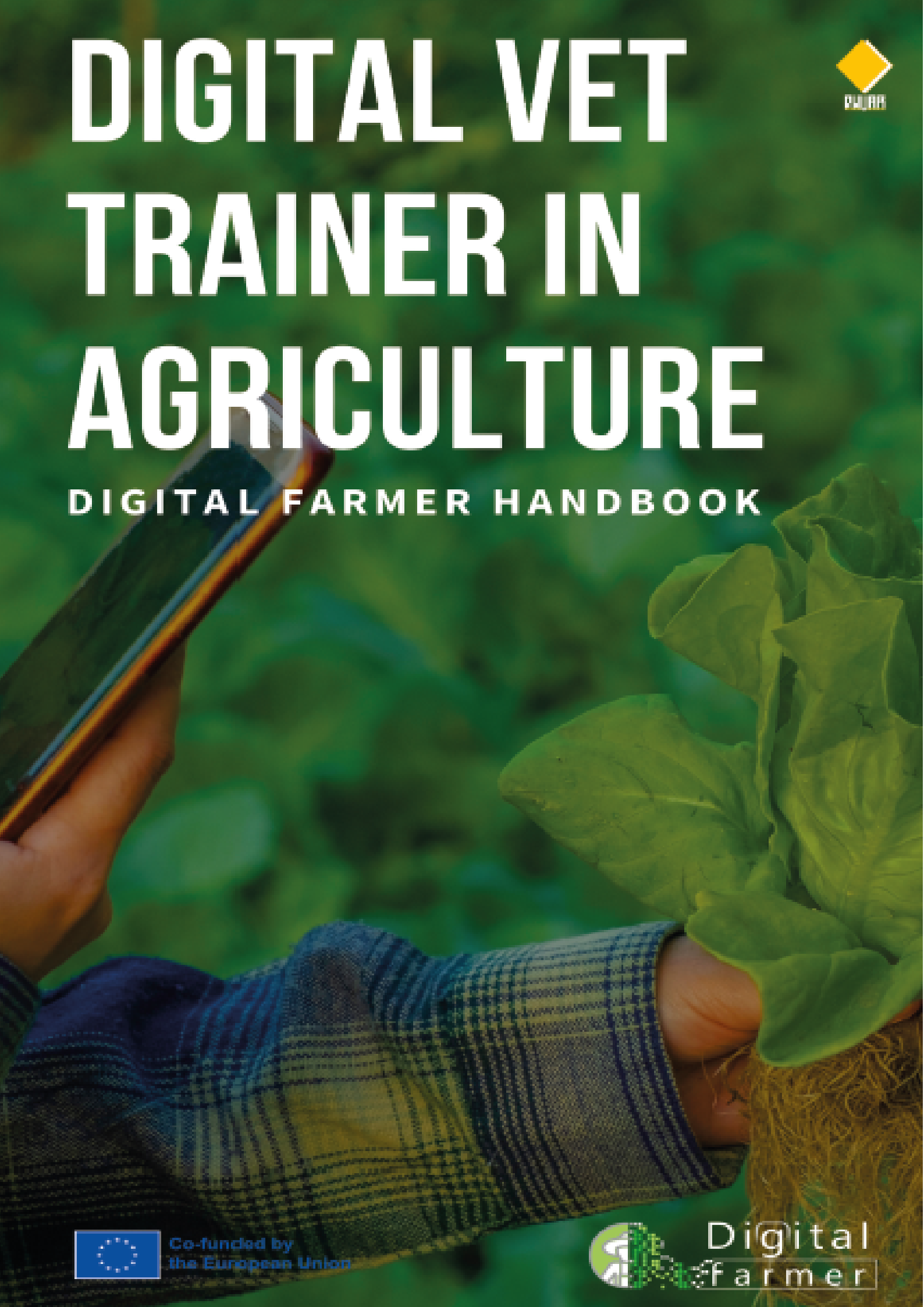
DIGITAL VET TRAINER IN AGRICULTURE

DIGITAL FARMER HANDBOOK



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Digital farmer

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*** Responsibilities for the contents of the published chapters belong to the authors.

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FOREWORD

Welcome to "Digital VET Trainer in agriculture" a manual designed to guide and inspire teachers who wish to integrate digital technologies into their daily teaching approach. This resource has been created with the goal of providing educators, trainers, and facilitators with a comprehensive tool to enhance digital skills, focusing particularly on the agricultural sector.

In the digital era we live in, the effective integration of technology in education has become essential. This manual aims to support teachers in addressing challenges and seizing opportunities offered by digital technology, following the guidelines of the European Framework for the Digital Competence of Educators.

Moreover, it will be a valid tool for the entire educational community, from policy-makers who will have a tool to outline guidelines and recommendations regarding distance learning, up to the learners who will be the final beneficiaries of the capacity building actions.

Main contents of the manual:

- Introduction: An in-depth analysis of the current digital context in education, with references to challenges and opportunities.
- Module 1 - Professional Engagement: it provides and overviewes on how to use digital tools to manage classrooms administratively, communicatively and for continuous professional development.
- Module 2 - Digital Resources: it explains how to use digital tools to make lessons, search and share learning content.
- Module 3 - Teaching and Learning: it discusses how digital tools can be useful for teaching in general, for stimulating student collaboration and self-education.
- Module 4 - Assessment: it indicates what digital tools a trainer can use to assess students' skills and knowledge, but also the quality of his or her teaching.
- Module 5 - Empowering Learners: it explains types of advertising and marketing platforms in agriculture and E-Commerce Software in agriculture.
- Module 6 - Facilitating Learners' Digital Competence: it investigates how to make use of digital tools to initiate teaching processes based on the needs of the individual student, i.e. it provides guidance on the personalization and individualization of the learning process.

What makes this manual unique:

- Based on the European Framework: This manual is grounded in the principles of the European Framework for Digital Competence of Educators, ensuring a standardized and recognized approach at the European level.
- Autonomy in Learning: Educators will have the opportunity to independently enhance their skills, adapting the training path to their specific needs.

- Comparative Analysis: A comprehensive view of practices and methodologies used in various European countries, providing a rich and diverse perspective for innovation in the agricultural field.
- Transferability: The high transferability potential of this manual means that acquired skills can be easily applied in different contexts, promoting the spread of innovation at the European level.

We hope this manual proves to be an opportunity for growth and innovation for European educators in the VET sector in agriculture. Thank you for investing in your professional development and the growth of the European educational community.

CHAPTER 1

Introduction

CHAPTER 1 Introduction

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Dear readers,

in front of you, there is the Manual "***Digital VET Trainer in Agriculture***" which has been developed within the scope of the European project "***Digital Farmer" (2021-1-IT01-KA220-VET-000033225)*** that aims to develop international multi-stakeholder cooperation between educational institutions, research centres, universities, industrial consultancy and regional promotion companies to improve vocational training in agriculture. This Manual is the first "Digital Farmer" project output and a composing part of the Digital Farmer project Toolkit, which encompasses also other 3 key project's outputs:

- *the Manual "Digital Traineeship in Agriculture",*
- *MOOC on 'Digital VET Trainer in Agriculture' and*
- *the Network of Digital Farmers.*

This Manual is the first "Digital Farmer" project output, and it will be available in both, printable and digital versions.

1.1 Manual purpose and targets

"Digital VET Trainer in Agriculture" was created on the basis of the DigCompEdu, a European framework that brings together the fundamental digital competences that European citizens should possess. The Manual follows the principles set out in the aforementioned document and applies them to the training sector; in fact, it is directly aimed at educators, trainers and VET providers willing to update their teaching skills in the digital environment, also indirectly benefiting the students and the learning processes. In this manual, you will find an overview of educational innovations in the digital sphere: the tools you can use to realise online or on-site lessons in an interactive manner are illustrated, guidance and materials are provided and new inspiration are drawn.

The innovation of this output stems from the fact that essentially there is the lack of manuals of this kind that would base on the European Framework for Digital Competence of Educator for European educators, trainers and facilitators working in the field of VET in agriculture. There is no Manual like ours through which the European educators, trainers and facilitators working in the field of VET in agriculture would be able to independently enhance their own competencies and be able to disseminate good practices and methodologies available through a comparative analysis of a large part of the European landscape.

1.2. The approach of the manual

The manual is designed to facilitate your learning process according to the microcredentials approach: this means that each chapter will be a concrete learning module providing you with theoretical information, practical suggestions and competences for an immediate realization of digital lessons for each area of interest. Each chapter takes inspiration for its content from the DigiEduComp, which serves, therefore, as an overarching framework and stands as a true file rouge throughout the manual. While the chapters are interconnected by DigiEduComp's educational purposes, they can be read easily by you and you can switch from one module to another as needed. Consequently, you can follow the entire pathway or you can

mix the modules in order to acquire the competences that you consider most important to you or in which you feel you are lacking.

In the printed version, the chapters and their paragraphs will be clearly marked in the table of contents; whereas in the digital version, simply click on the module of interest and you will be immediately directed to it.

1.3 Manual structure

In order to achieve this goal, the manual is characterised by an introduction, six teaching modules and a conclusion. Specifically, the chapters, their content and advantages are:

	MODULE	DESCRIPTION	DEVELOPABLE SKILLS and KNOWLEDGE
2	**Professional Engagement**	It provides and overview on how to use digital tools to manage classrooms administratively, communicatively and for continuous professional development.	• collaborative development of communication techniques with students and families; • using digital technologies to collaborate with peers (teachers, trainers); • initiating critical reflection on digital tools; • learning to use digital tools to grow professionally.
3	**Digital Resources**	The module explains how to use digital tools to make lessons, search and share learning content.	• identifying, evaluating and selecting digital resources useful for teaching; • creating educational content using digital tools; • learning how to share digital content with students and colleagues, keeping in mind the necessary licences.
4	**Teaching and Learning**	This section discusses how digital tools can be useful for teaching in general, for stimulating student collaboration and self-education.	• integrating digital tools into teaching practices; • using digital tools and services to improve teacher/trainer interactions with students; • using digital technologies to foster and optimise student collaboration; • help students to rework their learning through digital tools.
5	**Assessment**	The module indicates what digital tools a trainer can use to assess students' skills and knowledge, but also the quality of his or her teaching.	• using digital technologies for evaluation; • using digital data to analyse real student learning outcomes and to understand how to improve your teaching content or the tools used; • use digital tools to give immediate feedback to students and their families.

6	**Empowering Learners**	The chapter explains types of advertising and marketing platforms in agriculture and E-Commerce Software in agriculture.	• knowledge of the practical application of marketing and advertising platforms in agriculture • knowledge about advantages and disadvantages of digital/e-commerce platforms • knowledge about trends of marketing and advertising platforms in agriculture • ability to collect, manage, process and use various data
7	**Facilitating Learners' Digital Competence**	The chapter investigates how to make use of digital tools to initiate teaching processes based on the needs of the individual student, i.e. it provides guidance on the personalization and individualization of the learning process.	• use digital tools that address all students, taking into account their specific needs; • use digital tools to include students with difficulties in the classroom, stimulating their active participation. •
8	**Digital traineeships methodologies**	In this section, inputs are provided to enable trainers to develop the digital literacy of their students and how to educate them in the critical use of digital media for leading sustainable lives from a personal and social point of view as well, not only for educational purposes.	• involve students in the use of digital tools so that they use them to study, produce content, collaborate and communicate with peers; • increasing students' capacity for critical and responsible use of digital media.
9	**Conclusion**	This section is a summary of all sections.	• explains digital education • define tools used in digital education • list the advantages of digital education.

Table 1.1. Manual structure and description

The "Professional Engagement" and " Facilitating Learners' Digital Competence" modules are slightly different from the others: the first one is transversal and includes an overview of the different countries context related to the project and digitalisation of educational systems; the second one is directly linked to the second manual of Digital Farmer, "Digital Traineeship in Agriculture": it introduces the concept on how a trainer should engage students through innovative methods (for example, gamification).

Each chapter includes a theoretical introduction of the topic covered (European policies and recommendations, pedagogical principles underlying the importance of the topic, fields of application...), some capacity-building methodologies and tools to improve teaching effectiveness in the relevant field of application (self-learning materials, teaching and assessment platforms, references to deepen knowledge…). In addition, following the DigCompEdu, the modules also provide a generic description of how a given competence manifests itself at different levels of mastery. Namely:

- A1 Novice;
- A2 Explorer;
- B1 Experimenter;
- B2 Expert;
- C1 Leader;
- C2 Pioneer.

The progression is mainly cumulative, as each higher level includes all aspects described in the lower levels. In this way, you can understand your previous level of competence and better target your training and how to use this manual according to what you want to achieve.

We hope you will find this Manual useful!

1.4 Compliance with eu policies and recommendations

1.4.1 European Strategies

Over the past few years, the implementation and discussion of the digital transition in education and training fields have been a significant topic in Europe. With the rise of technology and its impact on various industries, incorporating digital tools and strategies into the education and training sectors has become increasingly important to prepare individuals for the demands of the modern workforce.

Europe has seen a notable increase in the adoption of digital technologies and online learning platforms, driven by the need to address several challenges faced by the education and training sectors. These challenges include access to education, the need for flexibility in learning, and the demand for new skills.

One of the primary advantages of digital education and training is the ability to reach a broader audience. Online learning platforms provide an opportunity for individuals who may not have access to traditional education to gain new skills and knowledge. This has been especially pertinent during the COVID-19 pandemic, where many educational institutions have had to shift to online learning to ensure the continuity of education. Another advantage of the digital transition is the ability to customize learning experiences. Online platforms can track learners' progress and provide personalized feedback and recommendations based on their learning styles and preferences, leading to more efficient and effective learning experiences.

The Manual "Digital VET Trainer in Agriculture" reflects a strong dedication in pursuing EU policies and recommendations, such as:

- the **Common Agricultural Policy (2023 – 2027)** where it takes into account and addresses specific objectives:
  - SO 2 - to increase competitiveness: enhance market orientation and increase of farm competitiveness focusing on research, technology and digitalisation;
  - SO 7 – to support generational renewal: facilitation of sustainable business development in rural areas;
  - SO 10 – fostering knowledge and innovation: modernisation of agriculture and rural area; uptake of knowledge, innovation and digitalisation by farmers through improved access to research, innovation, knowledge exchange and training.
- the outlined renewed vision for the **European Education Area**, the **Resolution on a Strategic Framework for European Cooperation in Education and Training for the period 2021-2030** – where the Manual addresses especially the Strategic Priority 3: Enhancing competences and motivation in the education profession (professional learning opportunities and support throughout career; well-being of teachers, trainers and educational staff in education and training systems; education and training leadership; development of competences and motivation of teachers, trainers and educational staff; operation of education and training institutions as learning organisations; networking, knowledge sharing and mobility among institutions providing learning opportunities for teachers and trainers, sharing of best practices and innovative pedagogies, allowing for mutual learning at a European scale).
- the **European Recommendation on Key Competences for Lifelong Learning - a European Reference Framework**, which sets out 8 key competences all considered equally important; each of them contributing to a successful life in society. The Manual addresses specifically key competence "Digital Competence", which includes information and data literacy, communication and collabo- ration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking.
- the **European Framework for digital education - Digital Education Action Plan (2021 – 2027) - Resetting education and training for the digital age** (achieving the goals of the European Skills Agenda - Action 4 -, the European Social Pillar Action Plan and the '2030 Digital Compass: the European way for the Digital Decade') the Manual addresses 2 strategic priorities (SP): SP 1 - To foster a high-performing digital education ecosystem and SP 2 - To enhance digital skills and competences for the digital age.
- the **European Framework for digital education - European Digital Competence Frameworks / Digital Competence Framework for Educators (DigCompEdu) -** A true file rogue of the Manual. It has been used as a template allowing the preparation of a concise and concrete tool, the Manual "Digital VET Trainer in Agriculture". Following this the Manual captures and describes educator-specific digital competences in 6 areas: Professional

Engagement, Digital Resources, Teaching and Learning, Assessment, Empowering Learners, Facilitating Learners.

- **Key Policy Recommendations for Strengthening Teaching and Leadership in Vocational Education and Training** (VET) – The Manual considers dimensions on: VET teacher supply, innovative pedagogy, VET teacher training and strengthened leadership.

1.4.2. National adaptations

European countries have adapted their training systems to fit within European policies and international trends in various ways, including the development of digital skills and the promotion of digital education. These adaptations have helped to update the training systems and to provide individuals with more opportunities to develop their skills and knowledge throughout their lives. Following some practical examples in the European countries involved in Digital Farmer:

Italy: in view of the digital transition, the Italian government has put in place a number of measures to support this transformation. In particular, it drew up the "DDI – Didattica Digitale Integrata" (Integrated Digital Education plan). It invites each school to design its plan and promotes the implementation of so-called 'Future Labs': each educational entity can run training courses, for a maximum of 25 hours, for teachers to improve their digital skills and expand their methodological knowledge.

Spain: in Spain, there has been an important enactment of legislation that would specifically regulate individual areas specified in the European framework of digital competences for educators (DigCompEdu), as well as those which develop european policies of digital transition.

The main pillar of the National Policy Framework is the Strategy "España Digital 2026", which constitutes the roadmap for all the policies within the digital framework. It translates all the objectives of the "European Digital Decade" to the national level and it comprises the principles and the main objectives that should be accomplished. España Digital 2026 is divided into eight specific plans and fifty programs and it organises funds and financial assignments.

In a second level, there is the Retech Initiative, which concretes the programs and policies within the regional and local levels and materialises the objectives of España Digital 2026. Thirdly, there are other supportive strategies like the Plan for the connectivity and digital infrastructure, the National Plan for Digital Skills, the National Strategy for Artificial Intelligence and many others.

Turkiye: Turkiye has made significant efforts to adapt its training systems to the digital transition. The country recognizes the importance of digital skills for the future of work and has implemented policies and initiatives aimed at promoting the use of digital technologies in

education and training. Here are some examples: The Digital Transformation Strategy of Turkey (it includes the development of digital learning platforms and the integration of digital technologies into the curriculum), The Distance Education Program (the program provides online courses and resources for students of all ages, including vocational training programs) and the The Smart Classrooms Project (the project involves the use of digital technologies such as interactive whiteboards, tablets, and projectors to enhance the learning experience).

Greece: Greece has been making efforts to adapt its training systems to the digital transition. The country has implemented initiatives and policies aimed at integrating digital technologies into education and training, providing access to digital infrastructure and tools, and upskilling individuals for the modern workforce (for example: Digital Transformation of Education program, Funding for Digital Education and Training, the digital learning platform called "E-Learning")

Estonia: Estonia has been making efforts to adapt their training systems to the digital transition, with initiatives aimed at improving digital skills, integrating digital technologies into education and training, and supporting the development of the digital economy. In this case, the Estonian government has launched the "Digital Literacy Program," aimed at improving digital skills among the population. The program includes courses on topics such as basic digital literacy, e-commerce, and cybersecurity.

Romania: Romania has been adapting its training systems to the digital transition, recognizing the importance of digital skills for the future of work. The Romanian education system has been adapting to the digital transition, with the Ministry of Education and Research launching the "Digital Education Strategy" in 2020. The strategy aims to integrate digital technologies into all levels of education and improve digital skills among students and teachers. Another concrete case is the National Agency for Digital Agenda for Romania, responsible for coordinating the implementation of the Digital Romania initiative, as well as other programs aimed at promoting digital skills and the use of digital technologies in various sectors, including education and training.

In conclusion, the digital transition in education and training fields is an important development in Europe, offering an opportunity to improve access to education, personalize learning experiences, and develop the skills required for the modern workforce. In any case, many steps still need to be taken. Therefore, the Digital Farmer partnership aims to provide its support and contribution to the digital transition in agricultural education through this manual.

CHAPTER 2

Professional Engagement

CHAPTER 2 Professional Engagement

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WHAT WILL WE LEARN IN THIS CHAPTER?

What are professional engagement and professional development?
Which are the principles of effective professional development?
Which are 21st century professional development skills for educators?
Which are the core competences for educators?
About DigCompEdu and competence "Area 1 - Professional engagement"

Keywords: professional engagement, professional competences, professional development, modern skills.

2.1. Glossary and abbreviations

In the following table, some words/abbreviations/definitions useful for understanding the chapter have been reported.

Professional Engagement	It is about how an educator embraces their personal philosophy or ideology, embracing a deeper level of interaction between the educator and the object of inquiry.
Professional Competences	Skills, knowledge and attributes that are specifically valued by the professional associations, organizations and bodies connected to your future career.
Professional Development	Activities that develop an individual's skills, knowledge, expertise and other characteristics as a teacher. Effective professional development is on-going, includes training, practice and feedback, and provides adequate time and follow-up support.
Continuous Professional Development	Skills, knowledge and attributes that are specifically valued by the professional associations, organizations and bodies connected to your future career.
Modern Skills	Teachers learn from each other to problem solve collaboratively, using technology devices to build their knowledge base, receiving coaching and mentoring services from model teachers, and being deeply involved in reflection and action.
Competences	Knowledge, skills, abilities, and behaviours that contribute to individual and organizational performance.
Knowledge	Information developed or learned through experience, study or investigation.
Skill	The result of repeatedly applying knowledge or ability
Digital Competences	Confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society.
OECD - Organisation for Economic Co-operation and Development	An international organisation that works together with governments, policy makers and citizens on establishing evidence-based international standards and finding solutions to a range of social, economic and environmental challenges.
VET - Vocational Education and Training	Provides workplace skills, technical knowledge and qualifications for rewarding jobs and careers.
CEDEFOP - European Centre for the Development of Vocational Education and Training	One of the EU's decentralised agencies (1975) based in Greece since 1995, It supports development of VET policies and contributes to their implementation. It helps the European Commission, EU Member States and the social partners to develop the right European VET policies.

CPD -Continuing (or Continuous) Professional Development	It is a combination of approaches, ideas and techniques that help individuals to manage their own learning and growth. The focus of CPD is firmly on results – the benefits that professional development can bring to an individual in the real world.
MOOC – Massive Open On-line Course	A course of study made available over the internet without charge to a very large number of people. "anyone who decides to take a MOOC simply logs on to the website and signs up"

Table 2.1. Glossary and abbreviations

2.2. Introduction

Nearly 500[1] million people in Europe rely on the food that European farmers produce, and they play a critical role in conserving the natural beauty of their nations. Ageing farmer populations, however, have made generational renewal a critical issue. The farming industry has to draw in a younger generation of farmers who have the abilities to thrive in difficult circumstances. In order to meet society's needs for healthy and balanced diets, they will need to produce more effectively while still conserving the environment, battle climate change, and keep up with the increasingly quickening pace of scientific and technical advancement. It is crucial that farmers receive proper agricultural education and training in addition to developing the diverse skills required to adjust to a changing environment. merely 8.5% of the current crop of farmers in Europe have completed a full agricultural education, and 70% have merely practical experience. Initial training is a matter of national competence, and agricultural education frameworks in the EU differ greatly. They offer degrees in a variety of fields, from certificate courses with a vocational bent to bachelor degrees or doctorates in applied sciences, and they give the way to a wide range of employment in agriculture and forestry.

Teachers and trainers in VET[2] are key actors in ensuring its quality and relevance to today's demands. They work in the context of innovation, globalisation, rapid technological and societal changes that pose challenges to education and training systems across Europe and globally. Committed and competent teachers, trainers and other VET professionals were acknowledged as key agents for high quality initial and continuous VET in the Bruges communiqué. Evidence shows they can embrace new challenges and reforms and ensure quality and effective learning experiences for both young and adult learners.

With the COVID-19 epidemic[3], the use of technology in VET instruction grown even further in recent years. There is evidence that VET teachers use digital tools more frequently than general education teachers. However, a sizable portion of VET teachers are ill-equipped to instruct in digital classrooms employing cutting-edge technology. In six OECD countries/regions, 26% of VET teachers do not feel adequately prepared to facilitate their students' learning through the use of digital technologies, according to TALIS 2018 data.

[1] Source: THINK TANK European Parliament: Agricultural education and lifelong training in the EU
[2] Source: CEDEFOP: Teachers' and Trainers' Professional Development (September 2022)
[3] Source: OECD: Teachers and Leaders in VET

Additionally, a sizeable proportion of teachers, particularly older ones, lack confidence in using digital tools for lesson planning, parent communication, and feedback. VET teachers require support to advance their digital skills and understanding of technology use in industry in order to integrate new technologies into their teaching. Peer learning networks and strategic direction from institutional leaders on how to use new technology into teaching are two additional forms of support that can be used in conjunction with professional development opportunities.

DigCompEdu[1] offers a broad framework for reference to assist in the growth of educator-specific digital skills in Europe. It lists six competency areas and 22 educator-specific competencies for teaching in a digital age. The ability of educators to use digital technologies for professional interactions with colleagues, students, parents, and other interested parties, for their own professional development, for the benefit of the group, and for ongoing innovation in the organisation and the teaching profession is an expression of their level of digital competence. ***This Area 1 - Professional Engagement***, which includes the following 4 competencies for educators' professional development:

- organisational communication,
- professional collaboration,
- reflective practice and
- digital competences professional development.

2.3. Professional Engagement

Professional Engagement is the process through which a teacher adopts their own personal philosophy or ideology and encourages a deeper level of participation with the subject of their investigation. An engaged professional is concerned with the objective and reason behind the project they are working on. Being passionate about concepts is only one aspect of professional engagement; successful professional engagement highlights the dimensions of professional learning, and successful professional engagement results in concept realisation. Engagement transforms a subject from being an abstract idea into a concrete experience that can be shared with the learning community. To effectively impact a larger group of professionals, we must have a clear knowledge of our own level of professional participation. One's immediate professional community becomes motivated by one's role's clarity.

Activities that enhance a person's abilities as a teacher, including knowledge, expertise, and other traits, are referred to as ***Professional Development***. The term acknowledges that development can be offered in a variety of settings, from formal to informal. It can be made accessible through collaboration between schools or instructors across schools (for example, observational trips to other schools or teacher networks) or within the schools where teachers work. External expertise may take the shape of courses, seminars, or formal qualification programmes. In the last scenario, coaching/mentoring, group planning and teaching, and the exchange of best practises can all be used to promote development. Professional development that is effective is ongoing, includes instruction, practise, and feedback, and offers enough time

[1] Source: Digital Competence Framework for Educators (DigCompEdu),

and aftercare. Successful programmes support the growth of teachers' learning communities and include teachers in learning activities that are analogous to those they will conduct with their students. The highest standards of technical, pedagogical, and transversal competences (such as digital and intercultural communication) must be developed and maintained by teachers and trainers.Below is a list of links and tutorials on how to use different ICT and automation systems in agriculture. It is dedicated to farmers and field workers who want to learn and learn more about the subject so that they can choose the best ICT or automation system for their farm or business.

2.3.1 Principles for Effective Professional Development1

- **Professional development needs to be an ongoing experience for educators.** Due to instructors' limited time to effectively learn and apply new techniques, brief one-time professional development sessions are less likely to have a significant impact on instruction. Education professionals are better able to gain new skills and teaching techniques through experiences that are a continuous process and offer prolonged learning opportunities. They also have a better chance of having a beneficial impact on student learning. (Darling-Hammond et al.; Gulamhussein)
- **Professional development needs to be a job embedded as much as possible.** The chance to put what they are learning into practise in the classroom is essential for teachers. The gap between comprehending a new method or concept and really putting it into practise in the classroom can be filled with the help of job-integrated practise and learning opportunities. (DeMonte, Darling-Hammond, et al.;);
- **Professional development needs to provide support for teachers during the implementation stage of using a new instructional method in the classroom**. Supporting a new teaching approach during the implementation phase increases the likelihood that it will be successful in the classroom.
- **Professional development needs to offer content that is specific instead of generic**. The information that educators get through professional development should be tailored to a particular objective, discipline, grade level, or developmental stage. Training and professional development programmes that involve the entire staff are significantly less effective than providing educators and the students they teach with pertinent, targeted content that speaks to their needs. (Gulamhussein; Darling-Hammond et al.)
- **Professional development needs to be engaging and use varied approaches to support learning for both groups and individuals.** "Teachers' initial exposure to a concept should not be passive, but rather should engage teachers through varied approaches so they can participate in making sense of a new practice" (Gulamhussein). Diverse approaches also make it possible to present content in ways that complement educators' particular learning styles, whether information is being given to a big or small group.

[1] Source: https://blog.kaplanco.com/ii/principles-of-effective-professional-development

- **Professional development needs to include modelling as major parts of teacher training.** Research has shown that modelling plays a vital role in helping educators understand new instructional methods. Active learning is facilitated by new practise demonstrations, which also assist teachers in comprehending how new practises might be used in actual classroom settings. A new technique or skill won't be as effective if you just hear about it; you need to see it in action by someone who has previously mastered it. (Gulamhussein; Darling-Hammond et al.)
- **Professional development needs to promote collaboration among teachers.** Collaboration is a great approach to support educators, especially those who are new to the field. Unfortunately, educators frequently lack the time necessary to do so. Because effective cooperation typically results in better teaching and instruction and also helps teachers address issues they are facing in the classroom, this can be damaging to both student and teacher learning. (DeMonte; Darling-Hammond et al.)

Effective professional development is also defined by success.

It is advisable to check and see if the professional development opportunities considered have good reviews.

Positive testimonials and feedback from current and past participants usually indicate a successful and effective programme.

2.3.2 21st Century Professional Development Skills for Educators – "Modern Skills"

- **Adaptability**

  Teachers need to be adaptable and versatile in today's modern, digital environment so they can handle everything that comes their way. In a same vein, administrators are altering learning standards and expectations. Every modern teacher needs to be able to adapt, whether it's to the way their pupils learn, the behaviours in their classroom, or their lesson ideas.
- **Confidence**

  Every teacher needs to have self-confidence as well as confidence in their students and fellow teachers. A self-assured person encourages others to be self-assured, and a teacher's self-assurance can influence students to be better people.
- **Communication**

  A crucial talent is the ability to interact not just with your pupils but also with parents and other staff members. It is important to be able to speak clearly and concisely because a teacher spends practically all of their day talking with kids and other staff members.
- **Team Player**

  Working well in a team or group is a skill that teachers must possess. Students have a better chance of learning and having fun when a team is working together. Success can only result from networking with other educators (even electronically) and working through issues as a team. By doing this, you help create a sense of community not only in your own classroom but also across the entire school.

- **Continuous Learner**

  Teaching is a process of continuous learning. It's up to you, the instructor, to keep up with it as the world, along with the curriculum and educational technology, is constantly evolving. A teacher will always be successful and effective if they are willing to go the extra mile to learn.

- **Imaginative**

  A teacher's imagination is their most potent teaching tool. Particularly now that many states have incorporated the Common Core Learning Standards into their curricula, teachers must be innovative and come up with new strategies to keep their pupils interested in learning. Many teachers believe that these standards have completely eliminated any creativity and fun from the learning process, thus they are coming up with creative solutions to restore this fun.

- **Leadership**

  A good teacher mentors their students and knows how to point them in the proper direction. They set an excellent example and serve as a good example. They support pupils and guide them towards achievement.

- **Organization**

  Modern educators are able to plan ahead and be ready for everything. They are constantly prepared for whatever that comes their way. To be sent home sick? They have a backup folder prepared, so there is no problem. According to studies, instructors who are organised create classrooms that are more productive. Being organised is therefore even more essential if you want your students to perform at a better level.

- **Innovative**

  A contemporary teacher is open to experimenting with new techniques, teaching methods, and technological tools. Being innovative entails not just trying new things but also challenging your pupils, establishing connections to the outside world, and developing a creative mind-set. It involves encouraging your kids to take calculated chances and learn how to work with others.

- **Commitment**

  Being dedicated to your work is both a traditional and contemporary teaching ability. A modern teacher must be dedicated to their work at all times. The teachers must demonstrate to the pupils that they are committed to helping them and are there.

- **Ability to Manage Online Reputation**

  This 21st century, modern teaching skill is definitely a new one. In this digital age, most, if not all, teachers are online, which means they have an “online reputation.” Modern teachers need to know how to manage their online reputation and which social networks are okay for them to use. LinkedIn is a professional social network to connect with colleagues, but other social networking site profiles, such as Instagram or Facebook, should remain private and separate from students.

- **Ability to Engage**

  Modern educators are adept at locating interesting resources. Finding content and resources for students today that will keep them interested is crucial. This entails staying current on new apps and learning technologies, as well as using the internet to browse and

network with other teachers. You must find a way to include pupils and keep the lesson exciting.

- **Understanding of Technology**

  Technology is developing quickly. We have already made enormous strides in the last five years alone, and we will continue to do so. All contemporary teachers must keep up with these advancements, even though it may be challenging to do so. You must not only be knowledgeable about the most recent technological advancements but also be aware of the best digital tools for your students. Although the procedure could take some time, it will have a significant impact on how well your pupils do.

- **Know When to Unplug**

  Modern educators are aware of when it's OK to disconnect from social media and unwind. They are also aware of the high rate of teacher burnout, making it all the more important for them to take some time to calm down and look after themselves. They also know when to encourage their kids to calm down and disengage. They allow their kids time each day to take a mental vacation and relax.

- **Ability to Empower**

One characteristic that goes along with the title of teacher is inspiration. Modern instructors may help pupils develop their critical thinking, creativity, innovation, adaptability, passion, and flexibility. They provide individuals the ability to lead, self-direct, reflect, and solve difficulties. They equip children with the skills they need to excel in life as well as in school.

2.3.3 Core Competencies for Educators[1]

Being a teacher at any level requires a significant amount of knowledge and skill. Paying attention to the core competencies for educators helps to ensure that all teachers and others who work in education are prepared to make school a positive experience for students and their families.

- **Interacting Well with Students**

  Educators must be able to positively interact with all students. This includes difficult students, students who work below grade-level and students whose personalities just grate on a teacher. Teachers must put aside their prejudices and feelings in order to treat all students with respect, provide them with equal opportunities for learning and make them feel confident.

- **Creating a Learning Environment**

  It's crucial to have a secure learning environment that promotes learning. Teachers must have high standards for both behaviour and academic performance. All regulations must be applied uniformly and fairly. In the classroom, students shouldn't have to worry about being bullied and should feel free to speak up.

- **Good at Lesson Plan Design**

  Every educator must be able to create lesson plans that address requirements while also catering to the needs of the students. To do this, you must be familiar with how to select and develop educational resources that may be used with students of various levels. Additionally,

[1] Source: List of Core Competences for Educators

a scope and sequencing must be developed that gives students enough time to grasp the requirements.

- **Able to Use Varied Teaching Strategies**

  Competent teachers can effectively teach the curriculum using best practises and other suitable teaching techniques. Competent teachers use a number of techniques, including non-traditional teaching methods, in addition to lectures to ensure that all of their pupils learn and are interested. In order to learn about new approaches and the most recent best practises, educators also often attend professional development seminars.

- **Able to Assess**

  Effective tests must be created, chosen, and given by educators. An evaluation needs to measure what has been taught and what the pupils have learnt precisely. To track students' progress, competent teachers utilise informal and formal assessment methods. In addition, they use portfolios, technology, and other innovative techniques to evaluate students.

- **Able to Identify Student Needs**

  One of the most important aspects of an educator's work is being able to recognise and respond to students' needs. In order to do this, training is partially guided by formal and informal assessments. But it also entails getting to know them on a level that extends beyond the classroom, discovering their passions, noticing mood swings, and ensuring that they are cognitively and emotionally focused on learning.

- **Good at Communication**

  One of the most important aspects of an educator's job is communicating successfully with parents and other parties involved in a child's education. A good teacher keeps parents informed about a student's development on a regular basis and responds to any concerns right away. A good educator also knows how to reason with challenging parents and reach conclusions that are in the child's best interests.

- **Able to Collaborate**

  Educators must be able to collaborate with other teachers and school staff. Through cooperation, instructors can gain knowledge from one another and develop into better educators. They can work together to enhance the school's general reputation and the quality of the instruction provided by creating a safe and productive learning environment for all students.

- **Maintaining a Professional Appearance**

  An instructor must always present themselves in a professional manner. This includes acting properly and donning appropriate attire. Teachers frequently act as role models for their students. Students may lose respect for a teacher as a result of behaviours including using harsh language, spreading rumours about teachers and students, or dressing poorly.

- **Demonstrating a Commitment to the Profession**

  Educators need to commit to continuing their education and developing professionally. Subject-matter expertise dwindles, instructional methods alter, and new research continuously alters how students learn and teachers instruct. Educators can keep raising the calibre of the education they deliver by participating in professional development activities and furthering their education.

2.3.4 Challenges

To varying degrees many teachers and trainers face similar ***challenges***. Depending on the sector and level of VET, CEDEFOP[1] research has identified the following main ones:

- ***Digitalization is advancing*** quickly, which is changing how teaching and learning are done and how they are done. Artificial intelligence (AI) integration in the learning process may lead to new understandings of how learning occurs, but it also suggests new responsibilities for VET teachers and trainers and raises significant ethical issues for educational and training organisations.
- ***New flexible learning routes*** are developed as work-based learning and apprenticeship programmes are expanded in businesses of all sizes. In order to support and mentor learners, there may be a greater demand for ***hybrid professions***, such as teachers and trainers who work in both VET institutions and businesses. There may also be a need for ***better cooperation*** between VET teachers and trainers.
- As we ***focus on the learning outcomes approach***, VET teachers and trainers are ***more involved in developing and implementing education and training reforms***, especially in relation to curriculum design, and in deciding on appropriate vocational pedagogies.
- ***Migration*** and ***international mobility*** alter learning settings because they create ***learner populations*** that are more ***diverse*** and ***more heterogeneous***.
- The ***realities of lifelong learning*** and an ***ageing population*** implies that VET teachers and trainers play a crucial role in enabling people to pursue learning for upskilling and reskilling in flexible programme frameworks.

- The current uncertainty in social, political, and environmental developments as well as the changing and emerging job market place an additional burden on VET teachers and trainers to impart key competencies that will support learners' personal development and in-still human values while also fostering civic engagement and social responsibility.

- Attracting competent people to the teaching and training profession is difficult due to the industry's low social status, pay, and working circumstances; this also includes creating the conditions and giving them the support they need to be dedicated and competent throughout their teaching/training career. ***It is crucial to comprehend the well-being and job contentment of educators and trainers***.

2.4 DigCompEdu Competence Area 1 - Professional Engagement[2]

2.4.1 Digital Competence Framework for Educators (DigCompEdu)

DigCompEdu provides a general reference framework to support the development of educator-specific ***digital competences*** in Europe. It details 22 educator-specific competences for teaching in a digital society along ***6 competence areas***.

[1] Source: https://www.cedefop.europa.eu/en/projects/teachers-and-trainers-professional-development

[2] Source: Digital Competence Framework for Educators (DigCompEdu),

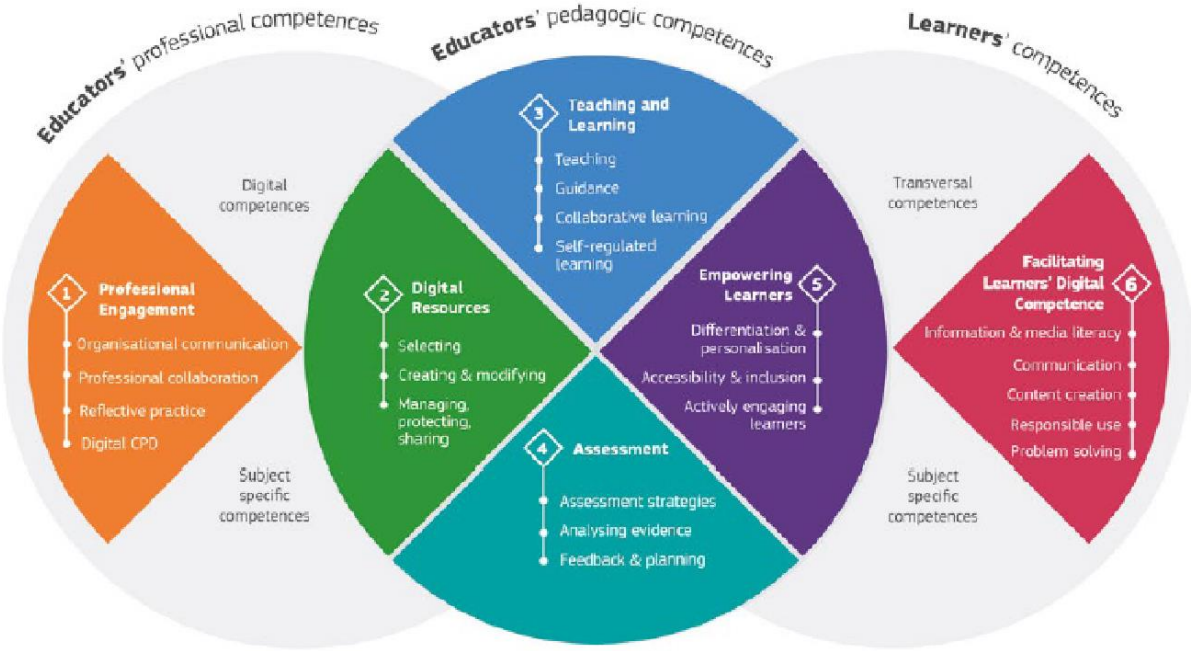

Figure 2.1. Digital Competence Framework for Educators (DigCompEdu)

These ***6 competence areas*** focus on different aspects of ***educators' professional activities***. The ***core*** of the DigCompEdu framework is defined by ***Areas 2-5***. Together these areas explain ***educators' digital pedagogic competence***, i.e. the digital competences educators need to foster efficient, inclusive and innovative teaching and learning strategies.

Areas 1, 2 and 3 are anchored in the stages characteristic of any teaching process, whether supported by technologies or not.

The competences listed in these areas detail ***how to make efficient*** and ***innovative use*** of digital technologies when planning (Area 2), implementing (Area 3) and assessing (Area 4) teaching and learning. Area 5 acknowledges the potential of digital technologies for learner-centred teaching and learning strategies. This area is transversal to Areas 2, 3 and 4 in the sense that it contains a set of guiding principles relevant for and complementary to the competences specified in these areas.

Each individual competence[1] The DigCompEdu framework is ***described*** along ***six proficiency levels*** (A1, A2, B1, B2, C1, C2) with a cumulative progression, linked to the Common European Framework of Reference for Languages (CEFR). Teachers at the first two levels, A1 and A2, have started to use technology in some areas and are aware of the potential of digital technologies for enhancing pedagogical and professional practice. Teachers at level B1 or B2 already integrate digital technologies into practice in a variety of ways and contexts. At the

[1] Source: https://www.researchgate.net/publication/333346181_Digital_Competence_of_Educators_DigCompEdu_Development_and_Evaluation_of_a_Self-assessment_Instrument_for_Teachers'_Digital_Competence

highest levels C1 and C2, teachers share their expertise with peers, experiment with innovative technologies and develop new pedagogical approaches.

According to this approach, a ***teacher's general digital competences*** (as described in DigComp) is a ***prerequisite*** for developing the ***teacher-specific digital competences*** as described in DigCompEdu. *Further prerequisites are the teacher's* ***subject-specific, pedagogical*** *and* **transversal** competences.

Hence, DigCompEdu agrees with the TPACK framework published by Mishra and Koehler in 2006, which postulates that ***three knowledge areas - technological, pedagogical*** and ***content knowledge*** - need to be effectively integrated for teachers to use digital technologies with added value in their teaching. However, where TPACK falls short of explaining how this connection is established, DigCompEdu aims to identify pedagogical and professional focus areas for the integration of technology into teaching and professional practice. To be able to supply such detail and still be applicable across all subjects and in a continuously changing technological landscape, the ***focus*** of DigCompEdu ***is clearly on the pedagogical element***.

DigCompEdu describes ***how technological competence*** (as described in DigComp) and ***subject-specific teaching competence*** (as described by curricula) can be ***pedagogically integrated*** by teachers to provide ***more effective, inclusive, personalised*** and ***innovative*** learning experiences to students. DigCompEdu furthermore acknowledges that to transform education in such a way a wider approach, ***including*** the ***professional environment*** and the ***integration of learning*** into the ***overall social*** and ***societal context*** is needed. ***Areas 1*** and 6 ***cover these aspects.***

The ***added value*** of the DigCompEdu framework:

- a solid foundation that may serve as the basis for policy at all levels;
- a template that eliminates the need to create a conceptual framework for this work and enables local stakeholders to swiftly move on to creating a physical instrument that meets their needs;
- a shared language and logic that can facilitate cross-border dialogue and the exchange of best practises.

2.4.2 DigCompEdu competence Area 1 – Professional Engagement

Educators' digital competence is expressed in their ability to use digital technologies not only to enhance teaching, but also for their professional interactions with colleagues, learners, parents and other interested parties, for their individual ***professional development*** and for the ***collective good*** and ***continuous innovation*** in the organisation and the teaching profession. This is the ***focus*** of ***competence Area 1 – Professional Engagement***, which encompasses 4 ***educators' professional development competences***:

- organisational communication,
- professional collaboration,
- reflective practice and
- digital competences professional development.

2.4.2.1 Organisational communication

Organisational communication is defined as the ***channels*** and ***forms of communication*** in which organizations engage, including both the ***internal*** communications that occur within an organization, and ***external-facing*** communications between organizations. From a broader perspective, organizational communication takes ***three different forms*** such as:

- internal operational communication,
- external operational communication, and.
- personal communication.

It builds trust which boosts engagement. The use of digital technologies in education enhances organisational communication with learners, parents and third parties. It contributes to collaborative development and improvement of organisational communication strategies.

Activities:

- the use of digital technologies to make additional learning resources and information available to learners (and parents).
- the use of digital technologies to communicate organisational procedures to learners and parents, e.g. rules, appointments, events.
- the use of digital technologies to inform learners and parents on an individual basis, e.g. on progress and issues of concern.
- the use of digital technologies to communicate with colleagues in the same organisation and beyond.
- the use of digital technologies to communicate with third parties relevant to the educational project, e.g. experts to be invited, places to be visited.
- communication via the organisation's website or through corporate digital technologies, platforms or communication services contracted.
- contribution of contents to the organisation's website or virtual learning environment.
- contribution to collaborative development and improvement of organisational communication strategies.

Digital tools supporting Organisational communication activities
With the help of the free Flip app from Microsoft, teachers can give their kids a platform where they may confidently express their ideas and creativity while interacting with their peers. Students and teachers can upload films about a relevant topic as a conversation starter. To help teachers and their students learn how to use this distinctive platform, starting guides and webinars are offered. The platform creates a safe online community for businesses (like schools) to improve communication, organise events, discuss achievements, involve donors, and do a lot more. The website makes it possible to share moments and stories..
Zoom for Education lets teachers communicate with children and families throughout the learning continuum, allowing a hybrid workforce to remain connected and flexible.
Slack It is a platform for instant messaging that makes it easier for teachers and their pupils to communicate. Slack guarantees data security so that only teachers and students have access to classes, and teachers can create channels devoted to certain themes. Students may quickly access all they need for their studies once a start hub has been established.
Bloomz An app called Bloomz facilitates communication between parents and teachers. This user-friendly tool makes it simple to schedule parent-teacher conferences, receive class updates, and monitor behaviour. To make learning accessible to everyone, translation is offered in over 100 different languages.
Slido - The industry's top audience interaction platform. By crowdsourcing the most important questions and involving attendees in live polls and quizzes, it enables users to make the most of meetings and events.
Google Classroom - is a free blended learning platform developed for educational institutions that aims to simplify creating, distributing, and grading assignments. The primary purpose of Google Classroom is to streamline the process of sharing files between teachers and students.

Table 2.2. Digital tools supporting Organisational communication activities

PROGRESSION		***PROFICIENCY STATEMENTS***
Newcomer (A1)	Making little use of digital technologies for communication	I rarely use digital technologies for communication.
Explorer (A2)	Being aware and making basic use of digital technologies in communication	I make use of digital technologies for communication e.g. with learners, parents, colleagues or support staff.
Integrator (B1)	Using technologies for communication in an effective and responsible way.	I use different digital communication channels and tools, depending on the communication purpose and context. I communicate responsibly and ethically with digital technologies, e.g. respecting netiquette and acceptable use policies (AUP).
Expert (B2)	Using digital technologies for communication in a structured and responsive way.	I select the most appropriate channel, format and style for a given communication purpose and context. I adapt my communication strategies to the specific audience.
Leader (C1)	Evaluating and discussing communication strategies	I evaluate, reflect on and collaboratively discuss how digital technologies are used effectively for organisational and individual communication. I use digital technologies to make administrative procedures more transparent for learners and/or parents and to allow them to make informed choices on future learning priorities.
Pioneer (C2)	Reflecting on and re-designing communication strategies	I contribute to developing a coherent vision or strategy on using digital technologies effectively and responsibly for communication.

Table 2.3. Organisational communication / Progression of Proficiency Levels

2.4.2.2 Professional collaboration

When teachers work together, they can benefit from one another's experience, share knowledge within their profession, and ultimately increase the guidance and assistance they can provide to their pupils.

Utilising digital tools encourages collaboration with other educators, knowledge sharing and exchange, experience exchange, and cooperative pedagogical practise innovation.

Activities:

- the application of digital tools to team up with other teachers on a certain assignment or project.
- the sharing and trading of information, assets, and experiences with co-workers and peers using digital technologies.
- the collaborative development of instructional resources using digital technologies.
- the investigation of innovative pedagogical techniques via professional collaboration networks.
- the process of developing one's own career through the usage of professional collaboration networks.

Digital tools supporting Professional collaboration activities
Common Curriculum - is a platform for collaboration and a planning tool. Users of the website can share lesson plans for a full class with a coworker (or several collaborators, with a school-wide subscription), using the Collaborate capabilities. Given that the associated class website's calendar may be automatically filled with lecture materials, it might be useful. It can be connected to an institution's current class webpage so that children, students, and parents can view updates on assignments and class activities.
OER Commons - makes it easy for teachers to connect with other educators and find relevant materials. To access resources, teachers can either use the advanced search option or search by subject area, standard, or keyword. These materials can subsequently be saved in OER Commons or distributed via Google Classroom, for example. In order to create lesson plans or unit plans that may be published publicly on the website or more discreetly within a hub or group, teachers can also use the lesson builder or module builder.
Teaching Channel - a one-stop shop for teacher learning and development. On the website, instructors can use video as a platform for after-hours classroom observations and professional development. Teachers are encouraged to discuss pertinent topics on the website's online community forum. As a result, educators from all over the world can collaborate and advance together. Teachers can quickly make notes to videos, save them for later viewing, and even set up customised reminders for themselves to revisit them. On this interactive platform, searching for movies and resources is easier. Results might not always provide useful films that can be used right away, though.
Trello - is a tool for managing your workload. In essence, it is designed to structure the work of teams and groups in order to enhance member cooperation, facilitate project management, and ultimately increase productivity.
Padlet - an online collaboration and support tool (visual boards for organising and sharing content) is used to speed up a variety of procedures. The content that we want to share with participants, the group, coworkers, students, and teachers—in other words, with anyone we want to share it with—is stored on these digital bulletin boards, walls, or canvases.

Table 2.4. Digital tools supporting Professional collaboration activities

PROGRESSION		***PROFICIENCY STATEMENTS***
Newcomer (A1)	Making little use of digital technologies for collaboration	I rarely use digital technologies to collaborate with colleagues.
Explorer (A2)	Being aware and making basic use of digital technologies for collaboration	I use digital technologies to collaborate with colleagues in my organisation, e.g. on a dedicated joint project, or to exchange content, knowledge and opinions.
Integrator (B1)	Using digital technologies to share and exchange practice	I use digital communities to explore new pedagogic resources or methods and to get fresh ideas. I use digital technologies to share and exchange the resources I use, my knowledge and opinion, with colleagues within and beyond my organisation.
Expert (B2)	Using digital technologies for collaborative knowledge construction	I actively use digital communities to exchange ideas and collaboratively develop digital resources.
Leader (C1)	Using digital technologies for reflecting on and enhancing practices and competences	I use the insight and resources, generated in the collaborative networks I belong to, to get feedback on and improve my competences, and to expand my repertoire of digital practices.
Pioneer (C2)	Using digital technologies to facilitate innovative practice	I use digital communities to collaborate with peers on innovating pedagogical practices. I use digital communities to help other educators develop their digital and pedagogic competences.

Table 2.5. Professional Collaboration / Progression of Proficiency Levels

2.4.2.3 Reflective practice

The capacity to think back on one's activities in order to engage in a process of continual learning is known as reflective practise. It enables educators to adapt and adjust to problems. It aids teachers in becoming aware of their underlying assumptions and beliefs on teaching and learning. It aids educators in fostering a supportive learning environment.

In light of digital technology, reflective practise refers to the individual and group reflection, critical evaluation, and active development of one's own digital pedagogical practise as well as that of one's educational community.

Activities:

- critical analysis of one's own pedagogical and digital practises.
- identifying opportunities for improvement and competency shortages.
- the seeking of assistance from others in order to improve one's pedagogical and digital practises.
- the lookout for specialised training and utilisation of chances for ongoing professional development.
- to look for ways to constantly improve and expand one's toolkit of digital pedagogical practises.
- aid others in gaining competency in digital pedagogy.
- reflecting on and giving critical feedback on digital practises and policies at the organisation level.
- active involvement in furthering the development of organisational digital technology use practises, policies, and ambitions.

Digital tools supporting Reflective practice activities
Digital Documents - the most basic way of reflecting digitally, **Microsoft Word** or **Google Docs** could be used to create one or more files where you can write your reflections, add images and links. **Digital notebooks** - Digital note-making platforms such as Evernote, Microsoft OneNote and Google Keep go beyond journalling and offer possibilities for handling notes in all areas of our life. **On –line diaries** - There are a few online diary options such as Penzu or Diaro but have fewer options than digital notebooks. **Audio and video journalling** - As most of us use smartphones with built-in audio and video recording functionality it is often as quick to make a short recording as it is to type up notes. **Reflective blogging and podcasting** Some people prefer to do their reflection in public and blogs are great for that. WorldPress and Blogger are the most well known platforms. If you prefer your public reflections to be entirely video or audio then YouTube will allow you to record or broadcast live from your desktop or mobile device and anchor.fm is the quick and easy podcasting tool.
Explore IrisConnect Blog IRISConnect: The Ultimate Guide to Reflective Practice in Teaching (Posted by Alexandra Spalding, April 18, 2023)
 SELFIEforTEACHERS - is an online tool to help primary and secondary teachers reflect on how they are using digital technologies in their professional practice. Teachers can use the tool to learn more about the digital skills they have and identify areas where they can develop further.

Table 2.6. Digital tools supporting Reflective practice activities

PROGRESSION		***PROFICIENCY STATEMENTS***
Newcomer (A1)	Being unsure about one's development needs	I am aware of the limits of my own digital competence and my training needs.
Explorer (A2)	Being aware of one's development needs	I am aware of the limits of my own digital competence and my training needs.
Integrator (B1)	Using experimentation and peer learning as a source for development	I seek to improve and update my digital pedagogical competence through experimentation and peer-learning. I creatively experiment with and reflect on new pedagogical approaches, enabled by digital technologies.
Expert (B2)	Using a range of resources to develop one's individual digital and pedagogic practices	I actively seek out best practices, courses or other advice to improve my own digital pedagogies and wider digital competences. I evaluate, reflect on and discuss with peers how to use digital technologies to innovate and improve educational practice.
Leader (C1)	Collaboratively reflecting on and enhancing pedagogic practice in general	I follow current research on innovative teaching and integrate research findings into my practice. I evaluate, reflect on and collaboratively discuss policy and organisational practice concerning the use of digital technologies. I help peers in developing their digital competence.
Pioneer (C2)	Innovating educational policies and practices	I develop, individually or in collaboration with peers, a vision or strategy for improving educational practice through the use of digital technologies. I reflect on and evaluate with colleagues and/or researchers different digital practices, methods and policies, with a view to developing innovative methods.

Table 2.7. Reflective Practice / Progression of Proficiency Levels

2.4.2.4 Continuing (or Continuous) Professional Development (CPD)

Continuing (or Continuous) Professional Development (CPD) can be broadly defined as any type of learning that you undertake which increases your knowledge, understanding and experiences of a subject area or role. CPD is an ongoing and planned learning and development process.

Digital Continuous Professional Development means the use of digital sources and resources for continuous professional development.

Activities:

- the process of using the internet to find appropriate possibilities for training and career advancement.
- updating one's subject-specific competencies using the internet.
- the utilisation of the internet to learn about innovative teaching techniques and approaches.
- the process of looking for and locating online digital materials that assist professional development.
- the use of conversation in online professional forums as a resource for learning.
- the utilisation of online learning possibilities, such as webinars, MOOCs, and video tutorials.
- the use of digital tools and settings to offer training opportunities to peers and co-workers.

Digital tools supporting Continuous Professional Development activities
Flip Educator Toolkit offers free tailored professional development training for schools, districts, or organisations, as well as access to professional development events and on-demand training from one of the Educator Innovation Leads in English, Spanish, or Hindi.
Education - Zoom Community is a community where Zoom users can work together, get help, and share expertise about how to use Zoom successfully in the education sector.
Bloomz – Teachers Resources resources have been put together helping educators to use, share and talk about Bloomz confidently. Bloomz Teachers Facebook Group created by teachers for teachers. They are looking for members who are interested in collaboration and helping others, providing helpful advice and strategies for using the Bloomz App, sharing classroom successes using Bloomz, etc.
BetterLesson – is a website with free searchable lesson plans, strategies, activities, and professional learning for educators. The site's breadth is enormous; thousands of courses covering dozens of topics are arranged by subject area and grade level. It's a one-stop shop for better classroom instruction when the abundance of instructional methodologies and professional learning materials are added. It is excellent for PBL, instructional design, and professional learning.
Teaching Channel - a one-stop shop for teacher learning and development. On the website, instructors / teachers can use video as a platform for after-hours classroom observations and professional development. Teachers are encouraged to discuss pertinent topics on the website's online community forum. As a result, educators from all over the world can collaborate and advance together. Teachers can quickly make notes to videos, save them for later viewing, and even set up customised reminders for themselves to revisit them. On this interactive platform, searching for movies and resources is easier. Results might not always provide useful films that can be used right away, though.
Explore IrisConnect Blog IRISConnect: Effective Teacher CPD: How To Enable Career-long Learning (Posted by Rico Patzer, May 15, 2023)

Table 2.8. Digital tools supporting Continuous Professional Development activities

PROGRESSION		***PROFICIENCY STATEMENTS***
Newcomer (A1)	Making little use of the internet for updating knowledge	I only rarely, if at all, use the internet to update my knowledge or skills.
Explorer (A2)	Using the internet for updating knowledge	I use the internet to update my subject-specific or pedagogical knowledge
Integrator (B1)	Using the internet to identify opportunities for CPD	I use the internet to identify suitable training courses and other opportunities for professional development (e.g. conferences).
Expert (B2)	Exploring online CPD opportunities	I use the internet for professional development, e.g. by participating in online courses, webinars, or consulting digital training materials and video tutorials. I use formal and informal exchanges in professional online communities as a source for my professional development.
Leader (C1)	Critically and strategically using the internet for CPD	I consult a range of possible online training opportunities and select those which best fit my development needs, learning style and time constraints. I actively participate in online training opportunities and contribute to improving them and guiding others in making appropriate choices by providing feedback.
Pioneer (C2)	Using the internet to provide CPD to peers	I use digital technologies to advise peers on innovative teaching practices, e.g. in professional communities, through personal blogs, or by developing digital training materials for them.

Table 2.9. Continuing (or Continuous) Professional Development / Progression of Proficiency Levels

CPD is a valuable learning tool to improve skills and knowledge.

The types of CPD vary based on the learning style used:

- **Active Learning / Structured CPD** often consists of interactive and participation-based research. It is frequently proactive to attend training sessions, workshops, seminars, conferences, eLearning courses, or CPD-accredited activities. Although the study and review would be regarded as self-directed learning, teachers taking tests with a professional focus can still benefit from CPD active learning.

- **Passive Learning / Reflective CPD** is defined as learning that has a structured format but no participant-based engagement, making it far more passive and one-directional than structured CPD. Reflective CPD activities include viewing instructional videos and tutorials, going to passive lectures, and listening to podcasts, case studies, and industry updates.

- **Self-Directed Learning / Informal CPD** encompass any unsupervised and unstructured learning. This entails taking part in online forums as well as reading magazines, books, and articles online or in print. You might also incorporate news from your sector or analysis of relevant topics. Self-directed CPD usually lacks set learning intervals, is informal, and has individualised learning outcomes.

There is no one-size-fits-all strategy for CPD; nevertheless, a blended approach to learning that integrates a diverse range of CPD can improve knowledge retention and engagement. There are different types of CPD learning:

- **lTraining Courses**

  The most common means of completing Continuing Professional Development is through a CPD training course, which can range in length from one day to many days or weeks. Training courses are either subject-specific or give skills in a certain field.
- **Seminars**

  A seminar is a short training event that can last anywhere from a few hours to a day. Attendees at CPD workshops can focus on a particular subject in depth. They frequently take place in teams of no more than 20 persons. In order to get people involved and promote material retention, CPD seminars frequently include group work, activities, and interactive discussions.
- **Webinars**

  Webinars are virtual learning events that are attended by an online audience. The main objective of a CPD webinar is frequently to quickly and effectively instruct professionals on new and pertinent topics. Attendees can engage in conversation and participation during CPD webinars by posing questions to the hosts, taking polls or surveys, and sharing documents. CPD webinars are crucial because they allow for wider, frequently global involvement because they do not require presence at an in-person event.

2.4.2.4.1 Some useful information from all around the world for further exploration

FutureLearn - FutureLearn offers a variety of free online teaching courses that are designed to help both seasoned and aspiring educators hone their skills and concentrate on professional development. They can locate instructional courses to help them achieve their goals, regardless of whether they want to pursue a hobby, develop their profession, or learn a new skill. FutureLearn provides microcredentials, longer programmes, and regular teaching courses. Micro-credentialing is the process of taking classes that allow you to advance your knowledge without having to complete a full degree. These topics related to the industry will count towards a degree or a separate certification. Additionally, a variety of pertinent degrees from top colleges are available, in addition to online courses for teachers. By providing information appropriate for both elementary and secondary education instruction, FutureLearn is dedicated to assisting in the professional development of teachers.

Cambridge Assessment, International Education – It offers a number of different professional development opportunities for teachers according to their experience and needs. Professional development courses are available ***online***, ***face-to-face*** or ***virtual***. Their approach to professional development supports teachers to become confident, responsible, reflective, innovative and engaged.

Class Central – Free On-line Teacher Professional Development Courses – with more than 400 online courses addressing Teacher Professional Development and enabling students to earn certificates with paid and free online courses from Harvard, Stanford, MIT, University of Pennsylvania and other top universities around the world.

TheEducationPeople - Provides extensive professional development for teachers, with training programmes for educators working in early year's settings, schools, and colleges. Although geographically focused on UK (Kent) this website can represent a valuable resource to be taken into account.

Coursera – is a global platform for online learning and career development that offers anyone, anywhere, access to online courses and degrees from leading universities and companies. Coursera partners with more than 275 leading universities and companies to bring flexible, affordable, job-relevant online learning to individuals and organizations worldwide. They offer a range of learning opportunities—from hands-on projects and courses to job-ready certificates and degree programs.

EdWEB.net – a free social network and professional learning community easing collaboration, engagement in peer-to-peer learning, sharing innovative ideas and resources. It includes: edWeb communities, edWebinars with CE Certificates and Professional Learning Models (Innovative Practices in Professional Learning).

Facing History – Professional learning opportunities, such as synchronous online courses and webinars, as well as live seminars and workshops, offer a new perspective. After taking part in professional development, they also offer assistance with all the materials required to design engaging and productive classroom activities. In addition to receiving ***certificates*** (A Certificate of Completion), ***ongoing coaching and support***, and the ***chance to join the Facing History educator network***, participants in professional learning have ***access*** to a ***wealth of educator resources***, such as unit and lesson plans, study materials, and multimedia.

TeachersFirst Workshops - TeachersFirst Professional Learning includes ***tutorials*** for ***creating technology projects*** (such as wikis or blogs), ***classroom activities***, and ***assessment***. There are free virtual workshops and Twitter chats available. TeachersFirst Professional Learning pages are created by experienced teachers who know everyday classroom realities.

ShareMyLesson - A community of teachers, paraprofessionals and school-related personnel, specialized instructional support personnel, higher education faculty, and parents and caregivers who contribute content, collaborate, and stay up to date on the issues that matter to students and educators everywhere (***webinars, blogs***).

EdWeek Special Education Webinars - Free professional development on special education, students with disabilities, learning disabilities, and gifted education (***events*** and ***webinars***).

Sanford Inspire – Offers more than 70 free professional development courses and webinars to support teacher training nationwide. Their Online Learning Portal gives the access to free, easy-to-navigate, on-demand courses and resources for teachers and connects them with educators around the country.

2.5. National perspectives

2.5.1 Italy

In view of the digital transition, the Italian government has put in place a number of measures to support this transformation. In particular, it drew up the ***"DDI – Didattica Digitale Integrata" (Integrated Digital Education plan).*** It invites each school to design its plan and promotes the implementation of so-called 'Future Labs': each educational entity can run training courses, for a maximum of 25 hours, for teachers to improve their digital skills and expand their methodological knowledge.

Both the Future Labs and the DDI have points in common with ***DigCompEdu*** – like ***Professional Engagement.*** In order to improve teacher-teacher, teacher-student communication and thus the professional skills of educators, some schools implemented training courses that made teachers aware of digital platforms for communication and participatory organisation of internal and/or external school activities. Furthermore, to improve dialogue with parents, organisation, educational approaches, teaching and training materials, timetable of activities will be conveyed through the institutional website and through the electronic register.

2.5.2 Slovenia

In Slovenia, there is no legislation that would specifically regulate individual areas specified in the European framework of digital competences for educators (DigCompEdu). The field of education and training in Slovenia is governed by the overall ***Act on the Organisation and Financing of Education and Training***, which, together with the by-laws, addresses the subject of DigCompEdu.

Act on the Organisation and Financing of Education and Training regulates the conditions for the provision and determines the management and financing of education and training. ***The by-law "Rules on in-service training of educational professionals"*** determines: (1) the conditions, method and procedure by which professional workers are provided with further

education and training, (2) the competences and composition of the bodies that lead the procedures for ordering or collecting programs for further education and training, (3) the rules for financing of programs, scoring of programs for the purpose of promotion of professional workers to titles, (4) the ways of recognising points for further education and training carried out outside the framework of published programs, as well as (5) the content, form and method of keeping documentation on further education and training.

2.5.3 Spain

Article 111.bis of Organic Law 2/2006 of 3 May *on* ***Education, on information and communication technologies in public schools***, establishes that a reference framework for digital competence in teaching will be drawn up to guide in-service teacher training and facilitate the development of a digital culture in the classroom.

Lifelong learning is defined as a right and obligation for all teachers in ***Article 102 of Organic Law 2/2006 of 3 May on Education,*** and has specific effects on the development of their professional career as a merit in promotion or mobility procedures or as a requirement for obtaining certain salary supplements.

In order to safeguard this right, it is deemed necessary to agree on the coordination mechanism that facilitates the mutual recognition of the certifications that correspond to the digital teaching competence, as well as the effects that derive from them, given that the planning, organisation and recognition of in-service teacher training activities are the exclusive competence of each of the Education Administrations.

2.6 Conclusions

Teachers need to update their competence profiles for 21st century challenges. They have to change their teaching strategies, develop their competences to empower 21st-century learners. The European Framework for the Digital Competence of Educators (DigCompEdu) represents a paradigmatic example of this endeavour. The requirements of education professionals by teacher competence frameworks can serve multiple purposes at different levels in education systems. At the micro level, it can support and guide teachers' practice and continuous professional development. At the meso level of local education governance, it can support the development of school institutions as learning organisations, providing common ground for dialogue, collaboration and reflection in professional communities of practice. At the macro level of quality assurance, it can provide reference standards for initial teacher education, and for education professionals' quality along the career continuum. DigCompEdu links teachers' and students' digital competence development, and can be linked to institutional capacity building and it is generic enough to apply to different educational settings and allowing adaptation as technological possibilities and constraints evolve.

Applied to the context of school education, Area 1 (Professional Engagement) describes teachers' efficient, appropriate use of technologies and digital learning opportunities for communication and collaboration with colleagues, students, parents and others. In addition, it emphasises the importance for teachers to individually and collectively reflect on their teaching practices, to critically assess the effectiveness and appropriateness of their digital teaching strategies and to actively develop them further.

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CHAPTER 3

Digital Resources

CHAPTER 3 Digital Resources

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WHAT WILL WE LEARN IN THIS CHAPTER?

What are Digital Resources?
The Digital Competences of Educators
The Progression Model
Managing Digital Resources

Keywords: Digital learning, Digital learning resources, DLR, Digital Resources, Digital information, Digital learning, DigCompEdu, progression model.

3.1 Glossary and abbreviations

Acceptable Usage Policy (AUP)	An Acceptable Usage Policy (AUP) is a document that outlines a set of rules to be followed by users or customers of a set of computing resources, which could be a computer network, website or large computer system. An AUP clearly states what the user is and is not allowed to do with these resources.
Assistive Technology	Assistive technology (AT) is a generic term used to refer to a group of software or hardware devices by which people with disabilities can access computers. They can be specially developed and marketed devices or off-the-shelf products that have been modified. Assistive technology can include devices such as alternative keyboards and mice, voice recognition software, monitor magnification software, multiple switch joysticks, and text-to-speech communication aids.
Continuous Professional Development (CPD)	CPD is the means by which members of professions maintain, improve and broaden their knowledge and skills and develop the personal qualities required in their professional lives, usually through a range of short and long training programmes, some of which offer accreditation.
Data	This job-related continuing education and training refers to all organised, systematic education and training activities in which people take part in order to obtain knowledge and/or learn new skills for a current or a future job.
Digital Communication	A sequence of one or more symbols given meaning by specific act(s) of interpretation. Data as a general concept refers to the fact that some existing information or knowledge is represented or coded in some form suitable for better usage or processing. Data is measured, collected and reported, and analyzed, whereupon it can be visualized using graphs, images or other analysis tools.
Digital Competence	Digital competence can be broadly defined as the confident, critical and creative use of ICT to achieve goals related to work, employability, learning, leisure, inclusion and/or participation in society.
Digital Content	Any type of content that exists in the form of digital data that are encoded in a machine-readable format, and can be created, viewed, distributed, modified and stored using digital technologies. Examples of digital content include: web pages and websites, social media, data and databases, digital audio, such as mp3s, and e-books, digital imagery, digital video, video games, computer programmes and software. For the DigCompEdu framework, digital content is divided into digital resources and data.
Digital Environment	A context, or a “place”, that is enabled by technology and digital devices, often transmitted over the internet, or other digital means, e.g. mobile phone network.

	Digital environments are usually used for interaction with other users and for accessing and publishing user-created content. Records and evidence of an individual's interaction with a digital environment constitute their digital footprint.
Digital Resources	The term usually refers to any content published in computer-readable format. For the purposes of DigCompEdu, a distinction is made between digital resources and data. Digital resources in this respect comprise any kind of digital content that is immediately understandable to a human user, whereas data need to be analyzed, treated and/or interpreted to be of use for educators.
Digital Services	Services that can be delivered through digital communication, e.g. internet, mobile phone network, that might include delivery of digital information (e.g. data, content) and/or transactional services. They can be either public or private, e.g. e-government, digital banking services, e-commerce, music services (e.g. Spotify), film/TV services (e.g. Netflix).
Digital Technology	Any product or service that can be used to create, view, distribute, modify, store, retrieve, transmit and receive information electronically in a digital form. In this framework, the term "digital technologies" is used as the most general concept, comprising ◆ computer networks (e.g. the internet) and any online service supported by these (e.g. websites, social networks, online libraries, etc.), ◆ any kind of software (e.g. programmes, apps, virtual environments, games), whether networked or installed locally; ◆ any kind of hardware or "device" (e.g. personal computers, mobile devices, digital whiteboards); and ◆ any kind of digital content, e.g. files, information, data. For the purposes of the DigCompEdu framework, the category of digital technologies is broken down into the following areas: Digital devices; digital resources (=digital files + software + online services); data.
Digital Tools	Digital technologies used for a given purpose or for carrying out a particular function of e.g. information processing, communication, content creation, safety or problem solving.
Educational Content	(Digital) content relevant, in one way or another, to the educational context. This term is broader than "educational resource" in that it also comprises content marginal to the instructional process, e.g. communication with students, parents, colleagues; administrative content, etc.
Educational Resources	Resources (digital or not) designed and intended to be used for educational purposes.
Educator	In the context of DigCompEdu, the term "educator" is used to generically refer to any person involved in the process of teaching or transmitting knowledge. In particular, it refers to teachers at all levels of formal education, ranging from pre-primary, primary and secondary, to further and higher education (e.g. university lecturers), to vocational and adult education, and including initial training and continuous professional development. It may, by analogy, also be used to describe people involved in providing training in non-

	formal and informal settings, e.g. social workers, library staff, parents providing home schooling, etc.
E-Portfolios	Collections of (students') work that can advance learning by providing a way for them to organize, archive, display and reflect on their work. E-portfolios are both demonstrations of users' abilities and platforms for their self-expression.
Formative Assessment	Formative assessment refers to a wide variety of methods that teachers use to conduct in-process evaluations of students' comprehension, learning needs, and academic progress during a lesson, unit, or course. The general goal of formative assessment is to collect detailed information that can be used to improve instruction and student learning while it is happening.
Learning Analytics	Learning analytics is the measurement, collection, analysis and reporting of data about learners and their contexts, for the purposes of understanding and optimizing learning and the environments in which it occurs.
Learning Outcomes	Learning outcomes are defined as the knowledge, skills and competences that people have acquired as a result of learning and that can be demonstrated if needed in a recognition process. According to the European Qualifications Framework (EQF) learning outcomes are statements of what a learner knows, understands and is able to do on completion of a learning process.
Open Educational Resources	Teaching, learning and research materials in any medium, digital or otherwise, that are in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions.
Peer-Assessment	Peer assessment is a process whereby students grade each others' assignments or tests, based on a teacher's benchmarks. The practice is employed to save teachers time and improve students' understanding of course materials and to improve their metacognitive skills. Peer
Self-Assessment	Assessment can empower students to take responsibility for, and manage, their own learning; enable students to learn to assess and to develop life-long assessment skills; enhance students' learning through knowledge diffusion and exchange of ideas; motivate students to engage with course material more deeply.
Self-Assessment Tool	Self-assessment involves the ability to be a realistic judge of one's own performance. Proponents of self-assessment suggest it has many advantages, for example, it: provides timely and effective feedback and allows students to assess their own learning quickly; allows
Self-Determined Learning	instructors to understand and provide quick feedback on learning; promotes academic integrity through student self-reporting of learning progress; promotes the skills of reflective practice and self-monitoring; develops self-regulated learning; increases student motivation; improves satisfaction from participating in a collaborative learning environment; helps students develop a range of personal, transferrable skills to meet the expectations of future employers.
Self-Directed Learning	A self-assessment tool is an instrument that assists professionals in their self-assessment, i.e. in evaluating the effectiveness of their performance in all

	areas of responsibility, and determining what improvements are required). Within this document the term is used to refer to online programmes in the form of questionnaires which allow teachers to evaluate their digital competence with the help of a set of questions. Usually, feedback in the form of a report is provided, identifying areas of strength and areas for development.
Self-Regulated Learning	Refers to learning that is guided by metacognition (thinking about one's thinking), strategic action (planning, monitoring, and evaluating personal progress against a standard), and motivation to learn. "Self-regulated" describes a process of taking control of and evaluating one's own learning and behaviour. The concept is related to the concepts of self-directed and self-determined learning. Since the latter two require a higher degree of autonomy, not feasible in all educational contexts, for DigCompEdu the concept of "self-regulated learning" is given preference.
Summative Assessment	Summative assessments are used to evaluate student learning, skill acquisition, and academic achievement at the conclusion of a defined instructional period - typically at the end of a project, unit, course, semester, programme, or school year. Summative-assessment results are often recorded as scores or grades that are then factored into a student's permanent academic record.
Teacher	A teacher is a person who provides education for students in formal education, i.e. within an educational institution. Since the term is often taken to only refer to school education, for DigCompEdu the wider term "educator" is used.
VLE (Virtual Learning Environment)	A virtual learning environment (VLE) is a web-based platform for the digital aspects of courses of study, usually within educational institutions. VLEs typically: allow participants to be organized into cohorts, groups and roles; present resources, activities and interactions within a course structure; provide for the different stages of assessment; report on participation; and have some level of integration with other institutional systems.

Table 3.1. Glossary and abbreviations

3.2. Introduction to DigCompEdu

The Manual "Digital VET Trainer in Agriculture" has been developed within the scope of the European project "Digital Farmer" (2021-1-IT01-KA220-VET-000033225) that aims to develop international multi-stakeholder cooperation between educational institutions, research centers, universities, industrial consultancy and regional promotion companies to improve vocational training in agriculture.

"Digital VET Trainer in Agriculture" was created on the basis of the DigCompEdu, a European framework that brings together the fundamental digital competences that European citizens should possess. The Manual follows the principles set out in the aforementioned document and applies them to the training sector; in fact, it is directly aimed at educators, trainers and VET providers willing to update their teaching skills in the digital environment, also indirectly benefiting the students and the learning processes. In this manual, you will find an overview of educational innovations in the digital sphere: the tools you can use to realize online or on-site lessons in an interactive manner are illustrated, guidance and materials are provided and new inspiration are drawn.

The innovation of this output stems from the fact that essentially there is the lack of manuals of this kind that would base on the European Framework for Digital Competence of Educator for European educators, trainers and facilitators working in the field of VET in agriculture. There is no Manual like ours through which the European educators, trainers and facilitators working in the field of VET in agriculture would be able to independently enhance their own competencies and be able to disseminate good practices and methodologies available through a comparative analysis of a large part of the European landscape.

DigCompEdu, the European Framework for the Digital Competence of Educators, is a scientifically sound background framework which helps to guide policy and can be directly adapted to implementing regional and national tools and training programmes.

In addition, it provides a common language and approach that will help the dialogue and exchange of best practices across borders.

The DigCompEdu framework is directed towards educators at all levels of education, from early childhood to higher and adult education, including general and vocational education and training, special needs education, and non-formal learning contexts. It aims to provide a general reference frame for developers of Digital Competence models, i.e. Member States, regional governments, relevant national and regional agencies, educational organizations themselves, and public or private professional training providers.

JRC (Joint Research Centre) research on Learning and Skills for the Digital Era started in 2005. The aim was to provide evidence-based policy support to the European Commission on harnessing the potential of digital technologies to encourage innovation in education and training practices; improve access to lifelong learning; and impart the new (digital) skills and competences needed for employment, personal development and social inclusion.

More than 20 major studies have been undertaken on these issues, resulting in more than 120 different publications.

Recent work on capacity building for the digital transformation of education and learning, and for the changing requirements for skills and competences has focussed on the development of

digital competence frameworks for citizens (DigComp), educational organizations (DigCompOrg) and consumers (DigCompConsumers).

A framework for opening-up Higher Education Institutions (OpenEdu) was also published in 2016, along with a competence framework for entrepreneurship (EntreComp).

Some of these frameworks are accompanied by (self-)assessment instruments.

Additional research has been undertaken on Learning Analytics, MOOCs (MOOCKnowledge,

MOOCs4inclusion), Computational thinking (Computhink) and policies for the integration and innovative use of digital technologies in education (DigEduPol). A study on blockchain for education is also underway.

More information on all these studies can be found on the JRC Science hub:

https://ec.europa.eu/jrc/en/research-topic/learning-and-skills

3.3 Introduction to the Module

As the world as a whole has become more technologically based, so has the classroom. Digital learning resources, sometimes abbreviated as DLRs, are digital resources that help students and teachers in the learning process. Most digital learning resources are accessed through a connection to the internet. Technology in classrooms has become increasingly prevalent, as many secondary schools move to a one-to-one device model, as each student is issued a laptop or tablet upon admission. SmartBoards are becoming more common in many classrooms, which allows the teacher to interact with digital learning resources during their presentation of new content. This has created an immense impact on how students learn new information.

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Digital technologies have made a paradigm shift in the entire education system. It is not only a knowledge provider but also a co-creator of information, a mentor, and an assessor. Technological improvements in education have made life easier for students. Instead of using pen and paper, students nowadays use various software and tools to create presentations and projects. When compared to a stack of notebooks, an iPad is relatively light. When opposed to a weighty book, surfing an E-book is easier. SmartBoards are becoming more common in many classrooms, which allows the teacher to interact with digital learning resources during their

presentation of new content. Most digital learning resources are accessed through a connection to the internet.

This Module describes the creation/collection/management processes of DLRs using criteria that are described in DigCompEdu, the European Framework for the Digital Competence of Educators.

3.4. Contents of the Module

Today, educators are confronted with a wealth of digital (educational) resources they can use for teaching. One of the key competences any educator needs to develop is to come to terms with this variety, to effectively identify resources that best fit their learning objectives, learner group and teaching style, to structure the wealth of materials, establish connections and to modify, add on to and develop themselves digital resources to support their teaching.

At the same time educators need to be aware of how to responsibly use and manage digital content. They must respect copyright rules when using, modifying and sharing resources, and protect sensitive content and data, such as digital exams or students' grades.

To be successful in the workplace of the future, people will need to have the right digital education. Whether in school, at university or on the job – the digital transformation that is under way is making IT skills more important every day. Digital media are also creating new opportunities for digital learning. I am confident that our company will be able to meet the challenges of digitalization and take advantage of the opportunities it presents, but we will need a comprehensive approach.

In order for digital education to become a reality, educational training for teachers must be modernized as well. Digital education requires well trained teachers who are able to use digital media to convey the relevant information to pupils, trainees and college students. Furthermore, the government should do away with the prohibition against federal involvement in state education matters and develop selected projects as part of an excellence initiative, for example, in the area of digital education. It is important that these efforts be practical, with a focus on the needs of companies.

Digital transformation in the education industry helps improve the learning experience for both students and teachers, as well as other people involved in the process. Such changes focus on improving engagement and accessibility through interactive and customizable learning. As a result, online education gets cheaper, more comprehensive, and more inclusive.

Some of the opportunities that digital transformation in higher education enables are micro-lessons, interactive videos or tests, and even games or AI-based learning methods. All these options help a student get more involved in the process and interact with respective elements or tasks. People with disabilities also get an education with no barriers or difficulties thanks to text-to-speech or colorblind-friendly visualization, for example.

Digital transformation for educational institutions is a huge step forward in enhancing the learning process and automating plenty of operations: from printing countless essays and coursework to evaluating tests and calculating the GPA.

In this module the following concepts will be covered:

- National perspectives
- Digital literacy
- Digital Resources
- Digital learning
- Selecting digital resources
- Creating and modifying digital resources
- Managing, protecting and sharing digital resources
- Organizational communication
- Professional collaboration
- Reflective practice

3.5. Digital literacy

In times of crisis, challenges related to the spread of disinformation and harmful content increase, putting strain on our democracies and individuals' wellbeing.

In a recent Eurobarometer survey, 70% of Europeans who responded shared that they come across news that they believe to misrepresent reality or even be false often.

In another survey (Edelman Trust Barometer, 2020), 74% of respondents expressed concerns about the presence of fake news in the context of the COVID-19 pandemic.

In 2020, respondents to the European Commission's Open Public Consultation on the Digital Education Action Plan 2021-2027 highlighted that skills related to digital literacy, such as identifying facts from fake information, managing 'information overload' and navigating safely online, are recognised as the top three digital skills needed for the 21st century.

Education and training has a crucial role to play in equipping citizens with the critical thinking skills required to exercise judgment in the online world, taking into consideration its particular phenomena, related to the presence of algorithms, 'information bubbles' and 'echo chambers'.

To ensure the effective development of digital literacy and tackling disinformation through the education and training process, teachers and educators need to be further supported with guidance and hands-on examples.

To help tackle these challenges, in October 2022 the Commission launched Guidelines to help teachers and educators to promote digital literacy and address disinformation through education and training.

The guidelines provide hands-on guidance for teachers and educators, including practical tips and activity plans. They are designed for primary and secondary teachers with or without specialist knowledge of digital education. They are accompanied by a final report which brings together the Expert Group's main findings and recommendations.

Digital literacy is an individual's ability to find, evaluate, and communicate information by utilizing typing or digital media platforms. It is a combination of both technical and cognitive abilities in using information and communication technologies to create, evaluate, and share information.

While digital literacy initially focused on digital skills and stand-alone computers, the advent of the internet and the use of social media has resulted in a shift in some of its focus to mobile devices. Similar to other evolving definitions of literacy that recognize the cultural and historical ways of making meaning, digital literacy does not replace traditional methods of interpreting information, but rather extends the foundational skills of these traditional literacies. Digital literacy should be considered a part of the path towards acquiring knowledge.

Digital literacy is linked with the situation of digital inclusion or e-inclusion, “where everyone in society can participate in the information society. This requires affordable access to technologies, the accessibility and usability of ICT tools and services, and the ability and skills of all individuals to use these tools” (European Commission).

The Guidelines for teachers and educators in primary and secondary schools, published by the European Commission on how to address disinformation and promote digital literacy in the classrooms, provide practical support for teachers and educators and include definitions of technical concepts, class-exercises and how to encourage healthy online habits. These Guidelines are a hands-on toolkit for teachers and educators. They will give teachers the knowledge and tools they need to teach our youth how to navigate the digital world. Even a teacher with no or little prior experience in digital education will now be able to effectively explain to pupils how to spot disinformation.

This toolkit covers three main topics: building digital literacy, tackling disinformation, and assessing and evaluating digital literacy.

Currently in Europe, one in three 13-year-olds students lack basic digital skills when directly tested, and according to the OECD, only a little over half of 15-year-olds in the EU reported being taught how to detect whether information is subjective or biased. There is consequently a clear need to strengthen the role of education and training in tackling disinformation and promoting digital literacy as well as media literacy. It will increase resiliency and the possibility to fight the impact of online disinformation more effectively.

The Guidelines are part of the Digital Education Action Plan (2021-2027) and the European Democracy Action Plan. They will contribute to achieving the European Education Area by 2025. They further complement the work that the European Commission is already undertaking to address disinformation through its Erasmus+ Programme, European Solidarity Corps and eTwinning.

The role of media literacy in the fight against disinformation is supported under the Creative Europe programme and via the European Commission supported European Digital Media Observatory and its regional hubs.

Digital inclusion is the European Commission’s effort to ensure that everybody can contribute to and benefit from the digital economy and society. Inclusion, although addressing

all individuals, is predominantly associated with enabling the disadvantaged to receive equal opportunities, as this deems to be a constraint.

The European Commission supports activities for digital inclusion, among others making ICT designs that are accessible for all individuals and developing assistive technologies for persons with disabilities for their better participation and interaction with the use of new technologies.

Moreover, many of the goals of the 2030 Agenda for Sustainable Development of the UE target persons with disabilities, especially Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Note: The Digital literacy tema can be discussed using the Alemira LMS platform (www.alemira.com), that allows to transform passive information consumption into high-engagement knowledge discovery.

Traditionally, content blocks are primarily static — texts, videos, assessments — and they are often repurposed time and time again without proper updates. Alemira LMS puts an end to that, leveraging an Active Approach to content block building.

The Active Model is used to replace static text, pictures, and videos. An instructional content block that, instead of just showing us a snapshot of a system or transition of the system from one state to another over a predefined trajectory, exposes controls for the system and allows the learner to experiment with the system. Importantly, the model allows the learner to perform measurements of the modeled system.

3.6. Digital Resources

Access to the Internet provides a wide variety of digital learning resources to both teachers and students. Some are geared specifically toward helping either students or teachers, but many are meant to help both.

A Digital Resource is defined as a resource that requires access to the computer or any electronic product that provides a collection of data, be it text referring to full-text databases, electronic journals, image collections, and other multimedia and media-based products. numerical, graphic, or temporal values, such as a commercially available title that was published for the purpose of commercialization. These can be delivered on CD ROM, on tape, over the Internet, etc.

Digital information is different from its physical counterpart in many ways. It can be rapidly duplicated, easily distributed, and stored in multiple locations. These factors mean that it can be hard to control and completely eliminate.

3.6.1 Relevant characteristics of digital information

Digital information is very different from its physical counterpart. Physical information has a fixed position in place and time. This is not the case with digital information, which can be:

rapidly duplicated and easily distributed (e.g. a message posted via social media is reposted elsewhere by friends or an email sent to a list of recipients within a very short time frame)

stored in multiple locations (e.g. a photo can be stored simultaneously on a laptop, a smartphone and in the Cloud) created and communicated automatically (e.g. a smartphone can synchronize emails with another device or an online service) stored with varying levels of 'discoverability' (e.g. image files that can only be accessed using a password or other method of authentication.)

To benefit from the use of digital resources and in order "to participate and take advantage, citizens must be digitally literate – equipped with the skills to benefit from and participate in the Information Society. This includes both the ability to use new ICT tools and the media literacy skills to handle the flood of images, text and audiovisual content that constantly pour across the global networks" (Europe's Information Society Thematic Portal, 2007).

In recent years, a number of related techniques and standards have been developed that allow you to create and distribute documents digitally. So, to cope with the current situation, librarians are moving to new means of communication, that is, digital assets for their development of compilation of documents from users who are better satisfied. For instance, the RFID-based library management system is the newest technology used to track inventory and strengthen library theft detection systems. This technology enhances the security of libraries and increases their efficiency by streamlining the processes and reducing human dependence.

Digital assets in magnetic and optical media have a major impact on the collections of school and university libraries. These are most useful due to the inherent capabilities of manipulation and investigation, provided that access to information is cheaper to acquire information resources, savings in terms of conservation and maintenance, etc. and sometimes the electronic format is the only alternative.

Focusing on the amount of digital resources online to choose from, first consider if this material is an open educational resource (OER) or requires the consent of its owner or is under license. Teachers are most interested in OERs, which are available online for free and with immediate access. Therefore, they are digital tools for anyone interested in either teaching or learning. OERs can take the form of lesson plans, syllabi, videos, websites, guides, textbooks, and more.

The term Open Educational Resources first came to use in 2002 at a conference hosted by UNESCO and where it was defined as "the open provision of educational resources, enabled by information and communication technologies, for consultation, use and adaptation by a community of users for non-commercial purposes". Currently the most common definition of open educational resources is that these are "digitized materials offered freely and openly for educators, students and self-learners to use and re-use for teaching, learning and research".

In order to protect copyright, most OERs operate on open licences, often on the Creative Commons (CC), thus making resources available for the broad audience. Although users will be

getting free access to the resource based on the CC license, there may be some underlying conditions they must meet.

This video provides practical indications on how to develop a OER content. A starter kit can be found here.

While the process of creating an OER will vary resource to resource, all creation can be distilled into these four steps.

Step 1: Create your resource

This step will be the most time-intensive and hardest to standardize, but will follow one of the three pathways described above: creating a new resource from scratch, assigning an open license to something you previously created, or adapting/customizing existing content.

Step 2: Pick an open license

OER typically use any Creative Commons (CC) license that does not include a no-derivatives (ND) restriction. For help picking which CC license is the best fit for you and your work, review "Choose and Apply a Creative Commons License" or visit:Creative Commons Licenses

Step 3: Indicate the open license on your resource

It’s good practice to indicate the license on your resource.

Step 4: Share your resource

3.6.2. Digital learning

Digital learning and its supportive technology can help you as a teacher advance learning, mitigate learning loss, and create opportunities for social and emotional engagement. These benefits are possible when you and your students are in the classroom and when you are teaching students who are learning at home.

In a digital learning environment, students need access to devices, internet connectivity, and skills to support optimal learning. Before implementing digital learning, you should consider how to close digital divides, teach digital citizenship, and maintain privacy and security for the student data created by digital learning tools.

In a digital learning environment, Digital Resources are often made up of separate digital media including text, video, images and sound. These are the building blocks which are often used to make composite learning objects such as those displayed above. You may want to use the individual elements to make your own learning resources.

Here are some examples of Digital Resources in a digital learning environment:

- *Digital textbooks*: Digital textbooks can be a cost-effective way to update the curriculum when necessary. They typically come equipped with helpful features, like interactive end-of-unit quizzes, search functions, and sources.
- *Online grade books and classrooms*: Programs like Google Classroom, Blackboard, Schoology, and the like are excellent organizational tools for teachers and students. Teachers can keep grade books, teaching materials, attendance, IEP information, and differentiation strategies organized all in one place. Students can choose to be alerted to upcoming assignments or newly posted material.
- *Interactive models*: When physical models are difficult or impossible to obtain, many interactive models can be sourced online. For example, in an anatomy and physiology classroom, a cadaver lab would be impossible in the K-12 context. However, interactive models of the human body online can allow students to learn the same information in an interactive way. Teachers can also use these interactive models during their presentation of new content.

More in general, the term Digital Resources usually refers to any content published in computer-readable format. A distinction is normally made between digital resources and data. Digital resources comprise any kind of digital content that is immediately understandable to a human user, whereas data need to be analyzed, treated and/or interpreted to be of use for educators.

Meanwhile, Digital Technologies are any product or service that can be used to create, view, distribute, modify, store, retrieve, transmit and receive information electronically in a digital form. In this framework, the term “digital technologies” is used as the most general concept, comprising:

- computer networks (e.g. the internet) and any online service supported by these (e.g. websites, social networks, online libraries, etc.);
- any kind of software (e.g. programmes, apps, virtual environments, games), whether networked or installed locally;
- any kind of hardware or “device” (e.g. personal computers, mobile devices, digital whiteboards); and
- any kind of digital content, e.g. files, information, data.
- podcasts and audio, such as music, boost participation and reach students with different learning styles.

Online educational games make learning concepts fun for students. Literature and online news articles are examples of digital learning materials that are quick to access and share.

3.6.3. What are Digital Educational Resources?

1. A set of software, information, technical and organizational support, that reflects a certain subject area and implements the technology for its study by different learning activities.

2. Digital entities produced specifically with the purpose of supporting teaching and learning.

For the purposes of the European DigCompEdu framework, the category of digital technologies is broken down into the following areas: Digital devices; digital resources (=digital files + software + online services); data.

Digital resources must be selected correctly to open the way to the right technologies. In particular, it is necessary to identify, assess and select digital resources to support and enhance teaching and learning. This can be done by considering the specific learning

objective, context, pedagogical approach, and learner group, when selecting digital resources and planning their use.

The European DigCompEdu Framework aims to capture and describe these educator-specific digital competences by proposing 22 elementary competences organized in 6 areas (see figure below):

- *Area 1* is directed at the broader professional environment, i.e. educators' use of digital technologies in professional interactions with colleagues, learners, parents and other interested parties, for their own individual professional development and for the collective good of the organization.
- *Area 2* looks at the competences needed to effectively and responsibly use, create and share digital resources for learning.
- *Area 3* is dedicated to managing and orchestrating the use of digital technologies in teaching and learning.
- *Area 4* addresses the use of digital strategies to enhance assessment.
- *Area 5* focuses on the potential of digital technologies for learner-centered teaching and learning strategies.
- *Area 6* details the specific pedagogic competences required to facilitate students' digital competence.

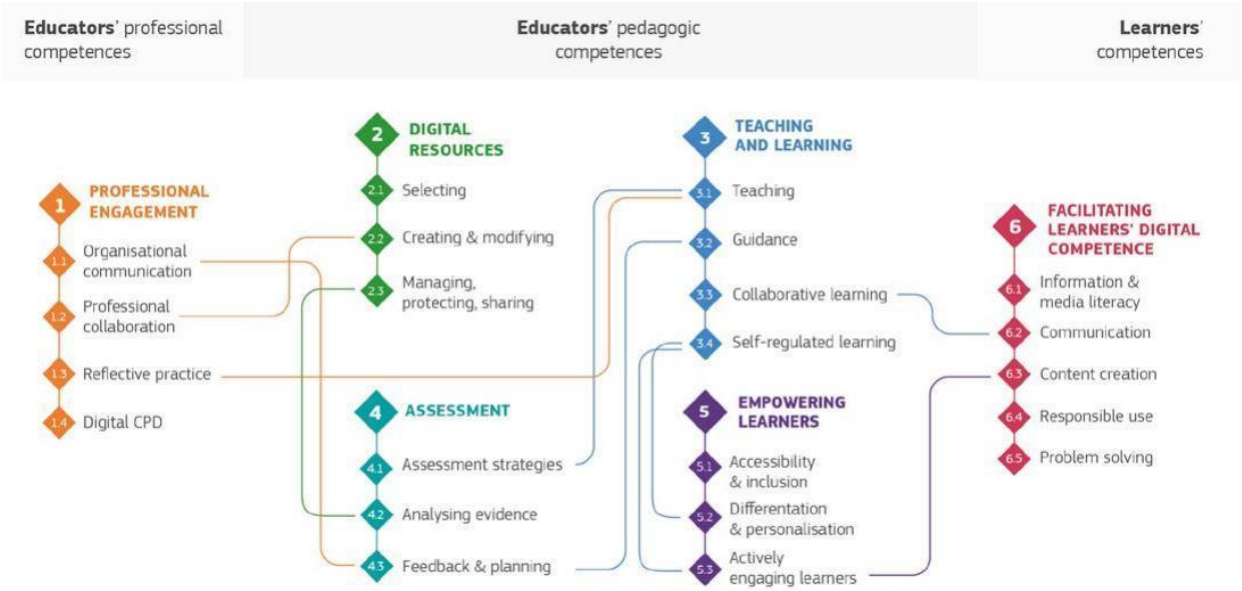

Figure 3.1. DigCompEdu competences and their connections

Source: "European Framework for the Digital Competence of Educators", https://publications.jrc.ec.europa.eu/repository/handle/JRC107466

The Framework also proposes a progression model to help educators assess and develop their digital competence.

It outlines *six different stages* through which an educator's digital competence typically develops, so as to help educators identify and decide on the specific steps to take to boost their competence at the stage they are currently at.

At the first two stages, Newcomer (A1) and Explorer (A2), educators assimilate new information and develop basic digital practices; at the following two stages, Integrator (B1) and Expert (B2), they apply, further expand and structure on their digital practices; at the highest stages, Leader (C1) and Pioneer (C2), they pass on their knowledge, critique existing practice and develop new practices.

In general, the following characteristics apply to the different competence stages:

Newcomer (A1):

Newcomers are aware of the potential of digital technologies for enhancing pedagogical and professional practice. However, they have had very little contact with digital technologies and use them mainly for lesson preparation, administration or organizational communication.

Newcomers need guidance and encouragement to expand their repertoire and to apply their existing digital competence in the pedagogical realm.

Explorer (A2):

Explorers are aware of the potential of digital technologies and are interested in exploring them to enhance pedagogical and professional practice. They have started using digital

technologies in some areas of digital competence, without, however, following a comprehensive or consistent approach.

Explorers need encouragement, insight and inspiration, e.g. through the example and guidance of colleagues, embedded in a collaborative exchange of practices.

Integrator (B1):

Integrators experiment with digital technologies in a variety of contexts and for a range of purposes, integrating them into many of their practices. They creatively use them to enhance diverse aspects of their professional engagement.

They are eager to expand their repertoire of practices. They are, however, still working on understanding which tools work best in which situations and on fitting digital technologies to pedagogic strategies and methods.

Integrators just need some more time for experimentation and reflection, complemented by collaborative encouragement and knowledge exchange to become Experts.

Expert (B2):

Experts use a range of digital technologies confidently, creatively and critically to enhance their professional activities. They purposefully select digital technologies for particular situations, and try to understand the benefits and drawbacks of different digital strategies. They are curious and open to new ideas, knowing that there are many things they have not tried out yet. They use experimentation as a means of expanding, structuring and consolidating their repertoire of strategies.

Experts are the backbone of any educational organization when it comes to innovating practice.

Leader (C1):

Leaders have a consistent and comprehensive approach to using digital technologies to enhance pedagogic and professional practices. They rely on a broad repertoire of digital strategies from which they know how to choose the most appropriate for any given situation. They continuously reflect on and further develop their practices. Exchanging with peers, they keep updated on new developments and ideas.

They are a source of inspiration for others, to whom they pass on their expertise.

Pioneer (C2):

Pioneers question the adequacy of contemporary digital and pedagogical practices, of which they themselves are Leaders. They are concerned about the constraints or drawbacks of these practices and driven by the impulse to innovate education even further. Pioneers experiment with highly innovative and complex digital technologies and/or develop novel pedagogical approaches.

Pioneers are a unique and rare species. They lead innovation and are a role model for younger teachers.

3.7. Selecting digital resources

Selecting digital resources means identifying, assessing, and selecting digital resources to support and enhance teaching and learning. To consider the specific learning objective, context, pedagogical approach, and learner group when selecting digital resources and planning their use.

The availability of digital resources themselves will not transform learning. Evidently, the activity of engaging and updating the already available digital resources is doomed due to technological advancements. Here is the role of the educator, who can decide upon passive use of digital resources, simply using available resources as they are, or active use, which can be demonstrated by designing own resources, peer collaboration, interacting with experts, or even coding.

Digital resources abound online. They can be more up to date and just as accurate as a textbook. Where do we find them, and how do we curate them?

Printed textbooks served such an important purpose for so long. For years, information was at a premium, and textbooks filled the void. They were chock full of it—a one-stop shop for the curious student.

But textbooks are bulky, inflexible, and pricey. They can be outdated when they arrive in classrooms, and they're often outdated when schools finally adopt new ones.

Things have changed. We don't have a lack of places to learn new things.

Google searches and YouTube are where many of us go first to get that quick question answered. They're often a good jumping-off point if we want to delve deep into a topic as well. But the info we find there can be inaccurate or superficial.

Open educational resources (OERs) may be one of the best options available right now.

They're also a great option for adding unique experiences to the lessons you already teach.

These resources include:

- individual reading selections
- videos
- PowerPoint presentations
- interactive digital experiences
- pre-made or customizable digital "textbooks"

The most recognized digital learning resources are Youtube, Khan Academy, MOOCs, podcasts, Quizlet, e-textbooks, and so forth.

Finding the most reliable websites for research starts with evaluating the website itself. Sites run by academic or government organizations rank high in reliability. Databases and specialized search engines can also provide good research sources.

Next, make sure you understand the source of the information and the process used to publish it. Scholarly articles and books that undergo peer review make for the best academic resources.

Finally, when in doubt, check with an instructor or an academic librarian. They can help point you to reliable sources or double-check sources you're unsure about.

Suggested activities

- To formulate appropriate search strategies to identify digital resources for teaching and learning.
- To select suitable digital resources for teaching and learning, considering the specific learning context and learning adjective.
- To critically evaluate the credibility and reliability of digital sources and resources.
- To consider possible restrictions to the use or re-use of digital resources (e.g. copyright, file type, technical requirements, legal provisions, accessibility).
- To assess the usefulness of digital resources in addressing the learning objective, the competence level of the concrete learner group as well as the pedagogic approach chosen.

3.7.1 Some suggested digital resources

"Cloud Computing for Kids", https://www.create-learn.us/cloud-computing-for-kids The best cloud computing class for kids is a cloud computing class designed for kids. Many cloud computing courses you may find online are for college students and older. These courses could be overly technical and theoretical for younger students. Kids learn concepts better with engaging hands-on projects that bring the concepts to life. The concepts must also be explained at a level appropriate for a child.

"Cloud Computing & Education" by Gordon Gottsegen, https://builtin.com/cloud-computing/cloud-computing-and-education Cloud computing in education refers to moving a school system's data and IT resources to an offsite cloud server. This server is managed by a third-party provider and allows appropriate personnel to access data from anywhere and at any time.

The decision to store school data on the cloud has delivered promising results, and this trend shows no signs of slowing down. Cloud computing in education is on track to become an $8.7 billion industry by 2027, offering a range of benefits that educators have come to embrace.

"Sparkle and Google Cloud: Transforming the Future of Research and Education", https://www.ocre.cloud.tisparkle.com/sparkle-and-google-cloud-transforming-the-future-of-research-and-education Cloud computing offers compelling advantages to researchers, from accelerating the speed of processing massive datasets to improving collaboration through shared tools and data storage. Within the OCRE Cloud Framework and through Sparkle's role as Cloud Integrator, Google Cloud will further support European R&E Institutions.

Google Cloud is a suite of cloud solutions for storage, compute, big data, machine learning and more.

Progression		Proficiency statements
Newcomer (A1) 	Making little use of the internet to find resources.	I only rarely, if at all, use the internet to find resources for teaching and learning.
Explorer (A2) 	Being aware and making basic use of digital technologies for finding resources.	I use simple internet search strategies to identify digital content relevant for teaching and learning. I am aware of common educational platforms which provide educational resources.
Integrator (B1) 	Identifying and assessing suitable resources using basic criteria.	I adapt my search strategies based on the results I obtain. I filter results to find suitable resources, using appropriate criteria. I evaluate the quality of digital resources based on basic criteria, such as e.g. place of publication, authorship, other users' feedback. I select resources that my learners may find appealing, e.g. videos.
Expert (B2) 	Identifying and assessing suitable resources using complex criteria.	I adapt my search strategies to identify resources which I can modify and adapt, e.g. searching and filtering by license, filename extension, date, user feedback etc. I locate apps and/or games for my learners to use. I evaluate the reliability of digital resources and their suitability for my learner group and specific learning objective. I give feedback and recommendations on the resources I use.
Leader (C1) 	Comprehensively identifying and assessing suitable resources, considering all relevant aspects.	In addition to search engines, I use a variety of other sources, e.g. collaborative platforms, official repositories, etc. I evaluate the reliability and suitability of content based on a combination of criteria, verifying also its accuracy and neutrality. When I use resources in class, I contextualise them for the students, e.g. by pointing out their source and potential bias.
Pioneer (C2) 	Promoting the use of digital resources in education.	I provide guidance to colleagues on effective search strategies and suitable repositories and resources. I set up my own repository of (links to) resources, appropriately annotated and rated, and make it available for other colleagues to use.

Figure 3.2. Selecting digital resources

Source: "European Framework for the Digital Competence of Educators", https://publications.jrc.ec.europa.eu/repository/handle/JRC107466

Google Cloud Platform allows Customers to avoid the vendor lock-in with its commitment to open source, multi-cloud and hybrid cloud, allowing to use data and run applications on any cloud or in any environment. Google Cloud distributed cloud solutions provide consistency between public and private clouds, enabling businesses to modernize and developers to build faster.

"Enhancing Education through Cloud-Based Technologies", https://acerforeducation.acer.com/technologies/high-education/enhancing-education-through-cloud-based-technologies Technology is a fundamental element of today's society, always with us in our daily lives. Cloud-based technologies are becoming increasingly essential in students' routine, both in and out of their classrooms. Thanks to cloud computing, teachers and students are able to better interact and get connected, and they can manage information in a faster and more dynamic way.

"Smart Farming: IoT Based Smart Sensors Agriculture Stick for Live Temperature and Moisture Monitoring using Arduino, Cloud Computing & Solar Technology" by Anand Nayyar et al., https://www.researchgate.net/profile/Anand-Nayyar/publication/313804002_Smart_farming_IoT_based_smart_sensors_agriculture_stick_for_live_temperature_and_moisture_monitoring_using_Arduino_cloud_computing_solar_technology/ Internet of Things (IoT) technology has brought revolution to each and every field of common man's life by making everything smart and intelligent. IoT refers to a network of things which make a self-configuring network. The development of Intelligent Smart Farming IoT based devices is day by day turning the face of agriculture production by not only enhancing it but also making it cost-effective and reducing wastage. The aim / objective of this paper is to propose a Novel Smart IoT based Agriculture Stick assisting farmers in getting Live Data (Temperature, Soil Moisture) for efficient environment monitoring which will enable them to do smart farming and increase their overall yield and quality of products.

3.8. Creating and modifying digital resources

In order to create digital resources you do not need to be a programmer or use complicated platforms. On the contrary, no matter which subject matters you teach, and whether you have access to support or not, there are many tools and applications allowing you to create engaging resources that may facilitate learning for your students.

In this video you can see an overview of H5P, an online tool that allows you to create interactive resources.

Most educational resources today are "born digital," meaning they are digital files before they are put into print or any other format. There is a wide variety of software and platforms available to assist with creating or editing digital content that can be used as OER, but it can be confusing to decide on which platform to use.

Low Tech

The simplest way to create educational resources is by using familiar word processing tools such as *Microsoft Word, Google Docs, or Libre Office*. This software includes most of the features needed for standard content, and the file can be easily exported as a PDF or printed. Additional low-tech options include:

LibreOffice Draw: Draw lets you produce anything from a quick sketch to a complex plan, and gives you the means to communicate with graphics and diagrams. Draw is an excellent package for producing technical drawings and other visual examples.

InkScape: An open source application that creates and edits PDFs and also works as a vector drawing and graphics tool. A better option for PDF editing if your document is image-heavy.

Medium Tech

Another common way to create or edit educational resources is to create a website or hosted resource. This could be in the form of a blog, a static website, or a wiki. *WordPress* can be a great tool for these sorts of medium-tech projects.

Additional medium-tech options include:

Gnu Image Manipulation Program (GIMP): GIMP is an open source, cross-platform image editor available for GNU/Linux, OS X, Windows, and other operating systems.

OER Commons Open Author: Open Author helps you build Open Educational Resources, lesson plans, and courses to share openly on the OER Commons platform.

Pressbooks: Pressbooks is a simple book formatting software. Some institutions, like Iowa State University, provide author support for publishing in Pressbooks through our Digital Press.

High Tech

There are a number of platforms that provide professional tools for authoring content, and some are very easy to use. A common tool used by OER projects is *PressBooks* (in which this text is published), a publishing software that makes it easy to produce interactive e-books and other text-based content. Other tools, like *Jupyter Notebooks*, may take time to master and require special expertise.

Additional high-tech options include:

GitBook: Created by GitHub, this open source tool allows you to create a book hosted on the GitHub platform. You can create your book in Markdown, add images and embed content from the Internet.

Bookdown: The bookdown package is an open-source R package that facilitates writing books and long-form articles/reports with R Markdown.

Jupyter Notebook: Jupyter Notebook is an open-source web application that allows you to create and share documents that contain live code, equations, visualizations and narrative text.

Some authoring platforms on the market include restrictions on how the final product can be published or shared. Before beginning, it is important to make sure you understand the terms of use and whether you will be able to move your work to a different platform if you choose.

Suggested activities:

- To modify and edit existing digital resources, where this is permitted.
- To combine and mix existing digital resources or parts thereof, where this is permitted.
- To create new digital educational resources.
- To jointly create with others digital educational resources.
- To consider the specific learning objective, context, pedagogical approach and learner group, when adapting or creating digital educational resources.
- To understand different licenses attributed to digital resources and the implications for their re-use.

3.9 Managing, protecting and sharing digital resources

The extensive and growing use of online resources and materials in learning and teaching presents new opportunities and benefits to institutions. Technology has made the sharing and re-use of resources easier, and institutions and their staff can exploit the benefits within their working practises.

Alongside this, institutional policies and processes may need updating to take into account the corresponding changes in management approach and system provision.

Institutions reviewing the opportunities to gain from these developments should assess the benefits of managing and sharing online resources for teaching, learning, and research, taking a fresh approach to copyright, finding incentives for staff to engage, and deciding what information systems are required to support the business processes involved.

Institutional repositories provide a managed online system where the institution's resources can be both stored and accessed. They can give staff private or group areas where they can share material with their immediate colleagues.

But material can, when appropriate, be re-used more widely, indeed openly, as staff and the institution see fit. Help from central support staff in managing resources in the system means that they are easy to find and work with. Ownership can remain with the university or college yet management be shared with tutors.

Progression		Proficiency statements
Newcomer (A1) 	**Refraining** from modifying digital resources.	I may make use of digital resources, but I do not usually modify them or create my own resources.
Explorer (A2) 	Creating and modifying resources using **basic tools** and strategies.	I use office software to design and modify e.g. worksheets and quizzes. I create digital presentations for instructional purposes.
Integrator (B1) 	Creating and modifying resources using **some advanced features**.	When I create digital resources (e.g. presentations), I integrate some animations, links, multimedia or interactive elements. I make some basic modifications to the digital learning resources I use to fit them to the learning context, e.g. editing or deleting parts, adapting the general settings. I address a specific learning objective when selecting, modifying, combining and creating digital learning resources.
Expert (B2) 	Adapting **advanced digital resources** to a concrete learning context.	I integrate a range of interactive elements and games into my self-created instructional resources. I modify and combine existing resources to create learning activities that are tailored to a concrete learning context and objective, and to the characteristics of the learner group. I understand different licenses attributed to digital resources and know the permissions granted to me as regards modifying resources.
Leader (C1) 	Creating, co-creating and modifying resources according to the **learning context**, using a **range of advanced strategies**.	I create and modify complex and interactive digital learning activities, e.g. interactive worksheets, online assessments, online collaborative learning activities (e.g. wikis, blogs), games, apps, visualisations. I co-create learning resources with colleagues.
Pioneer (C2) 	Creating **complex, interactive** digital resources.	I create my own apps or games to support my educational objectives.

Figure 3.3: Creating and modifying digital resources

Source: "European Framework for the Digital Competence of Educators", https://publications.jrc.ec.europa.eu/repository/handle/JRC107466

An institutional repository can help in the effective management of resources for e-learning and should be set up to meet the needs of an institution's strategy for managing, sharing and reusing resources.

A good strategy would lead to:

- A clear strategic vision of the institution's attitude and approach to management of learning and teaching resources
- Explicit and workable policies on copyright and ownership
- Improved institutional facilities for staff to share e-resources
- Higher levels of quality in e-learning materials
- An enhanced reputation for the institution and its staff

Teaching staff are already aware of the benefits of sharing materials in terms of saving time and trouble and improving quality. Lecturers readily share with their immediate colleagues and with collaborative subject groups, often using 'personal' means (such as email, memory sticks, personal web pages, etc.) and more recently, external sharing systems (such as Flickr, Slideshare, YouTube, etc.).

In many cases, teaching staff use the institutional Virtual Learning Environment (VLE) as a storage and sharing system, as this is where they upload a substantial amount of their teaching materials. However, VLEs are not really designed for this purpose. The recent development of centrally managed institutional repository systems offers much greater potential.

Benefits of managing and sharing resources for an institution include:

- Saving time and cost by re-use
- Making better quality resources available to tutors
- Supporting collaborative course development both within institutions and across institutions
- Giving access to outputs of development projects
- Supporting the transfer of institutional research and enterprise knowledge for learning and teaching
- Coping with situations where staff leave and are replaced
- Developing good professional reputations for individuals and institutions within the further and higher education (FHE) sector.

As well as teaching materials, repositories can be useful for a wide range of institutional resources and collections.

Examples include undergraduate dissertations, showcases of student work, past examination papers, digitized images used locally and collections of sound recordings from lectures or other activities. Educational material and its use differs from that in research repositories and will need a different approach. Within an institutional repository a university or college can decide its own way of working and set its own rules for usage and management.

Alongside benefits for individual institutions, there are additional benefits to the educational sector as a whole.

Some institutions are more than happy to share their online learning resources openly across the sector; others host publicly-funded projects which develop teaching materials, and could as a matter of policy always publish such materials openly in a readily accessible manner.

Suggested activities:

- To share resources using links or as attachments, e.g. to e-mails.
- To share resources on online platforms or personal or organizational websites/blogs.
- To share with one own repositories of resources with others, managing their access and rights as appropriate.
- To respect possible copyright restrictions to using, re-using and modifying digital resources.
- To appropriately reference sources when sharing or publishing resource subjects to copyright.
- To attribute (open) licenses to self-created resources.
- To take measures to protect sensitive data and resources (e.g. students' grades, exams).
- To share administrative and student related data with colleagues, students and parents, as appropriate.

3.10 Conclusion

Farmers can optimize the agricultural activities in a sustainable way with modern technologies. This integration has boosted the agriculture production due to high potentiality in assisting the farmers.

The impulse towards technological advancement has revived the traditional agriculture methods and resulted in eco-friendly, sustainable, and efficient farming.

In fact, the key to smart agriculture is in utilizing information and communication technologies to make agricultural cultivation and production automatic and intelligent.

During the pedagogical integration of the new technologies there are some challenges:

Figure 3.4. "Use of Information and Communication Technology (ICT) to achieve information literacy in agriculture".

Source: Anandaraja Nallusamy et al., International Journal of Agricultural Extension, http://www.escijournals.net/IJAE

Progression		Proficiency statements
Newcomer (A1) 	Not employing strategies for sharing resources.	I store and organise digital resources for my own future use.
Explorer (A2) 	Managing resources using basic strategies.	I share educational content via e-mail attachments or through links. I am aware that some resources distributed on the Internet are copyrighted.
Integrator (B1) 	Effectively sharing and protecting resources using basic strategies.	I share educational content on virtual learning environments or by uploading, linking or embedding it e.g. on a course website or blog. I effectively protect sensitive content, e.g. exams, students' reports. I understand the copyright rules that apply to the digital resources I use for school purposes (images, text, audio and film).
Expert (B2) 	Professionally sharing resources.	I share resources embedding them into digital environments. I effectively protect personal and sensitive data and restrict access to resources as appropriate. I correctly reference resources affected by copyright.
Leader (C1) 	Digitally publishing self-created resources.	I compile comprehensive digital content repositories and make them available to learners or other educators. I apply licenses to the resources I publish online.
Pioneer (C2) 	Professionally publishing self-created digital content.	I annotate the resources I digitally share and enable others to comment, rate, modify, re-arrange or add to them.

Figure 3.5. Managing, protecting and sharing digital resources

Source: "European Framework for the Digital Competence of Educators", https://publications.jrc.ec.europa.eu/repository/handle/JRC107466

In Smart Farming, the management of activities along the entire supply chain takes place on the basis of different types of data (position, climate, phytosanitary and/or economic-company status, etc.) collected in various ways (sensors, drones, satellites, etc.).

The data is analyzed and used to carry out more accurate and timely decision-making processes, through constant monitoring and specific analyzes of the so-called Big Data.

3.11 National perspectives

3.11.1 Estonia

The Estonian Education Strategy 2021–2035 guides the most important developments in the area of education. It is the basis of priority setting and funding decisions, and for the development of implementation programmes that support the achievement of strategic goals.

The strategy builds on the principle that to achieve the future goals of education in Estonia, it is necessary to maintain and further develop its strengths and to address bottlenecks.

Overall objective of the strategy is to equip the population of Estonia with the knowledge, skills and attitudes that prepare people to fulfill their potential in personal, occupational and social life and contribute to promoting the quality of life in Estonia as well as global sustainable development.

The overall objective is underpinned by three strategic goals:

1. Learning opportunities are diverse and accessible and the education system enables smooth transitions between levels and types of education.

2. Estonia has competent and motivated teachers and heads of schools, a diverse learning environment and a learner-centered approach to learning and teaching.

3. Learning options are responsive to the development needs of society and the labor market.

Digital solutions and the increasing level of digital competence have improved the accessibility, diversity and efficiency of Estonian education. General education schools and vocational schools have a high-level digital infrastructure. The Ministry of Education and Research highlights the need to continue the development of digital competences and support the diversification of learning, including through digital solutions.

3.11.2 Spain

Spain has a fairer, more social and more sustainable PAC-common agricultural policy to promote a strategic agri-food sector that has the budget and tools necessary to meet the economic, social and environmental challenges of the next decade, in line with the new demands of consumers.

The aim is to support professional and family farming to improve its competitiveness while at the same time promoting profound but gradual changes that reward the environmental commitment of farmers and livestock farmers, while at the same time increasing their efficiency and guaranteeing fairer and more efficient payments.

The Future of Agriculture in Spain: A new PAC model geared towards achieving the following results:

1. promote a smart, competitive, resilient and diversified agricultural sector that ensures long-term food security;

2. support and strengthen environmental protection, including biodiversity, and climate action and contribute to achieving the Union's environmental and climate objectives, including commitments under the Paris Agreement;

3. strengthening the socio-economic fabric of rural areas.

However, as in other fields, legislation and ICT are not moving at the same pace. Much remains to be done in terms of the regulatory framework to guarantee quality and safety in the industrial processes in which these technologies are involved.

3.11.3 Greece

The Ministry of Rural Development and Food in Greece is responsible for the country's agricultural policy, which aims to ensure high-quality and safe agricultural products while also providing a satisfactory level of income to farmers and protecting the environment.

The Common Agricultural Policy (CAP) of the European Union is also applicable in Greece, which includes regulations related to agricultural production, financial aid to farmers, rural development, and market regulation. The CAP has undergone various reforms to meet the changing needs of society and agriculture. In terms of technological development and mechanization in Greece, there is still a need for further investment in agriculture.

The application of innovative technologies and information and communication technologies can play a crucial role in promoting healthy entrepreneurship and economic progress in rural areas while ensuring sustainable production processes and protecting the environment. The Horizon European program also offers extra funding to support research and innovation in areas like food, agriculture, rural development, and bioeconomy in Greece. This funding works in conjunction with rural development interventions that are co-funded by the EAFRD (European Agricultural Fund for Rural Development).

3.11.4 Romania

During the pandemic, important steps were taken in the digitization of many Romanian educational systems. Thus, many of the schools did not even have a wifi network or computers that children did not have access to, but the Covid period forced things so that schools accept the importance of digital transformation.

Currently, in the vast majority of schools in Romania, especially those in cities, there are well-implemented information systems, such as Smart Classroom, ITeach, Kinderpedia (class/group management and learning activities, but also for communication and collaboration), DigitalEdu (database with educational resources in digital format created by teachers, organized by subjects and years of study), etc.

3.11.5 Slovenia

ICT are in general covered by the »Information Security Act«, especially within the articles 11 – 15 defining the conditions and measures related with information security that electronic service providers have to fulfil / take into account.

The communication technologies are additionally regulated by the new »Electronic Communications Act« adopted in November 2022. The articles 33 and 52 set the conditions for awarding the right for using the radio frequencies with communicating devices on terrain. It also sets the requirements for electronic communications networks and services, including cookies and direct marketing by electronic means. ZEKom-1 implemented the EU Privacy and Electronic Communications Directive (e-Privacy Directive) in Slovenia.

The »Agriculture Act« regulates, in articles 138 – 171, the collection of electronic data, database design, management and the use of available data related with individual agricultural economies.

3.11.6 Turkiye

In a study named "Evaluation of Teachers' Use of New Technologies and Web 2.0 Tools in Education" conducted by the General Directorate of Innovation and Educational Technologies of the Ministry of National Education in Turkiye, the areas that teachers prefer to use more and the web 2.0 tools in these areas were researched and 14 different usage areas (Survey preparation, Animation preparation, e-book preparation, photography and picture preparation, Journaling, Classroom management, Web page preparation, Logo making, Coding tool, Story writing, Video and music preparation, Virtual wall/board preparation, Slide and presentation preparation, 3D design) a total of 127 web 2.0 tools have been identified. Teachers reported that they came across the new technologies while surfing on the net 35.1%, and it was found that they followed them up on social media such as Facebook and Twitter 33.7%, and on the platforms such as eTwinning or EBA. In another study, it was concluded that teachers' digital competencies after the first year of the pandemic process (March 2021) increased significantly compared to their pre-pandemic (February 2020) competencies. In other words, the pandemic process has positively affected the development of teachers' digital skills. In the study, the time variable also created a significant difference on teachers' digital competencies. The time from the beginning of the pandemic process to the end of the first year of the pandemic has affected the digital competencies of teachers.

Suggested activity

The tema of national education strategy can be discussed using the Kialo (www.kialo.com) platform.

Kialo is a public discussion platform designed to facilitate reasoned debates about complex topics online. Since the first launch in the fall of 2017, Kialo has grown into a community with thousands of debates and millions of contributions.

Many teachers asked for an education-focused version of Kialo. Kialo Edu (kialo-edu.com) is now launched and fully operational.

Kialo Edu allows educators to curate spaces for students to work through complex subjects together, while giving students the space to ask questions, discuss, and evaluate new ideas.

Suggested digital platforms

1.Arduino https://www.arduino.cc

2.Kialo www.kialo.com

3.Alemira LMS www.alemira.com

4.7 CFR-Agriculture https://www.farms.com/agriculture-apps/education/7-cfr-agriculture

5.Abaco Farmer www.abacofarmer.com

6.AgriApp www.agriapp.com

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CHAPTER 4

Teaching and Learning

CHAPTER 4 Teaching and Learning

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WHAT WILL WE LEARN IN THIS CHAPTER?

Needs within DIGICOMP framework
Digital tools and methods to improve digital competencies
Self-assessment methods and tools

Keywords: Digital competence, self-assessment tools, training programmes, Digicomp.

4.1. Glossary and abbreviations

In the following table, some words/abbreviations/definitions useful for understanding the chapter have been reported.

Digital competence	A range of skills that permit a person to manage digital tools in its daily life.
Self-assessment tool	Tools that have been developed within the objective of permit to assess in an individual way, the knowledge acquired.
VET	Vocational education and training (VET) provide learners with essential skills enhancing their employability, supporting their personal development and encouraging active citizenship. VET boosts enterprise performance, competitiveness, research and innovation.
ICT	Abbreviation for information and communication technology: a school subject in which students learn to use computers and other electronic equipment to store and send information
Problem Based Learning (PBL)	Problem-based learning (PBL) is a student-centered approach in which students learn about a subject by working in groups to solve an open-ended problem. This problem is what drives the motivation and the learning

Table 4.1. Glossary and abbreviations

4.2. Chapter connection to the DigiComp

In the DigCompEdu, the "Teaching and Learning" section discusses how digital tools can be useful for teaching in general, for stimulating student collaboration and self-education. In particular, these are the knowledge and the skills that the reader can learn to:

- integrate digital tools into teaching practices;
- use digital tools and services to improve teacher/trainer interactions with students;
- use digital technologies to foster and optimise student collaboration;
- help students to rework their learning through digital tools.

4.3. Introduction to specific module

Teaching and learning are two of the most relevant elements of pedagogical action. These two elements had been transformed by the digitalization of the world, so that is why in this chapter we will learn how digital tools can be used for this purpose. The aim of this text is not to teach the technical aspects of the tools exposed, nor to enlist all the tools available, but to give a glimpse of what can be done. Digital proficiency does not mean to memorise user guides but to have a more intuitive perspective of what can be done. And that is because the human factor is at the core of new digital approaches. A digital proficient user knows that doubts of technical aspects of any specific tool can be easily solved by finding them in the right places.

The aim of the chapter will be to give the glimpse that it does not exist a universal pedagogical action that will fit into all groups. Human factors should be taken into account when teaching . In that regard, the task of the digital proficient teacher will be to know:

1) technical capacity of their students,
2) level of digital competences of their students,
3) the level of complexity students are asked,
4) the contents asked by programs and
5) the willingness of the educational institution to implement more digital approaches..

4.4. Opening section

As VET educators face a rapidly changing set of challenges, they need a broader and more sophisticated set of competences than ever before. In particular, the widespread presence of digital devices and the duty to help learners become digitally competent require educators to develop their own digital competence. Internationally, several frameworks, self-assessment tools and training programmes have been developed to describe each facet of educators' digital competence and to help them assess their qualifications, identify their training needs and provide them with specific preparation. This report presents a common European framework for the digital competence of educators (DigComp) based on the analysis and comparison of these instruments. DigComp is a scientifically sound reference framework that helps guide policy and can be directly adapted to implement international training tools and programmes. It also provides a common language and approach, which will help the dialogue and exchange of good practices between the different project partners (Redecker, 2017).

The teaching and learning area of the European Framework for the Digital Competences of Educators, divides this area in four abilities:

1. Teaching
2. Guidance
3. Collaborative learning
4. Self-regulated learning

All these abilities are important for an educator and a trainer regardless of the implications of the ICTs in the process. The DigComp document establishes a 6-grade system for each ability for teaching and learning:

A1 **Newcomer**	**A2** **Explorer**	**B1** **Integrator**	**B2** **Expert**	**C1** **Leader**	**C2** **Pioneer**
• Awareness • Uncertainty • Basic Use	• Exploring • Digital teaching and learning • Strategies	• Meaningfully Integrating • Digital Strategies	• Enchaining teaching and learning strategies	• Strategically &Purposefully • Renewing Teaching Practice	• Innovating Teaching

Table 4.2. The 6-grade system for each ability of DIGICOMP

4.4.1. Teaching

4.4.1.1. Level of proficiency: analysis of levels

This competence refers to designing, planning and implementing the use of different technologies in the different stages of the learning process. Teaching is one of the most central roles of the trainer. The DigComp system for educators graduates this confidence in six different stages.

The newcomer stage groups those teachers who make little use of digital technologies for instruction. In the year 2022, most educators in their teacher role had adapted some usage of the ICTs. ***In the second stage*** we can sort those educators who teach making basic use of available digital technologies (projectors, whiteboards) for instruction. Professionals in this progression stage are able to choose digital technologies according to the learning objective and context. ***The third stage*** in the ability is linked to the capacity of integrating different available technologies in a meaningful way. Educators and trainers in the role of teachers in this stage are able to organize and integrate different devices and media, like integrating videos or interactive activities in the same teaching process. One step behind in this ability we reach the knowledge of going from integrating devices and resources in a teaching activity to using ICTs in meaningful pedagogic strategies. These strategies pretend to find methodological variation. ***The next stage*** of proficiency requires being able to orchestrate, monetarize and adapt the use of these in pedagogic strategies. This stage does not only require using the ICTs properly in a strategic way, but being able to understand and evaluate how the outcomes of these processes are being held and readapting the use of digital pedagogy activities.

Stage	***Progression***	***Proficiency statement***
A1 Newcomer	• Making little use of digital technologies for instruction.	• I do not or only very rarely use digital devices or digital content in my teaching
A2 Explorer	• Making basic use of available digital technologies for instruction.	• I use available classroom technologies, e.g., digital whiteboard, projectors, PCs • I choose digital technologies according to the learning objective and context.
B1 Integrator	• Integrating available digital technologies meaningfully into the teaching process.	• I organize and manage the integration of digital devices (e.g., classroom technologies, students' devices) into the teaching and learning process. • I manage the integration of digital content, e.g. videos, interactive activities, into the teaching and learning process.
B2 Expert	• Using digital technologies purposefully to enhance pedagogic strategies.	• I consider appropriate social settings and interaction modes when integrating digital technologies.

		• I use digital technologies in teaching to increase methodological variation. • I set up learning sessions or other interactions in a digital environment
C1 Leader	• Orchestrating, monitoring and flexibly adapting the use of digital technologies to enhance pedagogic strategies.	• I structure learning sessions so that different (Teacher-led and learner-led) digital activities jointly re-inforce the learning objective. • I structure and manage content, contributions and interaction in a digital environment. • I continuously evaluate the effectiveness of digitally enhanced teaching strategies and revise me strategies accordingly
C2 Pioneer	• Using digital technologies to innovate teaching strategies.	• I provide full courses or learning modules in a digital learning environment • I experiment with and develop new formats and pedagogical methods for instruction.

Table 4.3. Stages covering the ability of teaching within DIGICOM, Source: European Framework for the Digital Competences of Educators (2017).

4.4.1.2. Useful tools and programmes

VET courses had a combination of seminal theory and practical procedures. Part of the VET courses are done at an institute or teaching facility and other part is done as an apprentice in a business.

The seminal part of the teaching processes is not so different for non-VET educational programs. In recent years using projectors to add visual support to the seminal classes had become a common practice. Programs used for this task include Microsoft PowerPoint. There are other services due to this task. Services like **Prezi, Canva, Haiku Deck, Edocr, Google Slides, SlideShare or Speaker Deck**. These alternatives can offer the possibility of creating more aesthetically appealing presentations. Some of these services have freemium and premium versions. Other platforms give the option to share presentations.

All these services have an intuitive learning process. Intuitive learning defines the ability to suddenly understand something without the need for conscious analytical or logical reasoning. That way , as Burbules and Callister (2000) argue, tools like Canva or Prezi allow to develop knowledge trees as well as conceptual maps, or vision boards that at the same time enable learning based on the connection of ideas.

Not only that , but these kinds of tools could have positive impacts on learners since they boost creativity and allow for a more prolonged concentration. They can also integrate multimedia products such as videos, audios and animations. It is important to understand that a presentation is material to improve a teaching process. That material is not an end itself, but a means to reach it.

Making a more complex presentation, with more materials than needed, won't make it better. Presentations can not only be used with a projector. It can also be used in the student's computers, smartphones and tablets. This kind of use is really handy to work with efficient hyperlink. Attaching a Web, a PDF document or a video link to a text, an image or a hyperlink can make a presentation as a more integrated document.

We can highlight the following tools:

Kahoot can be a very handy tool to reviewing concepts, knowing if a learned lesson has been understood, making the classroom more interested in a lesson by gamifying it or to testing the general level of the classroom around a subject. It can be really useful in these cases, but using it too much won't make pedagogical sense. Kahoot is a platform that lets students create a quiz game where all students participate. Using **Kahoot** requires at least 3 requirements.

- A computer linked to a projector where the questions and results are shown
- Internet connection
- A classroom where each student can access a smartphone or other devices.

Learning how to use this tool in a technical way is relatively easy. There are several tutorials on platforms like YouTube such as this one. The most difficult aspect is how to use it properly. First of all, setting a **Kahoot** session requires time. It will waste time that could be spent in other pedagogical actions. Secondly, **Kahoot** is a means for a pedagogical process. It could happen, and it is not rare, that in the end a **Kahoot** session ends up being just a game disconnected from any pedagogical objective. One of the most interesting aspects of **Kahoot** is that it can generate tangible feedback between the students and the teacher. In cases where smartphones or other devices are available, there is another tool called **Pickers**, based on the usage of cards. Another alternative is **Socrative.** This last one gives a wider information to the teacher of the performance of their students.

In order to generate feedback among the students and create a general panorama there is another tool called **Padlet**. **Padlet** is a digital pinboard that allows participants (students and teachers) to contribute by pinning different images, videos, text files, links, and more. You can learn the more technical aspects in this tutorial. One of the best things of these tools is that students can also have the opportunity to add their outcomes and to have their lead in generating a digital pedagogical context. Also, **Padlet** can be interactive between different formats and tools. This can be handy, whenever a lesson has ended students can write in the board what they have learnt about it. Also, after a theoretical lesson, students can create a collective pinboard with case examples.

Most of these tools can be integrated in wider pedagogical environments such as **Moodle** or **Google Classroom.**

According to several Agricultural VET Spanish teachers, the program lines redacted by the Spanish State, the use of ICTs has very few developments. Despite this, they comment that in their institutes there is an interest in using them the most possible. Some of the teachers had commented that in their centres there is a shortage of computers for their students. So, there is a drive from the VET professional to implement this kind of pedagogical orientations, but the

Spanish state hasten adapted the curriculums thoroughly that way. Also, in Spain, in 2017 almost half of the lower income quartile households didn't have a computer. If VET institutes have a shortage of them, there can also be problems to fully implement digital teaching styles.

We have explained the use of digital tools for pedagogical purposes. There is another part of the digital competences that an 21st century agronomic worker should have. The proficiency over the digitalization of farms. In the lower tier of Spanish VET programs (there are 3), there are very few implementations of this kind of knowledge. This tier of programs is focused on training people with no degrees in working as pawns in farms. In the middle and higher tier of Spanish VET programs, this kind of competences are being introduced, but they have an issue. This technology is being issued by different companies. Each company tends to implement their own interfaces and those interfaces tend to be different, there is not a standard, which could be problematic. Despite this, many farmer organizations have stated that younger farmers, with a developed digital intuition, don't tend to have problems to interiorise new digital systems, unlike the older farmers. Often, they rely on courses implanted by this kind of association or their sons.

According to some VET teachers in Spain these kinds of practices should be the object of evaluation by the programs signed by the state. Also, some of them had stated that new knowledge like topography or digital garden design should have their place in the curricula redacted by the state.

Most useful tools:

- Microsoft Powerpoint
- Prezi
- Canva
- Haiku Deck
- Edocr
- Google Slides
- Slide Share
- Speaker Deck
- Kahoot
- Pickers
- Socrative
- Padlet
- Moodle
- Google Classroom

4.4.1.3. Challenges in digital teaching/learning

As it has been commented above, access to a minimum of resources is key in the implementation of digital teaching techniques. This brings to the table a challenge that some countries experience more than others, and the importance of addressing them. For example, access to computers or tablets will be essential if we are going to add resources like PDFs. That kind of content is uneasy to use with a smartphone.

According to data from Eurostat for 2017 (most recent data found for the series), 82% of EU27 households had a computer. In the case of households located in rural areas, the

number is not much different, 79% of rural households had at least one computer. Cyprus, Lithuania, Portugal, Romania, Greece and Bulgaria had a gap between all household's and the ones located in rural areas. However, in the case of the first quartile of income households, just 67% of them had a computer. This income gap does not exist in some countries. In the Netherlands, 97% of the first quartile of income households had a computer. Nor does it occur in Luxembourg or the Nordic and Scandinavian countries.

However, in Southern and Eastern Europe there is a bigger gap in this sense. Almost all students coming from low-income families in Northern Europe will have a PC or a laptop at their homes. That won't be the case in many southern and eastern countries, nor in other non-EU countries like in Turkey or Serbia.

Often there is still an association between the socioeconomic background of a student and their pathway after the secondary education. Students from more affluent families tend to go to college and students from lower income ones tend to specialize in VET. So, the resources of VET students won't be the same in all the EU and countries.

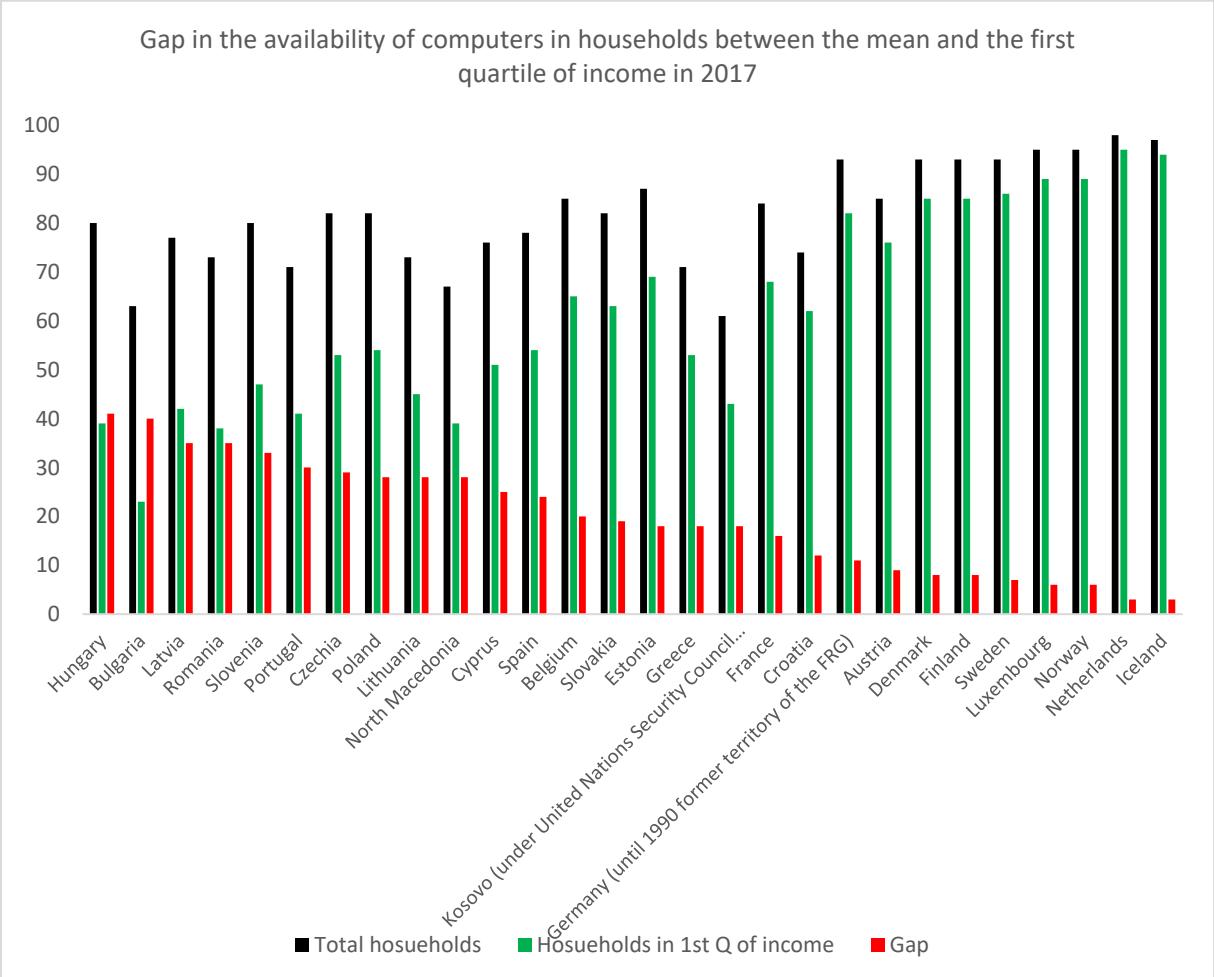

Figure 4.1. Gap in the availability of computers in households between the mean and the first quartile of income, 2017

Not only that, but it is to note the effective ability of people to use digital tools is another important variable to consider. Taking into account the statistics of Eurostat, the proportion of the population that had never used the internet was 7 % in 2022 in the EU, but reached 14 % in Greece and Portugal, and 13 % in Croatia and Bulgaria. Also, an important percentage of the internet use within population is not linked within professional, learning, commercial uses rather than occasional or casual.

That is the very reason why a digital competent teacher must read this situation in order to program which contents will be taught online and which online tools can be used. Another important thing to bear in mind is that digital competences do not mean just to know how digital resources are technically used but how to set them in a proper pedagogical strategy. Rather than using several digital tools in an unconnected way, a digital competent teacher will use fewer but in a strategical and goal-oriented way. Also, it is important to know what there are the usages of each tool.

4.4.2. Guidance

Newcomers to ICTs and digital tools might be able to hardly use e-mail services to communicate with their pupils. They can make use of some tools, but this is a spare way. Competence of digital tools is not just to have the technical knowledge of these tools, but to use it strategically. In these aspects, explorers (next stage of the process), are able to apply basic strategies.

Explorer teachers will be able to respond to their students' doubts by email in a regular manner. In the next stage (Integrator), the guidance relations tend to get more dynamic. Explorers will be able to respond to their pupil’s questions.

Integrators should be capable of enhancing the interactions between students and them. They will continue responding to doubts by digital tools but they also will take a lead and contact their pupils. Experts (Next stage in the process) will go one step ahead in the process by using collaborative digital environments. This environment will male monitor the academic performance of the pupils and give the tools to generate the feedback needed by the students to perfect their performance.

The next stage (Leader) is focused on generating complex strategies to provide guidance and support. This implies generating a mix of videos, tutorials, FAQs… while the performance of the pupils is being adequately monitored.

The last stage, Pioneers, requires the ability of innovating. Pioneers can generate new ways of using.

4.4.2.1. Analysis of levels

Stage	*Progression*	*Proficiency statement*
A1 Newcomer	• Making little use of digital technologies for interacting with learners.	• I do not or only very rarely communicate with learners through digital means, e.g., e-mail
A2 Explorer	• Employing basic digital strategies to interact with learners..	• I use digital technologies, e.g., e-mail or chat, to respond to learners' questions or doubts, e.g., on homework assignments.
B1 Integrator	• Using digital technologies to enhance interaction with learners..	• I use a common digital communication channel with my learners to respond to their questions and doubts. • I am frequently in contact with learners and listen to their problems and questions.
B2 Expert	• Using digital technologies to enhance monitoring and guidance.	• I interact with learners in the collaborative digital environments I use, monitoring their behaviour and providing individual guidance and support as needed. • I experiment with new forms and formats for offering guidance and support, using digital technologies
C1 Leader	• Employing digital technologies strategically and purposefully to provide guidance and support.	• When I set up learning activities in digital environments, I foresee learners' needs for guidance and cater for them, e.g., with a help or FAQ section, or with video tutorials. • When I implement digital learning activities in class, I make sure I am able to (digitally) monitor student behaviour, so that I can offer guidance when needed.
C2 Pioneer	• Using digital technologies to innovate guidance provision..	• I develop new forms and formats for offering guidance and support, using digital technologies.

Table 4.4. Analysis of levels (Source: European Framework for the Digital Competences of Educators (2017))

4.4.2.2. Useful tools and programmes

One of the aspects that make the difference between a good teacher and an excellent one is their role as guide and a mentor in the pedagogical process. This kind of work is mostly often done outside the classroom. The digital tools have given the opportunity for this aspect. Using such an easy and ubiquitous technology like email can be really handy in this aspect.

Some students can feel a little bit insecure about mailing their teachers in order to solve doubts about the lessons. It is important for teachers to foster the usage of this meaning. If you want to be a good teacher in this aspect you should make known that you will be there to respond

to doubts. Instant messaging apps like **WhatsApp or Telegram** can also be handy in this aspect. It is faster, almost every person in the EU has access to it. Is important to understand the needs of each student and knowing how using each tool can be easier for their pedagogical pathway.

A digital competent teacher should not just respond to doubts, but can use these tools (Email and instant messaging apps) to communicate to their students and make updates about the agenda. Sharing class chatrooms on tools like **Telegram** can be handy for making follow ups in this sense. It is important to underline that for this purpose **Telegram** is more desirable than **WhatsApp**. First of all, telegram is more friendly with data preservation. Whereas in WhatsApp all the members of a collective chatroom have the permission to observe the phone number of each member, in telegram users that want to persevere theirs have the chance to do so. Also, **Telegram** gives more developed features for integrating other tools, and a more well-functioning web version. This collective chatroom can be used to make announcements and give reminders of upcoming tasks.

There are two important tools that can make the interactions between teachers and students more efficient and easier. **Moodle** and **Google Classroom**. There are more tools of this kind. But these 2 are the most obliquus ones.

Moodle can be described as a platform or course management system (CMS) by its creators. The first version of the software was released in 2002. One of the main features of the program and the main root for its implantation in the educational system is its open-source foundation. Most educational institutions have made their own Moodle version.

Google classroom, if you are reading this on a digital device you got a tutorial here, despite being free for its use it is from private propriety and it's integrated the google tools system.

Moodle has been successfully adapted by several educational institutions. Moodle can adapt several modules for guidance such as:

- **Assignment module:** Students can upload assignments in a wide variety of formats. Date of the upload process gets registered. Teachers can also decide if an assignment won't get uploaded after a deadline. If students can upload an assignment after the expiration date, teachers can know how much time it has been delayed. Also, teachers can grade the assignments. This gradation system can be both quantitative and qualitative. Teachers have the capacity to write notes about the performance of their students.
- **Consult module:** It functions as a survey. Teachers can consult their students about any topic.
- **Diary and blog.** The diary is a feature where students can write about proposed questions by the teachers. Those texts can be read by their authors and the teachers. It can be a great tool for fostering guidance.

Google classroom lets teachers send emails to the participants in the classroom and to select the ones that will receive it. The tool also permits writing announcements. This announcement can have attached files, both from drive or for the PC, hyperlinks or videos. Teachers can select the audience of the announcements. Google classroom can also brand the

possibility to upload assignments and to grade them. Teachers can monetarize their student's activities.

These two tools can be really handy for fostering the guidance between pupils and their teachers. Knowing the technical aspects of these tools, the proficiency lies in the way they are used. Both Google Classroom and Moodle can be used from a PC or a Smartphone or a tablet. The availability of PCs or laptops is important in order to know how they are going to be used.

4.4.3. Collaborative learning

Newcomers toward ICTs regarding collaborative learning won't be able to use and consider digital tools whenever a collaborative learning activity is going to be placed.

Explorers should be able to have a grasp of the potential digital tools have to initiate collaborative projects. Explorers will try to encourage students to use this kind of means, but will have difficulties to implement and design activities of this kind. Integrators will be able to implement new tools in order to design collaborative activities. Integrators will put the lens of these processes on the sharing of sources and information.

Integrator will also require students to use digital tools in all the output generated in this process. Experts will make a step ahead and will implement digital environments. This digital environment will require a connection between tools rather than using a set of different tools. Using this environment of digital tools will also require experts to use it to motorize this activity. Also, Experts will be a catalyst in the collaborative learning process by making amiable the best outputs of their pupils for all students in order to generate resources.

Digital leaders in collaborative learning will be more focused on conducting the research environment to permit collaborative knowledge generation. Generating knowledge collectively will require several tools. Things like sharing findings, making observations, permitting students to peer review themselves.

The next step in the process, like in all pioneer stages, is to be able to innovate new ways of generating forms of collaboration by inventing them.

4.4.3.1. Analysis of levels

Stage	*Progression*	*Proficiency statement*
A1 Newcomer	• Making little use of digital in collaborative learning activities..	• I do not or only very rarely consider how students could use digital technologies in collaborative activities or assignments
A2 Explorer	• Encouraging learners to use digital technologies in their collaborative activities.	• When implementing collaborative activities or projects, I encourage learners to use digital technologies to support their work, e.g., for internet search or to present their results.
B1 Integrator	• Implementing digital technologies into the design of collaborative activities.	• I design and implement collaborative activities, in which digital technologies are used by learners for their collaborative knowledge generation, e.g., for sourcing and exchanging information.

		• I require learners to document their collaborative efforts using digital technologies, e.g. digital presentations, videos, blog posts.
B2 Expert	• Using digital environments to support collaborative learning.	• I set up collaborative activities in a digital environment, e.g., blogs, wikis, Moodle, virtual learning environments. I monitor and guide learners' collaborative interaction in digital environments. • I use digital technologies to enable learners to share insights with others and receive peer-feedback, also on individual assignments.
C1 Leader	• Using digital environments for learners' collaborative knowledge generation and peer assessment.	• I design and manage diverse collaborative learning activities, where learners use a variety of technologies to collaboratively conduct research, document findings and reflect on their learning, both in physical and in virtual learning environments. • I use digital technologies for peer-assessment and as a support for collaborative self-regulation and peer-learning.
C2 Pioneer	• Using digital technologies to innovate learner collaboration	• I design and manage diverse collaborative learning activities, where learners • I use digital technologies to invent new formats for collaborative learning. Use a variety of technologies to collaboratively conduct research, document findings and reflect on their learning, both in physical and in virtual learning environments. • I use digital technologies for peer-assessment and as a support for collaborative self-regulation and peer-learning..

Table 4.5. Analysis of collaborative learning levels (Source: European Framework for the Digital Competences of Educators (2017))

4.4.3.2. Useful methods and tools

New pedagogical approaches have conceptualized the learning process as collective rather than individual and based on applications of knowledge rather than in memorizing theory. A good example of this approach is called **Problem Based Learning** (**PBL**). In **PBL** students are going to be faced with a certain situation. This situation won't have a single right answer. Those problems might be long term ones like consuming a whole term. One great example of a PBL case in an agrarian VET program could be a hypothetical case where the students are in charge of a farm and they must prepare a plan to digitise it. It is an open problem (there might be several different correct approaches) and students can take in action different parts of their knowledge. With the information provided by the teacher, students should be able to research

themselves all the means *available* to make the plan viable. Key aspects of **PBL** are (Morales Bueno & Lanza Fitzgerald, 2004):

- Pupils take responsibility for learning and in making teacher-student relations.
- Teachers had the role of the facilitator, tutor, guide, assessor and mentor.
- The design is based on open problems.
- Teachers aim to improve the motivation and the lead orientation attitude of their students.
- Students are perceived as subjects with the agency for learning by themselves.
- Students clustered in small groups interact teachers, having a feedback situation
- Students work in groups, learning how to adapt knowledge in a diversity of contexts.
- Students learn in a collaborative way
- Students participate in an active way in the resolution of the problem, identifying learning needs. They research, learn and solve problems.

As we saw before, there are several tools for digital collective whiteboards, like **Google Jamboard**, Openboard or **Miro**. These tools can be used

Tools like **Nearpod** can help students upload and share different documents in different formats. **Dropbox** is another tool made for sharing folders and files. This one could function as a more formal one. **Drive** is the cloud based storage tool used by Google. **Drive** also leads users to share Google Documents that can also be linked to **Google Classroom**.

Wikipedia is one of the most famous digital resources of the net. **Wikipedia** is a collaborative open-source encyclopaedia. Since its conception it has been used by millions of students around the globe. Students see **Wikipedia** as a source.

Moodle allows students to work in teams and make learning a socially meaningful experience. One of the key aspects that google allows teachers to make a proper follow up of the process. Another key aspect for collaborative learning approaches that Moodle offers is the *wiki* module. The Wiki module works in a similar way as a Google document works. In this sense there are also particular groups and roles. Each group can edit the text for the wikis they've been assigned while they can read all the wikis. There is also the potentiality to generate a discussion about sources and the way work is being developed.

PBL is just a focus of how collaborative learning can be used. PBL can be used regardless of digital tools. It would be really hard to implement projects like this without digital tools. Digital tools can make this project easier to implement. Digital proficiency in teachers is an important step for making more interesting projects. These long-term projects will require the usage of tools like Drive, Dropbox or Moodle,

Explorers in this field can start by assigning groups to prepare certain lessons. These processes will require a week to prepare and half an hour to make the presentation. For teachers it is important to make sure that their students have the tools to find proper sources. Also it is important for making these processes, that teachers can provide the tools for sharing resources between students. In this modality of lessons prepared by students it would be also interesting to explore different formats. A good idea would be to generate videos. Students would be

divided in groups and each group can make a video about a certain lesson. Then all the videos would be in hand for all students.

Regarding **Moodle**, it is interesting for a teacher to develop 3 layers of managing collaborative projects and to experiment with different tools to maintain them.

- **Collaborative document**. As we have seen, having several people working on the same document makes collaborative document editing much easier than dividing fragments that would be shared later.
- **Reviewing**. Collaborative learning is more horizontal than regular teaching techniques. But in any pedagogical relation there are going to be teachers and learners. It is important for teachers to have the potential to review the work done, in order to guide students. It would also be really interesting for more advanced courses to enable the opportunity for different groups to peer *review* the work done by the class peers. Reviewing peers and giddying with them is also part of the collaborative way of learning and building knowledge.
- **Discussion back forum**. Having a discussion about how the document is being done, about the legitimacy of sources employed and the conclusion are being developed is crucial in any collaborative process of several kinds. In a collaborative learning process, this back forum will not only improve the output of the final document but is going to be knowledge significant.

For a teacher rather than focusing on the tools, the key aspect is to focus on these 3 layers of the process. The important part of the process is to have a healthy use of the 3 lyres. It won't matter to use one tool for each layer. The important part of the task for a teacher is to know what tools will be the most adequate ones for the class. And each class is going to have different profiles.

Google drive has a very useful feature drive for the development of collaborative learning processes is the possibility of editing documents collectively. These documents can be shared within 4 different roles. These documents can be shared within 4 different roles.

- **Owners**: They can edit documents, and erase them, they can share the document and they can decide the different roles shared people had.
- **Editors**: They can edit documents and share them if persimmon is giving to them
- **Commentators**: They can make comments over the document, but they can edit it
- **Readers**: They can read documents, but they can't edit or make comments over it.

For a collective learning process one class can be divided into several groups. Each group member is going to be editor over the document of their team. The teacher is going to be the commentator, so they can correct the work the teams are doing. Finally, every member of the course is going to be a reader of all documents. There are different google documents programs, like text editing, spreadsheets or presentation editors.

On its side**, Wikipedia** works almost like the wiki module of Moodle. It has a page where everybody in the net can edit documents and a discussion page where editors debate about the document. This debate page is also open for everybody on the net. Exploring this debate can be interesting for learners. Another interesting task for advanced groups could be to debate or edit content on **Wikipedia** and see how the discussion could follow. Editing in

Wikipedia would require some knowledge of wiki editing. Also, editing in Wikipedia would require students to have a proper knowledge of how to use references and sources.

Moodle also allows other forms of peer review with the workshop module. This module permits students to grade the peers in a peer review system. Being able to know how to peer review is also an important skill in this aspect.

4.4.4. Self-regulated learning

Newcomers to digital abilities would make little use of digital tools for self-regulated processes of learning. Whenever they ask for assignments, they will not think about digital tools. Explores, will start encouraging learners to use digital technologies in self-regulated learning activities. These tasks would be encouraged. Integrators would design deeper activities. This activity will also include digital records of the progress and the confection of final outputs in multimedia formats, like videos. Experts would go one step ahead in the way progress is registered. Experts will imply several environments in order for students to take registration of their progress, using a large set of tools. This stage will include the use of platforms to connect all the contents linked to these processes. Leaders will take a deeper perspective of these processes. This critical perspective on these processes will make leaders implement more strategic strategies in this field. As it happens with other abilities, Innovators will have the capacity to implement new ways of self-regulated processes (Redecker, 2017).

4.4.4.1. Analysis of levels

Stage	*Progression*	*Proficiency statement*
A1 Newcomer	• Making little use of digital technologies for self-regulated learning.	• I do not or only very rarely consider how students could use digital technologies in self-regulated activities or assignments.
A2 Explorer	• Encouraging learners to use digital technologies in self-regulated learning activities.	• I encourage learners to use digital technologies to support their individual learning activities and assignments, e.g., for information retrieval or presenting results.
B1 Integrator	• Implementing digital technologies into the design of self-regulated learning activities.	• I encourage learners to use digital technologies to collect evidence and record progress, e.g., to produce audio or video recordings, photos, texts. • I use digital technologies (e.g., e Portfolios, learners' blogs) to allow learners to record and showcase their work. • I use digital technologies for learner self-assessment. •
B2 Expert	• Using digital environments to comprehensively support self-regulated learning.	• I use digital technologies or environments (e.g. e-portfolios, blogs, diaries, planning tools) to allow learners to manage and document all stages of their learning, e.g., for planning, information retrieval,

		documentation, reflection and self-assessment. • I help learners in developing, applying and revising suitable criteria for self-assessment, with the support of digital technologies.
C1 Leader	• Critically reflecting on the digital strategies used to foster self-regulated learning.	• I reflect on the appropriateness of my digital strategies in fostering self-regulated learning and continuously enhance my strategies.
C2 Pioneer	• Developing new digital formats and/or pedagogic approaches for self-regulated learning.	• I develop new digital formats and/or pedagogical approaches to foster self-directed learning.

Table 4.6. Analysis of self-regulated learning levels (Source: European Framework for the Digital Competences of Educators (2017))

Smartphones have been the most important invention for mankind since Johannes Gutenberg invented the printing press, or even before. Smartphones give people access to a hideously vast ocean of data and information in the palm of the hand in a matter of seconds. The sociologist who coined in the 1980 the term "information society" could not imagine that. Knowing how to handle that much information and how to transform it into relevant knowledge is a crucial ability both in a professional context and in a personal one.

There is a gap between data, information and knowledge. This paper won't elaborate the difference around these stages in a deep way. We can say that information is data with context and that knowledge is the way information is procreated in a much more complex system of other knowledge, experiences and a focused frame.

Self-regulated learning is relevant today because it is not only a way of learning the things included on the curricula but because it will teach students how from a tremendous input of information, that in many cases will have lots of noise, they can generate a significant output of knowledge. And this is crucial.

4.4.4.2. Most useful methods and tools

Making single side research projects is important. In the last epigraph we have discussed how **Wikipedia** might be used in this way. This is a way of starting, but digital proficient teachers should go much ahead. Finding the original sources is key. A proper activity would be to analyse the sources referenced on Wikipedia.

Academic papers tend to be licensed, and some licences tend to be really expensive. Databases for academic papers like *scoups* require licenses. His licenses tend to be highly expensive, so most non-university learning institutions can't afford them. There are however some free access resources for academic papers like **Academia.edu** or **Google Scholar**. Some papers in this database might be under licence.

In this modality of learning the role of the teacher might be more back yard oriented. It is important for students to monitor their own performance and to make a checklist of the tasks they should accomplish.

Most tools for project management are work oriented and complex in several aspects. Spreadsheets are a good chance to make chronograms or checklists. Ensuring students can properly use them is important for developing their ability for now how to learn by themselves.

Another field where self-regulated learning is important is not just to collect data and papers but to generate new inputs. Students can record data on several topics. Photographs, recordings, video footage. All these digital tools can be useful for projects and recording the progress of these projects. Income gap with smartphones is not appreciated in Europe, so there won't be problems for making this kind of project.

Digital tools like **Moodle** and **Google Classroom** can be handy for students to record their progress. Linked to **Google Classroom** there are other two tools from the google app universe that can be handy for scheduling things. **Google Calendar** and **Keeps.** Google calendar can help organise scheduled events. Events can be shared between users**. Google keeps** functions as a board. It can contain photos, audios, texts, checklists and tasks. These tasks can be linked to **Google Calendar**.

The way that self-regulated learning processes operate is really similar to the way collaborative learning operates. Here as we said, the role of the teacher is the role of a guide. Students are the ones that will search for the proper sources.

The guidance of a teacher in this aspect should encourage in **the next aspects:**

- **Finding multimedia sources.** Texts are to the date the handiest form of knowledge transmission. Nonetheless, there are several other ways to access knowledge. There are infographics and data visualizations, audios and video. Video formats are gaining relevance in the last few years. We can access materials like documentaries and fictional movies that can be accurate for researching a topic. In recent years the Google oriented video platform has included a vast quantity of educational videos. The legitimacy of these videos and their frames can vary a lot.
- **Helping students to identify what the level of accuracy a source has.** As we have said, educational videos can vary a lot. Some are made by big institutions with a big budget and an institutional tone, others can be made by experts on a field or by enthusiast on a topic. In these last two cases tones can be less serious, with a language oriented to teenagers or people in their early twenties. Despite this tone, some of these videos can have a good accuracy. The role of a good teacher in this aspect won’t be to provide accurate content but o gives the tools to make a good screen. The same goes for written papers or web pages. This ability is one of the most relevant to develop not just for a future worker but for a digital citizen.
- **Teaching the tools to confront contradicting sources.** Textbooks tend to have a single correct answer. Nonetheless, worlds are much more complex. Self-regulated learning tends to accept this reality by stating that students should learn things beside their textbooks. When this happens, different sources may be contradictory. The role of the teacher has to be of a guide who gives the tools to integrate the differences between acceptable sources in a synthesis.
- **Teaching how to monetarize and organize learning processes.** To manage a project, it is a task itself. Self-learning projects are relatively simple and short. Software aimed to handle this kind of task tends to be really complex and oriented to complex projects

on working scenarios. Giving the guidelines to start handling these processes is important in this aspect.

- **The moon and the fingers.** There is a saying that states that whenever someone points at the moon the fool is going to look at the finger. Data, information, sources. They are relevant for knowing better about a topic. But they aren't relevant by themselves. It is *really* important for a teacher to make known that the aim of these processes is not to collect a lot of information to remember and recite that information, but to make sense of this information to have a better glimpse of the topics being studied

4.4.5. Self-learning

Firstly, we want to refer to TEd.es as a way to access good quality talks of university professors and experts on a wide range of themes , such as the one analysed here.

On another note , they are useful for all the reports elaborated by the Economy and Digital Affair Ministry of Spain as well as the digital observatory of the EU.

Also, data from Eurostat and INE (National statistical institute) were really useful to build the context and analyse the needs.

Kahoot! - https://kahoot.com/
The pedagogical background of Kahoot - https://www.linkedin.com/pulse/pedagogical-background-kahoot-one-most-useful-apps-karageorgakis 'Kahoot!' as an innovative educational gamification proposal- https://revistes.ub.edu/index.php/der/article/view/37523 Using "Kahoot!" in the Classroom: https://www.teachingexpertise.com/technology/how-to-use-kahoot-in-your-classroom/ 'Kahoot!' to gather student feedback - https://edtechmagazine.com/k12/article/2020/08/how-set-virtual-classroom
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Whatsapp and Telegram
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Whatsapp VS Telegram for teaching and learning - https://www.youtube.com/watch?v=1MnArhWagWs&ab_channel=OfficialUPSIEduInnovation

4.5. National perspectives

The digitalisation and the added value of data are changing the economic and social paradigm within the EU. That is why the European Commission has established as a priority the development of a political and legal framework towards digital transition. That way, in the past three years, the European Union has worked hard in the field so we can now talk about a comprehensive policy framework in the field. A framework that each member state has been progressively adapted to.

In that regard and in first place, we can classify EU policy framework in different fields:

1. ***Artificial Intelligence:***

This area focuses on the opportunities and risks of AI within the markets, education, labour, … That's why there is a project for the **European regulation of AI**, which regulates in a very comprehensive way the uses and scope of AI within the EU.

2. ***European strategy for data***

The very objective of this field of policies within the EU tackles the need to create a single data European market, promoting the innovation based on data. It is very well known that in order to have significant innovations within health, technologies, economy, industry… data are the raw material, but there is still a lack of interoperability and several barriers related to their use. Not only that but, data is also part of our privacy rights and one of the main pillars of protection within the EU. For that reason, it has been passed the **European Data Governance Act.**

3. ***Digital Skills***

The very objective of this policy field is to increase the level of digital skills of Europeans for studying, working, communicating, … This political frame materialises in the **Action Plan for Digital Education (DIGICOMP)** and in the **European Platform for Skills and Digital Employment**.

4. ***Digital society***

Finally, this policy field tries to comprehend a more general field of intervention, considering that digitalisation impacts in each corner of society. That way multiple initiatives have been developed, such as the new **EU Policy for Cybersecurity**, the **programs for accessible ICT in education**, or the **JoinUp platform** focused on the development of digital public services.

In a more general approach, it has been very important the European Commission **Initiative "The European Digital Decade",** which operates as the guidelines for the rest of

the policies and contain the main values and principles that should inspire all the regulations and policies.

In Spain, there has been an important enactment of legislation that would specifically regulate individual areas specified in the European framework of digital competences for educators (DigCompEdu), as well as those which develop European policies of digital transition. The main pillar of the National Policy Framework is the Strategy "España Digital 2026", which constitutes the roadmap for all the policies within the digital framework. It translates all the objectives of the "European Digital Decade" to the national level and it comprises the principles and the main objectives that should be accomplished. España Digital 2026 is divided into eight specific plans and fifty programs and it organises funds and financial assignments. In a second level we have the Retech initiative, which concretes the programs and policies within the regional and local levels and materialises the objectives of España Digital 2026.

In Italy, the DDI suggests the use of tools such as digital storytelling, flipped classroom, virtual debate... whose aim is to facilitate both cognitive learning and the development of learners' soft skills. At the same time, there would be an integration of tools - digital resources.

In Greece, the Ministry of Education and Religious Affairs is responsible for all levels of education in Greece, from pre-primary to adult. To enable free access to digital education services, the Ministry of Digital Government of Greece launched the Citizen's Digital Academy, which offers more than 279 online courses and tools for citizens of all levels. The National Coordinator for the European Agenda in Greece created a national network of lifelong learning stakeholders, including a National Steering Committee, which deals with lifelong learning issues. The National Recovery and Resilience Plan (NRRP) "Greece 2.0" includes a flagship reform of the governance of training provision for upskilling, reskilling and lifelong learning.

In Slovenia, the field of education and training is governed by the overall Act on the Organisation and Financing of Education and Training, which, together with the by-laws, addresses the subject of DigCompEdu.

4.6. Conclusions

Digitalization of the world has changed dramatically the core elements of teaching and learning. That is why this chapter has the aim to bring over what digital proficiency really means.

Firstly, in order to adapt teaching and learning to the new digital reality it is very important that educators become digital competent. Serving to that purpose, there are several frameworks and self-assessment tools, the most important the Common European Framework for digital competences (DIGICOMP).

Digicom includes 4 abilities: teaching, guidance, collaboration and self- regulation.

Each ability has established a 6-grade system and some countries have national variations as well.

The teaching ability is one of the most central roles and digitalization has impacted on it severely, including the use of new tools such as Canva, Prezi, google slides, google classroom or kahoot. All these tools have proven to be very useful.

Guidance ability is also very important since competence on digital tools is not just to have the theoretical knowledge but to use it strategically. Teachers need to provide guidance and support within the use of new technologies. And here, WhatsApp or telegram have become powerful tools as well as google classrooms.

Regarding collaboration learning, it is very important to encourage students towards collaboration projects, specially in order to create an implement the so-called digital environments. In that regard, digital leaders, need to be focused on conducting the research and to permit the collaborative learning. But, generating collaborative learning will require new tools and methodologies such as the Problem based learning method or tools such as Nearpod, Dropbox or drive.

Finally, self-regulated learning becomes an important process because there is a gap between the digital knowledge and its final practical application. In that very sense tools such as academia Edu or google scholar have proved to be very effective.

Having been through the main abilities, the chapter ends with a comprehensive analysis of both the legal and policy framework of digital transition within the European Union and Spain.

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CHAPTER 5

Assessment

CHAPTER 5 Assessment

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WHAT WILL WE LEARN IN THIS CHAPTER?

What is assessment?
What are assessment strategies?
How can digital be integrated into assessment?
What tools are useful for digital assessment?
What are the benefits of digital assessment?

Keywords: assessment; learning; evaluation; strategies; exercises; education; approach; communication; feedback; planning

5.1 Glossary and abbreviations

Assessment	In education, is a wide variety of methods or tools that educators use to evaluate, measure the progress, skill acquisition, or needs of students.
Distance Learning (DL)	A method thanks to which lectures are broadcast or conducted by correspondence, without the student needing to attend a school or college physically but with the help of digital tools.
Digital Competence Framework for Educators (DigCompEdu)	A scientific framework that describes how to be digitally competent to educators, providing general reference frames in order to support the development of educator's digital competences in Europe.
Digital Competence Assessment (DCA)	Assesses users' skills against competence areas such as content creation or safety.
European Higher Education Area (EHEA)	A series of policies promoting the mobility of students across the Europe, together with employability of the graduates and higher education.
Modular Object-Oriented Dynamic Learning Environment (MOODLE)	A digital space for learning and consulting materials for studying.
Low Order Thinking (LOT)	A basic series of skills (remembering, understanding, applying) that must be mastered in order to comprehend analytical skills.
High Order Thinking (HOT)	An advanced series of skills (analysing, evaluating, creating) that can be achieved through the comprehension of the low order thinking.

Table 5.1. Glossary and abbreviations

5.2. Chapter connection to the DigComp

In the DigCompEdu, the "Assessment" section indicates what digital tools a trainer can use to assess students' skills and knowledge, but also the quality of his or her teaching.

5.3. Introduction to specific module

Digital assessment has become an important tool in the training system due to its ability to improve efficiency, accessibility, objectivity, data analysis, and innovation in the assessment process. This is why, thank to this chapter the reader will be able to:

- use digital technologies for evaluation;
- use digital data to analyse real student learning outcomes and to understand how to improve your teaching content or the tools used;
- use digital tools to give immediate feedback to students and their families

5.4. Opening section

Before diving into the series of strategies on how to offer a perfect assessment, based on the development of digital innovation in the field of agriculture, it is necessary to specify what a real 'assessment' is. The internationally renowned Cambridge Dictionary[1] defines the practice as: 'the act of judging or deciding the amount, value, quality, or importance of something, or the judgment or decision that is made'. The practice is strongly linked to academic evaluation, or at any rate within an educational system. The amount of information provided, the value of the learning and the quality of how it was learned; the importance of the notions provided and, finally, the judgement that is made on the compendium of all these components. Thus, it is fair to think that assessment is actually a process that is not limited to providing a judgement, but that takes into analysis the entire learning process, from its beginning to its end, of the experience linked to it, as well as the level that the learner has shown at the end of this cycle, characterised by exchanges of information and learning through different methodologies. It is also important to specify the existence of different types of assessments: Diagnostic; Formative; Summative; Norm-Referenced; Criterion-Referenced; Interim (or Benchmark).

The first type of assessment, the 'diagnostic', evaluates a students' points of strengths, weaknesses, previous knowledge and skills possessed prior to the learning phase; it should be considered as a type of evaluation that defines a starting point from which the teacher can work on. The second type of assessment, the 'formative', defines the learning curve students are facing, it can be considered as a 'check-up', as an evaluation of the work in progress during the learning phase. Then, it is possible to find the third type, the 'summative', which can be considered as a final assessment. These first three types of assessments can be used to put up a set of strategies for a whole course, as they define the beginning level, the progress and a more experienced level at the end of the milestones/course. Yet, the next three types of assessment are related to particular factors that can be integrated in the previous ones. The fourth type, the 'norm-referenced', is achieved through a comparison of the evaluations with specific standard rules or successes; it is directly linked to the fifth type, the 'criterion-referenced', which is the comparison of the evaluations with a determined goal or parameter. The fourth and the fifth can be considered similar, but as the fourth one is focused on the comparison between the tests and

[1] https://dictionary.cambridge.org/dictionary/english/assessment

a standard evaluation on a national and transnational level, the fifth one is a comparison between the tests and one or more criteria. Last but not least, the sixth type of assessment, the 'interim' (also called 'benchmark'), isn't related to the end of the course, instead, it can be used as an evaluation of a particular milestone reached after a certain number of lessons. Using that type of assessment, it's theoretically possible to predict the evaluations of the final results at the end of the course.

Considering how different courses are, even when facing the same subjects or topics, and considering how different teachers are as well, the importance of using different types of assessments, along with multiple types of evaluations, is needed. Using said methods can offer a wider understanding of the learners' expectations and successes, as well as providing a deeper awareness of the learning and teaching experience.

Regarding the content of section 4.1., the best strategies for conducting an effective assessment will be analysed, reporting on the most suitable methods and tools according to the different types of assessment, together with the relative measures of effectiveness in relation to the learners. In section 4.2, on the other hand, it will be indicated how to analyse the results obtained from the aforementioned assessments, which will influence the competences reported in 4.2.1. Thanks to these results, then, it will be possible to address section 4.3., i.e., the feedback and planning phase, thanks to which an evaluation of the course and strategies as a whole can be realised. Section 4.4. will then provide the digital tools with which one may design one's own course and assessment strategies, as well as the feedback phase. With paragraph 4.4.1., the correct links and methodologies with which to manage the assessment phase via the tools will be shown.

5.4.1. Assessment strategies

It may be important to remember that each person is different, also by virtue of being a student - and not just a teacher - so it is fair to assume that each person learns differently and at different times. For this reason, it is necessary to develop assessment strategies that can take this extremely important factor into account. As previously explained, there are different types of assessment and each of them can be used to develop different assessment strategies, depending not only on the needs of the learners, but also on the needs related to the environment in which the lessons are being faced. Although, one must also consider different factors when thinking about the relationship between the course, or the compendium of lessons itself and the considerable time available to present or deliver the lessons. S. Nagowah and L. Nagowah (2009)[2] express the difficulty related to the time/evaluation relationship, regarding the 'formative' assessment:

"It has often been the case that formative assessment is neglected especially when instructors have a tight schedule. They have to complete a syllabus; therefore, they focus on the delivery of the lectures but omit the question-answer sessions where students can voice out their questions and difficulties. It is of prime importance to have interactive sessions between instructors and students in order to clarify doubts of students and make them more confident. Formative assessment like multiple choice questions and other informal assessment like discussions and debates can furthermore help to engage students in class and break the monotony often associated with non-stop lectures."

[2] Nagowah L., Nagowah S., *"Assessment Strategies to enhance Students' Success"*. 2009. In "Conference: Teaching and Learning".

Yet there are different types of exercises or strategies that can be used, considering all the types of assessment previously explained. The authors give a clarification of the different strategies and approaches that go along some of the forms of evaluation:

ASSESSMENT	*ACTIVITY*
Formative	Quizzes, multiple choice questions or tests
Summative	Tests and exams that contribute towards a grade
Norm-directed	Computation of final grades for specific modules
Criterion-directed	Assignments, projects, presentations, exams

Table 5.2. Assessment strategies in S. Nagowah and L. Nagowah (2009: 7)

But it is limiting to simply list assessment strategies within a standard education system; instead, it is important to specify how these strategies can be integrated within a system of digital innovation. This is where the design of digital and web-based assessment strategies comes in; T.H. Wang[3] (2007) of National Tsing Hua University states that when students have the opportunity to retake the test, the correct answers should not be given. Furthermore, the system should provide references to answers when students answer incorrectly. Buchanan (2000)[4] showed that these strategies enable students to engage more with the course material. He recommends repeating the test after doing the suggested reading in a test-learn-retest cycle, which continues until the subject is mastered. These strategies help participants know which items need reinforcement and allow students to focus on the course materials and consistently master the course concepts. It is absolutely necessary to remember that there may be certain evaluation methods that are more suitable for digital platforms, and others that are less effective in view of a form of digital education. So-called 'Distance Learning' (DL) is explored in depth by various scholars and researchers; it is certain that it brings several benefits, as well as many negative aspects. Marcus (2006) in Syed-Khuzzan and Ingirige (2006), asserts that a varied combination of assessment activities provides sufficient opportunity for the student to demonstrate learning, while several assessment options allow learners to respond to different evaluation strategies.

"Many studies indicate that integrating the DL environment with web-based assessment have positive results (Velan et al, 2002; Henly, 2003). Formative assessments refer to activities that are used to help students learn, e.g. short tests and quizzes, question and answer in a lesson, assignments, homework and so on. Buchanan (2000) showed that a web-based formative assessment strategy is able to improve student learning interest and scores. Formative assessment is often done at the beginning or during a programme, thus providing the opportunity for immediate evidence for student learning in a particular course or at a particular point in a programme."

Therefore, it is possible to observe how the digital approach to assessment is an extremely effective innovation, especially when certain testing strategies, various activities such as those listed in Tab 1 are used to carry out a proper assessment phase.

[3] T.H. Wang. "*What strategies are effective for formative assessment in an e-learning environment?*". 2007. In Journal of Computer Assisted Learning 23(3):171 – 186.
[4] Buchanan, T. "The efficacy of a World-Wide Web mediated formative assessment.". 2000. Journal of Computer Assisted Learning.

But what are the actual tools that an online assessment phase can use? Tab 1 lists only a few, but a more specific investigation of these methods is necessary. Certainly, Ley (1999) identifies certain tools that can be adapted according to the DL's needs:

- Discussion board participation: students seem to perform better when the discussion boards (or asynchronous communication) are required, where participation is 'rewarded' by a grade. This incentive of a grade brings a higher level of participation to the discussion, where students engage in dialogue begun by the instructor but often taking off on its own soon after.
- Online quizzes: an online quiz enables the instructor to regularly assess student understanding of the materials presented, thus keeping the instructor on track of the students' performance.
- Electronic paper and project submissions Paper and project submissions can be performed using the Digital Drop Box, or file sharing. By submitting the paper electronically, students do not have to make physical contact with a 1622 particular location in order to submit, and there is less chance of the instructor losing the paper. In addition, an electronic receipt is automatically generated when the instructor receives the submission, enabling accurate records to be kept of who submitted the assignment and when.
- Reading outside of the assigned textbook (including hyperlinks and electronic formatted documents) By posting hyperlinks to sources of information, and labelling them as required or recommended, the instructor can share these sources of information with students very quickly and easily at any point during the course. This therefore also encourages discussions and interactions between co-learners on the topics and information shared by the instructor.

It is natural to think, therefore, how the online approach of teaching, and thus of the assessment method, need not be completely different from the classical method. In the period of digital innovation, in fact, it is possible to consider this process as a kind of transition, which may lead to the adaptation, rather than the replacement, of certain assessment methods. Gaytan and McEwen (2007)[5] confirm precisely this concept:

"Effective online instruction involves translating the unique benefits of face-to-face interaction to online activities. The center encourages professors teaching online to get students to be actively involved in their learning by designing activities that promote student interactions and build a sense of community among students and faculty."

Using effective assessment techniques is an important part of teaching and learning within a digital space, the authors confirm. Educational institutions, in fact, hold student learning accountable for the most part, rather than teaching in the strict sense. Therefore, assessment is a considerably important part of accountability these days. Also, according to Gaytan and McEwan (2007; 2002), those who act as teachers, or trainers, need to establish a purpose by virtue of assessment, measuring certain criteria and outcomes, before putting such assessment strategies into practice. Similarly, Robles and Braathen (2002) assert that the e-learning environment is a "relatively new arena within which the challenges of assessment are even greater", conveying how the correct methods, and the correct implementation of assessment strategies are part of an area that is still not well defined or explored.

[5] McEwen, B. C., Gaytan J. "*Effective Online Instructional and Assessment Strategies*" in "*The American Journal of Distant Education*", 21 (3). 2007.

Assessment Strategies	Strongly Agree or Agree (%)	
	Faculty (N = 29)	Students (N = 332)
A wide variety of clearly explained assignments are required on a regular basis	93	69
Student work is evaluated to determine if learning outcomes are being met	93	73
Continual, immediate, and detailed feedback is required regarding student perceptions of the course	83	56
A rubric is used to determine if learning outcomes are being met	66	58
Self-assessments are being used to determine if learning outcomes are being met	66	59
Threaded discussions are used appropriately to ensure understanding of assignments	59	70
A variety of assessment techniques are used (e.g., electronic portfolios)	48	43
Self-tests are reviewed to ensure student understanding of course content	38	21
Students obtain immediate feedback through required peer assessment	28	29
Assignments are made out of student chat room discussions	17	21
Self-tests are required to provide students with immediate and honest feedback on learning and achievement	17	49
A rubric is used to assess the quality of interaction (e.g., analyze depth of postings)	17	43

Figure 5.1. Assessment strategies in Robles and Braathen (2002: 126)

As we are moving into an undefined zone, structurally and academically, it is natural to find different opinions on the definition of the correct assessment strategies. For instance, Marshall (2003), cited in Robles and Braathen,

Online assessment strategies are analysed in detail by the above-mentioned authors, who conduct a study on the effectiveness of strategies in a virtual environment: communicates how assessment should be based on the exponential improvement of traditional teaching and learning techniques, which can lead students to 'think', providing them with a reason to continue taking lessons, receiving help and encouragement. Others, such as Robles and Braathen (2002), assert that online assessment also needs a more continuous and systematic approach than that used in traditional guidelines. As considered by Conrad and Openo (2018)[6]Assessment strategies are assessment practices that must align with the teacher's ideas, towards which they channel their teaching philosophy, to also challenge their own methods and assessment criteria, in such a way that they coincide with their beliefs, and the way each learner should learn..

[6] Conrad, D., Openo, J. *"Assessment Strategies for Online Learning: Engagement and Authenticity".* 2018. AU Press, Athabasca University.

5.4.2. Analysing Evidences

Evidence analysis is an extremely important process within the course, as it allows one to be aware not only of the theoretical tools that are given to the learner, but also of the course's performance in a general way, as well as the effectiveness of the tools used to stimulate learning. It is a 360° process, which takes into account several factors; according to the 'Digital Competence Framework for Educators', in fact, the 'Evidence Analysis' process is used with multiple functionalities:

- To design and implement learning activities which generate data on learner activity and performance.
- To use digital technologies to record, compare and synthesize data on learner progress.
- To be aware that learner activity in digital environments generates data that can be used to inform teaching and learning.
- To analyse and interpret available evidence on learner activity and progress, including the data generated by the digital technologies used.
- To consider, combine and evaluate different sources of evidence on learner progress and performance.
- To critically value the evidence available to inform teaching and learning.

Producing data on learners' activities and performance allows one to keep track of all the progress in the course environment, as well as the potential of each learner. Using digital technologies to record and synthesise data also provides a possible comparison element on which to base different types of analysis within the assessment dimension. In addition, analysing and interpreting data on learners' activities and progress makes it possible to outline a possible learning curve on which to base any assessments to be administered. Finally, critically evaluating the evidence allows one to make a judgement on the correct methodology used during the course, in its entirety.

According to the "Digital Competence Framework for Educators", therefore, the evidence analysed allows for the definition of levels into which learners and their capacities can be placed.

PROGRESSION		**PROFICIENCY STATEMENTS**
Newcomer (A1)	Making little use of digital data for monitoring progress	I do not or only very rarely refer to digitally recorded data to understand where my students stand
Explorer (A2)	Evaluating basic data on learner activity and performance.	I evaluate administrative data (e.g. attendance) and data on student performance (e.g. grades) for individual feedback and targeted interventions. I am aware that digital assessment tools (e.g. quizzes, voting systems) can be used within the teaching process to provide me with timely feedback on learners' progress.
Integrator (B1)	Evaluating a range of digital data to inform teaching.	I evaluate the data resulting from digital assessments to inform learning and teaching. I am aware that the data on my learners' activity, as it is recorded in the digital

		environments which I use with them, can help me monitor their progress and provide them with timely feedback and assistance.
Expert (B2)	Strategically employing digital tool for data generation.	I use digital technologies (e.g. quizzes, voting systems, games) within the teaching process to provide me with timely feedback on learners' progress. I use the data analysis tools provided by the digital environments I use to monitor and visualise activity. I interpret the data and evidence available in order to better understand individual learners' needs for support.
Leader (C1)	Using digital data to reflect on learning patterns and teaching strategies.	I continuously monitor digital activity and regularly reflect on digitally recorded learner data to timely identify and react upon critical behaviour and individual problems. I evaluate and synthesize the data generated by the various digital technologies I use to reflect on the effectiveness and suitability of different teaching strategies and learning activities, in general and for certain learner groups.
Pioneer (C2)	Innovating data generation and evaluation.	I implement advanced data generation and visualisation methods into the digital activities I employ, e.g. based on learning analytics. I critically assess and discuss the value and validity of different data sources as well as the appropriateness of established methods for data analysis.

Table 5.3. Progression level in the 'DigiEduComp' Evidence Analysis

From the examples given in Table 5.3, therefore, it is possible to observe how Evidence Analysis is not simply used in assessments as a simple practice to highlight outcomes and results, but can provide concrete clues on the level of an individual learner, a group or an entire class, highlighting strengths and weaknesses, enabling the teacher or trainer to manage a trend (in the case of milestones assessments) or to draw certain conclusions in virtue of a subsequent course. The practice of evidence analysis, therefore, is a fundamental process that must not be underestimated, nor rushed, as a critical component through which a course can constantly improve.

5.4.3. Feedback and Planning

The 'Feedback' phase is generally considered as one of the final stages, usually carried out with the accumulated considerations from the assessment and evidence analysis phases. Through this, a critical conclusion can be drawn with the accumulated data. Feedback, however, involves both teacher and learners, allowing the former to adapt strategies and provide targeted support, confirms the 'Digital Competence Framework for Educators', also based on the digital technologies used. Feedback, again, is divided into several crucial points. The post-assessment phase, after which marks should be given; using the assessment management system to enhance the effectiveness of feedback; using digital technologies to provide targeted support. Alternatively, this phase can be used to adapt teaching or assessment practices, having collected digital data that will also allow learners to autonomously evaluate and interpret training results, both in terms of personal criticism and group interactions. Indeed, learners will be assisted in identifying the area of training on which to develop learning plans, thanks to this phase.

Furthermore, 'DigCompEdu' expresses how effective it can be to use these practices to define future priorities and studies.

The University of Tennessee[7] confirms how different types of feedback can exist, again, based on the purposes related to outcomes. For example, it is possible to list types such as 'Relevant', 'Specific' and 'Individualized', 'Aligned to Course learning Outcomes', 'Robust and Constructive', 'Timely'. The first type, the 'Relevant Feedback', focuses on addressing relevance that might persuade learners that the information, learning tasks, and feedback are valuable and worth applying, supporting the transfer of learning in the process. The 'Specific' feedback tackles any mistakes and misunderstandings that are evident in the particular student's work. The learner should also receive instruction and guidance, as well as any necessary correction. The 'Aligned to Course Learning Outcomes' feedback should go into more detail regarding how successfully the student completed the requirements of the assignment and whether or not their performance showed mastery of the associated learning outcome. To facilitate student growth, the 'Robust and Constructive' feedback must be both qualitatively and quantitatively adequate. It should contain descriptions that refer to the assignment criteria and should be considered specific for both content and context. 'Timely' feedback is given when it is most beneficial to students, that is, when they can use it to make improvements. However, the timing of feedback should vary and should be based on the ability and previous knowledge. Furthermore, there are several distinctions that must be done, and The University of Tennessee positively shows the features of a good 'feedback':

"Feedback can be formal or informal, and evaluative or descriptive. It can also be formative in nature, given during the learning process to provide additional opportunities for practice and improvement. Or it can be summative, provided at the end of the learning process as an overall assessment of learning. When you share feedback with students, you can share corrective feedback or you can share more elaborative feedback designed to provide guidance for improvement."

Classified as 'strategies' for this specific phase, they are enlisted as: 'Peer & Self-Directed Feedbacks', 'Rubrics', 'Multimedia Feedback':

STRATEGY	***ACTIVITY***
Peer & Self-Directed Feedback	Feedback forms, checklists, qualitative statements rated on a 'Likert' scale, rubrics, or written expectations.
Rubrics	Checklists, criteria grid layouts, holistic rubrics, single point rubrics, and more.
Multimedia Feedback	Audio, video, screencast, annotations.

Table 5.4. Feedback strategies according to the University of Tennessee Knoxville

There is a way to optimize and maximize the impact of the feedback phase, such as creating a strategy which can and must provide a basis for an overall approach. According to the Research Centre for The Knoxville University, teachers can use feedback banks, in order to manage repetitive contents; they can either use automated feedback generators, or provide the evaluation o a predetermined schedules. They can either use a 'leverage feedback', which sets the evaluation for a whole class or group, communicating it through short announcements or

[7] University of Tennessee Knoxville. "*Feedback Strategies*" (available at https://onlinelearning.utk.edu/online-teaching-learning-resources/quality-online-practices/feedback-strategies/)

group emails. However, providing resources and help, making sure students become aware of the resources and the materials, is one of the most important factors in this specific section.

The 'Planning' phase, on the other hand, turns out to be a particular stage of the course, which returns almost cyclically. If it is possible to use the results of the assessment to provide feedback, both for the students and the teacher, in fact, then it is possible to use that same feedback to manage what are the goals and features of a future course, as well as those provided within an assessment and feedback on milestones. Through the planning phase, then, it is possible to define what are the objectives of the future course, as well as the tools and methodologies that are used to deliver lessons that are correct and appropriate for the types of learners. This phase, then, is simultaneously based on the previous phases (assessment, feedback) but goes to outline what are the directives of the course that will take place next.

5.4.4. Assessment Tools

At this point, a question arises: what tools can be used to provide support to teachers, and students, for the assessment phase and the design of assessments? The answers are manifold; certainly, during the implementation of digital techniques and innovations necessary for the evolution of teaching and learning, during the pandemic, software and platforms were developed that definitely changed the related environment. There have been different benefits and downsides for the 'offline' assessment, as confirmed by Bardhan *et al.* (2020)[8]: "teachers used to take traditional pen and paper mode of assessments, surprise class tests, open book examinations or practical based evaluations. One advantage of offline assessment mode is it can check misconduct on part of students". Although, among the benefits of an 'online' type of assessment, an important European value can be respected: the sustainability of the environment. Once more confirmed by Bardhan *et al.* (2020): "embracing an online exam system would significantly aid in safeguarding the environment with reduced paper usage".

Among the recently developed platforms for online assessments, 'Google Form' based quizzes, 'Kahoot!', 'Quizizz', 'Socrative', 'Near Pod' and 'Educanon' can surely be enlisted as some of the most useful digital tools. Said platforms have different features that allow students and teachers to have different kinds of interactions, based on factors like flexibility, differentiation of quizzes, time-based questions and instantaneous results

[8] Bardhan, T., Mohanty, S., Dey, A. "Online Assessment Tools for e-teaching and learning: making icts more handy". 2020. (*available at:* https://www.researchgate.net/publication/344789706)

Point Of Comparison	Kahoot!	Quizizz	Google Forms	MS Teams Based Quiz
Mode	Online	Online	Online	Online
Real Time Interaction	Yes	Yes	No	No
Instantaneous result	Yes	Yes	Yes	Yes
Flexibility of place	Yes	Yes	Yes	Yes
Practice option for students	Yes	Yes	No	No
Time allotted/questions	Yes	Yes	No	No
Competitive environment	More	More	Less	Less
Gamified quizzes	Yes	Yes	No	No
Ease of accessibility	Easy	Easy	Easy	Moderately difficult

Figure 5.2. Comparison between assessment tools in Bardhan *et al.* (2020)

Of course, each platform has a particular feature that makes one different from the other; As explained by Pérez Sanchez et al. (2014): "the implementation of graduate studies to the European Higher Education Area (EHEA) has allowed a more focused approach in the training of students, measuring the effort that they spend, encouraging their self-learning and favouring more active participation, […] enable the acquisition of those skills needed for the practice of the profession". The implementation of the 'MOODLE' platform is, indeed, one of the best assessment tools developed nowadays, which allows teachers to keep tracking of the students' presence online, their grades and scores achieved through different types of examinations, with the possibility of developing a completely personal form of assessment, which can include comments, notes, etc.

Another effective assessment tool has been developed by Calvani et al. (2008) in order to implement a suitable evaluation for teachers. Named 'Instant DCA' , it has been defined as: "as a wide-ranged instrument sensitive to various types of knowledge, which can be gauged with a structured test. It has been conceived as a rapid means of assessment, and can be administered by scholastic institutes or single teachers". This new type of assessment method is based on the more widespread 'DCA' (Digital Competence Assessment) framework and tool. The 'Instant DCA' is built by 85 items, considering multiple-choice questions, matching items and small questions as well, it includes cognitive and ethical dimension-related questions, enhancing and empowering not only the digital and subject-related questions, but the cognitive, the moral hidden behind said subject. Furthermore, the 'Instant DCA' is: "more related to 'the ability to identify and resolve' the common critical inconveniences one faces when working on the computer and the capacity to understand typical interfaces, rather than that of possessing specific expertise on certain types of software or set-ups".

As previously mentioned, the implementation of new digital techniques for already known and well-developed methods should not be underestimated, thus combining two well-tested features to produce. According to Husain (2021), particularly effective was also the use of digital instrumentation in response to 'Bloom's Taxonomy', a model for assessment based on: remembering; understanding; applying; analysing; evaluating; creating. These are processes

that create a natural flow from understanding to producing something new by analysing the assessment itself. In Digital Bloom's Taxonomy, therefore, there is the use of different digital platforms:

BLOOM'S TAXONOMY LEVEL	***DIGITAL IMPLEMENTATION***
Level 1 (remembering) ***Level 2 (understanding)***	Video production and analysis Practice through digital platforms (Kahoot!; Socrative; etc.)
Level 1 (remembering) ***Level 2 (understanding)*** ***Level 3 (applying)***	Use of word processing software (such as the possibilities offered by MS, Office)
Level 3 (applying) ***Level 4 (analysing)*** ***Level 5 (evaluating)*** ***Level 6 (creating)***	Use of multimedia platforms created through software.

Table 5.5. Digital Bloom's Taxonomy implementation in Husain (2021)

Thanks to this type of model, learners can be stimulated to use LOT (low order thinking) skills and HOT (high order thinking) skills, achieving assessment in the most reliable way. Such an approach, which can integrate a proven system with the latest digital innovations, is an excellent solution especially for novice teachers, who can benefit from the experience of new implementations and those already developed by experts in the field. It is possible, therefore, to observe how different assessment methods have been implemented today, which make use of different tools to carry out the work of evaluation. Thanks to these, it is possible to provide the most important thing: immediate support for students, enabling them to achieve the most complete and empowered understanding of the studied subject.

5.4.4.1. Assessment Tools: Self learning section

Kahoot! - https://kahoot.com/
Reports to assess learning outcomes - https://www.youtube.com/watch?v=L6vJsGWMvfc
'Kahoot!' an assessment tool - https://www.youtube.com/watch?v=9GETy9J-08M
Using 'Kahoot!' for Classroom Assessment - https://www.youtube.com/watch?v=TrHZUr6puCo
'Kahoot!' for Formative Assessment - https://www.youtube.com/watch?v=CLS5H41uf1Q
How to assess students using 'Kahoot!' - https://www.youtube.com/watch?v=yzwteqwuWX4
Quizizz - https://quizizz.com/
How to use 'Quizizz' for assessment - https://www.youtube.com/watch?v=hr3oeLKOf7k
Full tutorial in 'Quizizz' - https://www.youtube.com/watch?v=RiIR4d25mY0
Using 'Quizizz' for quick assessment - https://www.youtube.com/watch?v=4Ql2fEmpqWY
'Quizizz' for formative assessment - https://www.youtube.com/watch?v=QQMujZk3p64

An easy way for 'Quizizz' assessment - https://www.youtube.com/watch?v=gRWw8OsJNVQ
Google Form - https://www.google.it/intl/it/forms/about/
Create an assessment in Google Forms - https://www.youtube.com/watch?v=SqQp8LKCUeM
Google Forms for Assessment - https://www.youtube.com/watch?v=-I7nyINyBKo
Audio files in Google Forms assessment - https://www.youtube.com/watch?v=yNbzg6ETxUQ
How to make an assessment using Google Forms - https://www.youtube.com/watch?v=5mBycr9o2UA
Microsoft Teams - https://www.microsoft.com/it-it/microsoft-teams/log-in
Assignment and assessments in MS Teams - https://www.youtube.com/watch?v=WmxzLAZIqJE
How to create assignments in MS Teams - https://www.youtube.com/watch?v=Z4I-bg2KgIA
Assessment via remote learning - https://www.youtube.com/watch?v=rNrquHqdXWs

Table 5.6. Links for self-learning with digital assessment tools

5.5. National perspectives

Thanks to the approval of the "DDI – Didattica Digitale Integrata" (Integrated Digital Education plan), numerous changes in education are being recorded in Italy. The transition to digital can also be seen in assessment aspects. For example, the evaluation can be made through semi-structured tests with non-googled tests; written tests delivered via virtual classroom

5.6 Conclusions

It is possible to observe that assessment is a necessary tool for the purpose of learner evaluation, but it is also an important step in the personal training of a teacher, who can use their competences (from the perspective of teaching and digital skills). The most important imperative is, therefore, to stay up-to-date on the most important tools in order to be able to complete the assessment phase. It was possible to observe which types of assessment can meet the needs of a class and its teacher, as well as the most suitable assessment strategies to help learners acquire the right competences, with the right testing methods. One must not, however, consider each topic addressed as a watertight, separate compartment, but must put everything in synergy to achieve the main goal: the attainment of the competences outlined within one's course.

Digital assessment can add important layers of protection to assessment and results that paper assessment cannot provide. In addition, it can relieve the pressure on institutions to keep paper files secure before and after examinations. By creating and storing assessment items digitally in the product bank, they can be protected and encrypted. Once examination papers are printed and sent out, there is always the risk of an interruption. Examination papers can be compromised if the shipment is lost or damaged during delivery, forcing issuing organisations to consider expensive and time-consuming replacement papers. With digital tests and assessments, the digital assessment partner can implement additional security measures to

protect assessments and assessment items. If exams are still conducted on paper, the use of digital assessments such as e-marking can help protect results and reduce risks. Candidates' paperwork is securely collected and sent to a reliable scanning centre, reducing the possibility of interruptions. End-to-end digital assessment, where candidates take tests on a computer, can ensure full traceability of the assessment process, facilitating a secure environment and preventing breaches. Fully digital assessment also opens up the possibility of conducting examinations remotely, something that many organisations and certification institutions have been interested in since the COVID-19 pandemic caused global restrictions affecting traditional examinations. Flexibility has become increasingly important as schools and universities around the world have been forced to close due to the pandemic. Digital assessment allows learners to continue to improve through online methodologies and to take exams online or offline, at home, at a testing centre or at school.

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CHAPTER 6

Empowering Learners

CHAPTER 6 Empowering Learners

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WHAT WILL WE LEARN IN THIS CHAPTER?

What does the term "empowering learners" in the context of DigiComp refer to?
What are the relevant tools?
How can digital be integrated into the strategies to empower learners?
What are the benefits of these strategies and tools?
What are the levels of proficiency of our module?

Keywords: empowering; learning; active learning; personalised; diversity; education; strategies; game-based learning; learning management systems

6.1 Glossary and abbreviations

Digital Competence Framework for Educators (DigCompEdu)	In education, there is a wide variety of methods or tools that educators use to evaluate, measure the progress, skill acquisition, or needs of students.
Empowering learners	the 5th area of the Digital Competence of Educators (DigCompEdu) which emphasises the importance of creating learning activities and experiences that are responsive to students' needs and enable them to actively shape their learning journey. Educators can use digital technologies to promote differentiation and personalization by allowing for varying levels and speeds, individual learning paths and goals. They encourage students to actively participate in digital activities and ensure equal access to technologies.
ICT	Information, Communication, and Technology
Learning Management Systems (LMS)	Software-based platforms that help teachers with the management, delivery, and measurement of learning progress in their classes.
Games-based Learning (GBL)	Gaming activities that are highly engaging, and it helps the learner to find ways of solving problems by various means
Digital Competence Framework for Educators (DigCompEdu)	In education, there is a wide variety of methods or tools that educators use to evaluate, measure the progress, skill acquisition, or needs of students.
Empowering learners	The 5th area of the Digital Competence of Educators (DigCompEdu) which emphasises the importance of creating learning activities and experiences that are responsive to students' needs and enable them to actively shape their learning journey. Educators can use digital technologies to promote differentiation and personalization by allowing for varying levels and speeds, individual learning paths and goals. They encourage students to actively participate in digital activities and ensure equal access to technologies.

Table 6.1. Glossary and abbreviations

6.2 Chapter connection to the DigComp

Educators must be excellent lifelong learners, both individually and collectively. It is critical to build their pedagogical capacity around the pervasive, enabling role of technologies in the new pedagogy model - to focus on the learning process, to support the development of students' digital literacies, and to be connected to institutional capacity building. Curricula, guidelines, or standards for digital literacy in education are now common in most European member states. Through a) in-depth analysis, clustering, and mapping of existing frameworks, self-assessment tools, guidelines, conceptual models, and tools used to develop teachers' digital literacy, and b) a series of expert and stakeholder consultations to refine, reframe, correct, and validate the conceptual model developed in the previous phase, the DigiComp was developed. The European Digital Competences Framework (DigComp) was published in 2013 and revised in 2016 and 2017 to provide a common reference framework. It describes the digital competencies that every citizen should develop to live successfully in a digital society and organises them into five areas: Information and Data Literacy, Communication and Collaboration, Digital Content Creation, Security, and Problem Solving[1].

The DigComp is based on extensive expert and stakeholder consultations and aims to structure existing insights and evidence into one comprehensive model that is applicable, in principle, to all educational contexts. The generation and dissemination of this framework illustrate how frameworks can contribute to innovation in education and teacher professional development[2].

The European Framework for the Digital Competence of Educators (DigCompEdu) details 22 educator-specific digital competences organised in six areas.

In this chapter, we explore the 5th area “Empowering learners”, which emphasises the importance of creating learning activities and experiences that are responsive to students' needs and enable them to actively shape their learning journey. Educators can use digital technologies to promote differentiation and personalization by allowing for varying levels and speeds, individual learning paths and goals. They encourage students to actively participate in digital activities and ensure equal access to technologies.

6.3. Introduction to specific module

Technology-enhanced learning has been growing in popularity in vocational education and training contexts. Different technology integration frameworks have been developed to assess the extent and nature of this technology integration for learning, using frameworks primarily developed in school and higher education contexts[3]. Information, Communication, and Technology (ICT) integration will help educators meet the global requirement to replace traditional teaching methods with technology-based teaching and learning tools and facilities. ICT integration is very effective for both educators and students. The results show that the good preparation of educators with ICT tools and facilities is one of the main factors for the success of technology-based teaching and learning. It was also found that professional development programs for educators play a key role in improving the quality of student learning[4].

[1] Caena, F., & Redecker, C. “Aligning teacher competence frameworks to 21st century challenges: The case for the European Digital Competence Framework for Educators (Digcompedu)”. 2019.
[2] Redecker, C. “European framework for the digital competence of educators: DigCompEdu (JRC107466)”.2017. Retrieved from http://publications.jrc.ec.europa.eu/repository/handle/JRC107466
[3] Reisdorf, B., Rhinesmith, C. “Digital inclusion as a core component of social inclusion”. 2020.
[4] Ghavifekr, S. & Rosdy, W.A.W. “Teaching and learning with technology: Effectiveness of ICT integration in schools” in International Journal of Research in Education and Science (IJRES). 2015.

VET is increasingly seen as a driver of innovation and is part of the lifelong learning indicator in the EU Innovation Scoreboard. VET also prepares learners for jobs that require creativity, fosters new ideas in business and industry, and helps close the skills gap (40% of workers are at risk of having their workplace tasks replaced by machines). VET linked to innovation and digitization has evolved in recent years, but more progress is needed to build the capacity of VET systems to incorporate innovation and digitization. In contrast to this broader context, the education sector, including VET, has traditionally been viewed as relatively static and lacking innovation. For example, the first OECD International Survey of Teachers, Teaching and Learning (TALIS) found that only slightly more than a quarter of teachers felt that more innovation in their teaching would be valued in their schools. Recent surveys of university graduates suggest that this may be changing: About 70% of university graduates working in education think their workplace is very innovative, compared with 69% in other sectors and industries[5].

More generally, it is crucial that education and training in Europe become innovative. Innovation would increase productivity, which is slower in education than in other sectors, despite increasing investment in education. Moreover, education and training institutions need to innovate to remain relevant in the face of technological change that facilitates and increasingly diffuses learning outside formal education. It was argued that current innovations in education and training involving new teaching and learning methods are so fundamental that they correspond to the early stages of a learning revolution: pedagogical examples include problem-based learning and students as co-creators, and the use of technology in the classroom (e.g., virtual learning environments, adaptive learning, immersive environments, mobile learning, and flipped classrooms) [6].

6.4. Opening section

One of the main strengths of digital technologies in education is their potential to support learner-centred pedagogical strategies and to promote learners' active involvement in and ownership of the learning process. For example, digital technologies can be used to promote active learner engagement, such as exploring a topic, experimenting with different options or solutions, understanding contexts, coming up with creative solutions, or creating an artefact and reflecting on it. Digital technologies can also help support classroom differentiation and personalized instruction by providing learning activities that are customized to each learner's skill level, interests, and learning needs. At the same time, however, care must be taken not to exacerbate existing inequalities (e.g., in access to digital technologies or digital skills) and to ensure accessibility for all learners, including those with special education needs[7].

Empowering Learners of DigiComp refers to the use of digital technologies by educators to enhance inclusion, personalisation and learners' active engagement. In this chapter, we will further examine the above competencies together with the corresponding methodologies to boost them.

[5] A report of the ET 2020 Working Group on Vocational Education and Training (VET) Eight insights for pioneering new approaches. Retrieved from file:///C:/Users/USER/Downloads/KE-03-20-517-EN-N%20(2).pdf
[6] A report of the ET 2020 Working Group on Vocational Education and Training (VET) Eight insights for pioneering new approaches. Retrieved from file:///C:/Users/USER/Downloads/KE-03-20-517-EN-N%20(2).pdf
[7] A report of the ET 2020 Working Group on Vocational Education and Training (VET) Eight insights for pioneering new approaches. Retrieved from file:///C:/Users/USER/Downloads/KE-03-20-517-EN-N%20(2).pdf

6.5. Analysing the levels of proficiency of our module

To empower learners through digital technologies in order to achive the 1) accessibility and inclusion, 2) differentiation and personalisation, 3) actively engaging learners it is important to incorporate specific learning activities, assignments, and assessments. Here are the key points:

1) Accessibility and inclusion

- Ensure equitable access to digital technologies and resources for all students.
- Choose and apply digital teaching strategies that consider learners' digital context, including technology constraints, competences, expectations, attitudes, misconceptions, and misuses.
- Utilize digital technologies and strategies, such as assistive technologies, to support learners with special needs, including those with physical or mental constraints or learning disorders.
- Address potential accessibility issues when selecting, modifying, or creating digital resources, and provide alternative tools or approaches for students with special needs.
- Implement design principles to enhance the accessibility of teaching materials and digital environments.
- Continuously assess and adjust measures to improve accessibility, adapting strategies as needed.

2) Differentiation and personalisation

- Employ digital technologies to cater to the unique requirements of individual learners, such as those with dyslexia, ADHD,etc.
- Provide flexibility by accommodating diverse learning pathways, levels, and speeds in the design and implementation of digital learning activities.
- Create personalized learning plans for students and utilize digital technologies to support and enhance these plans.

3) Actively engaging learners

- Utilize digital technologies like animations or videos to visually and effectively explain new concepts in an engaging manner.
- Incorporate motivating and engaging digital learning activities, such as games and quizzes, into the teaching process.
- Place learners' active use of digital technologies at the core of the instructional approach.
- Use digital technologies to enable learners to actively interact with the subject matter, involving different senses and manipulating virtual objects for deeper understanding.
- Choose the right digital technologies that best support active learning in a specific learning context or for particular learning objectives.
- Reflect on the effectiveness of various digital technologies in promoting active learning and adjust strategies and choices accordingly.

According to DigCompEdu, there are several levels of proficiency of students, both students and teachers, as shown in the table below: Newcomer (A1), Explorer (A2), Integrator (B1), Expert (B2), Leader (C1) and Pioneer (C2).

PROGRESSION		***PROFICIENCY STATEMENTS***
Newcomer (A1)	Concerns about accessibility and inclusion, coupled with uncertainty about the potential of digital technologies for differentiation and personalization, often result in minimal utilization of these tools for learner engagement.	-I am afraid that the use of digital technologies in teaching will make it even more difficult for already disadvantaged students to participate and keep up with the others, -I do not know how digital technologies can help me offer personalised learning opportunities, -I only very rarely, if at all, use digital technologies to motivate or engage learners.
Explorer (A2)	Being acutely aware of accessibility and inclusion issues, while also recognizing the immense potential of digital technologies for differentiation and personalization and actively employing these tools to engage and empower learners.	-I am aware that digital technologies have the capacity to facilitate differentiation and personalization -I understand the importance of ensuring equal access to the digital technologies used for all students. -I am aware that digital technologies can hinder or improve accessibility -I utilize digital technologies to vividly illustrate and elucidate novel ideas in a captivating and stimulating manner, often incorporating animations or videos. -I incorporate engaging digital learning exercises, such as games and quizzes, into my teaching approach e.g. Smart Learning Management Systems and Games-based Learning platforms
Integrator (B1)	Addressing accessibility and inclusion, leveraging digital technologies for differentiation and personalization, and fostering learners' active utilization of digital tools	-I prioritize equitable access to digital technology, recognizing its potential to bridge societal divides and its relevance to students' socioeconomic backgrounds. -I ensure universal access to digital resources and acknowledge the benefits of compensatory technologies for special needs learners. -I implement adaptive learning activities like quizzes and games, enabling individualized progress. -I place learners at the forefront of the digital learning experience by selecting suitable tools for active engagement, aligning with specific objectives and contexts.

PROGRESSION		***PROFICIENCY STATEMENTS***
Expert (B2)	Promoting accessibility and inclusion through strategic use of diverse digital technologies for differentiation and personalization, while actively engaging learners with the subject matter.	-I tailor pedagogical strategies to accommodate learners' diverse digital contexts, accounting for factors like limited screen time and available devices -I proactively address accessibility concerns by selecting or adapting digital resources, providing alternative tools for special needs students. -I utilize digital technologies, including assistive tools, to address individual accessibility challenges. -In designing learning and assessment activities, I leverage a variety of digital tools, adapting them to cater to different needs, levels, speeds, and preferences -I offer flexibility in learning pathways, levels, and pacing, adjusting strategies as circumstances or learner needs change. -To create an immersive digital learning environment, I incorporate diverse sensory channels, accommodate various learning styles and strategies, and incorporate methodological variations in activity types and group compositions. -I engage in reflective practice to assess the effectiveness of my teaching strategies in enhancing learner engagement and promoting active learning
Leader (C1)	Through comprehensive and critical implementation of strategies towards empowering learners, I promote active learning, differentiate and personalize instruction, and enhance accessibility and inclusion in the learning environment.	-I employ tailored digital pedagogical strategies that align with learners' digital skills, expectations, attitudes, and address any misconceptions or misuse. -I apply inclusive design principles, considering factors like font, size, colors, language, layout, and structure to enhance accessibility in teaching resources and digital environments. -I assess the effectiveness of these accessibility measures and adapt my strategies accordingly. -Collaborating with students and/or parents, I create personalized learning plans that cater to individual learning needs and preferences, leveraging appropriate digital tools and resources. -I critically evaluate how well my teaching strategies promote differentiation and personalization and adjust my methods and digital activities accordingly. -I carefully select, design, and incorporate digital technologies into the learning process to maximize their potential in encouraging active, creative, and critical engagement with the subject matter. -
Pioneer (C2)	Innovating the teaching strategies by harnessing digital technologies to enhance accessibility, inclusion, differentiation, personalization, and active learning	-I engage in a process of reflection, discussion, redesign, and innovation to ensure equitable access and inclusion in digital education -I engage in a process of reflection, discussion, redesign, and innovation to ensure personalising education through the use of digital technologies. - I engage in a process of reflection, discussion, redesign, and innovation to ensure actively engaging learners

Table 6.2. Levels of proficiency for teaching within DIGICOM , Source: European Framework for the Digital Competences of Educators (2017), page 71-75

6.5.1. Empowering Learners Strategies

- Accessibility and inclusion

Addressing the individual learning needs of all children, youth and adults, with a specific focus on those vulnerable to marginalization and exclusion; inclusive education as an approach implies all learners, with or without disabilities, to be able to learn together through access to common pre-school provisions, schools and community educational setting with an appropriate network of support services, which can be possible only in a flexible education system that assimilates the needs of diverse learners and adapts itself to meet these needs, ensuring that all stakeholders in the system are comfortable with diversity and see it as a challenge rather than a problem. The term 'disablism', which is found in Fernandez (2019) article, describes 'a set of assumptions (conscious or unconscious) and practices that promote the differential or unequal treatment of people because of actual or presumed disabilities'. Spaces that are inflected with the ideological imprint of 'disablism' could undermine accessibility, as these disabling spaces tend to exclude people whose bodies and cognitive functioning detract from societal 'norms'[8].

The goal of inclusion in Europe is to promote the socioeconomic inclusion of people with disabilities and to support equal access to services, education, and health care[9]. The ideal of digital inclusion encompasses accessibility, use, capabilities, and relevance of digital technologies for citizens. The concept of digital inclusion focuses on the actions taken to reduce digital inequality[10].

Digital access and connectivity are pivotal for refugees also, offering avenues to combat isolation, seek peer support, stay in touch with family, and access learning opportunities worldwide. A wide range of online educational resources tailored for refugees has emerged, spanning online courses, lectures, curated content, and even full degree programs.[11]

Digital inclusion can be defined as "the activities necessary to ensure that all individuals and communities, including the most disadvantaged, can access and use information and communication technologies.[12]" These, according to the National Digital Inclusion Alliance include reliable internet access at appropriate speeds, access to digital devices that meet users' needs, access to digital skills training, technical assistance, and content, apps, and software that are "designed to enable and promote empowerment, participation, and collaboration".

Multimedia representation of objects and processes through photos, videos, graphics, animation, and sound instead of traditional text descriptions are some examples of inclusive education settings. Students find the novelty of multimedia instruction interesting. The use of digital educational resources helps teachers significantly reduce the time needed to present the material, create engaging teaching and didactic manuals, hand out assessment and testing

[8] Fernandez, S. "Making space in higher education: disability, digital technology, and the inclusive prospect of digital collaborative making in International Journal of Inclusive Education. 2019.

[9] European Commission, EC: Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. Union of Equality: Strategy for the Rights of Persons with Disabilities 2021–2030. Brussels: EC. 2020. *Available at*: https://www.eea.europa. eu/policy-documents/communication-from-the-commission-to-1

[10] Reisdorf, B., Rhinesmith, C. "Digital inclusion as a core component of social inclusion." 2020.

[11] The Un Refugee Agency. "Turn the Tide: Refugee Education in Crisis". Retreived from https://www.unhcr.org/media/turn-tide-refugee-education-crisis

[12] National Digital Inclusion Alliance. Retrieved from https://www.digitalinclusion.org/definitions

materials needed to complete assigned educational tasks in the penitentiary system, and quickly find basic and additional educational materials on the topic of the lesson[13].

Also, many research articles have reported the positive impacted of using assistive technologies (such as educational software, reading machines, speech recognition systems, electronic spell chequers, talking computers, and word processors) with students with specific learning difficulties to enhance their academic achievement, independence, attention, and strengths[14].

ICT can help learners overcome difficulties in seeing, hearing, communicating, remembering/concentrating/learning, or moving their upper limbs (a skill often needed for writing or other school activities). ICT can be divided into three main categories:
- The educational content and activities themselves: digital media whose purpose is to teach lessons/skills to the student (e.g., an audio book, an educational video with sign language translation
- Hardware that serves as a facilitator to make specific educational content/activities accessible (e.g., a computer to display sign language interpretation of an audio document; alternative communication software to facilitate communication with teachers)
- Accessibility features that make the hardware accessible to all (e.g., a screen reader that allows a blind or visually impaired student to use a computer to access content on the Internet)[15].

Despite the willingness of educators to implement inclusive education practices, among their main barriers, is the need for professional training in the use of ICT in inclusive education.[16], together with limited governmental support, ineffective policies and legislation, inadequate funding, insufficient trained teachers and support staff, political instability, and economic crisis[17] and the availability of assistive technologies[18].

- Differentiation and personalisation

To better meet the needs of a broad range of learners, a change in the current pedagogical practice is urgent. While in the past whole-class instruction (one-size-fitsall) was widespread, with increased diversity in the classroom now there is a shift to the individual, addressing individual needs by providing tailored support, often referred to as personalised learning[19]. Personalization of learning has evolved in education because of current technological advances. Computer-based platforms and other devices and tools are emerging to support and enhance personalized learning. Research pointed out the availability of educational resources and the increasing adoption of educational technology challenge educational institutes to rethink the

[13] "Information and Communication Technology supporting the inclusion of children with disabilities in education", Factsheet - January 2022
[14]Al-Dababneh, K. A., & Al-Zboon, E. K. "Using assistive technologies in the curriculum of children with specific learning disabilities served in inclusion settings: teachers' beliefs and professionalism. Disability and Rehabilitation: Assistive Technology". 2020.
[15] "Information and Communication Technology supporting the inclusion of children with disabilities in education, Factsheet". 2022.
[16]Olga Mikhailenko*, Zhansurat Bashiyeva, Fatimat Balkizova, Budimir Nagoev Kabardino-Balkarian State University named after H.M. Berbekov, 340004, Nalchik, Russia. E3S Web of Conferences 273, 12115. 2021
[17] Ahmad, F. "Use of Assistive Technology in Inclusive Education: Making Room for Diverse Learning Needs"
[18] Al-Dababneh, K. A., & Al-Zboon, E. K. "Using assistive technologies in the curriculum of children with specific learning disabilities served in inclusion settings: teachers' beliefs and professionalism. Disability and Rehabilitation: Assistive Technology". 2020.
[19] Vanbecelaere, S., Cornillie, F., Depaepe, F., Guerrero, R. G., Mavrikis, M., Vasalou, M., & Benton, L. "Technology-mediated personalised learning for younger learners" in Proceedings of the 2020 ACM Interaction Design and Children Conference: Extended Abstracts. 2020.

structure of teaching and learning. Educational technology supports personalized learning by promoting students' diverse learning experiences and increasing their choices to improve learning outcomes.[20]

In a technology-enhanced personalised learning environment, learners are given control over setting their own goals for learning. The technology might also enable a reflective process during the learning journey and might be flexible enough for the students to take their learning outside the confines of the traditional classroom.[21]

According to the definition of the DigiCompEdu framework, this strategy refers to the "*use digital technologies to address learners' diverse learning needs, by allowing learners to advance at different levels and speeds, and to follow individual learning pathways and objectives*"[22]

- Actively engaging learners

Digital technologies have revolutionized education, opening up new opportunities for learners to engage actively and creatively with subject matter. By incorporating digital technologies into pedagogic strategies, educators can foster learners' transversal skills, deep thinking, and creative expression.

Active learning supported by the development of digital skills is crucial for learners in the digital world. Active learning is a teaching methodology that involves students' full attention and participation when they learn. It's the act of learning by "doing," not through traditional lectures or slideshows. With active learning as a more involved and student-focused teaching strategy, students are able to think critically, engage creatively, and learn effectively.

Active learning is transforming education towards a more innovative and technology-driven future. Active learning strategies that incorporate technology help keep students engaged in the learning process and achieve curriculum goals. Integrating technology in curriculum can also help students develop skills in areas such as AI, machine learning, and simulation modeling. Using technology in the classroom can help students develop innovative mindsets in design and computational thinking that will benefit them in their future careers. Preparing students for careers in the Fourth Industrial Revolution is essential, and using active learning approaches that incorporate technology can help ensure they have the skills they need to succeed in a tech-centered future. [23]

Digital technologies can be used in various ways to support active learning. For example, technology can be used to facilitate collaboration and communication among learners, provide access to digital resources and tools, and enable learners to engage in hands-on activities, scientific investigation, or complex problem-solving. Some examples of digital technologies used in active learning include online discussion forums, collaborative writing tools, virtual simulations, and multimedia presentations. In addition, digital technologies can be used to support active teaching methods such as flipped classrooms, project-based learning, and game-based learning. Flipped classrooms involve learners watching pre-recorded lectures or reading

[20] Holmes, W., Anastopoulou, S., Schaumburg, H., Mavrikis, M. "Technology Enhanced Personalised Learning - Untangling the Evidence". 2018.
[21] Vanbecelaere, S., Cornillie, F., Depaepe, F., Guerrero, R. G., Mavrikis, M., Vasalou, M., & Benton, L. "Technology-mediated personalised learning for younger learners". (2020). Proceedings of the 2020 ACM Interaction Design and Children Conference: Extended Abstracts.
[22] European Framework for the Digital Competence of Educators DigCompEdu. JRC Science for Policy Report. Punie, Y. (Ed.). Retrieved from: file:///C:/Users/USER/Downloads/pdf_digcomedu_a4_final%20(1).pdf
[23] Intel. (n.d.). Active Learning. Retrieved from https://www.intel.com/content/www/us/en/education/teaching-strategy/active-learning.html

materials before class, allowing for more interactive and engaging activities during class time. Project-based learning involves learners working on real-world projects that require them to apply their knowledge and skills to solve complex problems. Game-based learning involves using digital games to engage learners in active and immersive learning experiences.[24]

6.5.2. Inclusive, Personalised Education and Active Learning Tools

To better meet the needs of a broad range of learners, a change in the current pedagogical practice is urgent. While in the past whole-class instruction (one-size-fitsall) was widespread, with increased diversity in the classroom now there is a shift to the individual, addressing individual needs by providing tailored support, often referred to as personalised learning.

Personalization of learning has evolved in education because of current technological advances. Computer-based platforms and other devices and tools are emerging to support and enhance personalized learning. Research pointed out the availability of educational resources and the increasing adoption of educational technology challenge educational institutes to rethink the structure of teaching and learning. Educational technology supports personalized learning by promoting students' diverse learning experiences and increasing their choices to improve learning outcomes.

In a technology-enhanced personalised learning environment, learners are given control over setting their own goals for learning. The technology might also enable a reflective process during the learning journey and might be flexible enough for the students to take their learning outside the confines of the traditional classroom.

Specifically, below are some tech-driven educational approaches that promote personalisation in educational institutes learner-centre settings:

Smart Learning Management Systems (LMS) like are software-based platforms (such as Blackboard[25] and Moodle[26] that help teachers with the management, delivery, and measurement of learning progress in their classes. Some LMS might also be thought of as being smart as they also use data analytics, the analysis of what the student does on the platform (when they log in, what they do, where they click…), to recommend a personalised instructional plan or a personalised learner pathway for each student. It might include an understanding of how to motivate the learners if they become demotivated and tactics to deal with students who try to fool the technology into providing the correct answer. Finally, there is the Interface component (what the student sees and hears) that provides the channel through which the student and the technology communicate.[27]

[24] Maurer, M., & Drummond, J. (2018). Using Digital Technologies to Support Active Learning. In J. E. Brindley, C. Walti, & O. Zawacki-Richter (Eds.), Teaching and Learning at a Distance: Foundations of Distance Education (7th ed., pp. 131-152). Athabasca University Press. https://www.aupress.ca/books/120290-teaching-and-learning-at-a-distance/

[25] https://www.blackboard.com/

[26] https://moodle.org/

[27] Holmes, W., Anastopoulou, S., Schaumburg, H., Mavrikis, M. “Technology Enhanced Personalised Learning - Untangling the Evidence”.2018.

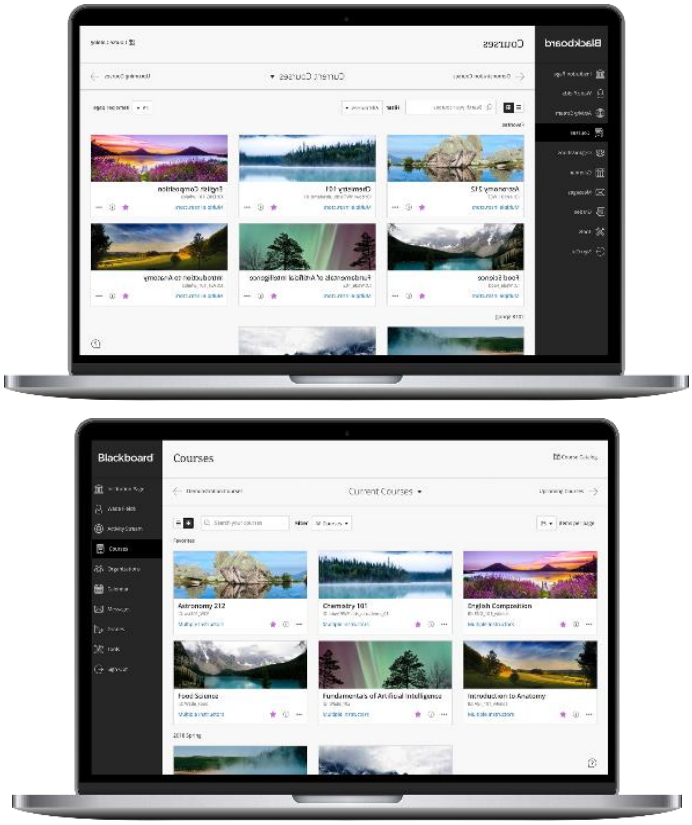

Figure 6.1: Blackboard software-based platform

Source: blackboard.com

Figure 6.2: Moodle software-based platform

Source: moodle.org

Smart Learning Management Systems		
Name	**Utility**	**Link**
Blackboard	A software-based platform that can help teachers with the management, delivery, and measurement of learning progress in their classes. The platform includes tools for course creation, content management, communication, collaboration, and assessment. It allows instructors to create and manage course content such as lectures, assignments, quizzes, and exams, and to communicate with students via email, discussion boards, and other tools. Blackboard.com also provides a range of features to support student engagement, such as social learning tools, gamification, and mobile learning capabilities.	www.blackboard.com
Moodle	Moodle is an open-source learning management system (LMS) designed to provide educators, administrators, and learners with a robust, secure, and integrated system to create personalized learning environments. It offers a range of features including course management, collaborative tools, assessments, and grading, and is highly customizable, allowing users to tailor the system to their specific needs. Moodle supports a range of different learning styles, including self-paced and instructor-led courses, and can be accessed from desktop or mobile devices	www. moodle.org

Table 6.3. Examples of smart learning management systems

- **Digital Games-based Learning**. Gaming activities are highly engaging, and it helps the learner to find ways of solving problems by various means. Using technology games gives the learner also immediate feedback of a skill obtained or mastered. Educationally game-based learning is designed with the purpose of helping the learner to interact within an organizational environment by learning skills that improve literacy in various disciplines. Educational game-based learning is just another way to incorporate learning using different media devices. Learners today have access to a wide range use of emerging technologies as they learn coursework in educational settings within the school and beyond the environment.[28]

Some popular examples can be seen in Table 6.4.:

[28] Dr. Ann Hilliard, Dr. Harriett F. Kargbo. "Educationally Game-based Personalized Learning Improves Learners' Literacy Across Disciplines" in Journal Of Humanities And Social Science (IOSR-JHSS). 2017.

Games-based Learning platforms		
Name	**Utility**	**Link**
EdApp	A software-based platform that can help teachers with the management, delivery, and measurement of learning progress in their classes. The platform includes tools for course creation, content management, communication, collaboration, and assessment. It allows instructors to create and manage course content such as lectures, assignments, quizzes, and exams, and to communicate with students via email, discussion boards, and other tools. Blackboard.com also provides a range of features to support student engagement, such as social learning tools, gamification, and mobile learning capabilities.	https://www.edapp.com/
Kahoot	As an online quiz maker and game-based learning platform, Kahoot! uses visually appealing gamification elements to maximize engagement and ensure higher completion rates among learners. Your learners can access these interactive games and quizzes, which are uniquely called "Kahoots", via a web browser or a mobile app. The best part is that they can be presented on a shared screen and answered by a group of "players" all at the same time through any video conferencing platform. Alternatively, you can set Kahoots as a self-paced challenge to be completed by each team member asynchronously. This platform also provides trainers with reporting and analytics so that knowledge gaps can be addressed, and feedback can be provided.	https://kahoot.it/
Gimkit	Gimkit is a game-based learning platform that anyone can access through any device. In a Kit, learners will be exposed to questions multiple times to ensure mastery of the content. There's in-game currency that serves as points and can be reinvested by purchasing upgrades & powerups. With millions of combinations, students can make purchases that suit their strengths. With 10 unique game modes and more on the way, you can make lessons and assignments more interactive and engaging.	https://gimkit.com

Table 6.4. Some examples of digital games-based learning applications

6.6. National perspectives

Greece has been taking steps to empower learners in the context of education, with efforts to promote inclusive education, provide more autonomy for educational institutions, and address students' needs. The conservative New Democracy government introduced a bill for "upgrading the school and empowering teachers" in 2021, which envisages the development of more autonomy for educational institutions to achieve better student outcomes[29] [30]. In addition, the Ministry of Education, Research and Religious Affairs (MERA) in Greece has been promoting inclusive education to empower mainstream schools to respond to the diversity of all learners, in line with the shared European vision for inclusive education[31]. In view of the digital transition, the Italian government similar to the Greek one has put in place a number of measures to support this transformation. In particular, it drew up the "DDI – Didattica Digitale Integrata" (Integrated Digital Education plan). It invites each school to design its plan and promotes the implementation of so-called 'Future Labs': each educational entity can run training courses, for a maximum of 25 hours, for teachers to improve their digital skills and expand their methodological knowledge. For example, for learners with psychophysical disabilities, in prison or hospitalised, it is all the more necessary for the teaching team or class council to agree on the daily workload to be allocated and to ensure that lessons can be recorded and listened to or PPTs. Each training organisation must organise and plan the teaching/learning process with respect for the potential of each and every learner, and the time and needs of each individual learner, developing a customised teaching plan.

6.7. Conclusions

Digital technologies can help support classroom differentiation and personalized instruction by providing learning activities that are customized to each learner's skill level, interests, and learning needs. At the same time, however, care must be taken not to exacerbate existing inequalities (e.g., in access to digital technologies or digital skills) and to ensure accessibility for all learners, including those with special education needs.

LMS and GBL methods like the above methodologies ask students to participate in the learning process by thinking, discussing, investigating, and creating. In class, students practise skills, solve problems, wrestle with complex questions, make decisions, propose solutions, and explain their ideas in their own words through writing and discussion. Timely feedback, either from the teacher or from classmates, is critical to this learning process. Educational research shows that incorporating active learning strategies into university courses significantly improves students' learning experiences.The above examples add significant value to the learning process. By approaching such tools with critical enthusiasm, teachers and learners can fully realise their creative potential and incorporate digital tools into their learning process.

In summary, as we have seen above, technology is sufficient for the new learning and teaching methods of 21st century education, in terms of an inclusive, perosnalised and engaged education

[29] Peoples Dispatch. (2021, July 26). Students and educators in Greece protest new bill that seeks to corporatize school education. https://peoplesdispatch.org/2021/07/26/students-and-educators-in-greece-protest-new-bill-that-seeks-to-corporatize-school-education/

[30] OECD. (2017). Education Policy in Greece: A Preliminary Assessment. Retrieved from https://www.oecd.org/education/Education-Policy-in-Greece-Preliminary-Assessment-2017.pdf

[31]https://www.european-agency.org/sites/default/files/TSI-SRSP%20files/SRSP%20EL%20Deliverable%207%20Conceptual%20paper.pdf

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CHAPTER 7

Facilitating Learners' Digital Competence

CHAPTER 7 Facilitating Learners' Digital Competence

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WHAT WILL WE LEARN IN THIS CHAPTER?

What is PDC?
What is DigCompEdu?
What are the levels of proficiency of our module?
What are the digital tools and applications help teachers?

Keywords: communication; digital competence; teaching practices; collaboration; DigCompEdu; technology

7.1. Glossary and abbreviations

In the following table, some words/abbreviations/definitions useful for understanding the chapter have been reported.

DigComp	Educational organizations, including primary, secondary, and VET schools, along with higher education institutions, can utilize the DigComp framework to facilitate a self-reflective examination of their advancement in achieving a thorough integration and successful utilization of digital learning technologies.
Innovation in education systems	The adoption of new services, technologies, and competencies by education organizations can help to improve learning outcomes, enhance equity and improve efficiency
AI	Artificial Intelligence
ICT	Information and Communications Technology
DigCompOrg	Digitally- Competent Educational Organizations
Facilitating learners' digital competencies	The ability which teachers can develop the students' digital competencies and allow them to articulate information needs, and find information and resources in digital environments.
VoIP	Voice over Internet Protocol
PDC	Pedagogical digital competence - something that can be expected to develop the more experienced a teacher becomes

Table 7.1: Glossary and abbreviations

7.2. Chapter connection to the DigComp

In this section of the DigComp, inputs are provided to enable trainers to develop the digital literacy of their students and how to educate them in the critical use of digital media for leading sustainable lives from a personal and social point of view as well, not only for educational purposes.

7.3. Introduction to specific module

The adoption of new services, technologies, and competencies by educational organizations, referred to as innovation in education systems, has the potential to enhance learning outcomes, promote equity, and increase efficiency. This process is most impactful and enduring when embraced by adequately trained teachers and integrated into well-defined teaching objectives. More needs to be done on how to best use digital means to reach education objectives.

Pedagogical digital competence c. PDC is something that can be expected to develop the more experienced a teacher becomes. University teachers have great influence over their students' learning contexts, the contexts that guide the students in their study of a particular subject. This is why, thanks to this module, it will be possible learn to:

- involve students in the use of digital tools so that they use them to study, produce content, collaborate and communicate with peers;

- increasing students' capacity for critical and responsible use of digital media

7.4. Analysing the levels of proficiency of our module

To enhance information and media literacy, digital communication and collaboration, digital content creation, responsible use, and digital problem-solving skills, it is important to incorporate specific learning activities, assignments, and assessments. Here are the key points:

1. ***Information and Media Literacy:***
- Foster learners' abilities to express their information needs and locate information in digital environments.
- Encourage the development and updating of personal search strategies.
- Facilitate the adaptation of search strategies based on information quality.
- Promote critical evaluation of sources for credibility and reliability.
- Support effective organization, storage, and retrieval of digital data and information.

2. ***Digital Communication & Collaboration:***
- Encourage learners to interact using various digital technologies.
- Develop understanding of appropriate digital communication means for different contexts.
- Foster sharing of data, information, and digital content through suitable technologies.
- Teach referencing and attribution practices.
- Promote participation in society through public and private digital services.
- Encourage self-empowerment and participatory citizenship via digital technologies.
- Foster collaboration, co-construction, and co-creation of resources and knowledge using digital technologies.
- Promote awareness of behavioral norms and cultural diversity in digital environments.
- Teach adaptation of communication strategies to specific audiences.
- Foster the creation and management of digital identities.
- Promote responsible handling of personal data and digital content.

3. ***Digital Content Creation:***
- Encourage expression through digital means and modification of digital content in different formats.
- Foster integration of information and content into existing knowledge.
- Promote creation of new, original, and relevant digital content and knowledge.
- Teach copyright, licenses, referencing sources, and attribution.
- Develop skills for creating and editing digital content.
- Foster understanding of copyright and licenses in relation to digital content.

4. ***Responsible Use:***
- While utilizing digital technologies, prioritize the physical, psychological, and social well-being of learners.
- Enable learners to effectively handle risks and responsibly engage with digital technologies.
- Encourage positive attitudes and creative/critical use of digital technologies.
- Teach safety measures, personal data protection, and privacy in digital environments.

- Promote awareness of digital risks and threats.
- Foster avoidance of health risks and dangers in digital environments.
- Raise awareness of digital technologies for social well-being, inclusion, and environmental impact.
- Monitor student behavior and respond promptly to threats.

5. Digital Problem Solving:

- Incorporate activities that require learners to identify and solve technical problems.
- Foster customization of digital environments to individual needs.
- Develop skills to select and use digital technologies for problem-solving.
- Promote innovative use of digital technologies for knowledge creation.
- Foster self-improvement and staying updated with digital advancements.

By integrating these elements into learning experiences, educators can effectively promote information literacy, digital skills, responsible use of technology, and problem-solving abilities among learners.

According to DigCompEdu, there are several levels of proficiency of students, both students and teachers, as shown in the table below: Newcomer (A1), Explorer (A2), Integrator (B1), Expert (B2), Leader (C1) and Pioneer (C2).

PROGRESSION		***PROFICIENCY STATEMENTS***
Newcomer (A1)	Making **little use** of strategies fostering learners' information literacy, digital communication and collaboration, digital content creation by learners, digital wellbeing and digital problem solving.	-I do not or only very rarely consider how I could foster learners' information and media literacy, digital communication and collaboration, to foster digital content creation by learners and problem solving. -I am aware that digital technologies can positively and negatively affect learners' wellbeing.
Explorer (A2)	**Encouraging** learners to use digital technologies for informational retrieval, for communication and collaboration, for creating content, to use digital technologies safely and responsibly and to solve problems.	-I encourage learners to use digital technologies for information retrieval, by producing texts, images, videos on assignments; to interact with other learners, with their educators, management staff and third parties. -I cultivate learners' understanding of the impact digital technologies can have on health and well-being, both positively and negatively. For example, I encourage them to identify behaviors that bring them happiness or sadness, whether it is their own or others'. -I promote learners' comprehension of the advantages and disadvantages of the open nature of the internet. -I motivate learners to resolve technical issues through trial and error. -I inspire learners to apply their digital skills to novel situations.

PROGRESSION		***PROFICIENCY STATEMENTS***
Integrator (B1)	**Implementing** activities fostering learners' information and media literacy, digital communication and collaboration, digital content creation by learners. **Implementing measures** to ensure learners' wellbeing and for digital problem solving	–I implement learning activities in which learners use digital technologies for information retrieval, for communication, to produce digital content, e.g. in the form of text, photos, other images, videos, etc. -I teach learners how to find information, how to assess its reliability, how to compare and combine information from different sources. -I provide guidance to learners in adhering to behavioral norms, making appropriate choices in communication strategies and channels, and cultivating awareness of cultural and social diversity within digital environments. -I encourage learners to publish and share their digital productions and to develop their digital competence. -I offer practical and experiential guidance on safeguarding privacy and data, such as using strong passwords and adjusting social media settings -I support learners in protecting their digital identity and managing their online presence. -I provide advice to learners on effective strategies to mitigate or address the consequences of inappropriate behavior, whether it is their own or exhibited by their peers. -I implement learning activities in which learners use digital technologies creatively, expanding their technical repertoire.
Expert (B2)	**Strategically** using a **range** of pedagogic strategies to foster learners' information and media literacy, digital communication and collaboration, digital content creation by learners and to foster learners' digital problem solving. **Pedagogically supporting** learners' use of digital technologies to ensure their wellbeing.	-I employ various pedagogical strategies to facilitate learners in critically evaluating and purposefully integrating information from diverse sources, to communicate easily, to enable learners to express themselves digitally, e.g. by contributing to wikis or blogs, by using ePortfolios for their digital creations. -I teach learners how to quote sources appropriately. -I provide support and encouragement to learners, enabling them to actively and consciously engage in public discourses and utilize digital technologies for civic purposes. -I enable learners to understand the concept of copyright and licenses and how to re-use digital content appropriately. -I devise strategies to proactively prevent, detect, and address detrimental digital behaviors that impact learners' health and well-being, such as cyberbullying. -I foster a positive mindset among learners towards digital technologies, emphasizing the awareness of potential risks and limitations while instilling confidence in their ability to effectively manage them for their own benefit. -I employ various pedagogical strategies to empower learners in applying their digital skills to novel situations or different contexts.

PROGRESSION		***PROFICIENCY STATEMENTS***
Leader (C1)	**Comprehensively** and **critically** fostering learners' information and media literacy, digital communication and collaboration, digital content creation by learners and problem solving. **Strategically and critically developing responsible** and **safe use** of digital technologies.	-I engage in critical reflection to assess the effectiveness of my pedagogical strategies in promoting learners' information and media literacy. Based on this evaluation, I adapt my strategies accordingly, digital communication , wellbeing and collaboration and adapt my strategies accordingly -I integrate assignments and learning activities that require learners to utilize digital technologies effectively and responsibly for communication, collaboration, knowledge co-creation, and civic engagement. -I actively identify and combat instances of plagiarism, leveraging digital technologies as a means to address this issue. -I empower learners to comprehend the risks and threats present in digital environments, such as identity theft, fraud, stalking, and phishing, and educate them on appropriate responses. -I equip learners with the ability to explore various technological solutions to a problem, evaluate their advantages and disadvantages, and engage in critical and creative thinking to develop innovative solutions or products. -I engage in critical reflection to evaluate the appropriateness of my pedagogical strategies in promoting learners' digital competence and expanding their repertoire of digital skills, adjusting my methods accordingly.
Pioneer (C2)	Using **innovative formats** for fostering learners' information and media literacy, for digital communication and collaboration, for digital content creation by learners and for problem solving. Developing **innovative approaches** to fostering learners' ability to use digital technologies for their own wellbeing.	I reflect on, discuss, re-design and innovate pedagogic strategies for fostering learners' information and media literacy, digital communication and collaboration for fostering digital expression and creation by learners, to foster learners' ability to use digital technologies for their own wellbeing and for digital problem solving skills. -I guide learners in designing, publishing and licensing complex digital products, e.g. creating websites, blogs, games or apps.. -I empower learners to think outside the box and apply their digital skills in innovative ways to address new situations, fostering their ability to develop creative solutions or products.

Table 7.2. Levels of proficiency for teaching within DIGICOM , Source: European Framework for the Digital Competences of Educators (2017), page 79

7.5. European policies and recommendations

Digital technologies are changing the world at an incredible speed and are reshaping how people in Europe live, work and study. Ongoing digital transformation impacts many parts of our daily life, from the ever-increasing integration of digital technologies in all sectors of the economy to the societal impact of emerging technologies such as Artificial Intelligence (AI).

Connected devices and intelligent systems surround us and support activities in terms of access and exchange of information, communication and collaboration, modes of work, business operations and, finally yet critically, learning opportunities. Like other sectors, education and training is undergoing a process of change. When properly planned and designed, the use of digital technologies for teaching and learning offers many opportunities, including the possibility to open up to a more diverse cohort of learners, increase flexibility, personalization and inclusion, and offer more interactive and engaging forms of cooperation and communication. At the same time, it brings challenges: educators need to master the digital environment to design high-quality and engaging learning experiences and learners also need to be technologically savvy. Education and training systems have an essential role to play in embracing digital technologies and enabling societies to reap the benefits of digital transformation, while avoiding the risks that may come from digital exclusion or inappropriate use of technology.

The EU framework for digital education was set in 2018 with the first Digital Education Action Plan, an integral part of the European Education Area. While limited in scope and duration to assess its overall impact, the 2018 Action Plan has received strong support, including from the European Parliament and the Committee of the Regions. Considering its achievements and the COVID-19 disruptions, stakeholders and Member States are now seeking a more ambitious approach to addressing challenges and harnessing opportunities for the future. Consequently, the Communication on repairing and preparing for the next generation announced the adoption of a renewed Digital Education Action Plan in the context of the recovery plan. The aim is to address and support the increased responsibility of Europe's education and training systems in managing the aftermath of COVID-19, in parallel with the ongoing digital transformation.

The Digital Education Action Plan (2021-2027) is a revitalized policy initiative by the European Union (EU) that presents a shared vision for high-quality, inclusive, and accessible digital education in Europe. Its primary objective is to facilitate the adaptation of Member States' education and training systems to the digital age. The Action Plan, adopted on 30 September 2020, is a call for greater cooperation at European level on digital education to address the challenges and opportunities of the COVID-19 pandemic, and to present opportunities for the education and training community (teachers, students), policy makers, academia and researchers on national, EU and international level.

7.5.1. National perspectives

Many European countries are facing the digital education issue in order to improve the quality of learning of students.

In Greece, for example, "Citizen's Digital Academy" is an initiative of the Ministry of Digital Government to provide citizens with free digital education services. Over 279 courses are available, addressing different levels of digital skills, offered by prestigious academic and educational institutions. The courses include digital skills for citizens, digital skills for the labor force, and digital skills for ICT specialists. Similarly, within the scope of the Turkish Qualifications Framework (TQF), which was prepared in accordance with the European Qualifications Framework, eight key competences that all individuals should acquire in the lifelong learning process were determined. Digital competency is one of these eight key competencies and it is the pillar on which many initiatives are carried out: Movement to Increase Opportunities and Improve Technology (FATIH) Project and EBA practices at primary and secondary education level for the transformation in education in Turkey; at the higher education level, various initiatives such as the Digital Transformation Project in

Universities are carried out. In the in-service training organized for teachers by the Ministry of National Education in Turkey, many courses are organized online for all teachers. The same situation is not available in Romania_ the education system does not offer courses for teachers to acquire transversal digital skills. However, there are some initiatives by mayors of big cities who have offered 100 euros vouchers to teachers from the pre-university system to attend an accredited course. There are also NGOs in the field of education that offer short courses to help teachers on the digital side.

At the same time, in Italy, the Government is proceeding in developing solutions to use digital tools in favour of fewer opportunities for people. For learners with psychophysical disabilities, in prison or hospitalised, it is all the more necessary for the teaching team or class council to agree on the daily workload to be allocated and to ensure that lessons can be recorded and listened to or PPTs. Each training organization must organize and plan the teaching/learning process with respect for the potential of each and every learner, and the time and needs of each individual learner, developing a customised teaching plan.

7.6. Information and media literacy

Education and training are the best investments in Europe's future. They play a vital role in boosting growth, innovation, and job creation. Europe's education and training systems need to give people the forward-looking knowledge, skills and competencies they need to innovate and prosper. They also have an important role to play in creating a European identity, building on common values and cultures. Education should help empower young people to articulate and engage, participate and shape the future of a Europe characterized by democracy, solidarity, and inclusion. Digital technology enriches learning in a variety of ways and offers learning opportunities, which must be accessible to all. It opens up access to a wealth of information and resources.

The adoption of new services, technologies, and competencies by educational organizations, referred to as innovation in education systems, can play a significant role in enhancing learning outcomes, promoting equity, and improving efficiency. To achieve these benefits, it is crucial for well-trained teachers to embrace innovation and align it with clear teaching goals. However, there is still a need for further exploration on how to effectively utilize digital tools to accomplish educational objectives. As digital advancements continue to evolve, they bring forth new challenges for students, teachers, and learners in Europe. Algorithms utilized by social media platforms and news portals can amplify biases and propagate fake news, while data privacy has emerged as a critical concern in today's digital society.

A key part of digital education is ensuring equity and quality of access and infrastructure. The digital divide has many dimensions, but improving access to technology and connectivity for all children in education must be a starting point for reducing inequality and exclusion. We also need to address the varying quality of access and infrastructure, as high quality offers a more innovative and fulfilling learning experience. Innovation in education and training depends greatly on empowering and connecting educators. Erasmus+ achieves this through peer learning. New expert-led training and practitioner workshops for both policymakers and educators, including the Platform of European Associations of VET Providers, will further strengthen connectedness by developing specific content in multiple languages and by utilizing key EU platforms such as School Education Gateway[1] and Teacher Academy[2]. Blended

[1] School Education gateway, https://www.schooleducationgateway.eu/en/pub/index.htm
[2] Teacher Academy, Teacher Training Courses – Europass Teacher Academy

mobility will be further promoted with new opportunities in Erasmus+ to support both online and face-to-face learning and exchange for pupils in different countries. Digital readiness in education requires know-how and involves adaptation and change. Schools and training institutions in Europe are diverse, with equipment, teacher skills, and approaches to technology use varying considerably. There are pockets of innovation in digital education throughout Europe. Yet innovative policies and practices need support to be scaled up.

The increasing digitization of education provided by universities and university colleges has presented new challenges for educators in delivering high-quality teaching and adapting to the evolving needs of students. This digitalization has introduced a new aspect to teachers' pedagogical skills and competencies known as Pedagogical Digital Competence (PDC). The ability to effectively foster students' digital skills has become an essential requirement in teachers' professional roles. However, research in this field is relatively limited due to its recent focus.

Pedagogical Digital Competence encompasses the consistent application of attitudes, knowledge, and skills necessary for planning, implementing, evaluating, and continuously improving ICT-supported teaching. This is based on theoretical foundations, current research, and proven experience, with the aim of facilitating optimal student learning. PDC encompasses various elements, including technology, learning theory, subject matter, context, and the interconnectedness of these factors. It is a competence that tends to develop further as teachers gain more experience in the field.

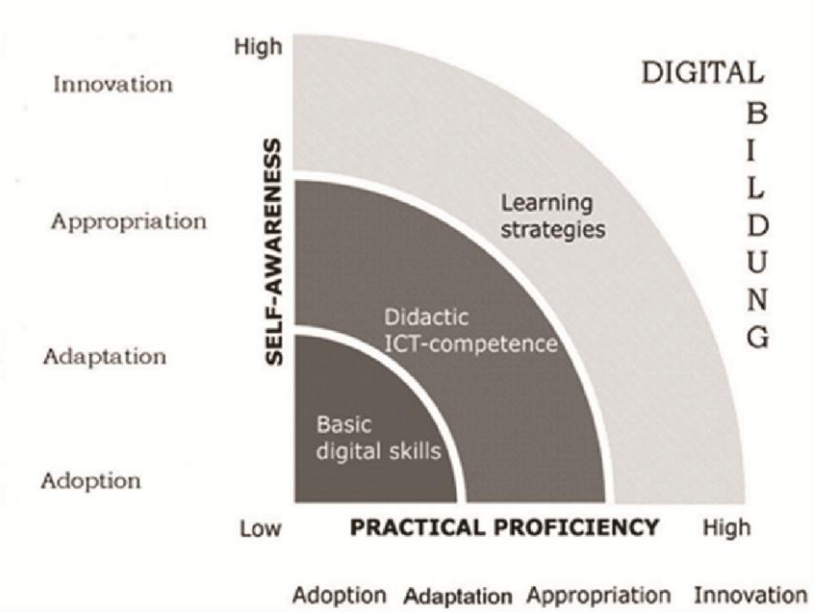

Figure 7.1. A model of teachers'/teacher educators' digital competence

"The term *digital competence*" appeared in the European discussion as early as 2000, when prerequisites for life-long learning started to be formulated, and the term was spread further when it was introduced as one of the eight key competencies in the EU recommendations of 2006[3]. A rough definition of the concept of Digital Competence (DC) would be that it refers to the ability to use ICT. Like the concept of competence, the meaning, depth and breadth of

[3] Annika Käck; Sirkku Männikkö-Barbutiu, *Digital competence in teacher education - An integration perspective*, Studentlitteratur publishing, 2012, p. 16.

the concept vary between authors. Rune Krumsvik notes that it is not clear "whether the underlying epistemology within education is steered by policymakers or by academics"[4].

Nursing researcher, Anna Vioral, stresses concepts such as knowledge, skills, experiences, ability, aptitude, attitudes and defines pedagogical competence as: "the ability to perform in the nursing academic context (online education) by applying the knowledge, skills, and experience of the pedagogical principles in curriculum development, instructional strategies, use of instructional technology, and evaluation techniques as outlined in the National League of Nursing (NLN) Nurse Educator Core Competencies"[5].

Initially, we talked about the changing context of universities and university teachers, which in turn is a reflection of a general development in society in which ICT has come to play an increasingly important role and as a result of which ICT-supported distance education now accounts for a substantial proportion of higher education. This development is not just a national phenomenon; its global generality has been commendable described by, for example, Diana Laurillard[6], who argues that current pedagogical issues can be solved through the use of ICT, provided that the issues are allowed to dictate the use of the technology and not the other way around. According to Dirk Schneckenberg, this will call for an upward revaluation of universities' pedagogical practices vis-à-vis their research practices[7]. Thus, a main characteristic of PDC is the ability to develop/improve pedagogical work by means of digital technology in a professional context, primarily in web courses/online teaching. In a wider sense, however, PDC (Pedagogical Digital Competence) involves all kinds of pedagogical works in professional contexts where digital technology is used. In addition, PDC can be said to comprise (at least) three levels, and their internal relationship, viz. a micro-level (interaction level) which involves the pedagogical interaction with students, a meso-level (course level) involving the design and implementation of courses, and the infrastructure of education (for instance integration of resources like the library or educational guidance) and a macro-level (organizational level) focused on educational management and the development of the organization. Thus, strategic pedagogical leadership is a central component of PDC on all three levels.

Pedagogical digital competence encompasses a comprehensive understanding of knowledge, skills, attitudes, and approaches regarding digital technology, learning theory, subject matter, context, and the interplay between these elements. As teachers gain more experience, it is anticipated that their pedagogical digital competence will continue to evolve and strengthen. University teachers have great influence over their students' learning contexts, the contexts that guide the students in their study of a particular subject. Teachers in higher education can in various ways impact and leave their mark on courses they teach or coordinate. In particular, they can influence the way in which their courses are run, the support made available to the students on their journey towards reaching the course goals and expected learning outcomes, such as lectures, seminars, laboratory work, quizzes etc. The choice of support thus reflects the teachers' attitudes to their students, the subject, learning, teaching tools etc. In addition to having an influence on how a course is conducted, teachers also have some

[4] Krumsvik Rune, *Digital competence in Norwegian teacher education and schools,* Högre Utbildning, 2011, p.39-51.

[5] Anna Vioral, *Exploring pedagogical competence in a distance education nursing program*: A case study. Journal of Nursing Education and Practice, 2013, p. 36-47.

[6]Diana Laurillard, *Technology enhanced learning as a tool for pedagogical innovation,* Journal of Philosophy of Education, 2008, p. 521-533.

[7] Dirk Schneckenberg, *Understanding the real barriers to technology-enhanced innovation in higher education*, Educational Research, 2009, p. 411-424.

say with regard to the content of their courses through discussions about course goals, course literature and expected learning outcomes. The ability to design courses is directly related to knowledge. Theories about teaching and learning, knowledge of the various ways in which learning takes place and how learning can be enhanced can be used as course design tools. Concretely, it is about how resources can be mobilized or developed in order to support students' learning. In this process, knowledge of such potential resources is essential. By knowing what resources are available, how they can be used and combined and being aware of their pros and cons, informed choices can be made about course design, material, activities, feedback, etc.

7.6.1. Best practices and methodologies and tools to improve teaching effectiveness

Education is a practical activity and teaching is an art as much as science, in equal parts knowledge and skills. However, neither of these two components is sufficient on its own. In order to attain PDC it is not enough merely to understand concepts, be familiar with current research and know what digital technologies are available. Skills are also needed, e.g., being able to use such technologies, meeting students where they are, and giving them precisely the kind of support they need to progress. A person possessing PDC can support students in their journey towards achieving expected learning outcomes and understand how this process works and how it relates to regulating principles. Attitudes expected of someone who has pedagogical digital competence, finally, include an attitude to his or her own teaching practice which over time leads to improved practical knowledge in the use of ICT for learning support, as well as an increasingly good conceptual understanding that will help to explain why something works or does not work in a given educational context.

We all know in theory about the fluidity, slipperiness and flexibility of language, and we experience it when we talk. Traditional methods of recording language – typically writing with a pen and ink – tend to lock words in place, and fix their form, sequence, and impact. The computer, by contrast, accentuates the fluidity of language. It enables experimentation and constant readjustment. Not only can the position and form of individual words be altered, but a writer can also radically change the visual impact of the text by selecting different fonts, sizes, and layouts. ICT also allows us to move beyond words on the page or the screen to embrace other modes of communication[8]. Images, still and moving, together with audio recording and editing can be employed in ways that are both innovative and more manageable. Furthermore, we can exploit the still-developing world of Web 2.0 applications to the advantage of our students and their learning without ever losing sight of our overriding purpose – developing our best practice in the teaching of English.

The use of educational technologies is increasingly mediating the relationship between teachers and students. This growing reliance on technologies has significant implications across all levels of education, particularly in higher education where students now spend more time online and less time on campus compared to the past. The introduction of educational technologies has led to the emergence of flexible learning models such as "flipped classes," massive open online courses (MOOCs), and a rising number of online programs offered by educational institutions. Moreover, the integration of data, analytics, artificial intelligence, and machine learning holds the potential to greatly impact the adaptability and personalization capabilities of educational technologies. These ongoing trends necessitate a continuous adjustment of the role of teachers and the dynamics of their relationship with students. Amidst

[8] Tom Rank, Chris Warren and Trevor Millum, *Teaching English using ICT. A Practical Guide for Secondary School Teachers*, Continuum, 2011.

these changes, it is crucial to prioritize quality and student learning as the primary considerations.

7.7. Technical contents regarding the topic

Digital technologies have the potential to revolutionize learning and teaching practices, but their mere presence does not guarantee success. In order to solidify advancements and achieve widespread and lasting impact, educational institutions must evaluate their organizational strategies. This evaluation aims to enhance their ability to innovate and fully utilize the capabilities of digital technologies and content.

While various frameworks and self-assessment tools are utilized in European countries, there has yet to be a concerted effort to establish a pan-European approach to organizational digital capacity. Adopting a systemic approach through a European reference framework can bring added value by promoting transparency, facilitating comparisons, and encouraging peer learning.

7.8. DigComp framework

Educational organizations, including primary, secondary, vocational education and training (VET) schools, as well as higher education institutions, can utilize the DigComp framework to guide a process of self-reflection. This process helps them assess their progress in achieving comprehensive integration and effective deployment of digital learning technologies.

DigComp contributes to transparency and comparability between related initiatives across Europe, and it also addresses the issue of fragmentation and uneven development among Member States.

The DigComp framework consists of seven key elements and 15 sub-elements that are applicable to all education sectors. Additionally, there is room to incorporate sector-specific elements and sub-elements. Each element and sub-element of DigCompOrg is accompanied by a set of descriptors, totaling 74. These elements, sub-elements, and descriptors are represented diagrammatically as segments of a circle, emphasizing their interconnectedness and interdependence.

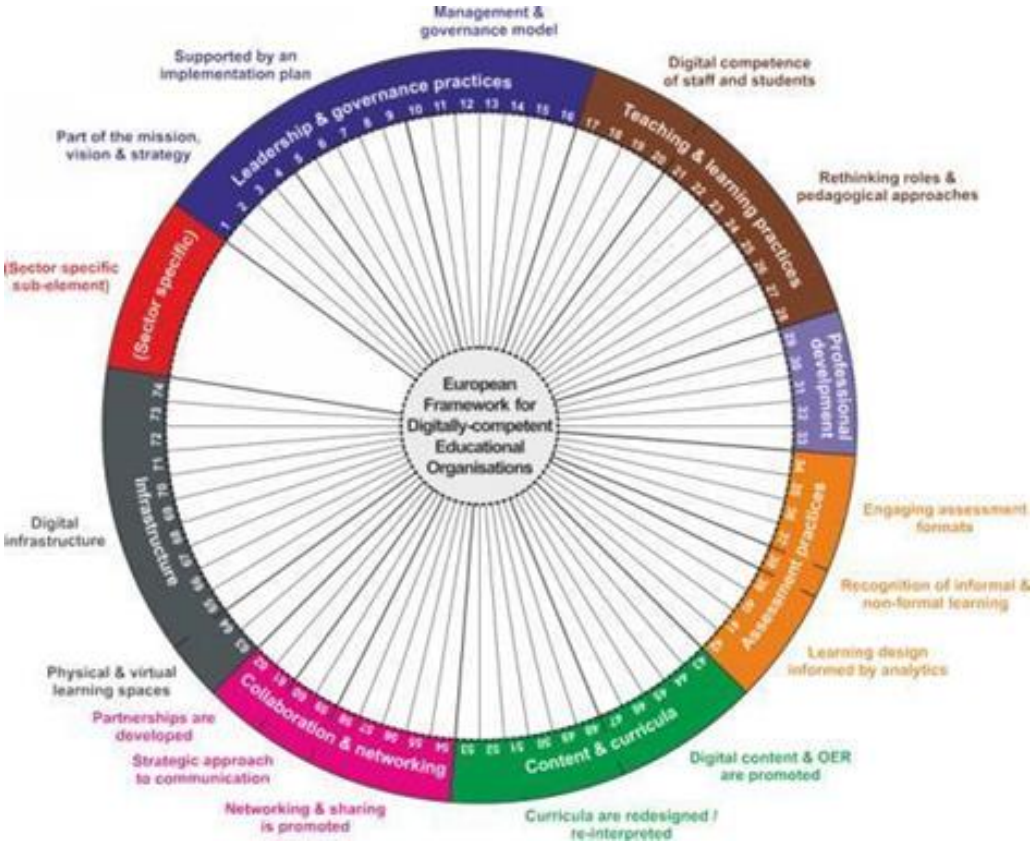

Figure 7.2. European Framework for Digitally-Competent Educational Organizations

Facilitating learners' digital competencies:

It is the ability which teachers can develop the students' digital competencies and allow them to articulate information needs, and find information and resources in digital environments.

- Information and media literacy: to organize and process information in a structured environment
- In the realm of digital communication and collaboration, it is essential to tailor communication strategies to the unique characteristics of the intended audience. This includes being conscious of the cultural and generational diversity that exists within digital environments. It involves adapting communication approaches to effectively engage and interact with individuals from different cultural backgrounds and age groups.
- Digital content creation
- Responsible use
- Digital problem solving: to seek opportunities for self-development and to keep up-to-date with the digital evolution.

Digital competencies and its components[9]:

[9] Eddy Alexander Galviz Giraldo, Digital competences and its components, September 2022, https://www.mindmeister.com/map/2414007663/digital-competences-and-its-components?fullscreen=1&v=public.

1. **Professional engagement**: educator's professional competencies in which tested the ability to use technology in order to improve communication, professional development, and collaboration

- Organization communication
- Professional collaboration
- Reflective practice: to seek to continuously expand and enhance one's repertoire of digital pedagogical practices

2. **Digital resources**: educator's pedagogic competence, in which we need to improve the ability to select, create, share, manage and protect digital resources.

- Selecting digital resources
- Creating and modifying digital resources: to combine and mix existing digital resources or parts thereof where this is permitted
- Managing, protecting and sharing digital resources: to take measures to protect sensitive data and resources (students' grades)

3. **Teaching and Learning**: it is a pedagogic strategic competence that invites teachers to be guides and mentors for students and develop tools supported by digital technologies and their management.

- Teaching
- Guidance: to digitally monitor student behavior in class and offer guidance when needed
- Collaborative learning
- Self-regulated learning: to use digital technologies to enable learners to reflect on and self-assess their learning process

4. **Assessment**: use the formative and summary assessment based on technologies. It is necessary to generate, select, analyze and interpret digital evidence on learners' activities in order to get real feedback to improve the process

- Assessments strategies: to use a variety of digital and non-digital assessment formats and be aware of their benefits and drawbacks.
- Analyzing evidence
- Feedback and Planning

5. **Empowering learners**: it is the ability to contribute to supporting classroom differentiation and personalized education by offering learning activities, adapted to each individual level of competence.

- Accessibility and inclusion: continuously monitor and reflect on the suitability of the measures implemented and adapt strategies accordingly.
- Differentiation and personalization
- Actively engaging learners

Another way to help teachers develop and create interactive lessons for students through technology is the RAT method, short for replacement, amplification, and transformation.

The RAT Model[10], developed by Dr. Joan Hughes, allows teachers to self-assess their integration of technology in the classroom. According to the RAT Model, digital technology can be used as a replacement, amplification, or transformation in the classroom.

Replacement refers to the use of technology that in no way changes instructional practices. Technology is simply a different means to the same instructional end.

Amplification is when the task remains fundamentally the same, but the use of technology increases efficiency, effectiveness, and/or productivity.

Transformation occurs when technology "reinvents aspects of instruction, learning, or curriculum in new and inventive ways."

RAT is an assessment framework for understanding technology's role in teaching, learning and curricular practices, originally developed for PK-12 education, but it has been applied in higher education, especially in pre-service teacher education. The original purpose of the RAT framework was to introduce it as a self-assessment for preservice and in-service teachers to increase critical technological decision-making.

7.9. Communication

Interaction and collaboration are a vital part of learning. This means being able to communicate with others through different modes and means. As teachers move to online methods of teaching, it can be hard to keep the same level of interaction up as there would normally be in the physical classroom. That's why it's important to find ways of allowing students to continue interacting with each other, and even with those beyond the physical or virtual classroom. One way of doing this is through online collaboration tools.

Digital technologies have changed traditional ways of social and business interactions including communication. In the era of digital advancements, tools and technologies have made cross-cultural communication more accessible and convenient. Many individuals find it easier to engage with representatives from different cultures when they are not in direct face-to-face interactions, particularly when language barriers pose significant challenges. Online translators, autocorrect features, and other digital aids can enhance a person's confidence during cross-cultural communication processes. These digital tools simplify the communication process and contribute to a smoother exchange of ideas and understanding between individuals from diverse cultural backgrounds.

Digital Communication forms:[11]

- The Internet and E-mail: as a concept was first described in 1962 by a researcher at MIT in the U.S, with the first email being sent in 1971. There is debate around who invented these technologies, but either way, the foundation was laid for communicating over networks. The most common communication is email, which is used for both business and personal communication.
- VoIP (Voice over Internet Protocol) allows people to communicate synchronously using the Internet. The most commonly used, and popular, platform for this is Skype. Originally this was voice only, but two years after their launch, the video was added,

[10]Joan Hughes, *Assessing Technology Integration: The RAT – Replacement, Amplification, and Transformation – Framework, Department of Curriculum and Instruction*, University of Minnesota, 2006, http://techedges.org/wp-content/uploads/2015/11/Hughes_ScharberSITE2006.pdf.

[11] Digital Communications Forms, https://digitalcitizenshippass.weebly.com/digital-communication.html.

allowing people to see each other whilst conversing. This type of communication enables the body language and tone to 're-enter' the communication, thereby reducing the risk of misunderstandings.

- Cell phones: are amazing in that they allow us to communicate with others anywhere and anytime. With cell phone communication we are still able to convey tone along with the actual words. Body language is limited to sounds we may make, e.g. laughing at a joke that is 'dry' and could be misinterpreted if the sound of laughter were not accompanied.
- Instant Messaging, MMS, and Texting: Instant messaging is when we communicate in writing and get a synchronous response. This form normally takes place on computers and tends to be synchronous. Text messaging (SMS or WhatsApp) is a form of IM but is to a lesser extent synchronous. The back and forth may happen fairly quickly but there is a certain lag, which does not necessarily exist in IM. Both forms have a high risk of misunderstandings, as the tone and body language are difficult to convey.
- Social Media: offer different ways in which to share, but essentially the purpose is to share what is going on in your life. Instagram is a platform for sharing your photos, Facebook is for sharing what you are doing, Flickr is for photos, Twitter is for your thoughts/ opinions, YouTube your videos, etc. It depends on what you are sharing and why this will dictate which platform you should use.

Blogs, wikis, and Internet Forums: Blogs are like online journals centralized around one specific theme. The blogger is someone who believes that their opinion on the theme is worth sharing. Wikis are editable websites, with the most famous one being Wikipedia. Internet forums are virtual places where people share ideas, advice, and thoughts around a specific topic or theme.

7.10. Content creation

In this section, you will find various digital tools that can be used in teaching and learning. The selection includes different types of digital tools or apps that cover all the possible needs that teachers might have to achieve the best results with their learners whether teaching is online or blended.

Digital tools and applications help teachers to create quality content, build a digital bank of materials, and above all, provide interactive and fun teaching activities. Using digital applications in the classroom adds immediate value to the process of learning because it facilitates curiosity and the desire to learn by the simple fact that it provides the learner with personal development, stimulates learner-learner learning and gives the freedom to learn at one's own pace.

BASIC TOOLS

QR Code Generator - qr-code-generator.com - FREE - is an online tool for creating QR codes that can be used to redirect to a link, web resources, or even create games like treasure hunt/quiz. It's very useful to avoid mistakes in copying complicated URLs.

Gmail - gmail.com - FREE - there are many users who already have a Gmail address. This is related to an application called *GSuite* with which you can easily work with word documents, tables, presentations and generous storage space.

Mindmup - mindmup.com - FREE and SUBSCRIPTION - is an application that can be used for notes, collaborative planning, teamwork, or individual work in the classroom. Maps can be created which can be easily converted to pdf, ppt, outlines, etc., and can be stored in GoogleDrive and shared online. In addition, the application can be used for writing activities, creating storyboards, planning and managing educational projects, etc.

TOOLS FOR INSTANT FEEDBACK AND GAMES

Socrative - socrative.com - FREE - is the best tool to engage learners while learning. The app helps you launch a quiz, receive grades, or launch a quick question that learners can answer instantly during a face-to-face lesson. From small quizzes to surveys, you can create any type of activity that fits the type, of course you're teaching.

Mentimeter - mentimeter.com - FREE and SUBSCRIPTION - the app provides the opportunity for users to provide instant responses from their mobile phones to various presentations, surveys, and brainstorming sessions at classes, conferences, or other group activities.

Poll everywhere - polleverywhere.com - FREE and with SUBSCRIPTION - is another application used to animate meetings or online courses with the help of which the presenter can track the audience's involvement and understanding of the topic conveyed by recording the instant feedback received from it.

PRESENTATION

Canva - canva.com - FREE and with SUBSCRIPTION - is a popular graphic platform with which you can create presentations, social media graphic content, or various documents with visual content. You'll get professional results with minimal effort.

Prezi - prezi.com - FREE and with SUBSCRIPTION - a tool used for creating presentations that are a little different from the classic PowerPoint. With Prezi, you have the ability to zoom or pan different parts of the slide to emphasize or draw attention to an idea. You can use an arrow cursor to navigate through the content of the presentation or to zoom in or out on a specific point.

TOOLS FOR INSTANT FEEDBACK AND GAMES

COLLABORATIVE PLATFORMS

Edmodo - new.edmodo.com - FREE - is an educational platform structured like a social media application - a safe space for creating different working groups on a specific study topic or theme. Learners can join these workgroups and work both online and offline. The assets offered by the platform are games, cyber security, interaction, progress measurement, content customization, and compatibility with most operating systems.

Kialo-Edu - kialo-edu.com - FREE - a collaborative platform that can host various debates in classes, and can facilitate the distribution of content or the evaluation of learning progress. Kialo-Edu is an ideal platform for developing discussions or debates by visualizing pros and cons graphics, creating teams, and enhancing the collaborative learning process.

Padlet - padlet.com - FREE and SUBSCRIPTION - an online platform with a simple and intuitive interface that allows storage and sharing of multimedia content. With the help of the platform, you can create a virtual panel where you can insert images, links, documents, video files or presentations, basically, it is an ideal tool for creating o online portfolios, creative collections, advertisements, virtual libraries or virtual corner with books, glossaries, etc.

Storyjumper - storyjumper.com - FREE and SUBSCRIPTION FOR PRINT OR PUBLISHING - is an application for creating and publishing illustrated stories. It allows for creating lesson plans, book reading or listening activities, or even creating books. Learners can work on a book, reading activity, video chat, or share and ask for feedback individually or in a group.

VIDEO and AUDIO EXPERIENCES

Edpuzzle - edpuzzle.com - FREE and with SUBSCRIPTION - is a tool used in teaching that allows the placement of interactive content in various videos. Both the teacher and learners can create interactive video content by inserting questions, notes or comments into the video files.

Flipgrid - filpgrid.com - FREE - is an app that allows learners to participate in a video discussion or create small video activities or express their creativity by adding stickers or notes. It is very simple or intuitive and is compatible with other learning platforms such as Microsoft Teams, Google Classroom, Remind, etc.

TOOLS FOR INSTANT FEEDBACK AND GAMES
Moovly - moovly.com - FREE and SUBSCRIPTION - is an application that helps create educational video files. Whether for learners, faculty or trainers it is a good tool for creating video content without help.
Audacityteam - audacityteam.org - FREE - a free audio and podcast editing and recording program. It is compatible with Windows and Mac operating systems.

Table 7.3. Some tools and programs

SUGGESTED DIGITAL PLATFORMS		
Name	**Utility**	**Link**
Udemy School	Offers many standard designing tools for course creators: videos, calculation sheets, documents, presentations	https://www.udemy.com/
WizIQ	Online courses created with WizIQ can also be offered for sale and with the possibility to turn them into MOOCs (massive open online courses), they can easily be made into a source of revenue. WizIQ also offers digital tutoring software for those interested in giving personal instruction on a chosen subject	https://www.wiziq.com/
edX	Created by Harvard and MIT graduates, edX is a higher-education oriented platform hosting online courses from different universities.	https://www.edx.org/
Blackboard learn	Is aimed at higher-education teachers and students, who need to be able to store and share the materials in the cloud or a course management system	www.blackboard.com
Coursera	Educational platform, which like edX, aims at delivering college-level education and quality training globally. It offers online degrees, specialized courses, and one-off activities, delivered by renowned partner universities from all over the world.	https://www.coursera.org/
Skillshare	Counts among well-known educational platforms focused on delivering practical	

SUGGESTED DIGITAL PLATFORMS		
	skill-oriented courses for its dynamic range of students	

Table 7.4. Some suggested digital platforms

7.11. Responsible use

When we participate in the digital world, we engage with digital activities every day during which we provide personal data in order to get access to different systems and services. Our privacy is at stake each time we use internet service and apart from our precautions, we depend on the security placed upon the devices we are using. Personal data represents any information that relates to an identified or identifiable living individual. Different pieces of information, which are collected together can lead to the identification of a particular person, and also constitute personal data (European Commission).

Examples of personal data:

- a name and surname;
- a home address;
- an email address such as name.surname@company.com;
- an identification card number;
- location data (for example the location data function on a mobile phone);
- an Internet Protocol (IP) address;
- a cookie ID;
- the advertising identifier of your phone;
- data held by a hospital or doctor, which could be a symbol that uniquely identifies a person.

Protecting our online reputation allows us to be in control when it comes to our online search results. Not only is protecting our personal information incredibly important, but creating a positive online reputation can be extremely beneficial to our personal life and our career.

If and when someone Googles your name online, the first search results they see are a determining factor of whether or not they will be able to trust us as a credible and trustworthy source. Over 90% of Google traffic[12] does not click past the first page of search results. When the person Googling our name is a hiring manager, college acceptance board, new client, customer, or coworker, it's in our best interest to make sure we're on the first page of Google search results highlighting our best qualities, not the worst.

a. How to stimulate the responsible use of digital tools in learners

Learning to use digital tools critically and responsibly can have beneficial effects on individuals' academic and professional careers. In the first case, in fact, it can improve students' academic performance. By understanding how to use digital tools effectively and responsibly, students can access and utilize online resources for research, collaboration, and academic work.

[12] William DiAntonio, *How to Protect Your Reputation on the Internet*, published in Reputation911 Journal, updated in April 21, 2022, https://reputation911.com/protecting-your-reputation-on-the-internet/.

In the second case, as digital tools continue to become an increasingly important part of modern workplaces, learning how to use them responsibly is crucial for future career success. By developing responsible digital habits early on, students can become more attractive job candidates and better equipped for the demands of the modern workplace.

But how can we stimulate responsible use of digital tools in learners? The most important role is covered by digital literacy teaching. In order to allow learners to develop awareness about the new tools and their potential, you can:

- incorporate technology in teaching such as videos to better explain difficult concepts or you could use digital educational tools such as interactive quizzes and educational games, elements that can help students to learn in a more engaging and entertaining way. During these learning sections, you can encourage the collaboration among students through the use of technology. This can include the use of online collaboration tools such as Google Drive or Microsoft Teams.
- you could support all these processes providing resources for self-directed learning: providing resources for self-directed learning, such as online tutorials and guides, can help students develop digital skills independently.
- Assigning projects that require learners to research, evaluate, and synthesize information from multiple online sources will bring them to think critically about the information they find and to re-elaborate them in order to develop a consistent text, content, essay and so on. Moreover, it could be an idea to encourage students to use digital tools for positive impact, such as creating content that promotes awareness on important issues, supporting a cause they care about, or helping others in their community.
- monitor learners' use of digital tools and provide feedback on how they can improve their use. This can be possible thanks to digital tools such as surveys (they can be a useful tool for gathering feedback from students on how they use digital tools and what challenges they face). After the collection of data, you can provide indication on how to improve the use of digital tools.

7.12. Problem-solving

Educators use technology very often during teaching because it provides tools that are easy to use and are easily accepted by learners. Even though technology is evolving every day, there are always technical problems that arise and need to be addressed, so that the process of learning can continue. The solutions to technical problems vary and depend on the nature of the problem each time.

There are different types of challenges[13] you might encounter when engaging with technology:

- Technical: technical problems are always present because technology does not always work. For educators working in low-resourced organizations, access to equipment, and broadband internet is low. There are different ways to handle technical problems. You

[13] Finding solutions to technological challenges, published in Future Learn, University College London, https://www.futurelearn.com/courses/transforming-education/0/steps/65512.

can either get support from the IT Support Service of the organization, try by yourself to find a solution from internet resources or engage less technological means in your learning activities.

- Personal: problems with personal knowledge and skills are also widespread. Many people are anxious about using technology because they feel they do not know enough. Added to this, many people think that young people can use technology without any issues, and older people inevitably struggle. This is not the case – for the young, or old. There is always a course that teaches you how to learn through technology, and this is the most valuable knowledge you can have when beginning to design digital learning experiences for your own classes. It is also worth remembering that there is one characteristic that marks out someone who is good at using technology – a willingness to try things out. This means simply clicking on a button to find out what happens, or having a go at a tool someone recommended. Just being ready to try things out will give you most of the technological knowledge that the "experts" seem to possess. And you can use your own experience as a guide – if you cannot use something easily, the chances are that your learners will struggle. Trust your own experience to choose which tools will work for you.
- Organisational: even if teachers are willing to try and organizations can be slow to encourage or take risks with technology. This often means that educators are forced to invest their own tools when it would be simpler if the whole school provided solutions. It is challenging to solve these problems, but the more knowledge that educators have, the better able they will be to press for institutional solutions to this problem.

7.13. Conclusions

Embracing professional development, such as the PDC, and adopting the DigCompEdu framework can empower educators to develop their digital competencies and effectively integrate technology in the classroom. With a variety of digital tools and applications at their disposal, teachers can create engaging and inclusive learning environments that foster student growth and achievement.

1. PDC, or Professional Development Continuum, refers to the ongoing process of learning and growth for educators to enhance their knowledge, skills, and competencies in using digital technologies for teaching and learning. It is crucial for educators to engage in continuous professional development to stay updated with the latest digital tools and strategies.
2. DigCompEdu, or the European Framework for the Digital Competence of Educators, provides a detailed set of 22 digital competences specifically designed for educators. These competences are organized into six areas and serve as a reference framework to guide educators in developing their digital skills and integrating technology effectively in their teaching practices.
3. Our module offers different levels of proficiency in digital tools and applications. These levels may include basic, intermediate, and advanced proficiency. By progressing through these levels, educators can gradually enhance their technological skills and

expand their repertoire of digital tools to facilitate engaging and effective teaching and learning experiences.

4. There is a wide range of digital tools and applications available to support teachers in their instructional practices. These tools can vary from learning management systems (LMS) for organizing and delivering course content to interactive presentation tools, collaborative platforms, assessment and feedback tools, and multimedia creation tools. By leveraging these digital tools, teachers can enhance student engagement, promote active learning, and facilitate personalized instruction to meet the diverse needs of learners.

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CHAPTER 8

Conclusions

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In conclusion, digital tools, strategies, and innovations have become increasingly important in the field of education, providing opportunities for teachers to engage with students in new and innovative ways. These tools have transformed the traditional classroom experience, enabling students to develop a range of digital competencies that are critical for success in the 21st century.

The EU recognizes that digital skills are becoming increasingly important in today's economy, and is taking steps to ensure that the workforce is equipped with the necessary skills to succeed in the digital age. By investing in training and education, the EU hopes to create a workforce that is capable of driving innovation, boosting economic growth, and improving the lives of European citizens. This is why the European DigCompEdu framework provides a useful structure for understanding the digital competencies that educators and students should possess in order to thrive in the digital age. The framework emphasizes the importance of a range of competencies, including digital content creation, communication and collaboration, data and information literacy, and digital citizenship.

Incorporating digital tools and strategies into teaching and learning is critical for preparing students to be successful in the digital age. Educators must continuously update their skills and knowledge to keep up with the rapid pace of technological change and ensure that they are providing students with the most effective and relevant learning experiences.

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