



# Development of an Expert Support System for Competency Assessment in Higher Education RESPO-VI (ATP21)

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## Project Deliverable T1.2.2: Report on competences needed in the labour market

### Analysis of EU policies and related strategies on 21st century competences

Version no °1

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# 1. Introduction

Rapid technology advancements are changing the environment in which international businesses operate. More and more businesses want to be successful in the wider, European, and even worldwide markets rather than operating in a more constrained local or national market. These businesses must all take part in global processes that power the global economy. Businesses that want to survive should be ready for frequent and rapid adjustments; as a result, employment arrangements change. Employment contract for an indefinite time period, which was prevalent until recently, is gradually disappearing. Shorter, more flexible forms continually provide new challenges and the need for new skills.

Career development is important for everyone. Employers place a greater value on abilities that promote productive teamwork and creative problem-solving. Individuals are expected to be open, focused on self-initiative training and have a working grasp of schooling and lifelong learning. More and more employers are looking for candidates with skills that go beyond a person's professional competence in their chosen field. The ability to successfully replace a job or profession, plan and act in accordance with changing career chances, develop technical and social abilities, and simultaneously comprehend how and why the gained talents can be utilized are all necessary for future job seekers.

This document presents the first part of the Report on competences needed in the labour market, which will be prepared based on a comparative analysis of questionnaires from large enterprises, SMEs, research institutes and development centres, the existing KOC-TOP competence model and the findings of this report. In this report, we have considered the findings of the recommendations of the EU (European Skills Agenda, Digital Education Action Plan 2021-2027, European Green Plan, New European Research Area, Eurostudent), OECD, WEF and the Slovenian higher education (HE) space. Based on the findings, the existing KOC-TOP competency model will be adapted to the needs of employers and the specifications of the selected study programmes to better connect qualified STEM students with potential employers. This experience will further improve the level of transferable skills acquired while allowing the education and training programme to be complemented by current and future workforce needs. The findings of this report will also serve as a basis for the preparation of the List of STEM Student Competences for Work and Life in the 21st Century.

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## 2. Relevant EU strategies and initiatives

Our daily lives are constantly changing and forcing us to adapt to new ways to work, learn and take part in society due to technological advancements, global and demographic challenges. To adjust to these changes, individuals need to develop the right skills ranging from basic, such as literacy, numeracy and digital, to vocational or technical skills, but also entrepreneurial and transversal skills, such as foreign languages, personal growth and learning to learn. All of these are needed to maintain an individual's well-being while contributing to society, productivity, and economic growth. European Union strives to equip people in Europe with the necessary skills by implementing various strategies and initiatives, which we summarised in this chapter.

### 2.1 European Skills Agenda

“The European Skills Agenda is a five-year plan to help individuals and businesses develop more and better skills and to put them to use, by:

- strengthening sustainable competitiveness, as set out in the European Green Deal;
- ensuring social fairness, putting into practice the first principle of the European Pillar of Social Rights: access to education, training and lifelong learning for everybody, everywhere in the EU;
- building resilience to react to crises, based on the lessons learnt during the COVID-19 pandemic.” [1]

The European Skills Agenda outlines policy priorities and initiatives that will further promote the green and digital transition while enhancing citizen employability and providing skills for the workforce. It is centred around three key work strands:

1. improving the quality and relevance of skills formation;
2. making skills and qualifications more visible and comparable;
3. advancing skills intelligence, documentation, and informed career choices.[2]

To realize the potential of a future recovery plan, it builds upon the first principle of the European Pillar of Social Rights [3], which concerns “the right to quality and inclusive education, training, and lifelong learning in order to maintain and acquire skills that enable them to participate fully in society and manage successfully transitions in the labour market”, and upon the ten actions of the Commission's 2016 Skills Agenda [1].

### 2.2 Updated Skills Agenda from July 2020

The European Skills Agenda of July 1st, 2020, sets out a five-year action plan with 12 actions organised around four building blocks:

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Table 1. European Skills Agenda structure (cited from [4])

Building Block	Action	Description
<b>Working together under a pact for skills</b>		
	<i>Action 1: Pact for Skills</i>	The Pact will mobilise a concerted effort for quality investment in skills for all working age people across the Union.
<b>Skilling for a job: aligning policies to deliver results</b>		
	<i>Action 2: Strengthening skills intelligence</i>	Includes the use of big data analysis using online job advertisements to examine the skills demanded by employers at regional level and the presentation of information tailored to individuals' needs, making it widely accessible.
	<i>Action 3: EU support for strategic national upskilling action</i>	The Commission will support all Member States to prepare holistic, whole-of-government national skills strategies.
	<i>Action 4: Proposal for a Council Recommendation on Vocational Education and Training (VET)</i>	Organisations providing education and training need to deliver relevant skills along the entire lifelong learning continuum
	<i>Action 5: Rolling out the European Universities initiative and upskilling scientists</i>	Higher education is an essential vehicle to provide students with the skills they need in the future. It is necessary to foster collaboration and mobility of scientist across Europe.
	<i>Action 6: Skills to support the twin transitions</i>	The jobs of tomorrow require skills for the twin (green and digital) transitions.
	<i>Action 7: Increasing STEM graduates and fostering entrepreneurial and transversal skills</i>	STEM (Science, Technology, Engineering and Mathematics) skills are critical to drive the twin transitions. Such skills are necessary to use new technologies, and a high level of STEM skills is crucial to foster innovation in cutting-edge ICT areas such as AI or cybersecurity
	<i>Action 8: Skills for Life</i>	The COVID-19 pandemic and the related containment measures have underlined the

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		importance of life skills and our capacity to adapt, manage change, and care for each other as a community. Resilience, media literacy, civic competence, financial, environmental and health literacy are key in this context.
<b>Developing tools that empower people to build skills throughout life</b>		
	<i>Action 9:</i> Initiative on individual learning accounts	Direct incentives for people to train, such as individual learning accounts, can make lifelong learning a reality by enabling everyone to participate in learning.
	<i>Action 10:</i> A European approach to micro-credentials	Empowering workers to up- and reskill throughout their entire lives also means making sure that all learning experiences are properly valued. Increasingly, workers are attending short and tailored training and need to get recognition for that. This is achieved with the use of micro-credentials.
	<i>Action 11:</i> New Europass platform	Once the individual has a certificate proving their skills, they need to be able to communicate them when applying for a job or further learning. Europass, an online tool, helps people effectively communicate their skills and qualifications.
<b>Making it happen: unlocking investment</b>		
	<i>Action 12:</i> Improving the enabling framework to unlock Member States' and private investments in skills	EU funds can act as a catalyst, but investment in skills needs to be financed by other public and private investments.

### 2.3 Digital Education Action Plan (2021-2027)

“The Digital Education Action Plan (2021-2027) is a renewed European Union (EU) policy initiative that sets out a common vision of high-quality, inclusive and accessible digital education in Europe, and aims to support the adaptation of the education and training systems of Member States to the digital age.” [5]

It was adopted on the 30<sup>th</sup> of September 2020 and calls for greater cooperation at European level on digital education due to the challenges that became more apparent during the COVID-19 pandemic. However, it also showcased new opportunities for education, training community (both students and teachers), policy makers, academia, and researchers on national, EU and

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international levels. Online and blended learning has never before been so important as it uncovered new and creative approaches to coursework and learning activities, but also increased the disparities between those who have access to digital technologies and those who do not. This is further emphasized by different levels of digital literacy and digital capacities of education and training institutions.

The initiative contributes to European Commission’s goals for a greener, more digital, and resilient European Union, while also being a key enabler to the implementation of European Education Area [5].

It consists of two strategic priorities and fourteen actions to support them:

*Table 2. Digital Education Action Plan (2021-2027) structure (cited from [5])*

Strategic priority	Action	Description
<b>Fostering the development of a high-performing digital education ecosystem</b>		
	<i>Action 1</i>	Structured Dialogue with Member States on the enabling factors for successful digital education and skills
	<i>Action 2</i>	Council Recommendation on blended learning approaches for high-quality and inclusive primary and secondary education
	<i>Action 3</i>	European Digital Education Content Framework
	<i>Action 4</i>	Connectivity and digital equipment for education and training
	<i>Action 5</i>	Digital transformation plans for education and training institutions
	<i>Action 6</i>	Ethical guidelines on the use of AI and data in teaching and learning for educators
<b>Enhancing digital skills and competences for the digital transformation</b>		
	<i>Action 7</i>	Common guidelines for teachers and educators to foster digital literacy and tackle disinformation through education and training
	<i>Action 8</i>	Updating the European Digital Competence Framework to include AI and data-related skills
	<i>Action 9</i>	European Digital Skills Certificate (EDSC)

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	<i>Action 10</i>	Proposal for a Council recommendation on improving the provision of digital skills in education and training
	<i>Action 11</i>	Cross-national collection of data and an EU-level target on student digital skills
	<i>Action 12</i>	Digital Opportunity Traineeships
	<i>Action 13</i>	Women’s participation in STEM
	<i>Action 14</i>	European Digital Education Hub - strengthening cooperation and exchange in digital education at the EU level.

## 2.4 The Digital Competence Framework for Citizens (DigComp)

Realizing strategies and initiatives across the EU is possible by having common understanding of what digital competence is. This is achieved with a digital competence framework, which serves as foundation for the development of digital skills policies, curricula, and assessments for both the education sphere and labour market. A central role in meeting EU objectives regarding the digital upskilling is played by DigComp and its updated version DigComp 2.2 [6].

The update takes into consideration new phenomena like the new teleworking conditions that have led to new and rising expectations for digital competence on the part of citizens as well as upcoming technologies like Artificial Intelligence, the Internet of Things, and datafication. The necessity to address the environmentally friendly and sustainable aspects of using digital technologies is also growing. Therefore, the current update considers the information, skills, and attitudes that citizens will need considering these developments [7].

## 2.5 ALMA (Aim, Learn, Master, Achieve)

ALMA (Aim, Learn, Master, Achieve) is an initiative put in place by the European Commission, which aims to support young people not in any kind of employment, education, or training (NEETs). Aged 18-30, they have limited access to work and training because of individual or structural reasons (e.g., lack of academic achievement or vocational skills, migration background, long-term unemployment, disabilities). By enhancing their skills, knowledge, and experience, the initiative allows integration into their home nation while also giving them the chance to forge new connections across Europe. Their social inclusion and finding a position in the job market are the ultimate goals. ALMA is upscaled from a social innovation implemented by Germany in 2008 IdA (Integration durch Austausch), which was then taken over in 2012 by a transnational network of 15 Member States with support from European Social Fund.

This cross-border youth mobility scheme will offer [8]:

- intensive tailor-made training in participant’s home country, prior to their stay abroad;

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- a supervised stay including work placement with accompanying mentoring service for a period of 2 to 6 months in another EU Member State;
- continued support upon return (coaching and counselling to gain employment or further education).

## 2.6 The European Year of Skills

Green and digital transitions are creating new opportunities for people and the EU economy, but only those with applicable skills can successfully navigate the changes in the labour market and participate fully in society. Providing people with means of obtaining such skills guarantees smaller social differences and makes the transitions fair and just for all. A workforce with in-demand knowledge supports sustainable growth, spurs more innovation, and raises the competitiveness of businesses. Due to a large percent (75 %) of businesses in the EU stating that they have difficulties finding workers with required skills, the European Commission has announced a proposal to make 2023 the European Year of Skills. It plans to give the incentive of lifelong learning by:

- “Promoting increased and more effective and inclusive investment in training and upskilling to harness the full potential of the European workforce, and to support people in changing from one job to another.
- Making sure that skills are relevant for labour market needs, by also cooperating with social partners and companies.
- Matching people's aspirations and skill sets with opportunities on the job market, especially for the green and digital transition and the economic recovery. A special focus will be given to activate more people for the labour market, in particular women and young people, especially those not in education, employment, or training.
- Attracting people from third countries with the skills needed by the EU, including by strengthening learning opportunities and mobility and facilitating the recognition of qualifications.”[9]

The proposed year also intends to encourage further development of skill intelligence tools and instruments for increased transparency and easier recognition of qualifications. In meeting those objectives, the European Commission can build upon many already ongoing EU initiatives such as the European Skills Agenda, Structured Dialogue, New European Innovation Agenda, European strategy for universities, Digital Skills and Jobs Platform and Digital Skills and Jobs Coalition [9].

## 2.7 ESCO platform

European Skills, Competences, Occupations and Qualifications (ESCO) is a multilingual reference terminology that can be used to describe skills needed in a specific occupation, but also skills acquired through formal, non-formal and informal learning. It can be implemented on different online platforms to provide services like matching job seekers with positions based on their skills and recommend training to those who want to reskill or upskill. Its purpose is to offer a

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"common language" on occupations and skills that can be utilized by many stakeholders on employment, education, and training matters. This will facilitate job mobility across Europe and, as a result, a more integrated and efficient labour market [10].

## 2.8 EU Skills Panorama

This is an online tool providing quantitative and qualitative central access to data, information and intelligence on skill needs in occupations, sectors, and countries. It also provides information by policy themes. It gives a European perspective on trends for skills supply and demand and skill mismatches [11], while also giving information about national data and sources to help policymakers and policy experts keep up to date with the latest developments, make comparisons with previous trends, and identify anticipated changes. With its data and forecast compilations to identify the top "bottleneck" occupations, it aims to improve Europe's capacity to assess and foresee skill needs. The EU Skills Panorama is managed by CEDEFOP on the behalf of the European Commission [12].

## 2.9 Key Competences for Lifelong Learning

"Key competences are a combination of knowledge, skills, and attitudes, which all individuals need for personal fulfilment and development, employability, social inclusion, sustainable lifestyle, successful life in peaceful societies, health-conscious life management and active citizenship." [11, p. 14] They are developed by formal, non-formal and informal learning in all settings, such as family, school, workplace, neighbourhood, and other communities, from early childhood through adulthood. All of them are valued equally because they all help create a successful life in society. They can be used in a wide range of situations and combinations as they overlap and interlock, with one competence's elements supporting another key competence. Consequently, elements of critical thinking, problem solving, teamwork, communication and negotiating skills, analytical skills, creativity, and intercultural skills are present in all key competences in some form or another [13].

The European Commission collaborates with the EU's Member States to encourage and reinforce the development of key competences and skills for all. The strategy to encourage key competences is enacted by:

- "providing high-quality education, training, and lifelong learning for all;
- supporting educational staff in implementing competence-based teaching and learning approaches;
- encouraging a variety of learning approaches and contexts for continued learning;
- exploring approaches to assess and validate key competences." [14]

**Key Competences for Lifelong Learning** is a European Reference Framework, which defines and identifies aforementioned key competences, provides a reference tool for policy makers, education/training providers, learners etc., and supports efforts at all levels (European, national, regional, and local) to foster competence development in lifelong learning. The Reference Framework sets out eight key competences:

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1. **Literacy competence** represents the ability to identify, comprehend, articulate, create, and interpret ideas, feelings, facts, and opinions in both oral and written form across different academic fields and contexts. It entails the capacity for appropriate and creative interpersonal communication and connection, while serving as basis for further learning and linguistic interaction. Literacy skills can be developed in the mother tongue, language of schooling and/or the official language of a nation or region.
2. **Multilingual competence** defines the capacity to communicate successfully and appropriately in a variety of languages. With its basis on the ability to comprehend, articulate and interpret ideas, feelings, facts, and opinions in both oral and written form, it broadly shares the main skill dimensions with literacy. Intercultural and historical dimensions, as well as the ability to mediate between different languages and media are also integrated into language competences.
3. **Mathematical competence and competence in science, technology, engineering.** The first competence represents the ability to create and apply mathematical reasoning and understanding of problems in daily life. The emphasis is not only on knowledge but also process and activity. Mathematical competence involves the ability and willingness to use mathematical modes of thought and presentation. Competence in science refers to the ability and willingness to explain the natural world. It is done by observation and experimentation with which evidence-based conclusions are made. Applications of the conclusions in response to human wants or needs represent the competences in technology and engineering. Understanding citizen's responsibilities and the changes caused by human activity is part of this competence.
4. **Digital competence** refers to the engagement and use of digital technology for learning, at work, and for social participation in a confident, critical, and responsible manner. It covers topics like information and data literacy, communication and teamwork, media literacy, media creation (including programming), digital content creation, safety (including digital well-being and cybersecurity competences), questions about intellectual property, problem solving, and critical thinking.
5. **Personal, social and learning to learn competence** means the capacity for self-reflection, efficient time and information management, constructive collaboration with others, resiliency, and career management. It includes the ability to deal with complexity and uncertainty, learn to learn, support one's physical and emotional wellbeing, maintain one's physical and mental health, lead a future-focused, health-conscious life, empathize, and manage conflict in a welcoming and encouraging environment.
6. **Citizenship competence** is the ability to participate fully in civic and social life and act as responsible citizens based on one's awareness of social, economic, legal, and political concepts and systems, as well as of global developments and sustainability.
7. **Entrepreneurship competence** defines the ability to act on opportunities and ideas and translate them into values for others. It is based on the ability to work together to design

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and manage initiatives that have value in terms of culture, society, or finances as well as creativity, critical thinking, and problem solving.

8. **Cultural awareness and expression competence** involve understanding and respecting the various ways that ideas and meaning are expressed and shared creatively across cultures and through a variety of arts and other cultural forms. It entails being actively involved in comprehending, developing, and expressing one's own ideas as well as one's sense of belonging or function in society in a variety of circumstances and ways.

The use of a variety of learning approaches and contexts; support for teachers and other educational staff; and assessment and validation of competence development are three challenges that have been identified in support of competence-oriented education, training, and learning in the context of lifelong learning [13].

## 2.10 Youth Employment Support: A Bridge to Jobs for the Next Generation

The goal of the Youth Employment Support: A Bridge to Jobs for the Next Generation package is to aid young people who are entering the workforce. Its activities are based on the ambitious recovery plan of the European Commission, which offers major EU financing options for youth employment so that all Member States can invest in young people [15].

The Youth Employment Support package is built around four strands that together provide a bridge to jobs for the next generation:

- **A reinforced Youth Guarantee**, the initial version of which was created in 2013 and has already helped 24 million young people gain access to the labour market, has expanded its reach to vulnerable young people (aged 15-29) across the EU, such as those from racial and ethnic minorities, with disabilities, from remote areas etc. It promises an offer of employment, education, apprenticeship, or training within four months of signing up to the Youth Guarantee.
- **A future-proof vocational education and training** strives to modernize systems and make them more appealing, adaptable, and suitable for the digital and green economy. Young people will be better prepared for their first employment with more flexible, learner-centred vocational education and training, while adults will have more options to enhance or change their careers. It will foster diversity and inclusiveness and assist providers of vocational education and training in becoming centres of vocational excellence.
- **A renewed impetus for apprenticeships** will benefit both employers and young people by providing skilled labour force to a variety of industries. More than 900,000 opportunities have been made available through the European Alliance for Apprenticeships. The revitalized Alliance will encourage national alliances, aid SMEs, and increase participation from social partners including trade unions and employers' organizations. Since the apprentices that are taught now will become highly skilled workers in a few years, the objective is to maintain the apprenticeship opportunities available now.

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- **A number of additional measures to support youth employment** include employment and start-up incentives in the short term, with medium term focus on capacity building, young entrepreneur networks and inter-company training [16].

The efforts outlined in this communication support the European Commission's COVID-19 pandemic recovery strategy. They promote the New Industrial Strategy and put into practice the European Pillar of Social Rights. Other European Commission measures, including the European Skills Agenda for Sustainable Competitiveness, Social Fairness and Resilience, help increase employment among young people [15].

## 2.11 New European Research Area

European Research Area (ERA) is a single, borderless market for research, innovation, and technology across the EU where countries collaborate and improve their research policies and systems and where free movement of researchers, knowledge and innovation is encouraged. Established in 2000, it has made significant progress over the years, but the current environment forced re-evaluation on strengthening its role, better definition and carrying out its objectives, and making it more appealing as a common space for producing valuable research and innovation.

Therefore, a **new European Research Area for Research and Innovation** was adopted by the European Commission. It is built on the principles of excellence, competition, openness, and talent priority and will enhance Europe's research and innovation landscape, hasten the EU's transition to climate neutrality and digital leadership, aid in its recovery from the societal and financial effects of the coronavirus crisis, and increase its resilience against future crises [17]. To achieve its goals, three additions were created:

- **Establishment of a new ERA governance**, with the creation of a dedicated expert group (ERA Forum), allows for closer cooperation on the implementation of ERA initiatives between the European Commission and EU countries.
- Adoption of a **Pact for Research and Innovation** in Europe, which lays out 10 shared values and principles that will guide research and innovation in Europe, as well as cooperation with the rest of the world. It establishes priority areas for collaborative action, sets ambitions for investments and reforms, and streamlines coordination and monitoring.
- **An ERA Policy Agenda with concrete actions**, annexed to the Council conclusions on the ERA governance, lists 20 concrete ERA actions that will take part between 2022 and 2024 to support the priority areas defined in the Pact for Research and Innovation [18].

## 2.12 European Framework for Research Careers

Innovation Union commitment no. 4 on ERA requests “Comparable research career structures”, which were lacking in the EU. There wasn't an accessible and open internal labour market for researchers, it was dispersed across the country, jobs in academia, industry, and other sectors were divided. Although there is cross-country and cross-sector mobility, there are still several barriers. Because switching industries can be extremely tough, career decisions are frequently final. Early career researchers may not be aware of the diversity of opportunities across work

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sectors because research careers usually lack a clear and transparent perspective, with employers frequently being unaware of the skills researchers possess and the advantages they could provide for their business. The **European Framework for Research Careers** was created as a reference tool to compare career hierarchies across industries and countries, helping researchers identify job offers and employers find suitable candidates. The descriptors are applicable to all researchers, whether they are employed by businesses, non-profit organizations, research institutions, research universities, or universities of applied sciences, because the framework is sector neutral. The four profiles serve as a bridge over sectoral or national divisions rather than replacing local or national nomenclature [19], and have the following titles:

- **R1 First Stage Researcher** – individuals, doctoral candidates, who conduct research under supervision in industry, research institutes or universities. Desirable competences include developed integrated language, communication, and environment skills, especially in an international context.
- **R2 Recognised Researcher** – includes Doctorate degree (PhD) holders who have not yet established a significant level of independence and researchers with an equivalent level of experience and competence. Desirable competences include understanding the agenda of industry and other related sectors, understanding value of their research work, communication with wider community about their area of expertise, promotion of advancements in society and mentoring First Stage Researchers.
- **R3 Established Researcher** - describes researchers who have developed a level of independence. Desirable competences include relevant collaborative relationships, effective communication, innovative research, forming of research consortia, securing research funding and commitment to own and other's professional development.
- **R4 Leading Researcher** – represents researchers who are leaders in their research area or field. The head of an industry R&D lab or the team leader of a research team falls under this category. Leading researchers may, as an exception in some disciplines, include those who work alone. Desirable competences include expert managing of projects and other researchers, long-term planning for the research community, expert networking, innovative and creative environment creation and acting as a professional development role model for others [20].

## 2.13 Eurostudent

The Eurostudent project gathers and analyses comparable data on the social aspect of European higher education. The social and economic circumstances of students are covered over a wide range of issues. EUROSTUDENT VII Synopsis of Indicators 2018–2021 recognizes a few key skills that contribute to successful employment after studies.

The most important skills students can get while studying are those developed during study-related work or internships. A job provides great value in the form of practical knowledge of the profession, work experience as such, and practical life skills. In addition to using theoretical knowledge in a practical setting, it enables them to begin networking early, giving them the chance to find employment more quickly after completing their studies. Work-related learning environments have also shown to be beneficial, especially for developing social and

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entrepreneurial skills. To help students navigate their study-work balance, which has become more feasible with blended learning, managerial and planning skills, along with flexibility, play a big role. After the coronavirus pandemic, education programmes are becoming more accommodating and are offering remote learning, however this calls for diligence and knowledge of digital skills from students. One aspect that increases individual's chances of employment is also their national and international mobility; language skills, independence and previous intercultural experiences all increase willingness to move [21].

## 2.14 UNESCO Transversal skills

UNESCO-UNEVOC is an International Centre for Technical and Vocational Education and Training, which is focused on acquiring knowledge and skills for the workplace and supports equitable and sustainable economic growth by assisting youth and adults in developing the skills necessary for employment, decent work, and entrepreneurship [22].

The demand for transversal skills is increasing as learners need to successfully adapt to changes and lead meaning and productive lives. As defined in UNESCO-UNEVOC's TVETipedia, transversal skills are ones that are typically considered as being applicable in a wide range of situations and work settings rather than being specifically tied to a particular career, task, academic discipline, or area of expertise. They include six domains:

- **critical and innovative thinking**
- **inter-personal skills** (presentation and communication skills, organizational skills, teamwork, etc.)
- **intra-personal skills** (self-discipline, enthusiasm, perseverance, self-motivation, etc.)
- **global citizenship** (tolerance, openness, respect for diversity, intercultural understanding, etc.)
- **media and information literacy** (the ability to locate and access information, as well as to analyse and evaluate media content)
- **others** (physical health or religious values, etc.) [23]

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## 3. Key competences for Slovenian HE

Rapid technology advancements are changing the environment in which businesses operate. Many want to succeed in wider markets and therefore have to adapt to changes, which are then also transferred to future job seekers. Transversal skills are gaining greater value and distinguish two candidates with the same educational background, giving those with self-initiated training, social skills, etc. a bigger advantage. Creating national and international initiatives in the field of career guidance is crucial for individual's development as offering help and additional education options encourages the development of key competences [24].

### 3.1 Skills for the future

Slovenia offers career guidance on two levels: with national initiatives and lifelong guidance tools/trainings/projects/events.

Within national context, Slovenia has accepted the **OECD Skills Strategy** and in its diagnostic report specified 3 priority areas for action:

- empowering active citizens with the right skills for the future (a portfolio of cognitive, socio-emotional and discipline specific skills that equip them to learn throughout life, interact effectively with others and solve complex problems);
- fostering a culture of lifelong learning;
- collaborating to strengthen skills.

It has also identified skills challenges facing Slovenia, which include equipping young people with skills for work and life, improving skills, boosting employment, attracting, and retaining talented people, utilizing people's skills in workplaces, using skills for innovation and entrepreneurship, etc.

Countries can reduce mismatches by efficiently analysing, anticipating, and communicating information on the evolving need for skills. Slovenia doesn't have a comprehensive system for assessing and anticipating skills, but it is working to improve what it does have. The Ministry of Labour, Family, Social Affairs and Equal Opportunities and the Ministry of Education, Science and Sport have central roles in skills anticipation activities. The main forms of **skills anticipation** according to EU Skills panorama in Slovenia are:

- collecting and analysing administrative data on job openings and unemployment, including information from the Labour Force Survey;
- surveys of employers conducted by the Employment Service of Slovenia and employers' organisations, as well as surveys conducted by the Statistical Office of the Republic of Slovenia and labour market intermediaries;
- skills forecasts within international networks, primarily CEDEFOP;
- discussions with key stakeholder representatives.

**Employment Service of Slovenia** gathers skills intelligence and publishes bi-annual employment expectations analyses, **Employment forecast**, based on it. It is one of the most important organizations in the Slovenian labour market. The research includes Slovenian

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companies with more than 10 employees and focuses on business expectations and services, employment in the upcoming six months, as well as difficulties in obtaining adequate workers in the previous six months. Additionally, it prepares the quantitative research **Occupational barometer** that demonstrates the relationship between offers and requests for occupations for the upcoming year. The study is based on data gathered by employment agencies, counsellors for the unemployed, and counsellors in contact with companies. Results of the barometer forecast include a given profession's deficit, balance, and surplus on a national level. The Employment Service of Slovenia is also carrying out the **Active Employment Policy** program, which helps unemployed people acquire skills that are relevant to the job market and is primarily targeted at long-term jobless people and other vulnerable groups that require additional support to enter the workforce.

### 3.2 Tools for lifelong career guidance

Regarding lifelong guidance, tools for career guidance focusing on clients' career paths were developed inside the Employment Service of Slovenia, where they present an important source for career counsellors who interact directly with job searchers and the unemployed.

Euroguidance Slovenia provides **Kam in kako (Where and how)** online ICT guidance tool in 2 versions: one for students at elementary schools, VET schools, general upper secondary schools, and their guidance counsellors, and one for higher education students, the unemployed and all citizens interested in changing their career. It serves as a basis for individual career counselling and guidance. Individuals can review their responses regarding their interests, skills, and proposed careers independently or in collaboration with a school/career counsellor.

The Employment Service of Slovenia offers **modular training for career counsellors in lifelong career orientation** from the employment and education sectors, with the goal of providing career counsellors with the necessary knowledge on useful working methods and theoretical background, as well as encouraging networking among career counsellors from various fields. The 160-hour multidisciplinary training consists of individual, group, and online work. It is broken down into 4 modules (career orientation, guidance, lifetime guidance career tools, and working with groups in career orientation) for 4 separate practice areas (employment counsellors, education counsellors, HR, and NGO). The training is offered as part of the Lifelong Career Guidance Service Development Project.

Employment Service of Slovenia also developed some other guidance tools, such as:

- tools for modular workshops for development of job searching competences on the basis of competence profile job searching;
- **eSvetovanje (eCounselling)**, which is a self-evaluation guidance tool for career planning;
- adapted from Dr. Amundson, **the scale for evaluating competency**, which serves as a self-help tool for career orientation;
- **Karierni Kompas (Career compass)**, a tool for career counselors created by CINOP (Euroguidance Netherlands) and translated for experts in the field of career orientation;
- **CH-Q method** for Career and competence self-management workshop for the unemployed, youth and long term unemployed.

Another important aspect that helps with career success is international mobility. **Cross-border seminar** is a way for guidance practitioners from central European nations to collaborate internationally on guidance and learn about future professions and skills. Additionally, the seminar

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serves as good practice that might be used in other nations. Another mobility opportunity is offered through **Academia network**, which is a professional learning mobility exchange and a chance for guidance practitioners to familiarize themselves with the guidance system and guiding practices in other European countries.

### 3.3 Initiatives tailored to address skill development in the employment/education sector

Initiatives can also be tailored to address skill development in the employment/education sector for the future. An example is a project **Increasing effective coordination of supply and demand in the labour market**, managed by the Employment Service of Slovenia, which aims to develop tools suitable for high-quality forecasts of worker needs, skills, and competences. This will help lessen structural labour market imbalances and speed up the process of getting unemployed people back to work. This project also develops a methodology to establish short-term employment needs for employers and updates the current methodology used to identify those needs.

In order to encourage the delivery of adequate training and counselling activities to employees, based on the identification of training/skills needs, the Public Scholarship, Development, Disability and Maintenance Fund of the Republic of Slovenia manages numerous programs. In collaboration with the Ministry of Education, Science, and Sport and the Ministry of Labour, Family, Social Affairs, and Equal Opportunity they support **Competence Centres for Human Resources**, where employers in the industry work together to identify key competences and train employees in accordance with the necessary skills and deficits that need to be filled.

The annual **Day of Open Doors of Slovenian Economy** educates schoolchildren and their parents about the jobs and competences required by Slovenian employers. They can connect with employers, positions, necessary skills, and employees in more than 100 businesses to talk about future employment and help with career decisions.

The Ministry of Education, Science, and Sport and the European Social Fund are jointly funding the diversification of schools, **Popestrimo šolo** programme, in which schools are encouraged to focus on professional development in order to boost student competency. The project's objective is to plan and coordinate a variety of group and individual activities that help students and teachers identify and develop their abilities and actively engage them in lifelong learning [24].

## 4.OECD Skills Strategies

The OECD emphasises that skills are the key to shaping a better future for individuals and countries to succeed in an increasingly interconnected and fast-changing world. In the recovery from the COVID-19 pandemic, countries will need to take coordinated actions to help graduate and postgraduate students find their first jobs and make effective use of the skills they have acquired during their studies in the workplace. In the long term, megatrends such as globalisation, climate changes, technological advances and demographic changes will continue to transform work and society, and countries should prepare today, by developing the skills needed to succeed in the world of tomorrow. Countries should strengthen the management of skills development policies to make their formal and informal skills systems more resilient and adaptable for the future.

The OECD is working with several countries to assess their challenges and opportunities in skills development, identify priority areas for actions and make concrete and targeted policy recommendations to build more effective skills systems that promote employment, productivity and social cohesion. Using the OECD Skills Strategy framework [25], they analyse the performance of skills in individual countries, taking into account the following aspects:

- the development of relevant skills across the life cycle from childhood to adulthood,
- the effective use of skills at work and in society,
- activating the supply of skills in the labour market, and
- strengthening the governance of the skills system.

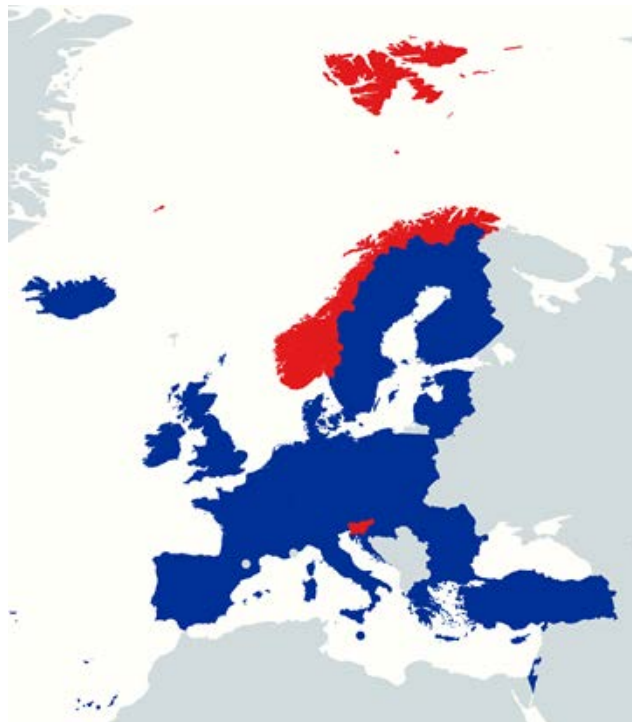


Figure 1. OECD countries in EU (blue colour) and selected countries from RESPO-VI project (red colour)

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Slovenia and Norway are among 30 countries where OECD Skills Strategy projects have been performed. Because the situation in each country is unique, also national project teams collaborate in these projects to evaluate the state of each country. In the following two subsections, we summarize the key findings in the OECD Skills Strategy Diagnostic Reports for Slovenia and Norway. Both countries are among the four countries in the OECD with the highest levels of income equality.

#### 4.1 OECD Skills Strategy Diagnostic Report: Slovenia

The OECD [26] identifies Slovenia as a relatively prosperous country with a good quality of life. However, jobs in the country have been affected by the global financial crisis and its recovery is not yet complete. Slovenia's population is ageing faster than in most other OECD countries, which means there are fewer workers to meet skills needs and fewer salary earners to support public spending. At the same time, highly skilled people are increasingly mobile in search of better education, jobs and lives. Technology and digitalisation continue to change the way Slovenians learn, work and live, changing some jobs and creating others. A better-skilled population, motivated to develop skills and knowledge and ready to realise its potential, will be key to meeting the challenges and exploiting the opportunities of the future.

Slovenia has successfully increased the quality of education in recent years. However, too many people - young and old - are still not equipped with the right skills for work and life. The OECD recommends that in the future Slovenia will need a better understanding of how the skills needs are changing, and greater capacity building and stimulations for students, educators, workers, and employers. Slovenia must continue to build a culture of lifelong learning and enable all adults to develop their skills over time and fill skills gaps. Achieving this will require more systematic cooperation within and between ministries and stakeholders.

Positive conditions in Slovenia are:

- high standards of living
- high level of income equality
- high levels of personal security
- relatively unspoiled natural environment and
- high educational attainment.

A vision of Slovenia 2050 is “to promote a society where people learn for and through life, are innovative, trust one another, enjoy a high quality of life and embrace their unique identity and culture” and here skills have a key role to achieve this vision. Higher levels of skills are associated with higher productivity, employment and earnings. The OECD has identified three areas for action in Slovenia:

- (i) Empowering active citizens with the right skills for the future: develop a portfolio of cognitive, socio-emotional and discipline-specific skills that equip them to learn throughout life, interact effectively with others, and solve complex problems. A well-informed and responsive skills system is essential for encouraging active citizenship and giving Slovenians the best chance of developing the right skills for a changing world. One such system can be also the RESPO-VI online application.
- (ii) Building a culture of lifelong learning for all actors – individuals, employers, educators, policymakers and others.

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- (iii) Working together to strengthen skills: systematic cooperation between different ministries and stakeholders to recognize the economic and social needs.

## 4.2 OECD Skills Strategy Diagnostic Report: Norway

Norway is the first country to work with the OECD on a project to put the OECD Skills Strategy into practice. The OECD has identified 12 skills challenges [27] for Norway, which have been developed through a series of interactive workshops held with a variety of stakeholders. Norway's future competitiveness will depend more on the skills of its people than on the wealth of its natural resources. For this reason, Norway is investing significantly in developing the skills of its population.

Norway's long-standing commitment to ensuring equal access to education and training is reflected in its high expenditure on education, which at 7.6% of GDP is among the highest in the OECD countries. A more efficient skills system is needed to increase Norway's competitiveness and maintain a high standard of living in the future. Young people and adults will need opportunities, motivation and enthusiasm to improve and use their skills already in the early years of schooling and throughout their lives.

Wage costs in Norway have risen steadily and real labour costs have thus increased faster than productivity. The high labour costs are partly a result of the high wages prevailing in Norway and partly to the low average working hours. The use of part-time work and the relatively low number of hours in a full-time working week contribute to maintaining a healthy work-life balance and can contribute to the high level of life satisfaction of Norwegians. Maintaining such a lifestyle requires an efficient and skilled workforce and a skills system that activates and uses all available skills.

Positive conditions in Norway are:

- relatively early recovery from the crisis
- low unemployment, low inequality and low inflation
- flexible working hours and labour market
- invests heavily in education
- skills are central to international competitiveness
- high participation rates in education, including in higher education
- support for lifelong learning
- solid education system with second chance options
- equality of access (social and geographic)
- regional distribution of education institutions
- strong economy and strong public sector
- knowledge based economy
- clear signals from industry on demand for skills
- effective government and well-functioning public sector
- flexible and rapid decision making
- clear and central responsibility for skills development allows for effective policy development
- stable economic growth
- trust between government and population

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- large public sector, including in education, means that there are opportunities to make changes
- close cooperation with social partners, business and industry

Main challenges from stakeholder point of view facing Norway skills development:

- high dropout rates from upper secondary
- low motivation among students
- lack of skills in science and technology
- generous funding increases the use of tertiary education for sorting purposes rather than for gaining useful skills
- lack of system to evaluate quality
- education policy pays little attention to future skills demands
- difficulties in recruiting adequately qualified teachers
- low unemployment levels undermine motivation for employers and employees to focus on skills development
- limited rewards for better skills of the individual
- poorly functioning immigration system for high skilled workers
- SMEs lack tradition of seeking workers with formal education
- as new forms of employment, entrepreneurship increase, traditional employee-employer relationships lose their role
- lack of coordination among regional agencies
- balance between regional coverage of higher education establishments and quality of institutions
- lack of a system to forecast skills needs and disseminate information

### 4.3 OECD Skills Strategy comparison between Slovenia and Norway

The OECD identified nine skills challenges Slovenia and Norway face in developing, activating and using skills. The nine challenges are described under each of the main pillars of the OECD Skills Strategy and are framed as outcome statements. The first six challenges refer to specific outcomes across the three pillars of developing, activating and using skills. The next three challenges refer to the “enabling” conditions that strengthen the overall skills system, by helping to boost outcomes across more than one pillar.

Table 3. Comparison of skills challenges between Slovenia and Norway as defined by the OECD

	Slovenia (2017 Report)	Norway (2014 Report)
<b>Developing relevant skills</b>	Challenge 1. Equipping young people with skills for work and life <ul style="list-style-type: none"> <li>• many recent graduates lack strong cognitive and socio-emotional skills</li> <li>• effective teaching strategies are not used widely enough</li> </ul>	Challenge 1. Building strong foundation skills for all <ul style="list-style-type: none"> <li>• relatively large share of the adult population in Norway has poor foundation skills</li> <li>• young adults are below average in literacy and are average in numeracy</li> </ul>

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	<ul style="list-style-type: none"> <li>co-operation between higher education institutions and employers is relatively weak</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>Develop high levels of skills for work and life for students</li> <li>Adapt Slovenia's higher education system so that it is more responsive to current and future labour market needs.</li> </ul>	
	<p>Challenge 2. Improving the skills of low-skilled adults</p> <ul style="list-style-type: none"> <li>almost 400 000 adults – have low levels of literacy and/or numeracy</li> <li>to achieve at least basic levels of cognitive skills</li> <li>accessible, high-quality lifelong learning opportunities</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>Encourage and motivate low-skilled adults to improve their skills</li> <li>Provide more flexible modes of learning and strengthen systems for validation of non-formal and informal learning</li> </ul>	<p>Challenge 2. Reducing drop-out</p> <ul style="list-style-type: none"> <li>the large number of students drop out of upper secondary school</li> <li>lower completion rates among students of vocational courses compared with students enrolled in more general courses</li> </ul>
		<p>Challenge 3. Informing educational choices</p> <ul style="list-style-type: none"> <li>shrinking numbers of jobs in elementary occupations and production</li> <li>better public data on current and projected labour market needs and professional career guidance services for young people in education and for adults seeking to reskill can help people make better choices</li> </ul>
<b>Activating skills supply</b>	<p>Challenge 3. Boosting employment for all age groups</p> <ul style="list-style-type: none"> <li>older, lower-educated and long-term unemployed adults, and youth need better support and incentives to work</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>Strengthen individuals' incentives to supply their skills, and employers' incentives to hire</li> </ul>	<p>Challenge 4. Enhancing labour market participation among those receiving disability benefits</p> <ul style="list-style-type: none"> <li>the highest rates of sickness absence</li> <li>10% of all working age adults receive permanent or temporary disability allowances</li> </ul>

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	<ul style="list-style-type: none"> <li>• Tackle additional barriers to labour market participation for disadvantaged groups</li> <li>• Improve employment services to enhance outcomes, especially for NEETs</li> </ul>	
	<p>Challenge 4. Attracting and retaining talent from Slovenia and abroad</p>	<p>Challenge 5. Encouraging labour market attachment among low skilled youth</p> <ul style="list-style-type: none"> <li>• those who do not complete upper secondary school are almost four times more likely to be unemployed than those who had completed tertiary education</li> </ul>
	<ul style="list-style-type: none"> <li>• help to meet skill needs and infuse new knowledge, technology and innovations into the economy</li> <li>• growing number of tertiary-educated and high-skilled Slovenians are emigrating (brain-drain)</li> <li>• Slovenia attracts a relatively small number of international students, only few courses are offered in English</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>• Adjust the tax mix to make working in Slovenia more attractive for highly skilled individuals</li> <li>• Make it easier for highly-skilled non-EU nationals to enter the Slovenian labour market</li> <li>• Expand the use of English in higher education programmes</li> </ul>	<p>Challenge 6. Ensuring Norwegians remain active longer</p> <ul style="list-style-type: none"> <li>• Almost one quarter of people over 55 years old are registered as disabled which is nearly double the OECD average</li> </ul>
<p><b>Using skills effectively</b></p>	<p>Challenge 5. Making the most of people's skills in workplaces</p> <ul style="list-style-type: none"> <li>• Slovenia's skill use performance is average, but well below top-performing countries</li> <li>• on-the-job learning is used relatively infrequently</li> <li>• larger firms in Slovenia use workers' skills and adopt High-Performance Work Practices (HPWP) less frequently than smaller firms</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>• Encourage the diffusion of HPWP in Slovenian firms</li> <li>• Monitor how Slovenia's labour market institutions and other factors affect firms' use of their employees' skills</li> </ul>	<p>Challenge 7. Engaging employers in ensuring a highly skilled workforce</p> <ul style="list-style-type: none"> <li>• 20% of Norwegian workers consider that they are over-qualified and 15% believe they are under-qualified for their current jobs</li> <li>• workers with low proficiency levels in low-skilled occupations may not benefit employer funded training</li> </ul>

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	<p>Challenge 6. Using skills for entrepreneurship and innovation</p>	<p>Challenge 8. Promoting innovation and entrepreneurship</p> <ul style="list-style-type: none"> <li>business start-up rates are among the lowest in OECD</li> <li>the level of self-employment as a share of total employment is low</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>innovative businesses and skilled entrepreneurs to run them</li> </ul>
	<ul style="list-style-type: none"> <li>relatively weak contribution of the higher education sector (R&amp;D) to innovation and market</li> <li>lack of entrepreneurial thinking and 'spirit' in the education</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>Strengthen efforts to implement the reforms to Slovenia's innovation system</li> <li>Improve opportunities, skills and attitudes towards entrepreneurship</li> </ul>	<p>Challenge 9. Enhancing the use of migrants' skills</p> <ul style="list-style-type: none"> <li>over-qualification is relatively widespread among the foreign-born population</li> <li>migrants offer a significant stock of untapped skills</li> </ul>
<b>Strengthening skills system</b>	<p>Challenge 7. Inclusive and effective governance of the skills system</p> <ul style="list-style-type: none"> <li>Ministries too often work independently of one another</li> <li>Municipalities play a relatively limited role in the policy process</li> <li>Existing mechanisms for engagement with stakeholders are not successfully motivating stakeholders to support decisions</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>Evaluate the government's performance in engaging stakeholders</li> <li>Encourage inter-ministerial coordination and collaboration</li> <li>Increase engagement of local levels in skills policy making and implementation</li> <li>Boost public sector capacity</li> </ul>	<p>Challenge 10. Facilitating a "whole-of government approach to skills"</p> <ul style="list-style-type: none"> <li>complex vertical coordination at national, district and municipal level</li> </ul>
	<p>Challenge 8. Enabling better decisions through improved skills information</p> <ul style="list-style-type: none"> <li>keeping today's skills mismatches low will become increasingly difficult due to digitalisation, technological change and globalisation</li> </ul>	<p>Challenge 11. Ensuring local flexibility and adaptability for nationally designed policies</p> <ul style="list-style-type: none"> <li>geographic diversity is reflected in the unique skills profiles and needs</li> </ul>

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	<ul style="list-style-type: none"> <li>• lack of a comprehensive skills assessment and anticipation (SAA) system</li> <li>• only limited information on current and future skills needs is readily available (no user-friendly online one-stop shop for information)</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>• Develop a more comprehensive and robust skills assessment and anticipation system</li> <li>• Disseminate information about current and future skills effectively to different users</li> </ul>	<ul style="list-style-type: none"> <li>• subnational authorities play an important role in implementing national skills policies</li> </ul>
	<p>Challenge 9. Financing and taxing skills equitably and efficiently</p> <ul style="list-style-type: none"> <li>• spends less on education per student, than the OECD average</li> <li>• vocational students in particular are disadvantaged by relatively low funding</li> <li>• individuals contribute less to their tertiary education than in three-quarters of OECD countries</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>• Ensure that vocational education at all levels receives the financial support needed to develop strong general and technical skills</li> <li>• Identify financial support that effectively encourages firms and adults to invest in skills</li> </ul>	<p>Challenge 12. Building partnerships at the local and national level to improve implementation</p> <ul style="list-style-type: none"> <li>• Employers, trade unions, education and training institutions, researchers and students should play a role in tackling Norway's skills challenges</li> </ul> <p>Recommendations:</p> <ul style="list-style-type: none"> <li>• Broad-based partnerships, which develop shared goals while mobilising the respective expertise and experience of each partner, are most likely to develop innovative approaches to addressing Norway's emerging skills challenges.</li> </ul>

#### 4.4 OECD Skills Profiling Tool

Everyone has different skills that enable them to do different types of work. Therefore, the OECD has developed a tool that assesses skill sets to help individuals and careers advisers to identify a person's strengths and suggests some occupations that use these skills to help them decide on their next career path [28]. To identify the skills profile, the tool needs information on the hard skills of the individual (technical knowledge and training) and on the soft skills (personal habits and characteristics). The tool obtains information on hard skills from the given level of education, the occupation with which the individual most closely identifies and the frequency with which the individual performs certain activities. To assess soft skills, the individual takes personality tests. These tests focus on the main soft skills that are most frequently referred to in the workplace:

- customer and personal service,
- time management and self-management skills,
- motivation and commitment, and
- creative thinking.

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## 5. World Economic Forum

### 5.1 The Future of Jobs Report 2020

The Future of Jobs report [29], published by the WEF, presents the jobs and skills of the future, with a focus on monitoring the pace of change. It aims to highlight:

- the challenges posed by the COVID-19 pandemic in 2020 and the history of economic cycles, as well as
- the expected outlook for technology adaptation, jobs and skills in the coming years.

In Figure 2, we summarize the key findings of the WEF report.



Figure 2. Key findings of the Future of Jobs Report from 2020.

The crisis in recent years has forced companies to:

- increase remote working,
- accelerating the adoption of digitalisation, and
- accelerating the introduction of automation.

All these decisions are changing the skills that jobs will need in the coming years. Machines will continue to replace human labour, but more machines need operators with the right skills, so re-skilling the existing workforce in current jobs is unavoidable. New jobs will demand specialised profiles in the following fields:

- Data analysis

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- AI and machine learning
- Big data
- Digital marketing and strategy
- Process automation
- Business development
- Digital transformation
- Information security
- Software and applications development
- Internet of Things

The report also provides in-depth information for 15 industrial sectors and 26 countries, but Norway and Slovenia are not included among them. We looked in more detail at the Education sector in general. Below is a list of skills that are expected to become increasingly important in education in the coming years:

- Creativity, originality and initiative
- Active learning and learning strategies
- Technology design and programming
- Emotional intelligence
- Critical thinking and analysis
- Complex problem-solving
- Analytical thinking and innovation
- Reasoning, problem-solving and ideation
- Service orientation
- Resilience, stress tolerance and flexibility
- Leadership and social influence
- Systems analysis and evaluation
- Persuasion and negotiation
- Technology use, monitoring and control
- Instruction, mentoring and teaching

In the education sector, there are also some technologies, which are expected to be adopted in the next years. In Figure 3 we present on the left side these emerging technologies, and on the right side, the most common barriers education institutions face when adopting such new technologies in the education process.

Education-related institutions have also identified the top 5 measures that will change working strategies due to the COVID-19 crisis:

- Accelerate the digitalization of work processes (e.g. use of digital tools, video conferencing)
- Provide more opportunities to work remotely
- Accelerate the digitalization of upskilling/ reskilling (e.g. education technology providers)
- Accelerate automation of tasks
- Accelerate ongoing organizational transformations (e.g. restructuring)

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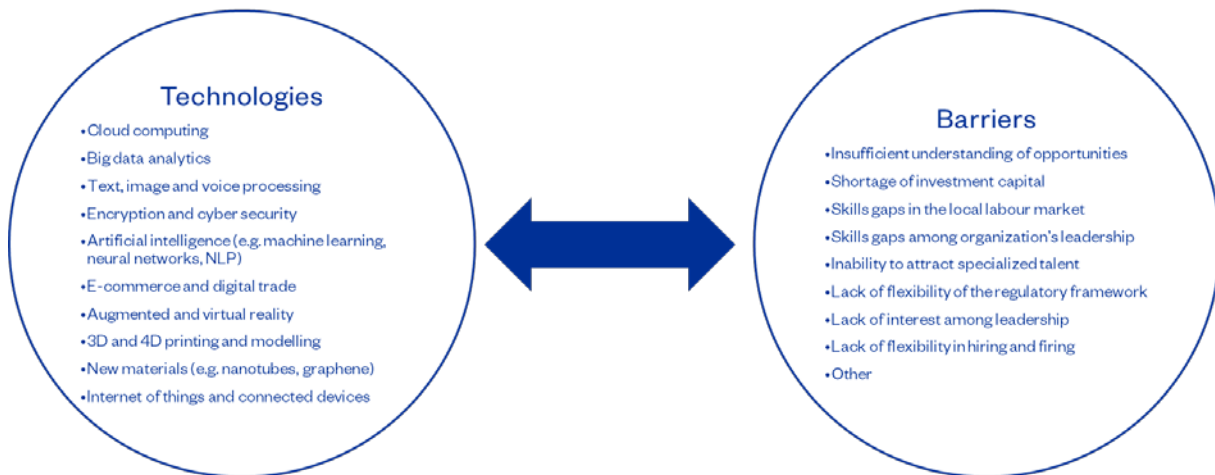


Figure 3. Emerging technologies and barriers to adopt them in education sectors

## 5.2 Forum's Reskilling Revolution platform

Forum's Reskilling Revolution platform (<https://www.reskillingrevolution2030.org/>) was launched in January 2020 and since then it was used by more than 100 million people. The platform prepares the world's workforce to acquire the skills needed for their future careers, as technologies such as artificial intelligence enable increasing automation. More than 350 organisations have endorsed the initiative, including Adecco, Coursera, the Education Commission, the French Government, LinkedIn, UNICEF, etc.

Technological change, the COVID-19 pandemic and the green transition show large skill and education gaps, which must be closed. Therefore, urgent investment in human capital for reskilling and upskilling around the world is crucial to update current teaching and learning programmes and to avoid skills mismatch in the future. The next decade is expected to play a key role in determining the future forms of work and education in the 21st century.

The platform started with several initiatives and actions. For the RESPO-VI project we focused on the following:

### Education 4.0 Initiative

There is an urgent need to update education systems to equip children and students with the right skills to navigate the future of work and the future of societies. The Education 4.0 framework includes both the technical and human-centric skills needed to shift learning experiences more closely to the future of work. The initiative is more directed to primary and secondary school systems, which have a critical role in preparing citizens and the workforce of the future that should be more inclusive, cohesive and productive. First, a system-level change is necessary to connect education ministries, educators and private sector leaders to start collaborating and think about the creation of holistic education systems. Secondly, connection across schools and school systems is a key to preparing the teaching workforce to acquire and use the skills of the future on the path to the transition to Education 4.0.

High-quality learning in "Education 4.0" is characterized by eight critical points as depicted in Figure 4.

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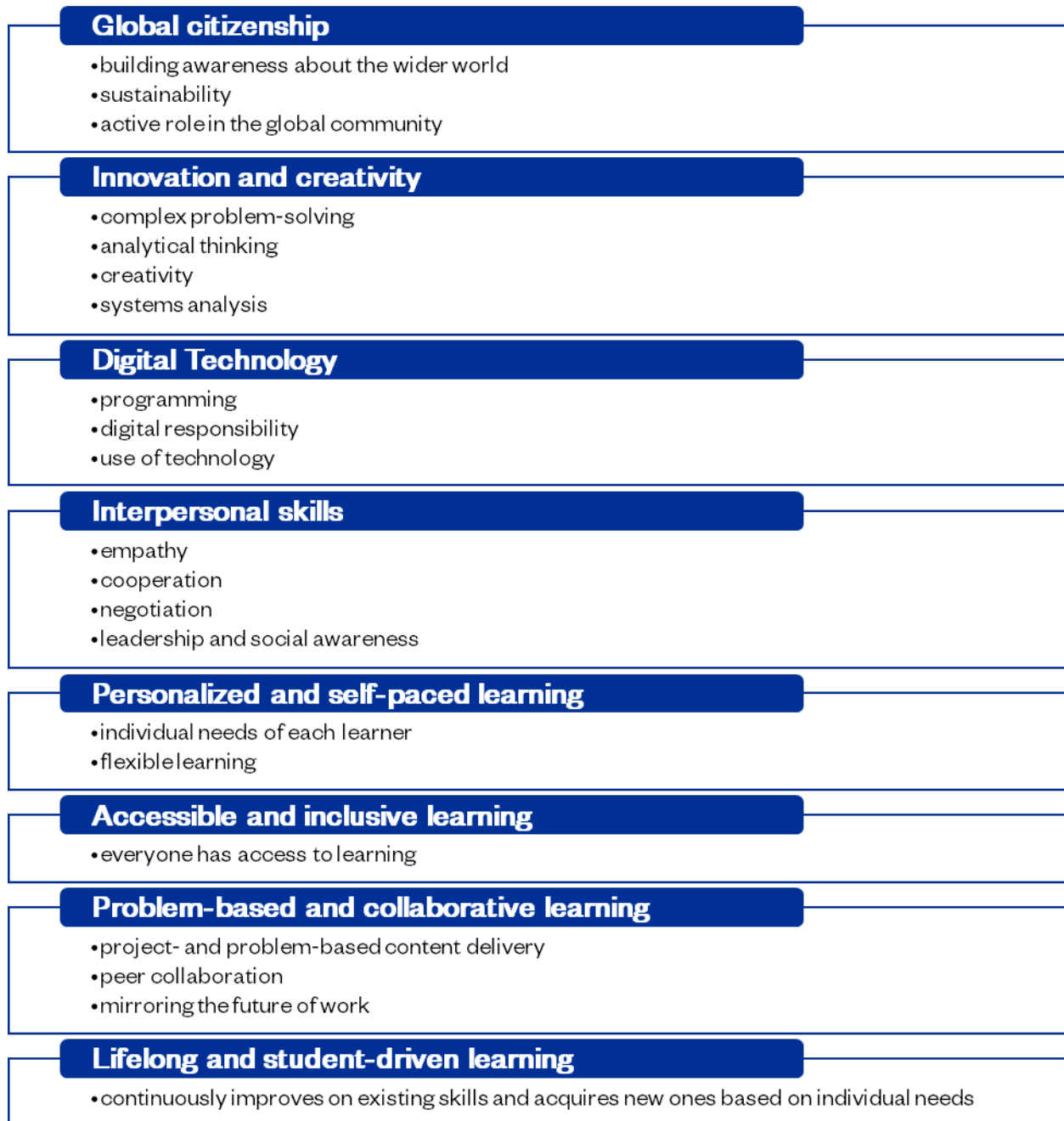


Figure 4. Eight characteristics for Education 4.0

### Global Skills Taxonomy

Many training providers and employers now use their own definitions and standards for skills, which creates further difficulties in matching workers with learning opportunities and, conversely, jobseekers with job competences. The WEF has proposed a framework for a global skills taxonomy [30] as a first step towards a skills-based labour market. The proposed taxonomy builds on the work done by ESCO (European Skills, Competences and Occupations) and the

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Occupational Information Network (O\*NET) framework by incorporating additional emerging skills, particularly in relation to future work trends. It aims to use a matrix approach that brings together skills and occupations. This taxonomy focuses on skills that are known to be increasingly important in a rapidly changing labour market and aims to serve as a "universal adapter" for existing taxonomies in the field of education supply and demand by allowing users to compare their taxonomy against this framework. This proposed global skills taxonomy consists of:

- Definitions: a set of definitions and differentiations of commonly used terms
- Categorizations: a categorization of skills clusters and groupings at various levels of granularity
- Recommendations: mechanisms for adoption in assessment, hiring, learning and redeployment practices
- Use Cases: examples of how the taxonomy has already been leveraged to lead the Reskilling Revolution

They define competences as a collection of skills, knowledge, attitudes and abilities that enable an individual to perform job roles. Categorising or grouping skills at different levels increases the efficiency and reach of the taxonomy by allowing employers and education providers to benchmark their own taxonomies against a global framework. Granularity increases with each level, with levels 1-3 remaining as core levels that remain unchanged. Level 4 provides opportunities to add skills as the scope of skills is constantly changing. Level 5 is defined by the end user (i.e. employers, education providers, policy makers). Users can essentially 'plug in' their own taxonomy at level 5.

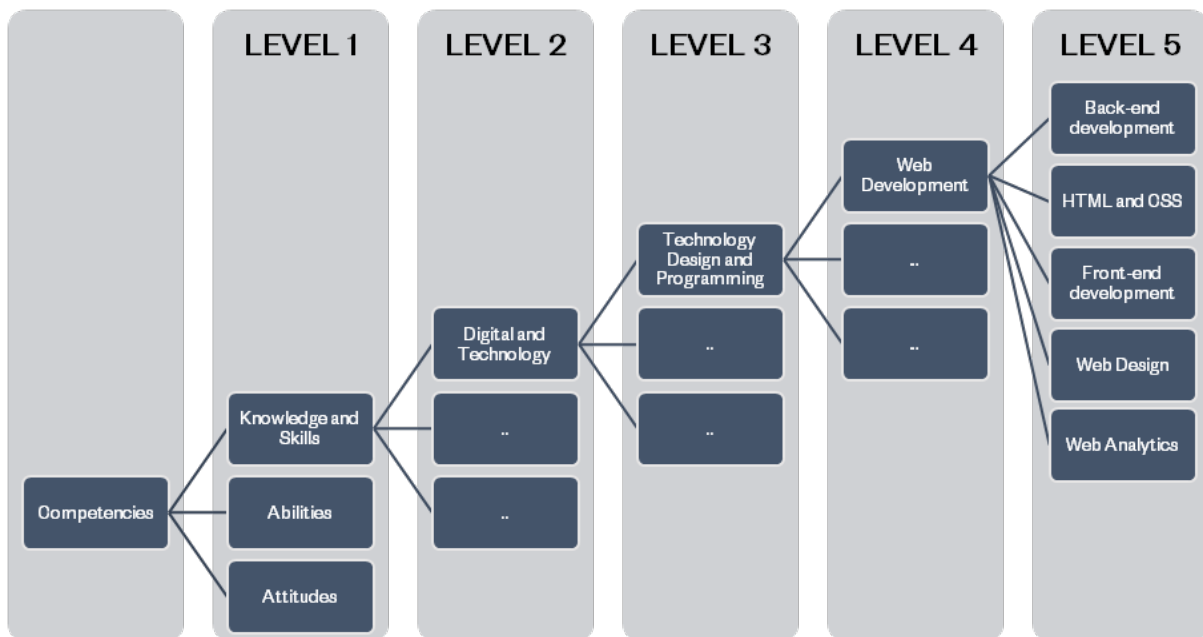


Figure 5. Global Skills Taxonomy: Example on required skills for online application development such as RESPO-VI

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### 5.3 Top 10 work skills

The above described taxonomy can be also applied to provide forecasts for emerging skills at global and national scales as well as sectoral levels. These skills forecasts can inform decision-making around reskilling, upskilling and redeployment. The taxonomy may also be leveraged to understand how skills are changing within specific workplaces. According to WEF reports, the top 10 work skills will change over the next decade. Workers and jobseekers will have to be more analytical, critical, systematic, innovative, and creative. They will need to become active lifelong learners, who will be able to handle stress and be ready to adapt to rapid changes.

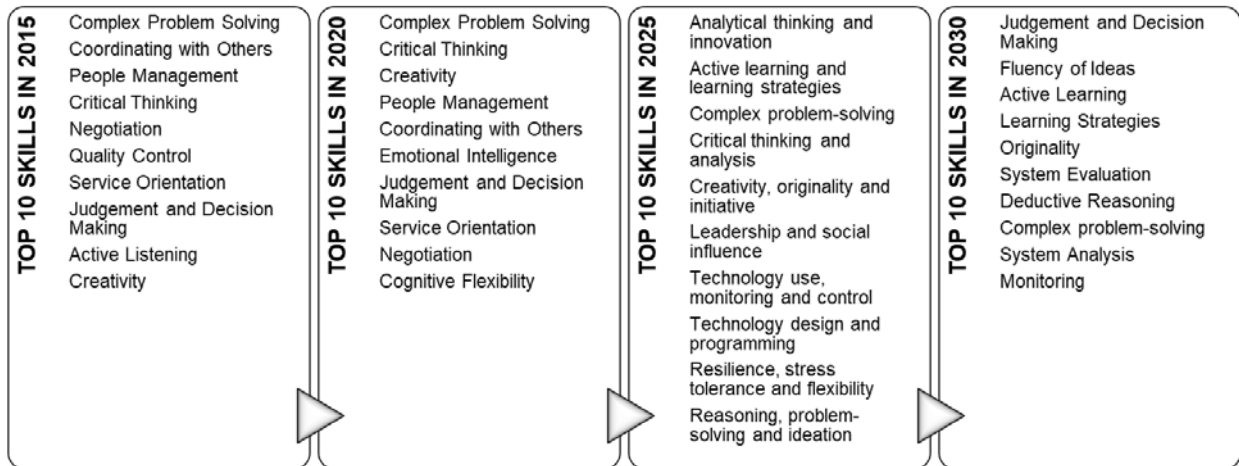


Figure 6. Changing the top 10 skills between 2015 and 2030

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## 6. Key competences for 21st-century for students

### 6.1 Different but similar conceptions of key competences in education

KeyCoNet (<http://keyconet.eun.org/>) is a growing network of more than 100 organisations funded by the European Commission under the Lifelong Learning Programme to improve the delivery of key competences in school education. The network uses the European framework on Key Competences for Lifelong Learning as a reference point, which includes the following 8 key competences:

- Communication in the mother tongue
- Communication in foreign languages
- Mathematical competence and basic competences in science and technology (STEM)
- Digital competence
- Learning to learn
- Social and civic competences
- Sense of initiative and entrepreneurship
- Cultural awareness and expression

These key competences are all interdependent, and the emphasis in each case is on 7 transversal skills:

- critical thinking,
- creativity,
- initiative,
- problem-solving,
- risk assessment,
- decision taking and
- constructive management of feelings.

The European Council has repeatedly stressed the key role of education and training for the EU's future growth, long-term competitiveness and social cohesion. To achieve this, it is crucial to strengthen the education element of the knowledge triangle "research-innovation-education", starting at an early age - in schools. The competences and learning habits acquired at school are essential for developing new skills for new jobs later in life. The EU has identified the main challenges facing education systems, which can best be improved by working together in three areas:

- focus on competences
- high quality learning for every learner
- teachers and school staff.

A more flexible learning environment is required to help students develop different competences while maintaining basic knowledge. Suggested approaches included new pedagogical methods, cross-curricular approaches to complement and involve learners more in the design of their own curricula. **Literacy** and **numeracy** are essential components of key competences, as they are fundamental for further learning. Numeracy, **mathematical and digital competences** and an

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**understanding of science** are also key to full participation and inclusion in the knowledge society and the competitiveness of modern economies.

Today's jobseekers need to be able to work collaboratively, communicate and solve problems - skills that are developed primarily through social and emotional learning. Combined with traditional skills, these social and emotional skills will equip learners to succeed in the evolving digital economy. WEF listed the following 21<sup>st</sup>-century skills for students according to three categories:

- foundational literacies: literacy, numeracy, scientific literacy, ICT literacy, financial literacy, cultural and civic literacy;
- competences: critical thinking and problem-solving, creativity, communication, collaboration;
- character qualities: curiosity, initiative, persistence and grit, adaptability, leadership, social and cultural awareness.

## 6.2 STEM competences

The current era is characterised by a growing need for a new set of skills, often referred to as generic or 21<sup>st</sup>-century skills. These include also STEM skills, which remain a challenge for undergraduates in science, technology, engineering and mathematics, as STEM graduates are sometimes underprepared for what today's professions require. The level of academic achievement of students rarely matches their relevant levels of 21<sup>st</sup>-century skills and the demands of employers.

There are several studies and research that set the framework for STEM competences in the 21<sup>st</sup> century. Many of them also address teaching and learning methods that will need to be transformed in the future to achieve a level of STEM competences in students that will meet the competence demands of employers and workplaces of the future. Lavi et al. [31] applied the following competence framework for STEM students for their analysis:

- Domain-general skills: complex problem-solving, critical thinking, individual learning, and question-posing.
- Soft skills: creativity, entrepreneurship, collaboration, oral communication, and written communication.
- STEM-specific skills: engineering design, experimenting and testing, STEM knowledge application, and systems thinking.

The United Nations' 2030 Agenda for Sustainable Development, entitled "Transforming our World", established 17 Sustainable Development Goals (SDGs) to tackle global issues such as poverty, climate change, food shortage, the protection of the planet; and to ensure that all individuals enjoy peace, prosperity and quality of life for all. STEM education plays a crucial role in achieving these goals.

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Figure 7. The seventeen Sustainable Development Goals (SDGs), source:

<https://www.un.org/sustainabledevelopment/blog/2015/12/sustainable-development-goals-kick-off-with-start-of-new-year/>

“The core feature of STEM is the use of science, mathematical, technical, engineering knowledge to solve daily or societal problems, making the learning of science, technology, engineering and mathematics more meaningful and contextual.”

Bybee, 2013

However, there are different conceptions of what STEM means in practice, depending mainly on the perspective from which it is viewed in the education system. In general, STEM competences [32] cover both the ‘know-what’ (the knowledge, attitudes and values associated with the disciplines) and the ‘know-how’ (the skills to apply that knowledge, taking account of ethical attitudes and values in order to act appropriately and effectively in a given context).

STEM knowledge includes epistemological knowledge, procedural knowledge and technical knowledge associated with each contributory STEM discipline and how associated ideas, concepts, principles and theories overlap and interrelate. Procedural knowledge provides the foundation for the acquisition, application and practice of STEM skills such as measuring data, ascertaining its’ precision, validity and reliability, as well as selecting and displaying it. Technical knowledge is related to the application of knowledge, skills, attitudes and values to a specific field, career or task, such as civil engineering [32]. The UNESCO framework for STEM competences is summarized in Figure 8.

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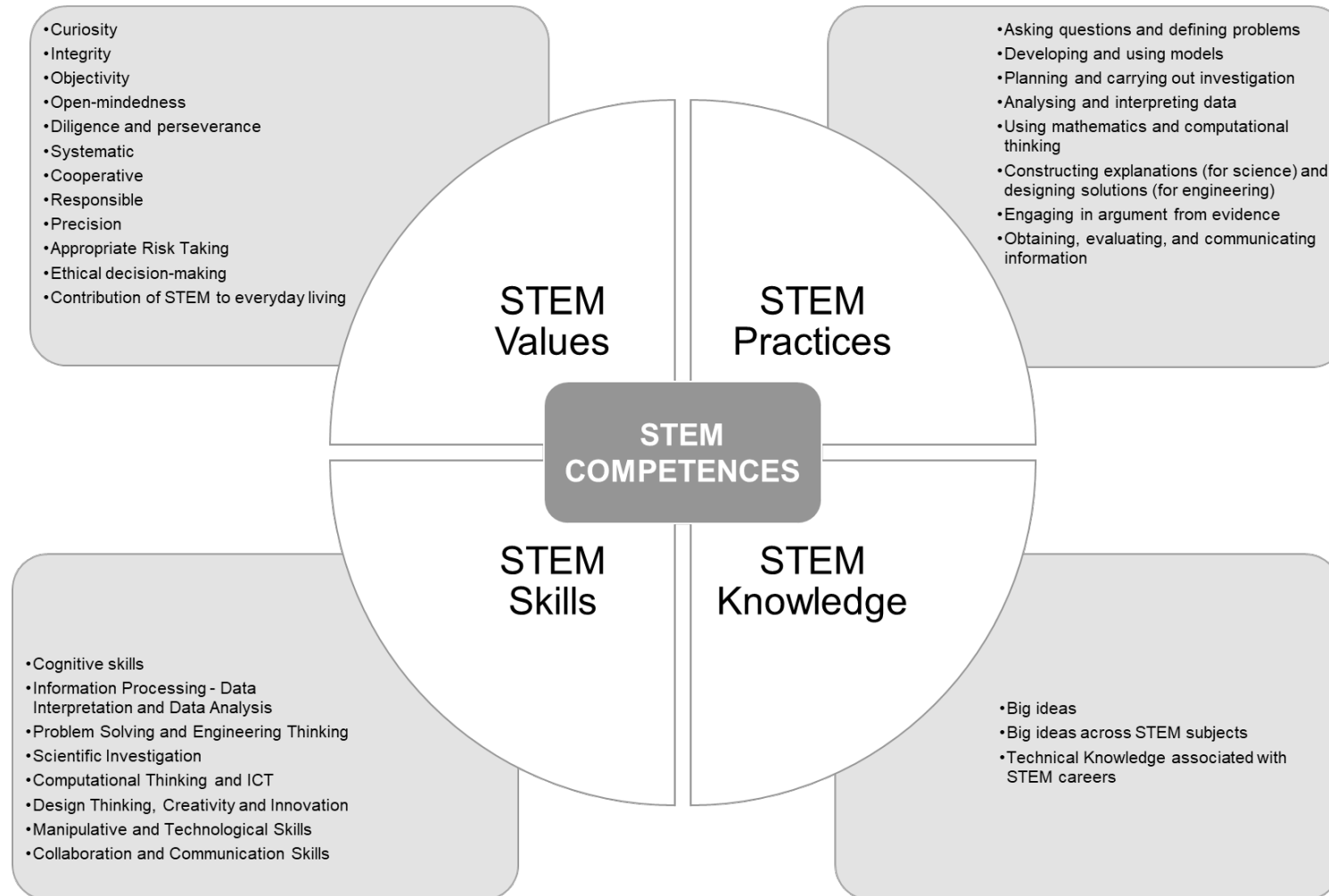


Figure 8. UNESCO framework for STEM competences

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The EU STEM Coalition (<https://www.stemcoalition.eu/>) is a pan-European network working to improve STEM (science, technology, engineering, maths) education in Europe. Their aim is to shape STEM education policies and practices that promote economic growth, opportunity and prosperity for all. They provide a unique forum and knowledge hub for data and analysis, exchange of best practices and direct support, from reducing the skills shortage in STEM to fostering new ways of collaboration between educational institutions, businesses and governments. They stress that we need to ensure that STEM subjects in higher education provide students with a wide range of competences, including important cross-cutting skills such as creativity, flexibility and an entrepreneurial mindset.

ATS STEM Conceptual Framework [33] determined the following eight core STEM competences, which are basically categories into which the 243 specific STEM skills were grouped, arriving at their conclusions from an analysis of the literature:

- Problem-solving
- Innovation and creativity
- Communication
- Critical-thinking
- Meta-cognitive skills
- Collaboration
- Self-regulation
- Disciplinary competences

Adams (<https://www.weareteachers.com/important-stem-skills-teaching-kids/>) listed the following 7 most important STEM skills we should be teaching our students and kids:

- Statistics
- Problem-Solving
- Creativity
- Argumentation
- Intellectual Curiosity
- Data-Driven Decision-Making
- Flexibility

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## 7. Conclusions

The European Union's policies and guidelines highlight skills as key to sustainable competitiveness, resilience and social inclusion. This is also the key of the European Skills Agenda, which focuses on investing in lifelong learning (up-skilling and re-skilling) to sustain recovery from the coronavirus pandemic and to meet the challenges of a digitalising world and a greening economy. As these changes are already underway and accelerating, Europeans will need to acquire new skill sets or improve their existing skills to better adapt to the rapid changes ahead and to be successful and satisfied in the future labour market.

Knowledge and skills have become key factors for individual well-being and economic success in the 21st century. Without investing in people's knowledge and skills, we cannot expect a high quality of life in society, technological progress and economic competitiveness and innovation. Countries need to focus on creating the right mix of skills and ensuring that these skills are fully exploited in the labour market.

In the next step, we will compare the competences highlighted by the different strategies and guidelines (EU, OECD, WEF, UNESCO, National authorities, etc.) with those identified as important by the companies through the questionnaires. The comparative analysis will lead to key competences that will be also compared with the competences and learning outcomes of the selected study programmes of the participating HEIs and the competences identified in the KOC-TOP competency model for the factories of the future.

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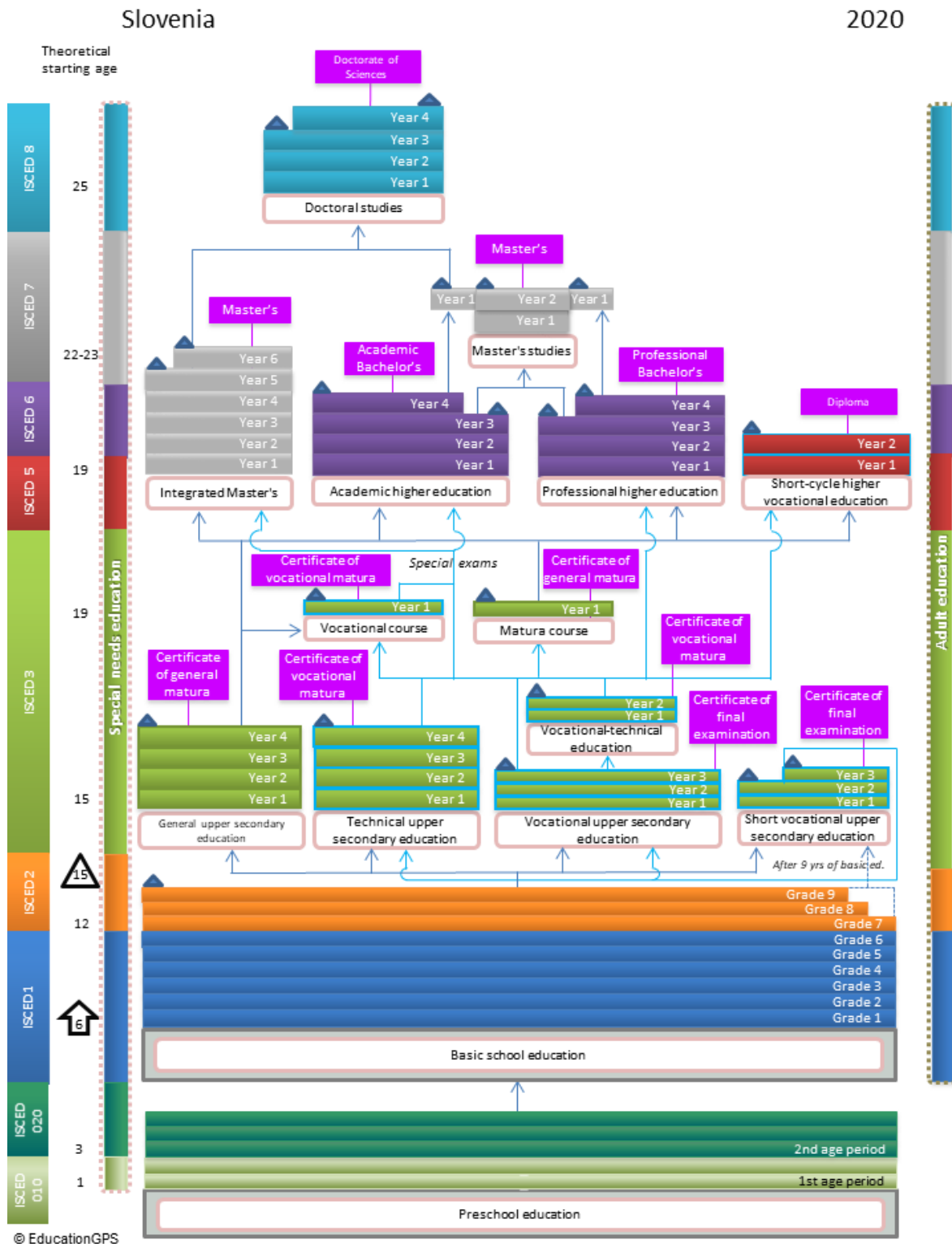
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# Diagram of the education system in Slovenia



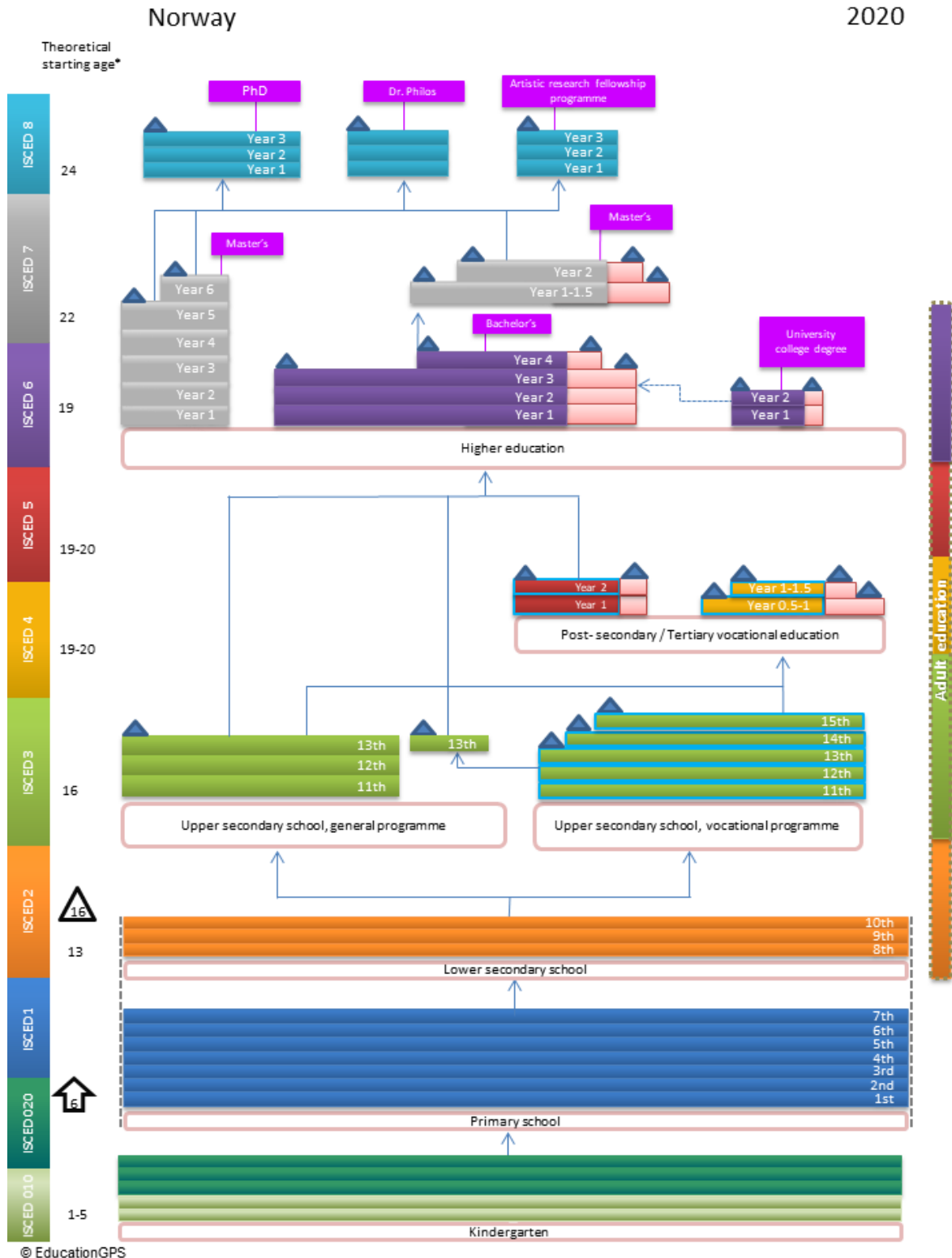
Source: <https://gpseducation.oecd.org/CountryProfile?primaryCountry=SVN>

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# Diagram of the education system in Norway



Source: <https://gpseducation.oecd.org/CountryProfile?primaryCountry=NOR>

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