

digitalisation manager

e-salesperson

logistics management officer

warehouse management supervisor

Source: Examples from BILT survey participants.

The growing awareness that **sustainable development and the transition to a low carbon economy** are essential is also driving new TVET 'green modules' forward. These address the implementation of circular economies, climate protection, water resources management, and agricultural production. The BILT survey further showed that TVET systems are creating qualifications for new occupational profiles that include electric vehicle technician, energy specialist, remote service specialist, circular economy officer, and automation expert.

Overall, the results show how occupations related to green and digital competencies are gaining in relevance, especially in sectors where ICT and manufacturing are most prominent. Other fields also benefiting from workers equipped with green and digital competencies include construction, human health and social welfare.

FIGURE 5. **Examples of recently updated or newly created occupations (orange) and modules (green) related to greening**

3.5.
Survey results: Demands of different types of competencies across the BILT thematic areas

The BILT survey on NQC in Europe has sought to learn more about the level of demands for different types of competencies across four thematic areas: digitalization, greening, entrepreneurship, and migration. This research uses OECD's skills typology to define four different types of competencies (basic competencies, advanced cognitive competencies, social and emotional competencies and professional and technical competencies) as presented in Section 3.2.

Survey respondents assigned great importance to all four types of competencies, although with variations between one BILT theme and another. The results suggest that TVET qualifications must go beyond the traditional focus on teaching narrowly-defined professional and technical knowledge and skills, to encompassing new and broader competencies

related to the application of socio-emotional skills, entrepreneurship learning, problem-solving, and functioning in a multicultural environment.

3.5.1.
Demand for different types of competencies for digitalization

Survey results indicate that for digitalization there is a high demand for basic competencies (94%), professional and technical competencies (83%), and advanced cognitive competencies (63%), while less than half (47%) of survey results indicated social and emotional competencies as highly relevant. The three 'highest relevance' responses – 94% for basic, 83% for professional and technical, and 63% for advanced cognitive competencies – indicate a strong perceived need for digital competencies across a wide range of professions

While most professions need at least basic competencies in digitalization, specialised occupations need both professional and technical skills, ideally encompassing also the ability to solve complex problems, rated as an advanced cognitive skill.

BILT survey participants offered the following examples where basic digital competence is needed: creating digital content, collaborating through digital technologies, using software for online teaching and learning, as well as holding virtual work meetings. Examples of professional and technical competencies requiring digital skills and knowledge include additive manufacturing, the IOT, data analytics, drone technology, automation, and artificial intelligence.

FIGURE 6. **How relevant are different types of competencies for digitalization?**
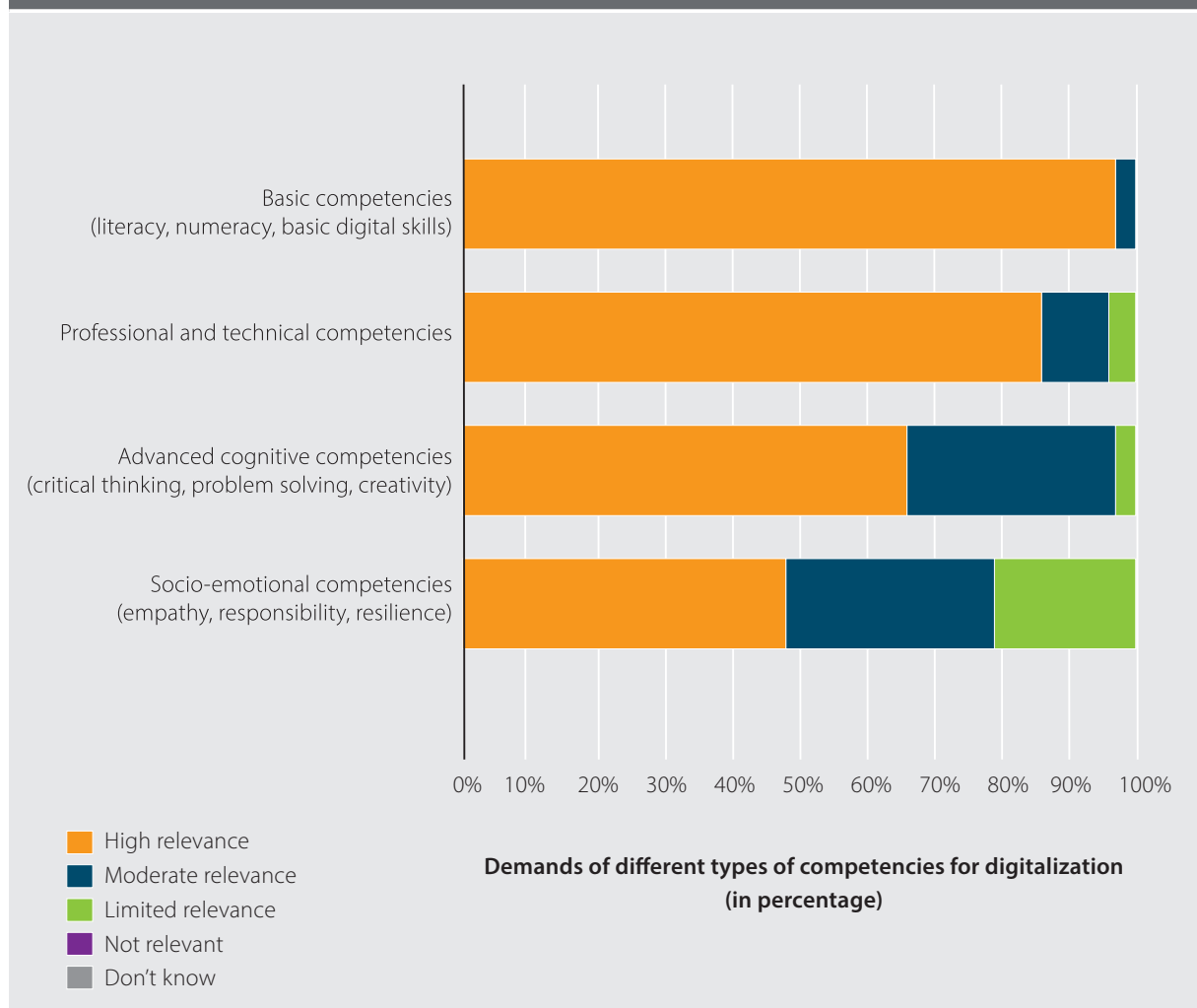
Source: BILT survey.

3.5.2.
Demand for different types of competencies for greening TVET

Although their responses were focused on professional and technical competencies, such as operating and repairing hybrid and electric vehicles, as well as reducing material waste in manufacturing processes, over 50% of survey participants suggested that all four types of competencies (as shown in Figure 7) are highly relevant – and even required – in to succeed at greening the planet, because greening is a cross-cutting issue intimately linked to the larger question of sustainable development.
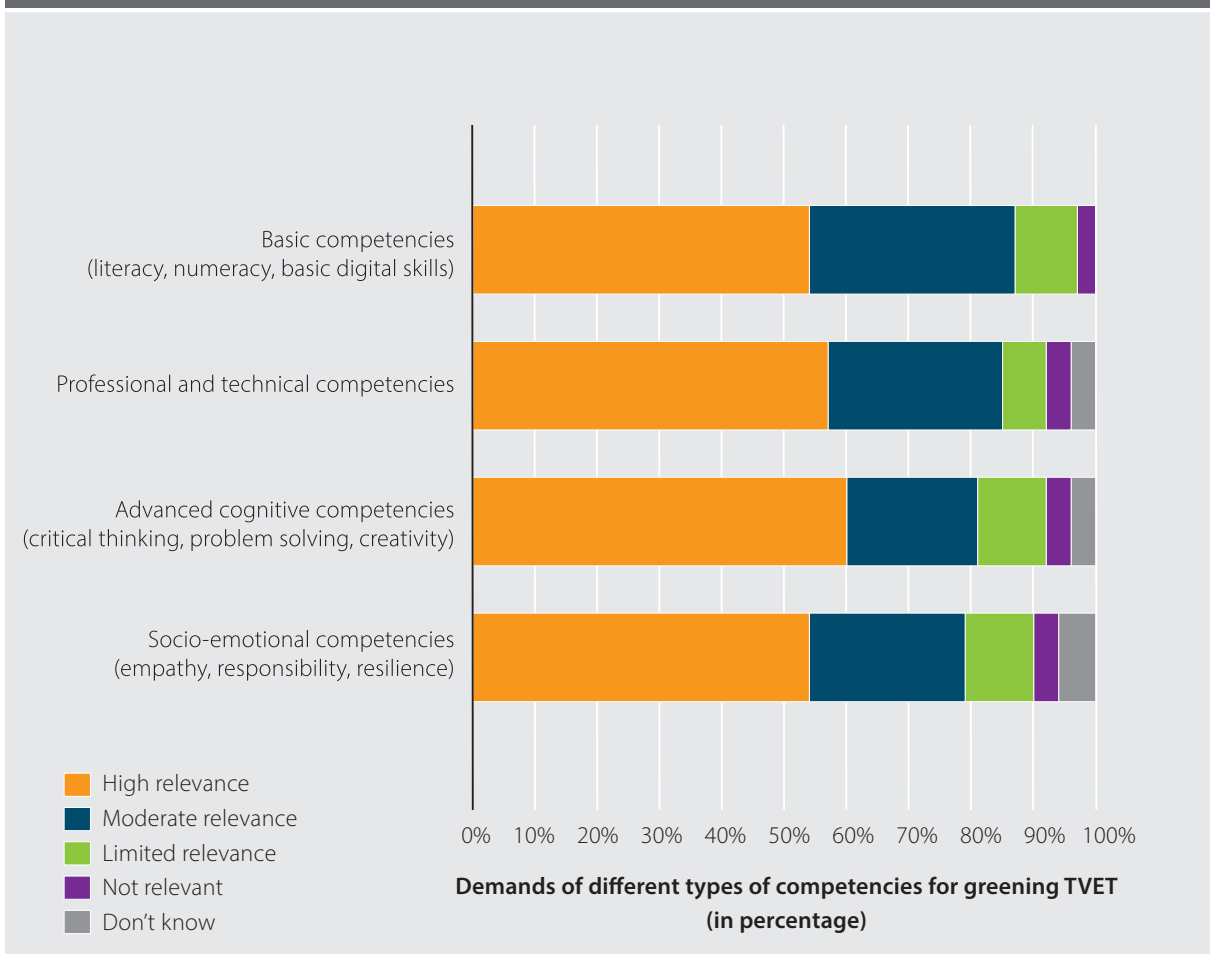
Advanced cognitive skills are needed in order for learners to be able to critically apply sustainability-related competences in various work situations and to find creative ways to integrate sustainable action into their daily working life.

3.5.3.
Demand for different types of competencies for entrepreneurship

Almost 80% of BILT survey respondents suggested that advanced cognitive competencies are highly relevant for entrepreneurship. This illustrates that entrepreneurship requires a higher level of critical thinking, complex problem- solving, and creative capacity. The qualitative data present examples of advanced cognitive competencies in the context of entrepreneurship, such as transforming creative and innovative ideas into profitable and sustainable business ventures; turning ideas into action; or unearthing financing opportunities for creation and development of start-up projects.

Socio-emotional competencies are also identified as highly relevant to entrepreneurship according to almost 70% of respondents. Furthermore, Virtual Conference and the BILT Online Survey participants

FIGURE 7. **How relevant are different types of competencies for greening TVET?**

Demands of different types of competencies for greening TVET
(in percentage)

High relevance
Moderate relevance
Limited relevance
Not relevant
Don't know

Source: BILT survey.

mentioned the need to 'encourage' or 'motivate' TVET students to start their own business. The participants seem to recognise that in Europe, at least, emotional and often also cultural barriers play an important role in stopping these students from becoming entrepreneurs.

In comparison, basic competencies (59%) and professional and technical competencies (50%) are considered to be less important for entrepreneurship. As with greening, this might arise from entrepreneurship being viewed as a cross-cutting issue, which requires new types of competencies and soft skills. Nonetheless, when entrepreneurship is understood as 'business education' basic, professional and technical competencies are considered relevant.
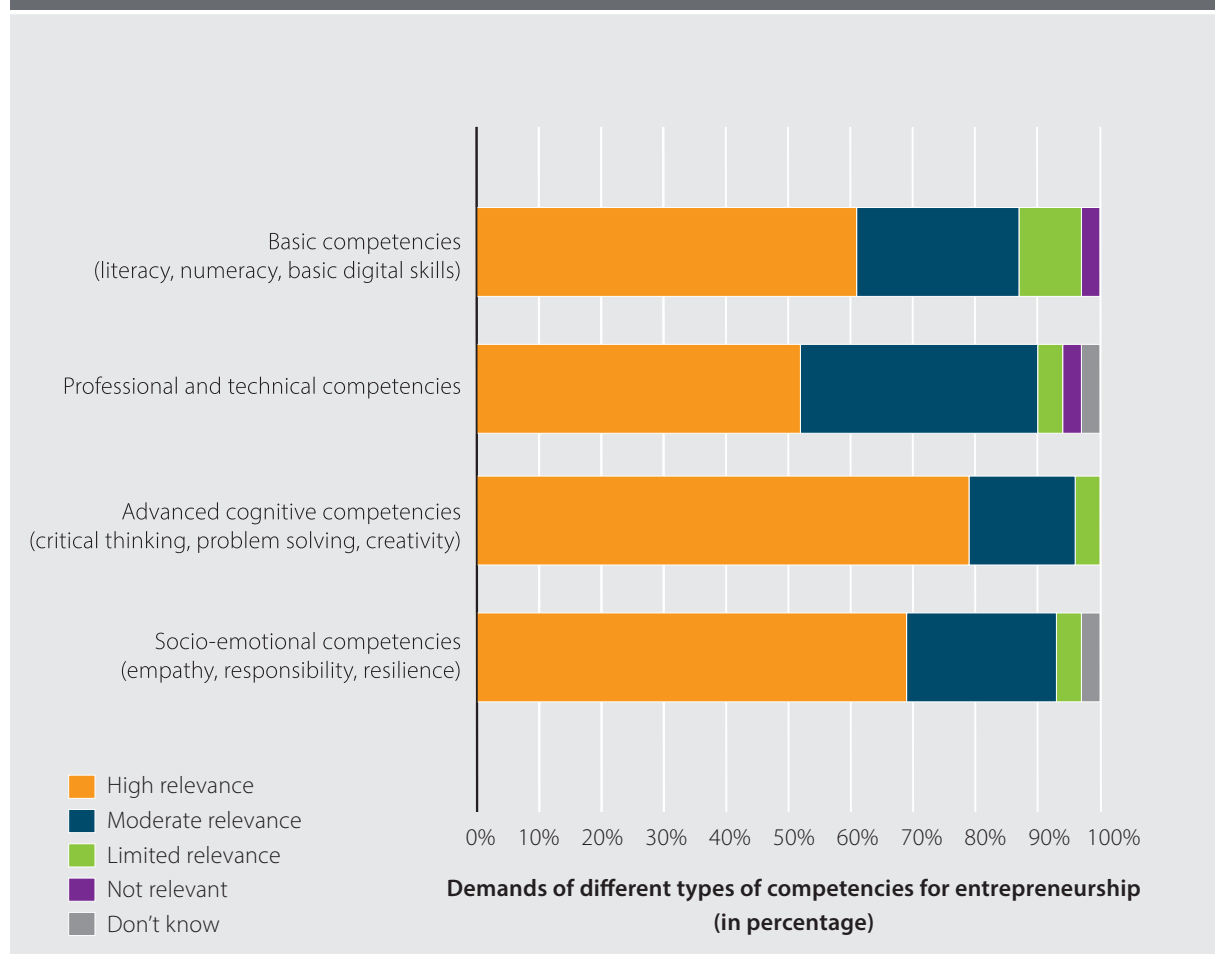
3.5.4.
Demand for different types of competencies to support the integration of migrants

The BILT survey asked participants to identify the most relevant competencies required for successful integration of migrants, broken down to include local and migrant students, as well as TVET teachers and in-company trainers.

A large majority (72%) of participants suggested that basic competencies are highly relevant for the integration of migrants into European societies and labour markets. Clearly, language proficiency, is one such pre-requisite for the acquisition of complex professional and technical competencies. By 67% of the respondents, socio-emotional competencies were also judged to be important for migrant students, with developing capacity for peer and collaborative learning skills cited as examples. One might thus conclude that migrant students are

FIGURE 8. **How relevant are different types of competencies for entrepreneurship?**

Basic competencies
(literacy, numeracy, basic digital skills)

Professional and technical competencies

Advanced cognitive competencies
(critical thinking, problem solving, creativity)

Socio-emotional competencies
(empathy, responsibility, resilience)

■ High relevance
■ Moderate relevance
■ Limited relevance
■ Not relevant
■ Don't know

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

Demands of different types of competencies for entrepreneurship (in percentage)

Source: BILT survey.

often expected to actively engage in collaboration with student peers or colleagues in the workplace. Conversely, survey participants regarded professional and technical competencies, as well as advanced cognitive skills, as being less relevant – although they might become more relevant in a later stage of the integration process.

When viewing the competencies needed by local students to support the integration of migrants into European labour markets and societies, helping migrants gain language proficiency came at the top of the list. Socio-emotional competencies, such as intercultural communication and knowledge of the arts and history, were also mentioned. According to survey respondents, these socio-emotional competencies foster awareness of how a person's cultural heritage, gender, class, ethnic-racial identity, sexual orientation, disability, and age cohort can help shape their personal values, assumptions, and biases as related to migrants. Empathy is another

desirable quality for better understanding the peer migrants' specific circumstances. Professional and technical competencies, however, along with advanced cognitive competencies, were regarded as gradually less important for promoting the integration process.

This picture looks very different when it is about TVET teachers and trainers in the face of migration. Some 60% of survey participants see basic competencies, advanced cognitive competencies and socio-emotional competencies as highly relevant for TVET teachers and (in-company) trainers in this context. Moreover, in comparison to migrants and local students, it is teachers and (in-company) trainers who need professional and technical competencies the most (54%) in order to assist the social and economic integration of migrants. This may indicate how teachers and trainers are expected to assume a broader role, relaying skills that are relevant for both everyday life and the workplace.

FIGURE 9. **How relevant are different types of competencies for the integration of migrants?**
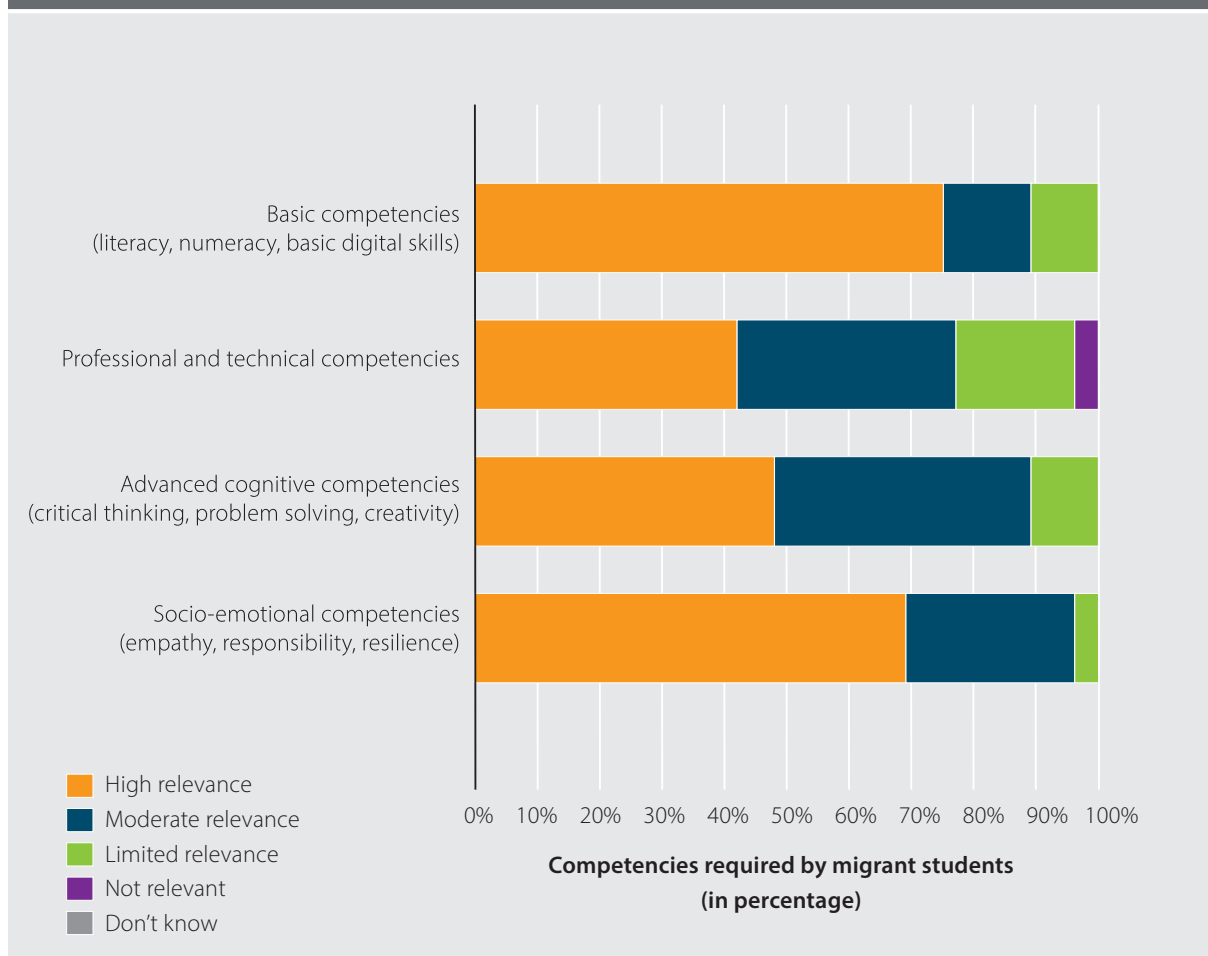

Competencies required by migrant students
(in percentage)

FIGURE 10. **How relevant are different types of competencies needed by local students in the face of migration?**

Competencies required by local students
(in percentage)

High relevance
Moderate relevance
Limited relevance
Not relevant
Don't know
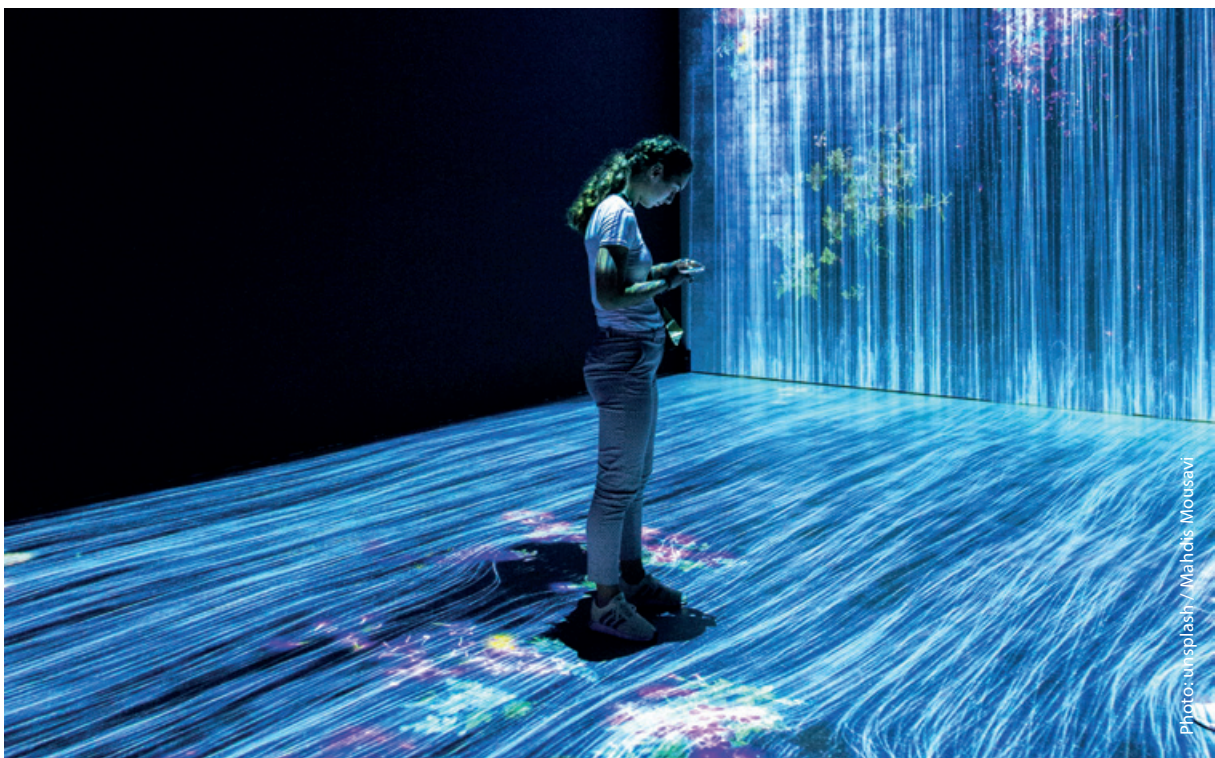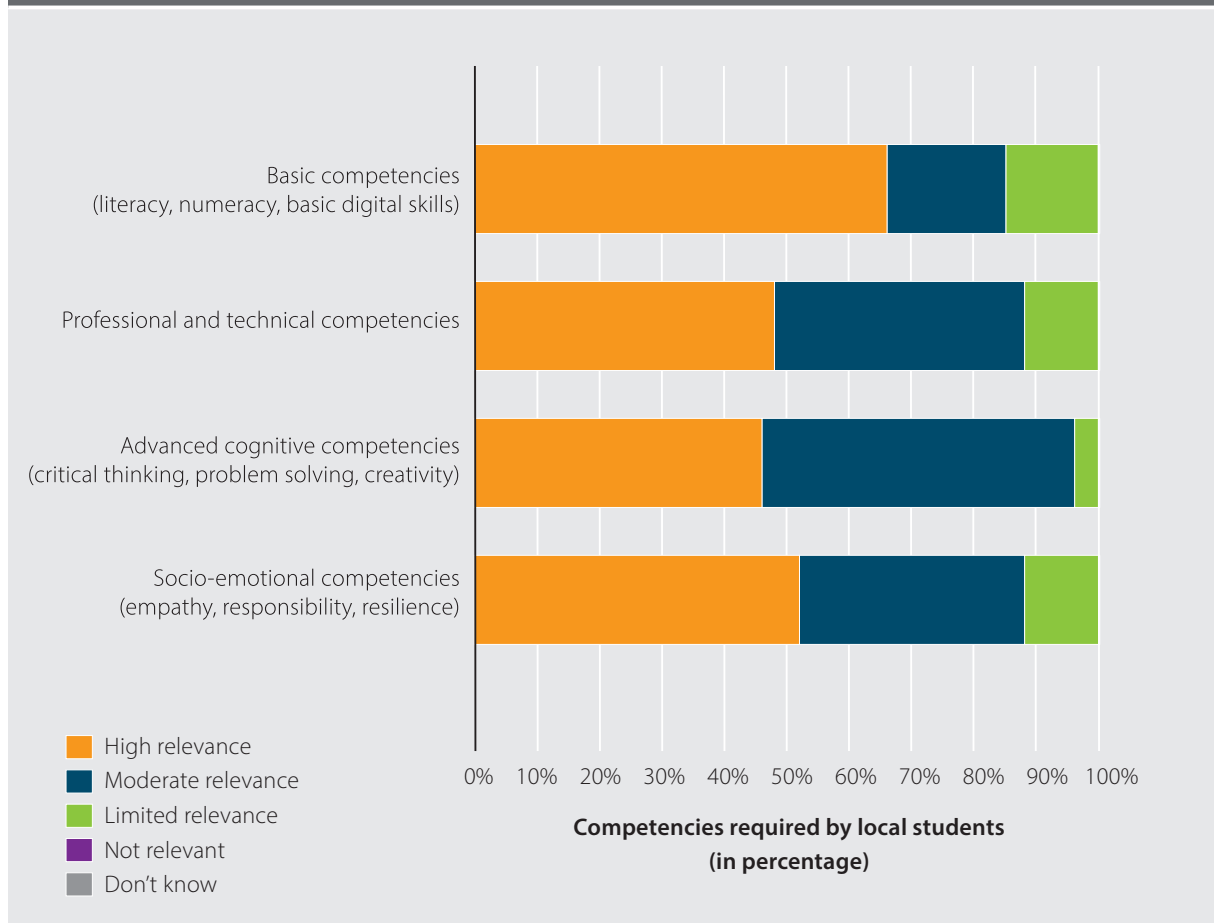
FIGURE 11. **How relevant are different types of competencies for TVET teachers and trainers in the face of migration?**

Basic competencies
(literacy, numeracy, basic digital skills)

Professional and technical competencies

Advanced cognitive competencies
(critical thinking, problem solving, creativity)

Socio-emotional competencies
(empathy, responsibility, resilience)

High relevance
Moderate relevance
Limited elevance
Not relevant
Don't know

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

**Types of competencies required by teachers and trainers
(in percentage)**

Photo: UNESCO UNEVOC

4. Integrating NQC into TVET curricula and training regulations

This section presents four approaches (see Section 4.1) that TVET stakeholders can use to produce or update TVET curricula and training regulations, as well as create individual learning pathways, more apt to respond to the need for NQC. The following questions can serve as a guide:
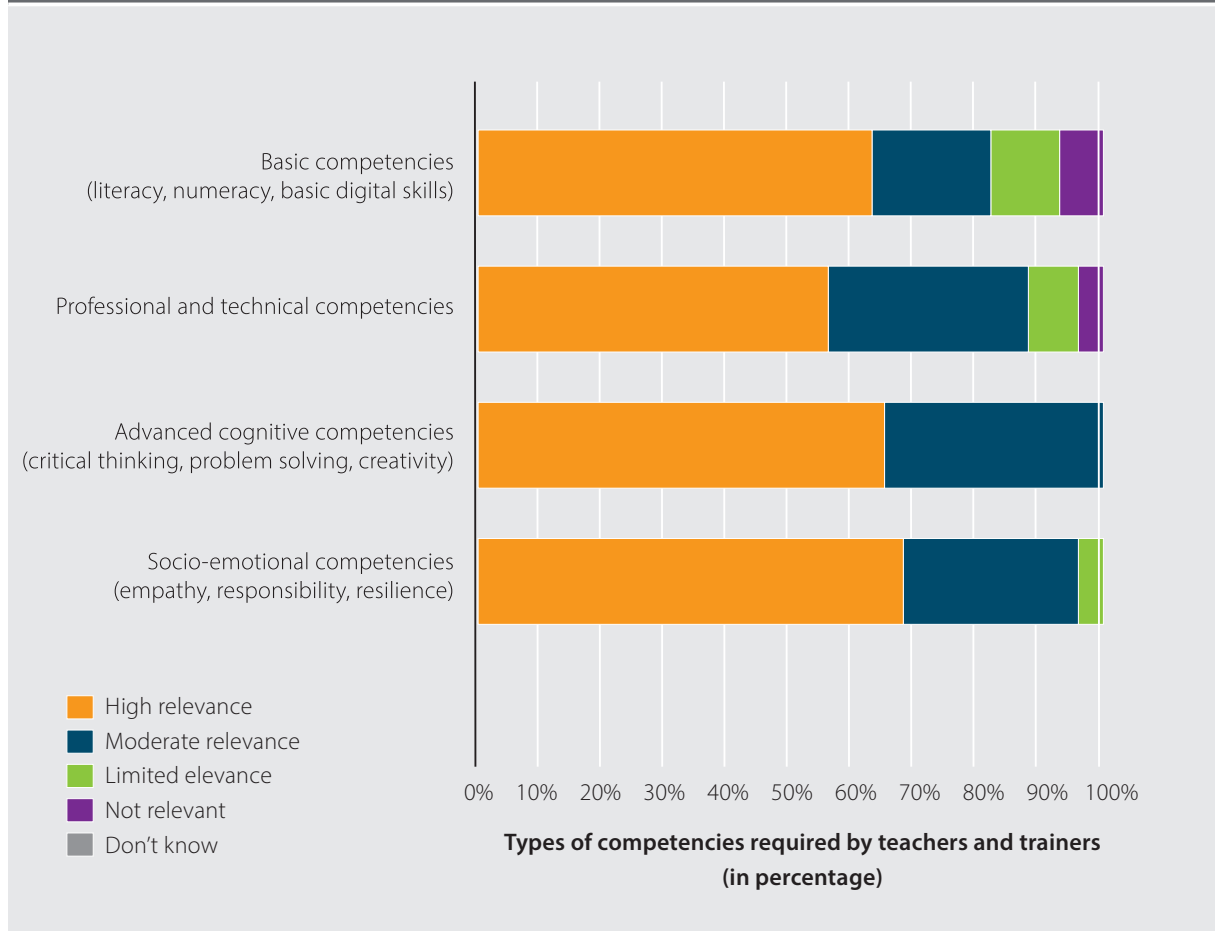
- What are the different ways of integrating NQC into TVET used in the European UNEVOC Network? To what extent are these strategies relevant?

- How are TVET systems implementing flexible curricula, while also assuring that national standards are met? How can TVET systems improve their responsiveness in view of NQC?

- What ways of individualising learning pathways exist in the European context and how are they beneficial to the learner?

- What examples of NQC can be found in European TVET systems?

4.1.
What are the challenges of integrating NQC into TVET curricula and training regulations?

The biggest challenge confronting **TVET stakeholders** is to first identify the different types of possible approaches and then to apply them in order to promote relevant competencies across specific target groups. The BILT project proposes an initial list of **four different but complementary approaches** to the integration of NQC into TVET curricula and training regulations:

1) **Cross-cutting approach**: These competencies are implemented in all curricula or training regulations given their relevance for all learners, for example, the competency to promote and include sustainability in work and life-related activities.

2) **Sectoral approach**: These competencies are relevant for different curricula and training regulations affiliated to the same sector, for example, manufacturing or the service sector.

3) **Occupational approach**: These competencies are related to occupation-specific curricula and training regulations, for example robotics technician or wind-energy specialists.

4) **Additional approach**: These are additional modules that complement compulsory TVET within initial or continuing training. The modular or additional approach allows TVET providers to deliver a quick response to new developments, enhancing the level of flexibility at local levels.

In order to make optimal use of these approaches, an initial challenge for TVET stakeholders is to **understand labour market needs**, and also to determine which competencies are needed by all TVET students, or only by specific groups (from specific sectors or occupations), and to identify the gaps and shortcomings in current TVET qualifications that can be, for example, addressed with additional modules.

During the BILT digitalization workshop, participants expressed concern about the slow **responsiveness of TVET curricula and training regulations** in the face of the rapid proliferation of new technologies. In order to improve their responsiveness, TVET stakeholders must have the capacity and ability to quickly debate, negotiate, create or reform TVET curricula and training regulations to address emerging societal and economic demands.

However, given that system-wide implementation can be a time-consuming process, it may be easier simply to enable local institutions to address gaps in curricula and training regulations, as well as provide customised training for learners and the private sector.

Furthermore, as demonstrated by examples from the BILT NQC workshop, the provision of 'individual learning pathways' requires fundamental changes in the design of TVET curricula and training regulations so that these customised pathways can be based on the experience, learning pace and style of individual learners. TVET stakeholders must therefore be able to perform a number of specific complementary tasks – such as the creation of legislation, financing, recognition of prior learning, and pedagogical planning – while simultaneously customising TVET curricula.

4.2.
Trends in integrating NQC into TVET curricula and training regulations

This section presents examples of the four modes of implementing new competencies into TVET curricula and training regulations proposed by the BILT project. They include cross-cutting, sector-specific, and occupation-specific cases, along with a review of international literature.

4.2.1.
Cross-cutting approach

Using the cross-cutting approach, TVET systems integrate transversal competencies that are relevant to all learners into all curricula and training regulations within a TVET system. Basic ICT competencies are examples of knowledge and skills that every TVET student needs, regardless of their specific sector and occupation. Multiple reports also discuss the importance of integrating green skills and knowledge into all TVET curricula and training regulations[26] at the European level. They caution, however, that the successful integration of competencies through a cross-cutting approach requires there be significant political effort to develop the necessary accompanying regulations, policies, and strategies.

TVET systems may also integrate competencies related to entrepreneurship into all curricula and training regulations. In Spain, for example, the innovation institute Tknika includes a compulsory 'Business and Entrepreneurial Initiative' unit for all TVET students from the Basque TVET system (learn

---

26 CEDEFOP (2018; 2019a; 2019b)

more about the IKAENPRESA initiative in Box 11. (Page 37). And in Finland, national TVET curricula and training regulations have already integrated transversal competencies into a cross-cutting approach (see Box 6).

4.2.2.
Sectoral approach

In the sectoral approach, TVET systems focus on integrating competencies that are relevant to one sector only. This approach can be used:

a. to integrate competencies into all curricula and training regulations concerning a single sector; or
b. to create one curriculum or training regulations for a specific sector.

By providing sectorial competencies, TVET systems can enhance the capacity of individuals to work in different industries of the same sector.

The Pro-DEENLA project in Germany, described in detail in Box 16 on page 44, offers an example of how competencies can be integrated into different curricula and training regulations for a single sector (a). In this case, green competencies are integrated into regulations that cover training for jobs in logistics.

BOX 7 Ireland: New sectoral apprenticeship for manufacturing technicians

A 2014 survey conducted by the Irish Medical Devices Association found great market demand for manufacturing technicians, with perhaps as many as 600 positions available every year. Recognising the need for greater flexibility in this sector, the Irish Medical Devices Association created a new sectoral standard for manufacturing technicians, one focused on general tasks such as providing technical support for manufacturing operations, and establishing and coordinating preventive maintenance for on-site equipment. Examples of competencies developed in this apprenticeship programme include: (1) solving routine technical problems related to manufacturing environments; (2) following quality control and assurance procedures as required; and (3) applying knowledge of processes, tools, and automation in order to design solutions that will improve the performance of systems for the manufacture and assembly of products.

Source: Eurofound (2019a)

BOX 8 Austria: Qualification for E-commerce merchant

In 2018, the Austrian Federal Ministry for Digitalization and Economic Affairs published training regulations for e-commerce merchants. These merchants work in trading companies that sell their products via online shops, such as large retailers or retail chains for clothing, sports, books, electronics, or for furnishings and food. They are responsible for the internet sales platforms, processing customers' orders and ensuring the ordered items are delivered in full and on time. Normally they work in a team with professional colleagues, team leaders (e.g. e-commerce managers), IT employees, and with specialists from marketing and sales. This job requires not only commercial knowledge and skills, but also competencies in IT, logistics, marketing, and advertising.

Source: IBW (2018)

Another example of the sectoral approach comes from Ireland, where a new apprenticeship programme for manufacturing technicians imparts different competencies through a single curriculum for all learners in one specific sector. (b). In other words, graduates having the same profile can occupy different types of positions in the same sector. Box 7 highlights this new sectorial apprenticeship programme where the focus is on advanced cognitive and technical competencies related to the main technologies used in the manufacturing sector.

4.2.3.
Occupational approach

Using the occupational approach, TVET systems integrate competencies relevant for one specific occupation into their curricula and training regulations, thus allowing TVET stakeholders to create a totally new occupation or update an existing one. However, this process can be time-consuming, especially when a wide range of stakeholders are involved in the consultation process.

Austria, Germany and Switzerland have instituted an occupational approach that relies on what they call holistic modularization. This refers to 'the breaking down of whole educational qualifications into useful sub-units (modules), each of which has measurable outcomes that are assessed (and in some instances certified) in their own right, as well as contributing to a larger overall educational outcome (primarily a qualification)".[27] In traditional and holistic modularization, TVET curricula and training regulations present a unified programme based on specific occupations. The linear structure of learning content makes certification possible only after the successful completion of the final assessment, with no certified intermediate routes for the labour market before then. In this way, the countries aim to protect both an occupational identity and the quality of school- and company-based training.

---

27 Stanwick (2009)

4.2.4.
Additional/modular approach

In the additional/modular approach, TVET systems integrate complementary competencies via additional or optional units/modules in order to promote flexibility and keep TVET programmes and courses updated according to new and local demands. TVET systems and providers use this approach for different reasons. For instance, with this approach, TVET providers can offer students the possibility to choose between various additional modules, which they complete as part of their regular training programme. These can be either compulsory or optional, allowing students to set their own priorities and choose a specialization.

'Radical TVET modularization' [28] is one example of an additional approach. For example, most of the initial TVET programmes in England are now composed of modules. However, they are still linked to an overarching qualification structure based upon National Occupational Standards. This approach includes the flexible combination of different modules, certification of individual modules, as well as unrestricted entrance and exit opportunities for learners. The result is greater flexibility for both TVET

providers and learners, and better identification of the competencies that students have, as well as the ones that they may need to develop. The additional or modular approach can thus help to implement individualised learning pathways.

The need to be responsive to local conditions – an environmental problem or specific industry demand, for example -- is another reason why TVET providers might wish to offer additional training modules. These could also form part of continuing vocational education and training. Employees who have completed initial training may choose from a range of additional modules of interest or perhaps required by their employer.

4.3.
BILT survey results: Approaches for integrating NQC into TVET curricula and training regulations

The BILT survey on NQC asked participants what types of approaches were used most for integrating NQC into TVET curricula and training regulations. Choosing from a list of four different but comple-mentary approaches - cross-cutting, sectoral,

---

BOX 9   Germany: Developing additional qualifications for digital competencies at the ABB Training Centre

In Germany, trainees in the dual system can also participate in programmes to acquire additional qualifications. Such qualifications provide competencies that go beyond regular training, and are either conventional or standardised: TVET providers may offer conventional additional qualifications that are not defined by training regulations, or standardised additional qualifications, where trainees receive structured training that is recognised by employers at the national level. These two types of additional qualifications can help learners to, for example, acquire computer certificates or deepen language skills in courses taken at a vocational school or during a stay abroad. Training companies and vocational schools are the main providers of additional qualifications in the German TVET system, along with various chambers of commerce, trade and crafts associations and industry training centres.

In this context, the Training Centre of the global technology company ABB, has developed an additional qualification just for digital competencies. The initiative started with the identification of transversal skills related to the digitalization of production processes, irrespective of the specific occupation or sector. ABB has clustered these manufacturing competencies into five groups: (1) learning and working in the digital world (learning with digital media, digital-driven knowledge); (2) management competencies; (3) information and communications technology competencies (hardware, software); (4) handling data (data security, data protection, data analysis, and evaluation); and (5) systems and processes (work processes, added value, cross-company processes/networking).

Source: Eurofound (2019b)

---

28 Cedefop (2015b)

occupational and additional/modular - survey participants indicated that 73% of TVET stakeholders use mostly the occupation-specific approach, while 64% preferred the cross-cutting approach. This reflects the common view of the literature that competencies can be transversal or specific, with transversal competencies being transferable between jobs, and specific competencies necessary to perform a particular job. Survey respondents further indicated that approximately half of TVET stakeholders use of sectoral or additional/modular approach.

The following sections explain of how specific TVET stakeholders in Europe use different approaches for integrating NQC into TVET curricula and training regulations. All the cases cited, as well as the discussion results, come from the BILT focus group activities. Annex 6 also presents examples identified by focus group research

4.3.1.
Occupational approach

The occupation-specific approach was recognised as the strategy most frequently used by BILT survey participants (73%) to integrate NQC. However, respondents acknowledged that the occupational approach is also a very time-consuming way – taking from one to three years – to create or update a TVET curricula and training regulation. Some of the reasons include:

1. Need to create a compromise on social and economic demands among different independent actors.

2. Lack of data and evidence on the demands for NQC.

3. Need for a formal process and approval from national authorities. Against this background, some institutions have suggested the possibility of fast-tracking the updating process to one year.

FIGURE 12. **Types of approaches most widely used to integrate new qualifications and competencies into TVET curricula and training regulations (in percentage)**
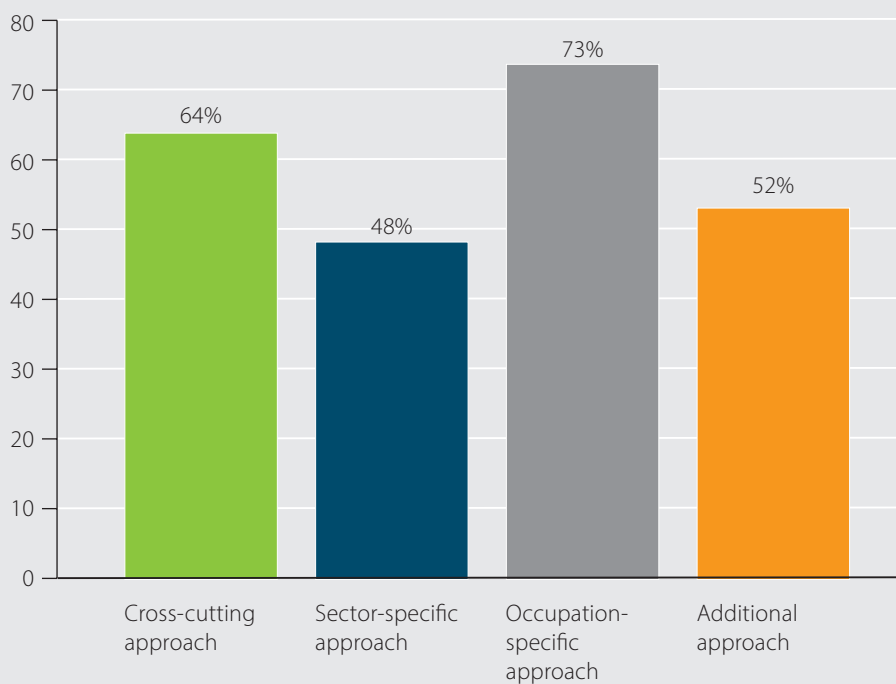
Source: BILT Survey

4. Difficulty of coordinating a vast group of independent actors.

Participants suggested that the sectoral approach would be easier if national TVET standards were simplified. In this way, TVET curricula and training regulations would require less frequent updating and would provide more flexibility at the local level. Current experience from Romania and Switzerland shows a need for at least two or three years to integrate NQC into TVET curricula and training regulations using the occupational approach. Yet, despite being very time consuming, the process is also said to gain by being more inclusive. For this reason, participants argued that occupation-based TVET curricula and training regulations will require less revision or discussion when new demands arise from emergent TVET stakeholders in the NQC ecosystem.

One example of the occupation-specific approach, where a new bachelor is tested on a local level, can be found in France.

4.3.2.
Cross-cutting approach

According to BILT survey responses, 64% of TVET stakeholders believe that this approach can help to integrate entrepreneurial competencies into all TVET curricula. Entrepreneurial skills, such as developing creative and purposeful ideas or dealing with uncertainty, ambiguity and risk, are relevant to all occupations and useful not only for those who are interested in becoming an entrepreneur. Box 11 presents how Tknika promotes entrepreneurial culture through the 'IKASENPRESA' initiative in the Basque Country, Spain.

BOX 10 France: Campus des métiers et des qualifications (Technocentre Henri Fabre)

The 'Campus des métiers et des qualifications' of the Henri Fabre Technocentre near Marseille brings together training stakeholders to provide responsive solutions to current and future skills and knowledge requirements of the business world. The campus is an ecosystem that brings together, in an extramural network, institutions of secondary and higher education, initial and continuing education, with school or apprentice status (6 lycées, 2 apprentice training centres, 2 universities and 5 engineering schools). At the regional level, these institutions are also present in the strategic governance body of the Camp(us. The campus aims to develop training courses around the technological building blocks of the industry of the future: additive production, collaborative robots, drones, advanced simulation, augmented reality, Internet of Things (IoT)and artificial intelligence

One interesting outcome is the implementation of digital engineering programmes to train technicians at the bachelor level, for example at the Lycée Jean Perrin in Marseille. The programme trains qualified technicians capable of mastering methods, tools, and technologies for the engineering, implementation, management, and improvement of production systems for goods or services industries of the future. The professional competencies that students acquire in this bachelor programme are relevant to an extensive range of companies in the manufacturing sector. Their training promotes the use of a broad range of technologies and digital professional tools in the areas of design, machining, composite rapid prototyping virtual and augmented reality.

Link: *https://team-henri-fabre.com/?lang=en* (Website in English)

BOX 11   Spain: Fostering an entrepreneurial culture with Ikasenpresa and the Tknika Institute of Innovation

Created in 2012, 'Ikasenpresa' integrates entrepre-neurial competencies into TVET curricula using a cross-cutting approach. The regional TVET policy in the Basque Country promotes entrepreneurial competencies as transversal competencies in a compulsory 'Business and Entrepreneurial Initiative' module for all TVET students. Ikasenpresa is an educational programme that uses enterprise creation as a methodological tool. TVET centres in the Basque region can opt to implement the programme using traditional didactic units or specific challenges, such as 'discover the idea that could change your life', or 'who wants our product?' and 'let's sell'. Tknika, the Basque Institute for Innovation in Technical Education, provides a competency framework with different levels (advanced, intermediary, basic, and elementary), as well as entrepreneurial competency-based learning materials. It also hosts annual events such as the Ikasenpresa fair and facilitates peer learning among TVET students and teachers of the Basque region through workshops and other activities.

By 2019, 86 TVET centres had implemented Tknika's entrepreneurship programme across the Basque region, with the involvement of more than 200 TVET teachers. Since the beginning of this programme, its students in the Basque region have created more than 1000 companies.

Tknika believes that the use of a cross-cutting approach in the Basque country present a high level of flexibility. However, it also recognizes that teachers and trainers often lack the understanding and competence required to adapt and customise the implementation of local entrepreneurship curricula, thus highlighting the need to promote curricula design programmes for teachers and trainers.

Link: *https://tknika.eus/en/* (Website in English)

4.3.3.
Additional/modular approach

BILT survey participants indicated that 52% of TVET stakeholders characterised the additional/modular approach as a way for boosting the flexibility and individualization of curricula. By combining the traditional occupational approach with additional and optional modules, TVET stakeholders promote curricula flexibility by enhancing students' choices. This is in line with the idea that TVET curricula and training regulations are often divided into two main parts: an occupation-specific segment focused on key competencies, followed by a flexible segment where students can define their learning pathways by choosing from a certain range of options offered by the same TVET provider or in cooperation with other educational institutions (including training companies).[29] The qualitative data show that the flexible segment can also offer other opportunities and services, such as working abroad, internships, workshops, and volunteer work. Participants agree that providing better and more possibilities to customise curricula and training regulations improves students' interest and motivation. In addition, providing students with opportunities to choose may help attract secondary and tertiary students to TVET as an interesting career pathway.

In Romania, the Practice Enterprises initiative from the National Centre for TVET Development (NCTVETD), is an example of how stakeholders are using the additional approach to implement TVET activities, based on the interest of students and teachers.

---

29 UIL, ETF and Cedefop (2015). Global Inventory of Regional and National Qualifications Frameworks. Volume I: Thematic Chapters. Hamburg.

BOX 12   Romania: Practice Enterprises - NCTVETD

NCTVETD promotes the implementation of Practice Enterprises (PEs), a model for practical business and entrepreneurship training where students develop competencies in a learning environment set up like a real-life company. A Practice Enterprise is a simulated business that students run as a hands-on way of learning about business practices or improving their existing business skills. The Practice Enterprise can trade its virtual products and services with other PEs in a worldwide virtual economy that is managed by EUROPEN-PEN International. TVET students work as employees in their PEs and earn virtual salaries. This form of entrepreneurial training is highly adaptable and suits a wide range of target groups. Results show that this interactive learning method improves the transition from training to the workplace for a high number of TVET students, increases adaptability when changing jobs, and fosters opportunities for the development of risk-taking and initiative skills.

Links: *http://www.tvet.ro/* (in Romanian)
https://www.penworldwide.org/ (in English)

4.3.4.
Sector-specific approach

BILT survey respondents, as well as participants from the virtual conference and focus groups, suggested that 48% of TVET stakeholders believe that the sectoral approach enhances workers' adaptability by providing a broad range of competencies that can be deployed in different occupations within one specific sector. By creating sectorial standards, TVET stakeholders help to make students more flexible and autonomous in terms of their competencies. This is not only important for promoting students' employability, but also to reduce the incidence of skill mismatches in labour markets. The BuildEST project in Estonia is an example of how the sectoral approach can be used (see Box 13).

4.3.5.
Other approaches: 'local-specific'

The BILT survey included space to describe other types of approaches for integrating NQC into TVET curricula and training regulations. One suggestion was the local-specific approach, where local TVET providers tailor curricula to the needs of local companies. This approach focuses only on matching skills and competencies with local demands, but

BOX 13   Estonia: BuildEST, a continuing education and training roadmap and action plan for the construction sector

BuildEST set out to develop qualifications in the construction sector in Estonia, with a special emphasis on meeting the EU2020 Energy Efficiency targets. It focused on promoting the technical competencies required by specific occupations in this field, while relying on a combined occupational and sectoral approach.

From 2011 to 2013, the first phase of the project revealed that almost half of Estonia's construction workers lacked certain competencies. To address this gap, BuildEST I developed the 'Action Plan for Training Workers in the Estonian Construction Sector', including proposed occupational standards for different construction areas, such as municipal heating systems, energy efficiency of buildings, technical systems, general construction, and building finishes. BuildEST II (2013-2016) focused on the implementation of activities foreseen in the BuildEST I action plan, with the aim to provide, by 2020, training and qualification (and requalification) of the majority of building workers, both non-qualified and qualified, who need such training in Estonia (ca. 16 000 construction workers out of 41 000). The project has also created 14 different courses (including training materials) and a new pilot training course for TVET trainers.

Links: *http://www.ttu.ee/projektid/buildest/buildest2* (in Estonian)
https://old.taltech.ee/public/p/projektid/BuildEst/poster_roadmap.pdf (RoadMap in English)

does not consider the need for nationally regulated qualifications. TVET systems that wish to allow for flexibility to address local needs and solutions may find this approach more useful compared to TVET systems that choose to create nationally stipulated curricula.

Survey respondents explained that the local-specific approach is more agile than other approaches because there is no need for a formal process and the approval of national authorities to create or adapt TVET curricula and training regulations. For example, in France, TVET providers can create pilot projects based on the demands of local and regional companies. After the creation and implementation of a 'proof of concept', regional and national authorities supervise the programme and examine the possibility of implementing it nationally. This process, as described by French TVET stakeholders in Annex 3, aims to decentralise the integration of NQC into TVET curricula and training regulations, and to spread responsibility among different authorities and levels of the TVET system (macro, meso, or micro-level).

In other words, TVET stakeholders promote joint development of highly customised NQC together with the private sector, thus enhancing the responsiveness of TVET systems. This collaboration is possible because the specific companies that participate in these pilot projects are not only involved in the development but also in the implementation and evaluation of training modules and learning materials. Such collaboration provides important feedback and opportunities to improve and share learning materials with a greater number of companies.

4.4.
TMS results: Flexible TVET curricula and training regulations and individualised learning pathways, their benefits and challenges

In several cases, participants of the virtual conference and the focus groups suggested that promoting more flexible TVET curricula and training regulations is a useful way to address changing requirements and demands. Also, a flexible TVET curriculum or training regulation can adapt to and is accessible for students with different needs and capabilities.

Individualised learning pathways represent an advanced form of flexible TVET curricula and training regulations, one allowing the development of personalised plans that address the specific needs of the students, yet are independent from different types of learning (school-based, work-based, blended learning). Discussions indicated that this approach is a recent phenomenon in education policy and practice in Europe, and still largely not used by TVET stakeholders.
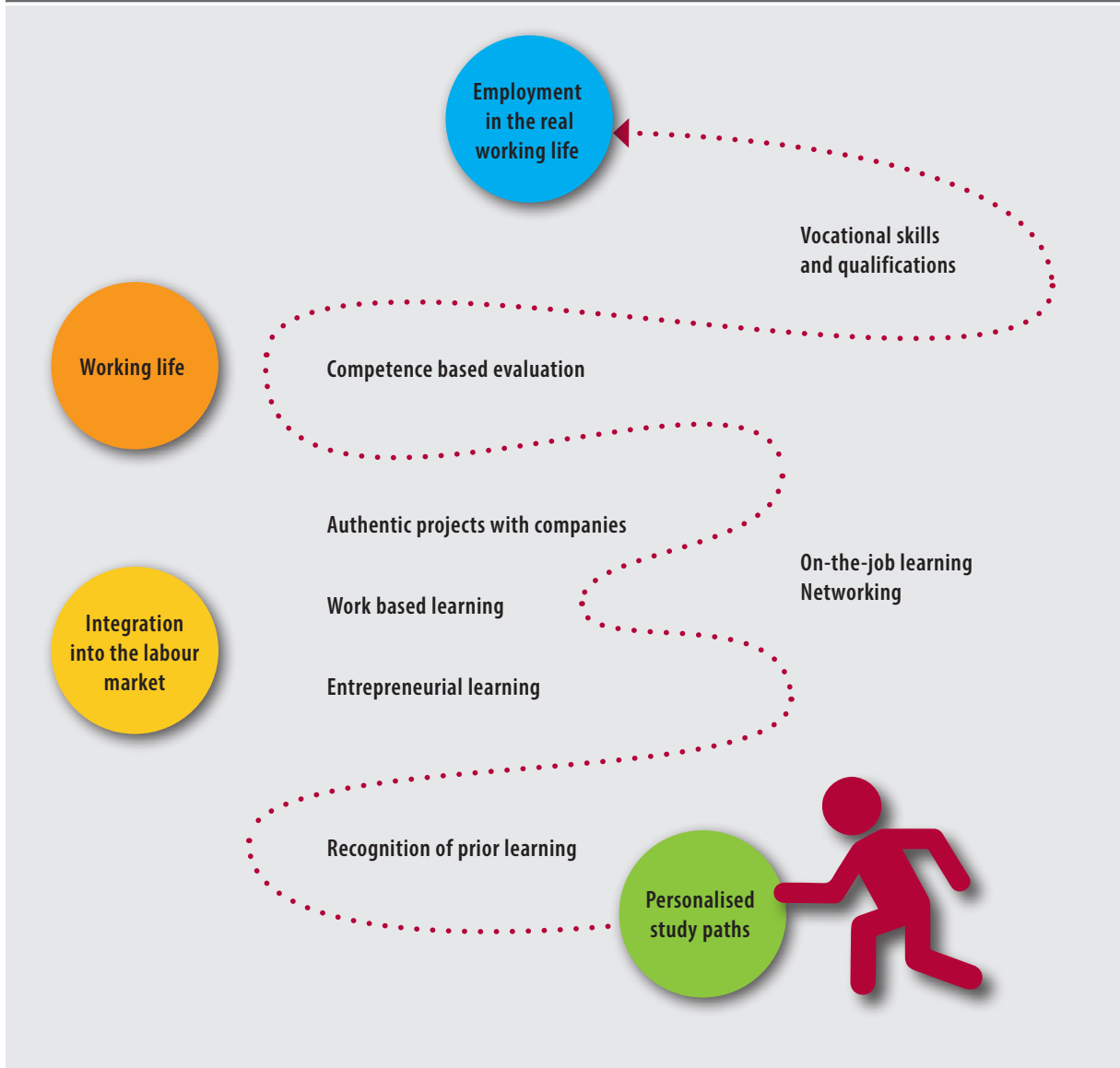
In Finland, individualised learning pathways are a legal right provided by national legislation to all TVET students, and are a recent development in TVET policy following national reforms that became law in 2018 (see Box 6, page 32).

The design and implementation of individualised learning pathways differ vastly from traditional TVET curricula and training regulations. This approach starts with the recognition of prior learning and competencies, followed by a process of collecting information on the students' needs and motivation, which then culminate in the development of individual learning plans. Participants suggested, however, that the change towards individualising learning pathways creates significant additional work compared to traditional TVET curricula and training regulations, which do not require the creation of customised plans. Such plans require specialised personnel responsible for designing and implementing them, as well as extra funding (public or private). In Finland, TVET policy specifies that public resources shall finance the activities of such specialised professionals.

Finally, the focus groups indicated that individualised learning pathways could be useful for European TVET stakeholders that provide training and education for migrants and minorities. They would gain more understanding of the unique skills needs of migrants and minorities, and be able to follow upon the development of these students.

From a national perspective, increasing flexibility in TVET curricula and training regulations may represent an issue affecting the state, employers, and workers alike, and should not be achieved at the expense of national qualification frameworks (NQF) and national standards. National standards play a crucial role in recognising prior learning of migrants and thus encouraging the circulation of workers in European labour markets.

FIGURE 13. New vocational education and training

Employment in the real working life

Vocational skills and qualifications

Working life

Competence based evaluation

Authentic projects with companies

On-the-job learning
Networking

Integration into the labour market

Work based learning

Entrepreneurial learning

Recognition of prior learning

Personalised study paths

Source: Omnia, Finland

5. Implementing new qualifications and competencies in TVET teaching and learning

Once NQC have been integrated into TVET curricula and training regulations, delivering them becomes the responsibility of the TVET provider, which raises the following questions:

- How do TVET schools, companies, and other TVET providers take part in the process of identification and deliver NQC in terms of teaching and learning approaches, practices, and technologies? What successful practices can be identified?

- What are the impacts of NQC that may arise for teachers and (in-company) trainers training?

5.1.
What are the challenges of implementing NQC?

After consultation with several European TVET institutions, the BILT project has identified three main challenges concerning the implementation of NQC:

- **The implementation of NQC requires a move towards a learner-centred approach**. This approach, in contrast to the traditional teacher-centred approach, allows for more active involvement of students. It is action-oriented and problem-focused, helping to integrate teaching, learning, and assessment through the development and exercise of both theoretical and practical skills.

- **TVET providers should deliver NQC through innovative teaching and learning practices and technologies**. The term 'practices' refer to a broad range of teaching and learning methods and styles that are implemented by TVET teachers and (in-company) trainers, such as 'blended and entrepreneurial learning'. The application of new supportive technologies (for example virtual reality, augmented reality, and artificial intelligence) can be very helpful

to improving quality and effectiveness of learning, as well as the attractiveness of TVET qualifications, but they can be difficult to prepare and execute.

- **Substantial changes in the roles of TVET teachers and (in-company) trainers are necessary but challenging**. Changes in TVET curricula and training regulations require teachers and in-company trainers not only to stay abreast of new developments in technology, but also to move towards collaborative programmes and content design. The delivery of NQC for meeting these demands requires strong training programmes and activities to support teacher and (in-company) trainers in adapting to these new roles.

5.2.
Trends in the implementation of NQC in TVET teaching and learning

According to previous studies, the learner-centred approach is beneficial for learners in several ways, such as:[30] (1) making the processes of teaching and learning more responsive to learner interests and needs and thus increasing motivation; (2) increasing the control that individuals or groups of students exercise over their learning; (3) giving greater attention to learning outcomes or competencies; and (4) providing access to a greater range of 'innovative' practices and technologies. This section presents an overview of what some international publications have to say about learner-centred practices and technologies relevant to the BILT themes of entrepreneurship, greening and digitalization.

---

30 CEDEFOP (2015b)

5.2.1.
Learner-centred practices in TVET

In general, international publications describe three types of learning styles that European TVET providers use to implement learner-centred practices: experiential, dialogic, and blended.[31] They all focus on practice orientation, cooperation and dialogue between teacher and learner, and openness to diverse sources and methods of information, knowledge, and expertise, and place of learning. In these settings, learning shifts from passive to active, whereby students investigate real-life problems and work on solutions or options by engaging in group work.

Experiential learning is translatable as 'learning by doing'. Learning environments should create opportunities to gain new experience, promote action and reflection, and encourage practitioners to assimilate this approach. Experiential learning is typically present in TVET systems based on apprenticeship (work-based). It can also be achieved in school-based systems through, for example the implementation of (1) problem-based learning, where students provide solutions for complex issues using an interdisciplinary approach, and (2) project-based learning, where students develop and apply knowledge and skills within the context of a specific project.[32] A shortlist of different types of experiential teaching and learning practices in TVET include, for example, roleplay, simulations, and exercises.

Dialogic learning (peer-learning) suggests a partnership between two or more people communicating to learn together. The learners explore and share knowledge, using reasoning techniques and questions. Dialogic learning improves communication, socio-emotional competencies and teamwork.[33] Some examples include brainstorming and case studies. Through brainstorming, teachers and learners can solidify suitable ideas from a pool of many different initial ideas, as well as find suggestions for future activities or for solving a problem very quickly before considering any of them more carefully. Moreover, the use of case studies not only promotes knowledge of relevant examples and general principles, but also enhances students' capacity to find, compare, and evaluate information with their peers.

Blended learning combines face-to-face learning or activity-based learning in classroom, outdoor, community and workplace settings with distance, online or digital learning. In blended learning, digital means and resources are used to supplement or revise face-to-face learning.[34] Some of the teaching and learning practices[35] focused on blended learning include, for example, the flipped classroom and station rotation models. In the flipped classroom model, the traditional order of lecture and homework elements is reversed. Learners gain exposure to new material online, allowing them to engage with interactive content and focus on key concepts prior to class. In the station rotation model, learners rotate among online learning, direct instruction from a tutor and small-group work among themselves. By doing so, tutors increase their opportunities to work with small groups and address the different needs of individual learners.

BOX 14   Germany: Blended learning approach at the ABB Training Centre

The additional qualification on digital competencies developed by the ABB Training Centre in Germany uses a combination of blended learning with project-based learning. Learners use a common online platform to develop their practice projects. Two apprentices form a tandem and exchange information about their practical projects in a binding and regular manner. The learners must develop their digital competencies in a self-organized way, with the support of learning coaches if necessary. There are only a few face-to-face sessions with the entire group. Plus, the qualification defines competency goals for each student, based on their needs and potential. The assessment of the learning achievements focuses on how learners use knowledge to solve challenges methodically and meaningfully.

Source: Eurofound (2019b)

---

31 CEDEFOP (2015b); UIL, ETF, and Cedefop (2015).
32 UNEVOC (2019)
33 Wegerif (2006)

34 Latchem (2017)
35 The Blend4VET Toolkit offers more information on the implementation of Blended learning in TVET, as well as digital Tools to support blended learning. Access the link: http://blend4vet.eu/toolkit/Blend4VET_Toolkit_English.pdf

Photo: Gustavo Fring / Pexels

In the following section, the 'learner-centred approach' will be applied to the BILT themes of entrepreneurship, greening and digitalization, and will be illustrated by practical examples.

Teaching and learning practices in entrepreneurship

TVET systems in Europe are increasingly promoting entrepreneurial learning.[36] Two general ways to implement entrepreneurial learning in TVET practice are presented. These reflect some of the practices discussed in the last section, including experiential (or learning by doing) learning. In experiential entrepreneurial learning, TVET students develop skills and knowledge in real-life contexts and situations, such as work-based learning or working in teams to create viable solutions to real-life business or community challenges (for an example of the 'school-enterprise model' see Box 15). The second way, more common in school-based TVET systems, concerns the development of entrepreneurial competencies in simulated scenarios or through project activities and business plan development. TVET providers

BOX 15 **Finland: Entrepreneurship learning in TVET institutions**

In 2018, the Finnish Education Evaluation Centre (FINEEC) carried out an evaluation of entrepreneurship in vocational education and training in Finland. The results show that 72% of TVET providers organized entrepreneurship studies. According to the evaluation, students in the Finnish TVET system have a high opinion of experiential entrepreneurial learning in cooperation with entrepreneurs, using diverse and multi-method approaches, and combining different fields of study. The study supports the recommendation to encourage students to participate in forms of learning that involve practical business activities. Other recommendations from the study include the importance of creating an entrepreneurial environment in schools, and developing capacity to monitor and assess entrepreneurship activities based on diverse data sources, such as quantitative and qualitative goals for business cooperation, as well as feedback from partners and consumers.

Source: FINEEC (n.d.)

---

36 UNESCO-UNEVOC (2019, p. 7)

may also implement add-on activities, such as an 'entrepreneurial week' or themed weeks where all curriculum subjects focus on contributing to a whole-school, multidisciplinary, practical entrepreneurial experience for students.[37]

Teaching and learning practices in greening

Education for sustainable development (ESD) requires that key topics - like climate change, disaster risk reduction, biodiversity, poverty reduction, and sustainable consumption – be introduced early on. Participatory teaching and learning that is centred on the student motivate them to engage personally with sustainability issues and seek solutions. A **problem-based and project-based learning approach to ESD** provides students the opportunity to address sustainability issues while also developing communication, problem-solving and team-working skills. Some **other teaching and learning practices** for ESD are also mentioned in the literature: (1) discussions of critical incidents to consider students' personal perspectives and actions in relation to a moral or ethical stance; (2) the use of reflexive accounts to understand the effect of an individual's action on issues/solutions; (3) development of critical reading and writing to understand possible motivations of the author and how the author might envisage alternative futures as a consequence; and (4) modelling good practices to demonstrate action-taking behaviour such as reducing paper use or turning off lights at the end of the class.

Teaching and learning technologies

A previous UNESCO-UNEVOC publication[38] provided insights on how new technologies impact teaching and learning practices in TVET. First, there is now access to online resources, such as open educational resources (OER) or massive open online courses (MOOC) designed for the unlimited participation of learners worldwide. Second, the recent development of virtual reality technology enables learning from 3D models of machines and equipment in safe, more convenient, and better-controlled environments. Third, augmented reality can easily provide access to digital information, designs, and prototypes from learners' tablets and smartphones. Fourth, ICT-based simulations,

---

> **BOX 16 Germany: ESD in the logistics sector**
>
> One example of problem-based learning is the Pro DEENLA project, sponsored by the Federal Ministry of Education and Research. It addresses the need for vocational training responsive to social and industry concerns in the transportation and logistics sector. This training includes competencies for sustainable vocational action provided via 27 learning tasks across ten modules, designed for in-company trainers, teachers, and trainees. The training supports businesses in their efforts to respond quickly to consumer demands, providing modern vocational careers that contribute to maintaining competitiveness in the sector.

Source: BIBB (2019).

games, and roleplays can model certain situations and enable learners to learn by trial and error and conduct experiments. Fifth, 3D printing technology enables learners to download and develop 3D digital designs, print them out, and remake if necessary. Finally, artificial intelligence has the potential to facilitate the customization of content through adaptive learning programmes and software, tracking and monitoring diagnostics, automation of grading, and even AI tutors. However, as the UNESCO-UNEVOC virtual conference on artificial intelligence in education and training concluded, 'while the TVET sector shows interest in AI, this has not yet translated into institutional practices on a large scale'. [39]

---

37 UNESCO-UNEVOC (2019, p. 15)
38 UNESCO-UNEVOC (2019)

39 UNESCO-UNEVOC (2020)

BOX 17   Italy: Fabrication laboratories in the TVET system

A fabrication laboratory (fab lab) is a small-scale workshop that aims to democratise access to digital fabrication and new technologies for many people, including TVET students and other stakeholders. In Italy, the number of fab labs has increased exponentially in the last ten years. Fab labs are school-friendly laboratories and represent a consolidated reality, accredited by institutions and uniformly distributed throughout the whole national territory. In the Lazio region, fab labs represent a new concept of learning that involves the whole community. In its fab labs, students, technicians, and inventors can build prototypes and custom-made items just like a start-up, in addition receiving training courses and sharing lab experiences. The Lazio region promotes several such programmes for students, such as the 'Start-Upper School Academy Programme', to encourage high school students to set up a business. The programme includes themes of entrepreneurial orientation, self-assessment of entrepreneurial skills, drafting a business model, 3D printing, laser cutting, 2D/3D-modeling, and electronics.

Source: D'Amico, T. (2020).

5.3.
TMS results: Innovative implementation examples of teaching and learning approaches

This section presents results from the BILT virtual conference discussions concerning the implementation of NQC in TVET, as well as the different examples collected through focus group activities.

Some of the factors that help to explain the differences in the implementation of NQC through TVET teaching and learning practices include: (1) the different types of TVET systems (dual, school, or in-company-based systems); (2) the level of cooperation between different types of training providers (schools, companies, other providers); and (3) the different specialization of each TVET provider in terms of economic sectors.

BOX 18   Austria: Green pedagogy at the agricultural research and education centre Raumberg-Gumpenstein

In this Austrian TVET school, the competencies developed through a green pedagogy reflect four main core values: competencies must be ecological, sustainable, social, and relevant to the economy. This pedagogy aims to provide students with an education focused on life quality, individual ability to achieve professional success and happiness, and the goals of gender mainstreaming. For this reason, TVET activities in the school are very comprehensive, including different school disciplines, vocational subjects, and other elements such as work-practice, sports, and working abroad. This approach also emphasises the need for TVET to combine theory and practice. All the students must engage in practical learning as well as the development of applied research. Scientific work is carried out with diploma theses, special courses, and project studies. While developing their research and analytical skills, TVET learners can help to create solutions for sustainable development. Use of technologies, featuring drones and simulation-based software, are important for helping students to develop research on sustainable development and the impacts of climate change.

About 100 young students from all parts of Austria and (neighbouring countries) graduate every year. Raumberg-Gumpenstein provides its expertise for governmental decision-making, farmers, and companies. The school also organizes around one hundred (international) conferences each year focused on sustainability issues.

Link: *https://www.raumberg-gumpenstein.at/cm4/de/*

In general, **participants showed a particular interest in promoting practical training in a real-life or simulation environment, combined with the use of online learning.** The Austrian agricultural research and education centre Raumberg-Gumpenstein, with its focus on occupations in the fields of ecology, climate change and sustainable development, is an example of TVET teaching and learning organized around a model of green pedagogy (see Box 18).

Much discussion on the implementation of NQC in TVET covered the importance of using technology to combine different types of learning activities and venues (online, work- or school-based) according to the needs and possibilities of students. The COVID-19 pandemic, which forced TVET providers to adapt to online teaching in a short period of time, also revealed to many institutions their teachers' and trainers' lack of experience and familiarity with online teaching and learning.

The discussion on NQC also showed that technologies, such as robotics, artificial intelligence and augmented reality, have great potential to develop simulation-based learning, as well as virtual visits and laboratories, providing practical experience within the virtual or distance learning environment. In the context of the COVID-19 pandemic, participants perceived the use of these technologies as very relevant. Yet TVET providers cautioned that the use of these technologies requires long-term planning and experience. They further stressed that learners still need to do practical activities as part of their learning in virtual environments or distance learning.

The case of the Finnish TVET provider Otavia and the 'KATE Project' shows that TVET systems can use technology to integrate teaching and learning with other types of services for migrants in one specific online platform (see Box 19).

Finally, BILT project discussions showed that TVET teachers are interested in the use of digital platforms for enhancing communication with students. Digital platforms can also allow students to interact with experts in the labour market, as well as TVET learners from different countries in order to share experiences with peers from other institutions. During the virtual conference, TVET teachers also mentioned the use of a more informal type of technology such as instant chat applications. The discussions showed that this simple technology is more than adequate for sharing demonstration videos and other materials with students, as well as helping to manage the students' course work and assessment, and provide private feedback.

5.4.
TMS results: Teacher and trainer training

The delivery of NQC requires strong and effective training of teachers and (in-company) trainers so that they understand the main TVET challenges identified in this field:

- know students and how they learn;
- create and maintain supportive and safe learning environments;
- assess, provide feedback and report on student learning;

BOX 19   Finland: The KATE project

The KATE project, coordinated by the municipal education enterprise Otavia, offers a hybrid (blended) accessibility model where services are provided both in person and online. The blended service model offers customers a tailored educational and employment roadmap based on their unique background and skills. Any person with a foreign background (including second-generation immigrants) who is over 16 years old can participate in the KATE project. The integration of different services for migrants starts with the evaluation of a participant's competencies through an online questionnaire and an interview, followed by the development of a personal plan with clear targets for a working life. The plan includes guidance and support from project staff on issues related to study and employment

The project offers training, job search coaching, visits to companies, and business start-up advice for young people and newcomers in the South Savo region. It also brings benefits for employers, such as quickly finding suitable employees for companies in South Savo, and establishes close contact with and between companies by, for example, organizing match-up events where business representatives and international comers meet and build networks. Employers also receive information on hiring foreign employees. Each foreign employee has a personal job counsellor and can receive support before and at the beginning of the job.

Link: *https://otavia.fi/kate-en/* (English)

- engage in professional learning; and
- engage professionally with colleagues, parents/careers and the community.

5.4.1.
New profiles and roles of TVET personnel

Participants demonstrated a need to **diversify the profile of TVET personnel**, beyond the traditional roles of teachers and (in-company) trainers. For example, they referred to 'tutors' who could be exclusively focused on the development of socio-emotional competencies and individualised learning pathways. Other profiles include 'digital tutors' as the professionals specialised in providing support to students, teachers, and trainers on learning technologies, while 'pedagogical tutors' could help teachers and trainers to implement innovative teaching and learning, and 'international tutors' could support teachers, trainers, and students in coping with multicultural integration.

Concerning the **competencies required by teachers and trainers** in TVET, participants suggested that tasks are changing from transmitting content to designing learning spaces, integrating content, activities, resources, and communication. They also mentioned that TVET teachers and trainers need to develop project management skills, especially when using challenge- or project-based learning. This is to say that teachers and trainers must be able to supervise the development of students' projects and initiatives, not only acting as a learning facilitator. Some TVET institutions indicated that the ability to create challenge-based learning is crucial to preparing local actors to use and adapt open education resources (OER). They also suggested the need to include curricula design as a subject in training programmes in order to support trainers and teachers in adapting national standards to local needs, implementing flexible TVET curricula and training regulations, and integrating individualised learning pathways.

5.4.2.
Gaps in teachers' and trainers' competencies

Several participants raised concerns with the profile of TVET teachers and trainers in the field of **entrepreneurship**. Participants argued that too often it is TVET professionals with little knowledge and experience in entrepreneurship who are teaching entrepreneurial modules. Therefore, there is a need to provide specialised training for a) entrepreneurship as a module on 'business education' and b) entrepreneurship as a cross-cutting competency integrated into various subjects.

Participants suggested there is a similar gap in teachers' **digital competencies**, especially concerning online teaching and learning. This

Photo: Dana Smillie / World Bank

gap has become more critical during the current COVID-19 pandemic, with an urgent need to embrace online, distance, and blended learning solutions. According to participants, the core requirements for teachers and trainers training in the context of distance learning are: conducting off-the-job learning and training; conducting work-based training programmes and ensuring that all learning is translated into practice; maintaining students' attendance records and training performance data; and verifying the achievement of distance learning and training objectives.

Unsurprisingly, participants argued that in many fields, TVET teachers and (in-company) trainers are primarily technology users themselves and have so far not been required to develop specialised digital competencies.[40] They also suggested that it is unrealistic to expect all TVET teachers and trainers to become equally proficient in the use of advanced teaching and learning technologies. Instead, TVET systems should find ways to provide extra support to teachers, trainers and students by bringing in specialised individuals familiar with technology in the classroom, such as robotics, artificial intelligence, or augmented reality.

Teachers and trainers training programmes

Every participating TVET institution indicated **they use both external and internal teacher and trainer training programmes**. Many TVET stakeholders implement external training programmes by outsourcing them to specialised local universities. Such programmes normally encompass teachers and trainers from several other TVET schools and institutes, which helps to enhance cooperation and exchange of practices. In the case of internal programmes, TVET stakeholders provide summer camps and internal research programmes on pedagogy, along with their usual curricular responsibilities. Finally, the development of practice and action-based research enhances the capacity of teachers to institute systematic and flexible lesson planning based on observation of their students.

---

40 Janne Möhkölä (Omnia), distance learning teacher taking part in an international project CORE (Cooking For The Future) shares his thoughts and experience on Distance Teaching during the COVID-19 pandemic. https://www.omnia.fi/uutiset/online-distance-teaching

6. Conclusions and recommendations

This concluding section summarises the findings of the recent Trends Mapping Study (TMS) carried out in 2020 by the UNEVOC network and its partners as part of the Bridge Innovation and Learning (BILT) in TVET project. Their aim is to identify trends in new qualifications and competencies (NQC) as society, economies and labour markets evolve in ever-faster cycles. This requires new approaches and innovation if technical and vocational education and training (TVET) are to remain relevant and responsive to the contemporary world. With such trends identified, the TMS explores innovative strategies for integrating these NQC into curricula and training regulations, and to do the same for teaching and training through the use of new methods and technologies.   Selected working examples of applied projects and initiatives offer a wide range of illustrations.

Based on the literature review, survey, focus groups, and virtual conference that comprised the mapping study, nine conclusions emerge, that reflect priorities and considerations of all those involved in the BILT project.

IDENTIFICATION OF TRENDS IN NQC FOR TVET SECTORS AND OCCUPATIONS

1.

A broad range of TVET stakeholders are involved in the identification of NQC, but NGOs, civil society organizations, youth organizations and individual experts should be more involved (Section 3.3)

According to the TMS, the participating UNEVOC centres perceive a clear imbalance across different types of TVET stakeholders when it comes to their involvement in the identification of NQC in national contexts. Currently, institutions such as ministries, national bodies and TVET providers are seen to have the highest level of influence on the identification of NQC. Other stakeholders, such as youth

organizations, non-governmental organizations or individual experts seem to have fewer opportunities to share their perception and demands of NQC. However, as fields like digitalization and greening become increasingly complex, participating UNEVOC centres have enlarged their outreach so that stakeholders with specialised knowledge, NGOs, civil society and youth organizations have more opportunities to contribute to the process. For instance, 'digital natives' might be in the best position to suggest which digital competencies and learning technologies could make TVET an attractive career path. Similarly, individuals, associations or research institutions specialised in greening might be best able to assess on a technical basis which green competencies are most relevant for TVET.

✅ Thus, in the future, the BILT project may wish to explore ways of involving a wider range of specialised stakeholders in identification of NQC.

2.

Recently introduced or reformed TVET occupations particularly concern 'digitalization' and 'greening'. ICT and manufacturing are the sectors with the highest demand for NQC (Section 3.4)

The trends mapping exercise clearly identified information and communication technology (ICT) and manufacturing as the sectors with the greatest need for NQC. While there is demand for NQC also in other sectors, it is much less pronounced. The TMS revealed to UNEVOC network members the importance of sectors and occupations related to greening/sustainability and digitalization. Occupations such as electric vehicle technician, offer one example. The COVID-19 pandemic crisis has underscored the need to explore new green and digital competencies in TVET, while also highlighting the need to implement distance-learning solutions and to equip teachers, trainers and students with the ability to use such technologies. The pandemic has furthermore

demonstrated that reduced industrial activity can have positive impacts on the environment it has therefore also raised questions about how such benefits might become permanent once life returns to normal. The focus on green and digital competencies is further intensified by European Union initiatives, such as the 'EU Skills Agenda',[41] which puts greening and digitalization forward as a priority for TVET.

✅ Future BILT collaboration activities may therefore increasingly concentrate on greening and digitalization, following an initial focus on NQC.

3.

Each BILT theme requires a particular mix of competencies – basic and advanced cognitive competencies rank highest across the themes (Section 3.5)

Based on a list of relevant competencies for the 21st century, developed by OECD (cf. page 15), the TMS exercise identified four themes of greatest importance to the participants, although in varying degrees: digitalization, greening, entrepreneurship and migration. Both basic and advanced cognitive competencies are perceived by everyone as relevant for all BILT themes and rank consistently high, with a special mention for critical thinking. Here is a breakdown of how each theme was viewed:

- **Digitalization**: Basic digitalization competencies are seen as absolutely essential in addition to professional and technical competencies. This reflects the growing importance of digitalization for all professions – and therefore for the integration of basic digital competencies for all learners – as well as for new highly specialised occupations that require technical digital competencies. Socio-emotional competencies, however, are ranked comparatively low in the context of digitalization.

- **Greening TVET**: Results from the TMS suggest that participants want a balance among the four different types of competencies.

Basic, advanced cognitive, socio-emotional and technical competencies all seem to be of importance in the context of greening. As with digital competencies, this might reflect a tendency to try to integrate green competencies into all professions, as sustainability issues gain increasing attention in all spheres of society. This awareness shows why a highly specialised profession like electric vehicle technician is in such demand. Finally, the ability to assess new situations using advanced-cognitive competencies, such as critical thinking, seems to be relevant as each student and trainee must assume responsibility for sustainable action.

- **Entrepreneurship**: While TMS participants indicated that advanced-cognitive competencies are relevant for all themes, they are perceived as being particularly relevant in entrepreneurship. This may seem unsurprising since problem solving and creative thinking can be considered as classical components of any entrepreneurial undertaking. At the same time, the results show that the TMS participants clearly understand entrepreneurial competencies as going well beyond just 'business creation' to encompass wider-ranging competencies relevant for all TVET students. Socio-emotional competencies, such as self-efficacy and the ability to collaborate, are also in high demand, which reflects awareness of the interconnected nature of successful entrepreneurship.

- **Migration**: The BILT project examined competencies related to migration concerning three groups of people:

  a. migrant students,
  b. local students, and
  c. teachers and trainers.

TMS participants highlighted basic and socio-emotional competencies as being important for both migrant and local students. Yet TVET institutions participating in the TMS considered all four types of competencies as relevant for teachers and trainers, expecting them to assume a 'meta-role', mastering all competencies in order to be able to convey all of these to students and trainees.

---

41   https://ec.europa.eu/social/main.jsp?catId=1223

✅ In future BILT activities, the project might further explore why these types of competencies are relevant in the different BILT themes, and how TVET stakeholders can integrate them into their systems.

4.

Non-routine competencies are highly meaningful for future-oriented jobs (Section 3.5)

Besides the continuous relevance of technical and professional competencies, the TMS suggests that other types of competencies are becoming increasingly so: as -routine tasks and jobs are automated, the learner who has mastered advanced cognitive skills may have an easier transition to the job market. Complex problem solving, learning to learn, and self-regulation are all of growing importance in today's world of work. These new types of competencies, in turn, may lead to a new self-understanding by TVET students and trainees, contributing to a fuller appreciation of TVET as a demanding and therefore attractive career path.

✅ Future BILT discussions may focus on how TVET stakeholders can strengthen non-routine competencies and integrate advanced cognitive competencies into curricula and training regulation.

INTEGRATION OF NQC INTO CURRICULA AND TRAINING REGULATIONS

5.

The occupational and cross-cutting approaches are still recognised as the best strategies for integrating NQC (Section 4.3)

According to the TMS, occupational and cross-cutting approaches were recognised for offering the best strategies to integrate NQC into curricula and training regulations, which the literature confirms. Given that participants underlined the importance of basic, technical and advanced cognitive competencies for digitalization, and all four types of competencies for greening, the best solution may be to integrate digital and green competencies via a cross-cutting approach (basic and advanced cognitive digital competencies, as well as basic, advanced cognitive and socio-

emotional green competencies for all learners) and via an occupational approach (technical digital and green competencies for specialised occupations).

✅ In the future, the BILT project may wish to explore further what advantages are offered by using occupational and cross-cutting approaches or a combination of different approaches for integrating   NQC into curricula and training regulations.

6.

Other approaches for the integration of NQC into TVET can be valuable complements or alternatives (Section 4.3)

Although less well known to participants in the TMS, there are other approaches to NQC integration that might be explored further, such as the sectoral and additional approaches, which are a means to increase the responsiveness of regulatory processes, to achieve greater individualization of curricula and to increase flexibility. Participants agreed that providing a higher degree of customization helps to increase students' and trainees' interest and motivation. Finally, the study identified a supplementary approach, which the BILT project had not considered before: the 'local-specific' approach. This allows TVET providers to tailor curricula based on local requirements without the need for prior national recognition, making more agile and quicker testing and implementation of training possible, and offering a rapid response to a specific local demand. If pilot projects testing this approach to local training prove successful, they could then   be introduced on a national level.

✅ The BILT project may wish to further explore the applicability of alternative approaches and identify other future-oriented strategies for integrating NQC.

IMPLEMENTATION OF NQC INTO TEACHING AND TRAINING

7.

Innovative teaching and training methods and technologies help to improve learning significantly (sections 5.2/5.3)

The TMS revealed a growing interest of the participating UNEVOC Centres in learning about innovative methods and technologies for the practical implementation of NQC. They found the learner-centred approach an especially useful concept because it is in line with existing innovative practices like the involvement of students in the production of real products and services or the development of entrepreneurial competencies using simulated scenarios. UNEVOC members observed that such practices improve students' interest and motivation significantly, offering an optimal mix of theory and practice. Digital platforms and technologies also have a great potential to improve training and enhance communication between teachers, trainers, students and trainees. However, these modern technologies are not always available in every context. Thus, while new technologies are certainly helpful to achieve a greater level of TVET quality and attractiveness, the implementation of NQC does not and should not rely on such technologies. Good, innovative teaching and learning methods do not necessarily depend on costly solutions.

✅ Consequently, the BILT project should explore different types of innovative teaching and learning methods that include both easily accessible and high-end solutions.

8.

The roles and self-understanding of TVET teachers and trainers are changing (section 5.4.1)

Because TVET teachers and trainers are assuming new responsibilities in education and work, their roles and self-understanding may continue to change in the future, as this TMS has shown. Traditionally, TVET teachers and trainers may have been perceived solely as transmitters of technical knowledge. But now, with the growing importance of new competencies, teachers and trainers have become more like 'tutors' who must also provide socio-emotional and other support, for example for assisting the multicultural integration of migrant students. By using modern learning technologies, teachers and trainers can also enhance the attractiveness of TVET. These considerations of the new roles and self-understanding of TVET teachers and trainers should perhaps become a more important part of initial teacher and trainer training.

✅ In the future, the BILT project may wish to explore further how TVET stakeholders can conceive innovative teacher and trainer training that takes into account the new roles and self-understanding that teachers and trainers should acquire.

9.

Modern forms of teacher and trainer training are necessary to understand and convey the importance of NQC (sections 5.4.2 / 5.4.3)

The TMS revealed that TVET teachers and trainers often lack competencies to understand and convey the need for NQC, including the required technical knowledge and ability to apply adequate teaching or training methods. As they are confronted with new training and teaching content, they should have access to advanced TVET courses on NQC and be ready and motivated to attend them. Two gaps stand out in particular: first, the need to provide specialised training on entrepreneurship; and second, the capacity to use digital teaching and learning technologies. The COVID-19 pandemic has demonstrated how crucial digital solutions are in these times, but also how the lack of technical equipment or insufficient teaching and training experience are still major obstacles. TVET stakeholders remain focused on the need to ensure that learners are able to conduct practical activities as part of their education, whether in virtual environments or online. This poses additional challenges to TVET teachers and trainers that need to be addressed.

✅ In the future, the BILT project may wish to further explore how competencies can be successfully and increasingly implemented in teacher and trainer training, with special attention paid to entrepreneurial and digital competencies as well as online teaching and learning.

7. References

Aepli, M., Angst, V., Iten, R., Kaiser, H., Lüthi, I. and Schweri, J. (2017). *Die Entwicklung der Kompetenzanforderungen auf dem Arbeitsmarkt im Zuge der Digitalisierung.* Arbeitsmarktpolitik 47 (Band 11.2017). Bern: Staatssekretariat für Wirtschaft SECO.

BIBB (Bundesinstitut für Berufsbildung) (2018). *Weniger Geflüchtete im Übergangsbereich, mehr in Berufsausbildung? Welche Hinweise liefern amtliche Statistiken?* Bonn: BIBB.

Bowe, R., Ball, S. J., and Gold, A. (1992). *Reforming education and changing schools: Case studies in policy sociology.* London: Routledge.

Calvino, F. et al. (2018). *A taxonomy of digital intensive sectors.* OECD Science, Technology and Industry Working Papers, no. 2018/14. Paris: OECD Publishing.

Cedefop (European Centre for the Development of Vocational Training) (2015a). *Vocational pedagogies and benefits for learners: Practices and challenges in Europe.* Research Paper, No. 47. Luxembourg: Publications Office of the European Union.

—— . (2015b). European guidelines for validating non-formal and informal learning. Cedefop reference series, no. 104.Luxembourg: Publications Office.

——. (2015c). *The role of modularisation and unitisation in vocational education and training.* Working Paper, No. 26. Luxembourg: Publications Office of the European Union.

——. (2015d). *Vocational pedagogies and benefits for learners: practices and challenges in Europe.* Research Paper, No. 47. Luxembourg: Publications Office of the European Union.

——. (2018). *Skills for green jobs in Spain: an update* [unedited proof copy].

—— . (2019a). *Skills for green jobs: 2018 update.* European synthesis report. Luxembourg: Publications Office of the European Union.

—— . (2019b). *Vocational education and training in Finland: short description.* Luxembourg: Publications Office of the European Union.

D'Amico, T. (2020). *Adapting VET to digitalisation, AI and the future of work: Italy.* Cedefop ReferNetThematic Perspectives series. Luxembourg: Publications Office of the European Union.

Delloite (2020). *Addressing the impact of COVID-19: How the future of work is transforming our work, workforce, and workplace.* London: Delloite.

Eurofound (2019a). Future of manufacturing: 'New' apprenticeships in the light of technological change – Ireland. Dublin: Eurofound.

—— . (2019b). *Future of manufacturing: Modernisation of dual apprenticeship training at ABB – Germany.* Dublin: Eurofound.

European Commission (2019a). *What is the European Green Deal?* Retrieved from https://ec.europa.eu/commission/presscorner/api/files/attachment/859152/What_is_the_European_Green_Deal_en.pdf.pdf

—— . (2019b). *The changing nature of work and skills in the digital age.* Luxembourg: Publications Office of the European Union.

FINEEC (Finnish Education Evaluation Centre) (n.d.) *Entrepreneurship in vocational education and training and in higher education.* Retrieved from: https://karvi.fi/en/vocational-education/thematic-system-evaluations/entrepreneurship-and-innovative-capacity-in-higher-education-and-vocational-education-and-training/

Gill, P., Stewart, K., Treasure, E. et al. (2008). *Methods of data collection in qualitative research: interviews and focus groups.* British Dental Journal, no. 204, pp 291–295.

IBW (Institut für Bildungsforschung der Wirtschaft) (2018). *Ausbildungsleitfaden E-Commerce Kaufmann/-Kauffrau.* Vienna: IBW Austria.

International Labour Organization (ILO) (2018). *Recognition of prior learning (RPL): learning package.* Skills and Employability Branch. Geneva: International Labour Office.

—— . (2019). *Skills for a greener future. A global view based on 32 country studies.* Geneva: International Labour Office.

—— . (2020). *Global employment trends for youth. Technology and the future of jobs.* Geneva: International Labour Office.

ILO/UNECE (2020). *Jobs in green and healthy transport: making the green shift.* Geneva: International Labour Office.

Jeon, S. (2019). *Unlocking the Potential of Migrants: Cross-country Analysis.* OECD Reviews of Vocational Education and Training. Paris: OECD Publishing. https://doi.org/10.1787/045be9b0-en.

Jonker, H., März, V. and Voogt, J. (2018). *Curriculum flexibility in a blended curriculum.* In Proceedings of EdMedia: World Conference on Educational Media and Technology (pp. 459–464). Amsterdam: Association for the Advancement of Computing in Education (AACE).

Latchem, C. (ed.) (2017). *Using ICTs and blended learning in transforming TVET.* Paris: UNESCO and Commonwealth of Learning.

Kerschbaumer, M. and Tamerl, O. (n.d). *Guideline for the training of 'Digital Competence Promoters'.* Retrieved from: https://www.dc4work.eu/fileadmin/user_upload/dc4work/01_startseite/IO2_GUIDELINE_for_Digital_Promoters_DC4W_Final.pdf

Mathieu, H. (2020). *The impact of digital technology on skills in logistics warehouses.* Training and Employment, no. 145, pp 1-4.

McCallum E., Weicht R., McMullan L. and Price A. (2018). EntreComp into Action: get inspired, make it happen (M. Bacigalupo and W. O'Keeffe eds). EUR 29105 EN. Luxembourg: Publications Office of the European Union.

McKinsey Global Institute (2017). *Jobs Lost, Jobs Gained: Workforce Transitions in a Time of Automation.* Washington D.C: MGI.

MIT (Massachusetts Institute of Technology) (2020). *Covid-19 and the workforce: Critical workers, productivity, and the future of AI.* Technology Review Insights. Retrieved from https://www.technologyreview.com/2020/04/30/1000888/covid-19-and-the-workforce-critical-workers-productivity-and-the-future-of-ai/

Nedelkoska, L. and Quintini, G. (2018). *Automation, skills use and training.* OECD Social, Employment and Migration Working Papers, No. 202. Paris: OECD Publishing.

Organisation for Economic Co-operation and Development (OECD) (2019). *OECD Skills Strategy 2019: Skills to Shape a Better Future.* Paris: OECD Publishing.

Pavlova, M. and Chen, C. S. (2019). *Facilitating the development of students' generic green skills in TVET: An ESD pedagogical model.* TVET@Asia, vol. 12.

PricewaterhouseCoopers (PwC) (2020). *Skills for Industry Curriculum Guidelines 4.0: Future-proof education and training for manufacturing in Europe.* Luxembourg: Publications Office of the European Union.

Ratcheva, V. et al. (2020). *Jobs of tomorrow: mapping opportunity in the new economy.* Geneva: World Economic Forum.

Rihova, H. (2016). *Using labour market information: guide to anticipating and matching skills and jobs, Volume 1.* Compendium on Anticipation and Matching of Skills. Luxembourg: Publications Office of the European Union.

The Guardian (2020). *Bosses speed up automation as virus keeps workers home.* Retrieved from https://www.theguardian.com/world/2020/mar/30/bosses-speed-up-automation-as-virus-keeps-workers-home

UNESCO Institute for Lifelong Learning (UIL), European Training Foundation (ETF) and Cedefop (2015). *Global Inventory of Regional and National Qualifications Frameworks. Volume I: Thematic Chapters.* Hamburg: UIL.

UNESCO-UNEVOC (2017). *Greening technical and vocational education and training: a practical guide for institutions.* Bonn: UNESCO-UNEVOC

—— . (2019). *Innovation in TVET – UNESCO-UNEVOC trends mapping studies.* Bonn: UNESCO-UNEVOC.

—— . (2020a). *Digitalization and TVET.* Retrieved from https://unevoc.unesco.org/bilt/BILT+-+Digitalization

—— . (2020b). *Virtual conference on artificial intelligence in education and training* – Virtual Conference Report. Bonn: UNESCO-UNEVOC.

Wegerif, R. (2006). *Dialogic Education: What is it and why do we need it?* Education Review, No. 19, pp 58-67.

World Economic Forum (2020). *Jobs of tomorrow: mapping opportunity in the new economy.* Geneva: World Economic Forum.

Annex 1
Trends Mapping Study components

Phase 1:
Literature Review

The literature review covers the publications on new qualifications and competencies (NQC), with a particular focus on:

1. the demands for NQC across different BILT (Bridging Innovation and Learning in TVET) thematic areas in Europe;
2. examples for and relevance of the four modes of implementation of competencies in TVET curricula and training regulations proposed by the BILT project (including cross-cutting, sector-specific, occupation-specific, additional or modular, and potential other approaches); and
3. the delivery of NQC at the micro-level (TVET schools, companies, and other TVET providers).

The literature review reflects mostly the content of international publications in English, rather than comparing national publications and perspectives from Europe. National contexts can thus vary greatly, including the understanding of what is a qualification or competence.

Phase 2:
BILT virtual conference on NQC in TVET, 1-12 June 2020
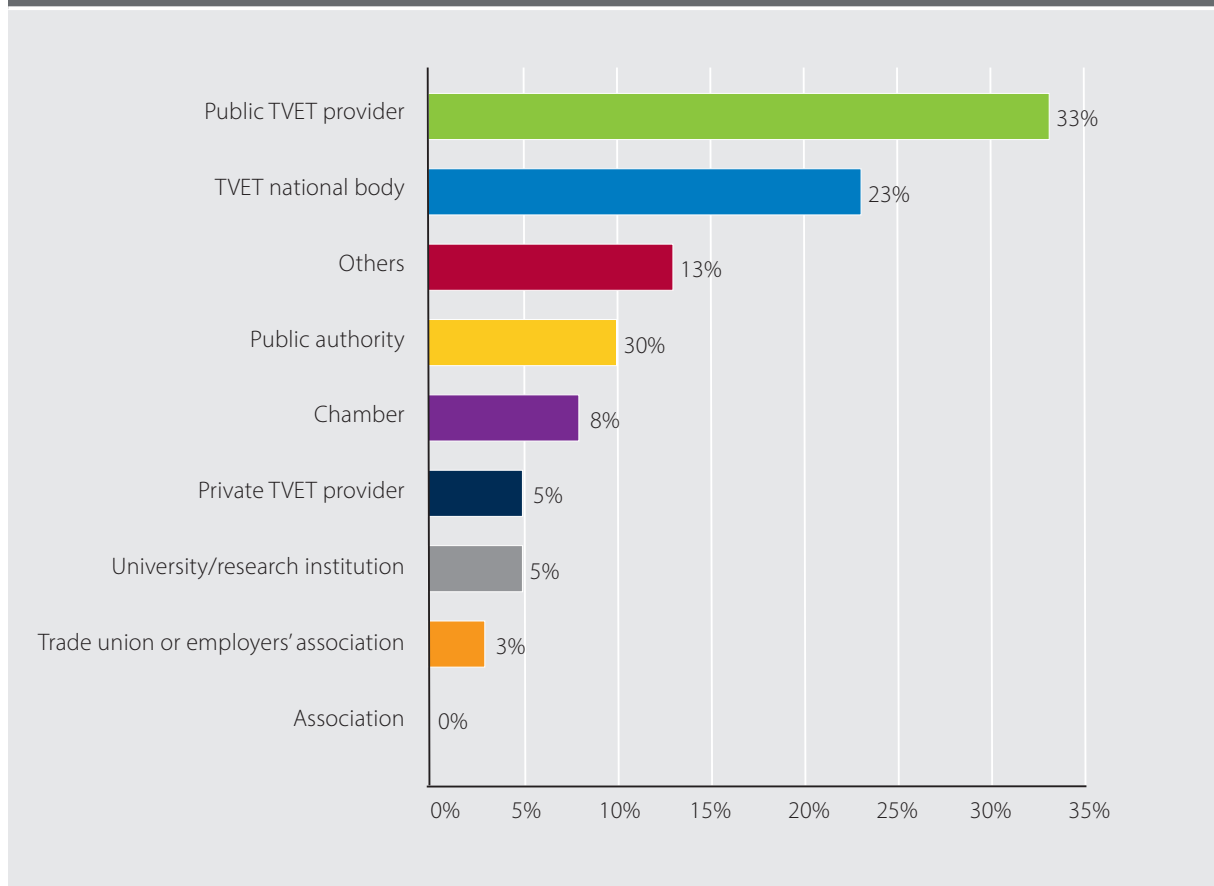
The virtual conference on NQC in TVET gave participants the opportunity to discuss how NQC are identified and how they find their way into TVET practice, with the initial literature review providing a basis for discussion. The virtual conference was open to all members of the UNESCO-UNEVOC TVET Forum, an online community with more than 6500 members. The subjects discussed in the virtual conference covered the identification of NQC, their integration into curricula and their implementation in training and teaching. Moreover, the virtual conference presented examples of NQC in relevant TVET sectors and occupations in the fields of greening, digitalization, entrepreneurship, as well as migration.

Phase 3:
Online survey and focus groups

A quantitative and qualitative survey was conducted among TVET stakeholders in Europe, with a focus on the identification of NQC in TVET. The online survey collected data on NQC concerning the four BILT thematic areas (digitalization, greening, entrepreneurship, and migration) in different economic sectors and occupations. Furthermore, qualitative open questions provided participants the opportunity to present examples of NQC in TVET.

Rather than obtaining representative results of the demands on NQC, the survey aimed to collect and compare data on the responses of each survey participant.

FIGURE 14. **Different types of European TVET institutions participating in the online survey (in percentage)**

Institution	Percentage
Public TVET provider	33%
TVET national body	23%
Others	13%
Public authority	30%
Chamber	8%
Private TVET provider	5%
University/research institution	5%
Trade union or employers' association	3%
Association	0%

In total, 39 respondents from different European TVET institutions participated in the BILT survey on NQC (Annex 2). As Figure 15 shows, 45% of participants work for micro level institutions (public and private TVET providers, as well as universities).

Focus groups were also used as a qualitative method of data collection[42] to help answer questions related to the integration of NQC into curricula and their implementation in teaching and training. Focus Group 1 addressed questions related to the formalisation of NQC, including examples of NQC, ways and strategies of integrating NQC into TVET curricula and training regulations, and of improving the responsiveness of such processes and the flexibility of TVET curricula and training regulations. Focus Group 2 debated questions linked with the implementation of NQC, including teaching and learning approaches and practices, and teacher and trainer training. In addition, both focus groups debated the subject of 'individual learning pathways', given that the customisation of TVET curricula encompasses different tasks and roles in the implementation of NQC in TVET curricula and TVET teaching and training.

The participants presented cases of expertise and excellence in the thematic areas of greening, digitalization, entrepreneurship and migration. In total, 13 experts from European TVET institutions at macro, meso, and micro levels participated in the focus groups' activities (for more details, see Annex 3).

42 According to Gill et al. (2008, p. 293), a 'focus group is a group discussion on a particular topic organised for research purposes. This discussion is guided, monitored and recorded by a researcher (sometimes called a moderator or facilitator)'.

FIGURE 15. **Survey participants by role and position (in percentage)**
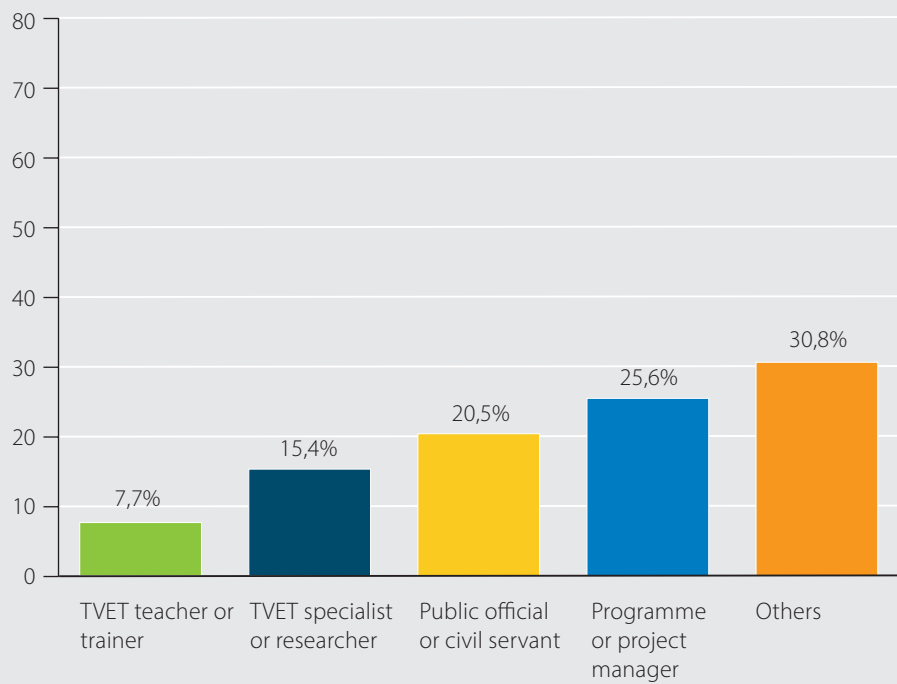
Annex 2
List of the BILT online survey participants

Countries	N° of answers	TVET institutions
Albania	1	National Agency for VET and Qualifications
Armenia	1	Ministry of Education and Science
Austria	1	HBLFA (Agricultural Research and Education Centre) Raumberg-Gumpenstein
Bulgaria	2	National Agency for Vocational Education and Training
Cyprus	1	Pedagogical Institute
Czech Republic	1	TREXIMA (consulting firm)
Denmark	1	Niels Brock Copenhagen Business College
Estonia	1	Foundation Innove
Finland	3	Omnia (multidisciplinary education provider and regional development centre)
Germany	6	German Confederation of Skilled Crafts, TU Dortmund University, Federal Employment Agency, Federal Institute for Vocational Education and Training, Berufskolleg an der Lindenstraße, UNESCO-UNEVOC
Hungary	2	Centre for Modern Education, Nemzeti Szakképzési és Felnőttképzési Hivatal
Malta	6	Malta College of Arts, Science and Technology
Netherlands	2	Zuyderland Care, Sustainable TVET Netherlands
Poland	1	Kazimierz Wielki University in Bydgoszcz
Portugal	2	ISQ, CENFIM (TVET providers)
Romania	1	National Centre for TVET Development
Slovenia	5	Chamber of Commerce and Industry of Slovenia, Electronics and Electrical Industry Association – CCIS, Institute of the Republic of Slovenia for Vocational Education and Training, Center Republike Slovenije za poklicno izobraževanje.
Spain	1	Miguel Altuna LHII (TVET provider)
Sweden	1	cFL Halsingland Education Association
Total	**39**	

Annex 3
List of participants in focus group activities

Countries	Focus Group	TVET institutions	Thematic Area
Austria	2	HBLFA Raumberg-Gumpenstein	Greening
Estonia	1	Foundation Innove/ Education and Youth Authority	Greening
Finland	2	Omnia	Digitalisation
Finland	2	Otavia	Migration
France	1	Technocentre Henri Fabre	Digitalisation
Germany	1	Federal Institute for Vocational Education and Training (BIBB)	Greening
Germany	1	Bertelsmann Foundation	Migration
Italy	2	Cometa Formazione	Entrepreneurship
Romania	1	National Centre for TVET Development	Entrepreneurship
Spain	1	TKNIKA	Entrepreneurship
Spain	1	Fundacion Secretariado Gitano	
Switzerland	1	Swiss Federal Institute for Vocational Education and Training	Digitalisation
Total	**12**		

Annex 4
Transformation of main economic sectors and occupational profiles (low carbon economy)[43]

Economic Sector	Level of Transformation	Examples of new/changing occupations
Renewable energy	One of the most significant sectors for the development of new occupational profiles, and common to all countries.	Medium skill level: solar PV/wind turbine/biomass systems: installers, technicians, plant managers, quality engineers. High skill level: Engineers and system designers (overlap with manufacturing).
Environmental goods and services, including water and waste management	One of the most significant sectors for occupational change, related to more careful management of environmental impacts and of the environment itself.	Medium skill level: environmental engineering technicians, soil and water conservationists, environmental science and protection technicians. High skill level: soil and water conservationists, water resource specialists, and water/wastewater engineers, energy managers, energy auditors, climate-change analysts, environmental restoration planners, environmental certification specialists.
Construction and building services	Mainly skills being adapted and/or added on to existing occupations; all main trades and professions likely to be increasingly affected in some way in all countries.	Medium skill level: carpenters, plumbers, electricians, heating engineers, roofers, painters and decorators, plasterers, building services technicians. High skill level: facility managers, architects, engineers, energy auditors and energy consultants (overlap with environmental goods and services).
Manufacturing	Likely to involve mainly adaptation of existing occupations rather than the creation of wholly new ones, though eco-design is a new field. All manufacturers will need new skills related to the reduction of environmental impacts; this may involve new occupations, e.g. pollution control officers.	Medium skill level: occupations related to reducing environmental impacts, e.g. pollution control officers, energy auditors. High skill level: occupations related to the design and production of new products and systems, e.g. product designers, production engineers.

43 International Labour Organization (2019)

Agriculture and forestry	Greatest effect on occupations likely to be felt at higher skill levels where new occupations are in demand. Little evidence of widespread adoption of greener skills.	Medium skill level: adoption of organic farming techniques; agricultural technicians involved in crop diversification; application of improved technologies.
		High skill level: soil and water conservationists, environmental restoration planners, environmental certification specialists, environmental economists, water resource specialists, and water/wastewater engineers, agricultural meteorologists.
Transportation	Mostly changes in existing occupations through the addition of new knowledge and skills among vehicle mechanics/technicians.	Medium skill level: occupations related to use, conversion (greening) and maintenance of existing vehicles.
		High skill level: R&D occupations related to the design of greener transport systems, e.g. engineers, systems analysts.
Tourism	Mostly changes in existing occupations through the addition of new knowledge and skills, e.g. eco-tourism.	Medium skill level: occupations related to eco-tourism.
Extractive industries	Mostly changes in existing occupations through the addition of new knowledge and skills. Evidence of widespread effects on occupations lacking at present.	High skill level: R&D occupations related to the design of greener extractive processes systems, e.g. engineers.

Annex 5
List of research questions and assigned data collection methods

Questions	Data Collection
1. What are the demands for NQC identified by TVET stakeholders on the macro level in the four BILT thematic areas (greening, digitalization, entrepreneurship, and migration) and different sectors and occupations?	Survey
2. What are the demands for NQC identified by TVET stakeholders on the meso level (national bodies, associations, chambers)?	Survey
3. How far are the expectations of local TVET stakeholders (micro level: schools, companies, and other TVET providers in different sectors and occupations) included in the discussions on the demands of NQC?	Survey
4. What examples of adapted, modernised and NQC can be found among European members of the UNEVOC network?	Focus Group 1
5. What are the different strategies of integrating NQC into TVET curricula and training regulations (including cross-cutting, sector-specific, occupation-specific, additional, and potential other approaches) that can be found among the UNEVOC network members? To what extent are these strategies regarded as relevant?	Focus Group 1
6. How can TVET systems improve their responsiveness in view of NQC?	Focus Group 1
7. How are TVET systems implementing flexible curricula, while assuring national standards? What are the benefits and challenges of implementing flexible TVET curricula and training regulations?	Focus Group 1
8. What ways of individualising learning pathways exist in the European context and how are they beneficial to the learner?	Focus Group 1 and 2
9. How are NQC being delivered by TVET schools, companies, and other TVET providers in terms of teaching and learning approaches, methods, practices, and technologies?	Focus Group 2
10. What are the impacts of NQC for teacher and (in-company) trainer training?	Focus Group 2

Annex 6
Case studies

Switzerland: Development of occupational standards

The Swiss Federal Institute for Vocational Education and Training (SFIVET) trains TVET practitioners, provides TVET research, develops career opportunities?, and also assists international education and training cooperation. SFIVET acts as an interface between trade associations, professional organizations and the country's 26 cantons (with hundreds of vocational schools and professional colleges). As a national institute, SFIVET plays an important role for these partners, acting as a central contact point for all matters relating to TVET? development projects and the basic and continuing training of TVET professionals.

 A great part of SFIVET's work is devoted to the development of occupational standards (encompassing 30/40 competencies per occupation) based on work tasks and processes. The SFIVET's Centre for the Development of Occupations offers methodological and pedagogical support to identify and describe activities associated with a given occupation or profession; to establish competences, training objectives, and training content; and to devise examinations.

 SFIVET's methodological support helps to define current activities relating to a given occupation or occupational field. Analysis takes place during workshops with members of the occupation. These workshops use the Develop a Curriculum (DACUM) method. Analysis also includes the identification of those activities that will remain important in the future. Moreover, this analysis serves as the basis for the creation of a new regulation framework for a federal professional examination or TVET curricula and training regulations. The State Secretariat for Education, Research and Innovation (SERI) must be informed of any TVET development or revision project and give it prior approval.

Link: *https://www.sfivet.swiss/cdo* (in English)

Germany: MYSKILLS, Bertelsmann Stiftung (foundation)

The Bertelsmann Stiftung is one of the largest private foundations in Germany. Its activities are exclusively and directly philanthropic with a focus on exchanging ideas and experience across cultural and national borders. The foundation was founded in 1977 with the objective to promote research and understanding in the areas of religion, public health, issues concerning youth and seniors, culture and the arts, public education and career training, social welfare, international cultural exchange, democracy and government, and civic engagement.

The MYSKILLS initiative offers a competency-based test that measures exclusively technical and professional competencies based on practical tasks. MYSKILLS is a computer-supported process that jobseekers, including migrants, can use to demonstrate professional competencies. The test covers

30 different professions with a broad range of occupations, including, for example, nursing care aide, plumber, or machine and system operator for metal technology. The test is optional and free of charge, and is available in several languages. During the test, participants see videos and images that illustrate typical practical situations. Based on the videos and images, they then have to answer practical questions about the tasks. The results indicate the areas of a profession in which participants already have professional competencies. Counsellors at the jobcentre or employment agency can use the results to find relevant job offers or help participants to obtain additional qualifications.

Link: *https://www.myskills.de/en/* (in English)

Spain: Empleando Digital (Fundación Secretariado Gitano)

The Fundación Secretariado Gitano (FSG) is an intercultural, social and non-profit organization that provides services to foster the Roma community in Spain and Europe. While its activity started in the 1960s, the foundation was not legally established until 1982. The mission of the FSG is the integral promotion of the Roma community on the basis of respect and support for its cultural identity. The foundation aims to promote the access of Roma to rights, services, goods, and social resources on an equal footing with the rest of the citizenry. To this end, the FSG develops all kinds of activities that help Roma achieve full citizenship, improve their living conditions, promote their equal treatment and prevent any form of discrimination, while ensuring that the Roma community's cultural identity is recognised.

Empleando Digital, which is a pilot project of the FSG, aims to provide ICT competencies for Roma people in Spain. It offers a customised pathway that encompasses not only training but also different types of services, such as guidance, coaching, and social support. The amount of training and other services provided depends on the needs of students, with the ultimate objective being their immediate employment. The initiative promotes the acquisition of competencies by offering short-term courses (4 months) that are designed by the FSG in partnership with private companies in the ICT sector. In doing so, the foundation can identify and create training solutions in shorter periods. Qualifications can be highly customised according to the needs of a specific company. These certifications, however, are not nationally recognised and do not give access to further formal education. The partnerships with private companies in the ICT sector involve not only the provision of customised training but also the possibility to use training materials, software, and other technologies produced by the companies. Furthermore, the foundation stresses the importance of individualised learning pathways when considering training for ethnic minorities and migrants. The expertise of Secretaria do Gitano suggests that a strong combination of prior learning recognition and individualised learning pathways is essential when addressing these target groups.

Link: *https://www.gitanos.org/que-hacemos/areas/employment/empleando_digital.html* (in English)

Germany: Sustainability in the bakery trade ('NiB-Scout' project, BIBB)

The Federal Institute for Vocational Education and Training (BIBB) is a centre of excellence for vocational research and the development of vocational education and training in Germany. BIBB works to identify future challenges in TVET, stimulate innovation in national and international vocational systems, and to develop new, practice-oriented solutions for both initial and continuing vocational education and training.

The initiative implements sustainable pilot projects in different sectors of the German TVET systems that combine the occupational approach with a sectorial approach. The pilot project 'sustainability in the bakery trade' (NiB-Scout) promotes a broad set of sustainable competencies in the occupation of baker. NiB-Scout is an in-construction digital and web-based learning tool that aims to provide a flexible, adaptable, and thus sustainable instrument for imparting competence and knowledge, with a focus on the bakery trade.

For practical training, a teaching-learning concept is developed that is closely based on operational reality. The materials focus on the provision of personal and technical competencies. Personal sustainable competencies include social responsibility, communication skills as well as advising consumers. Technical competencies include skills and knowledge related to energy saving and waste, bio-production, as well as traditional methods of production. Despite the spotlight on the occupation of baker, the sustainable competencies promoted by the project are also transversal and relevant to other occupations in the same sector. Furthermore, the project aims to create a framework for sustainable vocational education that allows for future expansion and use in other relevant occupations in the German TVET system.

Link: *https://nib-scout.de/* (only in German)

THE BILT PROJECT IS COORDINATED BY:

UNESCO UNEVOC

United Nations
Educational, Scientific and
Cultural Organization

International Centre
for Technical and Vocational
Education and Training

AND SUPPORTED BY:

bibb

Federal Institute for
Vocational Education
and Training

IN COLLABORATION WITH:

UNEVOC
Network

SPONSORED BY THE:

Federal Ministry
of Education
and Research

4 QUALITY EDUCATION

Sustainable
Development
Goals