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ARTIN FUTURE PROJECT

Curriculum Development

A handout for educators

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Contents

1 Didactical models for ArtIn Future	3
1.1 P21 - 21st century skills	4
1.1.1 Learning & Innovation skills “The 4 C’s”	5
1.1.2 Information, Media & Technology skills	8
1.1.3 Life & Career skills	10
1.2 The DigCompEdu Framework	13
1.2.1 Professional Engagement	15
1.2.2 Digital Resources	16
1.2.3. Teaching and learning	17
1.2.4. Assessment	18
1.2.5 Empowering learners	19
1.2.6. Facilitating Learners’ Digital Competence	20
1.3 Technological Pedagogical Content Knowledge (TPACK)	23
2 Educator skills and learning objectives	28



1 Didactical models for ArtIn Future

On the following pages, you will find information about the three didactical models that were used to develop the curriculum for the ArtIn Future project. These models are:

- P21 - 21st century skills
- DigCompEdu Framework
- Technological Pedagogical Content Knowledge (TPACK)

1.1 P21 - 21st century skills

The 21st century skills include abilities, skills and learning dispositions identified by representatives of education, business and governmental organisations as those needed for successful participation in our rapidly changing, digital, 21st century society.

Learning and innovation skills

Learning and innovation skills increasingly are being recognised as those that separate students who are prepared for a more and more complex life and work environments in the 21st century, and those who are not. A focus on creativity, critical thinking, communication and collaboration is essential to prepare students for the future.

Information, media, and technology skills

People in the 21st century live in a technology and media-suffused environment, marked by various characteristics, including: 1) access to an abundance of information, 2) rapid changes in technology tools, and 3) the ability to collaborate and make individual contributions on an unprecedented scale. To be effective in the 21st century, citizens and workers must be able to exhibit a range of functional and critical thinking skills related to information, media, and technology.

Life and career skills

Today's life and work environments require far more than thinking skills and content knowledge. The ability to navigate the complex life and work environments in the globally competitive information age requires students to pay rigorous attention to developing adequate life and career skills.

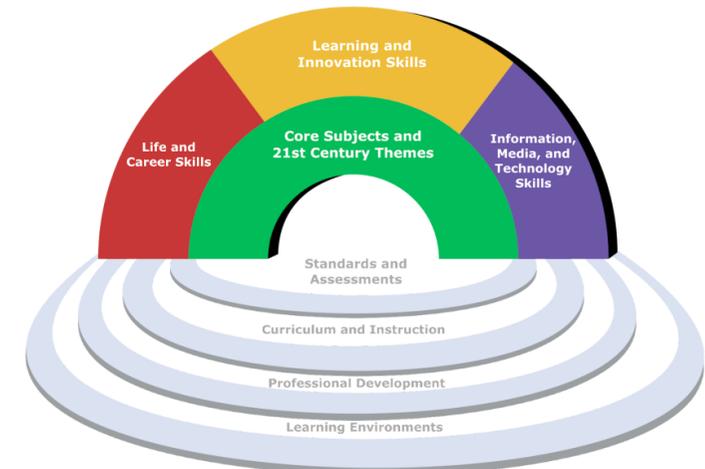


Figure 1 - P21 Framework for 21st Century Learning



Main categories/ Skills	Learning & Innovation skills “The 4 C’s”	Information, Media & Technology skills	Life & Career skills
Subcategories	Creativity & Innovation	Information Literacy	Flexibility & Adaptability
	Critical Thinking & Problem Solving	Media Literacy	Initiative & Self-Direction
	Communication	ICT Literacy	Social & Cross-Cultural Interaction
	Collaboration		Productivity & Accountability
			Leadership & Responsibility

1.1.1 Learning & Innovation skills “The 4 C’s”

1.1.1.1 Creativity & Innovation

Think Creatively

- Use a wide range of idea creation techniques (such as brainstorming)
- Create new and worthwhile ideas (both incremental and radical concepts)
- Elaborate, refine, analyse and evaluate their own ideas in order to improve and maximize creative efforts

Work Creatively with Others

- Develop, implement, and communicate new ideas to others effectively
- Be open and responsive to new and diverse opportunities; incorporate group input and feedback into the work
- Demonstrate originality and inventiveness in work and understand the real world limits to adopting new ideas
- View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

Implement Innovations

- Act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur



1.1.1.2 Critical Thinking & Problem Solving

Reason Effectively

- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use Systems Thinking

- Analyse how parts of a whole interact with each other to produce overall outcomes in complex systems

Make Judgments and Decisions

- Effectively analyse and evaluate evidence, arguments, claims and beliefs
- Analyse and evaluate major alternative points of view
- Synthesise and make connections between information and arguments
- Interpret information and draw conclusions based on the best analysis
- Reflect critically on learning experiences and processes

Solve Problems

- Solve different kinds of unfamiliar problems in both conventional and innovative ways
- Identify and ask significant questions that clarify various points of view and lead to better solutions

1.1.1.3 Communication

Communicate Clearly

- Articulate thoughts and ideas effectively using oral, written, and nonverbal communication skills in a variety of forms and contexts
- Listen effectively to decipher meaning, including knowledge, values, attitudes, and intentions
- Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
- Utilise multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
- Communicate effectively in diverse environments (including multilingual environment)



1.1.1.4 Collaboration

Collaborate with Others

- Demonstrate ability to work effectively and respectfully with diverse teams
- Exercise flexibility and willingness to be helpful in making necessary compromises to accomplish a common goal
- Assume shared responsibility for collaborative work, and value the individual contributions made by each team member



1.1.2 Information, Media & Technology skills

1.1.2.1 Information Literacy

Access and Evaluate Information

- Access information efficiently (time) and effectively (sources)
- Evaluate information critically and competently

Use and Manage Information

- Use information accurately and creatively for the issue or problem at hand
- Manage the flow of information from a wide variety of sources
- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information

1.1.2.2 Media Literacy

Analyse Media

- Understand both how and why media messages are constructed, and for what purposes
- Examine how individuals interpret messages differently, how values and points of view are included or excluded, and how media can influence beliefs and behaviours
- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of media

Create Media Products

- Understand and utilise the most appropriate media creation tools, characteristics, and conventions
- Understand and effectively utilise the most appropriate expressions and interpretations in diverse, multicultural environments



1.1.2.3 ICT Literacy

Apply Technology Effectively

- Use technology as a tool to research, organise, evaluate and communicate information
- Use digital technologies (computers, PDAs, media players, GPS, etc.), communication/networking tools and social networks appropriately to access, manage, integrate, evaluate and create information to successfully function in a knowledge economy
- Apply a fundamental understanding of the ethical/legal issues surrounding the access and use of information technologies



1.1.3 Life & Career skills

1.1.3.1 Flexibility & Adaptability

Adapt to Change

- Adapt to varied roles, jobs responsibilities, schedules, and contexts
- Work effectively in a climate of ambiguity and changing priorities

Be Flexible

- Incorporate feedback effectively
- Deal positively with praise, setbacks, and criticism
- Understand, negotiate and balance diverse views and beliefs to reach workable solutions, particularly in multicultural environments

1.1.3.2 Initiative & Self-Direction

Manage Goals and Time

- Set goals with tangible and intangible success criteria
- Balance tactical (short-term) and strategic (long-term) goals
- Utilise time and manage workload efficiently

Work Independently

- Monitor, define, prioritise and complete tasks without direct oversight

Be a self-directed Learner

- Go beyond basic mastery of skills and/or curriculum to explore and expand one's own learning and opportunities to gain expertise
- Demonstrate initiative to advance skill levels towards a professional level
- Demonstrate commitment to learning as a lifelong process
- Reflect critically on past experiences in order to inform future progress



1.1.3.3 Social & Cross-Cultural Interaction

Interact Effectively with Others

- Know when it is appropriate to listen and when to speak
- treat others in a respectful, professional manner

Work Effectively in Diverse Teams

- Respect cultural differences and work effectively with people from a range of social and cultural backgrounds
- Respond open-mindedly to different ideas and values
- Leverage social and cultural differences to create new ideas and increase both innovation and quality of work

1.1.3.4 Productivity & Accountability

Manage Projects

- Set and meet goals, even in the face of obstacles and competing pressures
- Prioritise, plan and manage work to achieve the intended result

Produce Results

- Demonstrate additional attributes associated with producing high quality products including the abilities to:
 - Work positively and ethically
 - Manage time and projects effectively
 - Multitask
 - Actively participate and be reliable and punctual
 - Present oneself professionally and with proper etiquette
 - Collaborate and cooperate effectively with teams
 - Respect and appreciate team diversity
 - Be accountable for results



1.1.3.5 Leadership & Responsibility

Guide and Lead Others

- Use interpersonal and problem-solving skills to influence and guide others towards the goal
- Leverage strengths of others to accomplish a common goal
- Set an example for others by being selfless and inspire them to do their very best
- Demonstrate integrity and ethical behavior in using influence and power

Be Mindful to Others

- Act responsibly with the interests of the larger community in mind

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1.2 The DigCompEdu Framework

The DigCompEdu Framework aims to capture and describe educator-specific digital competences by listing 22 elementary competences in 6 areas.

Area 1 describes a broader professional environment, i.e. educators' use of digital technologies in professional interactions with colleagues, learners, parents, and other interested parties, for their own professional development and for the collective good of the organisation they are a part of. 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.

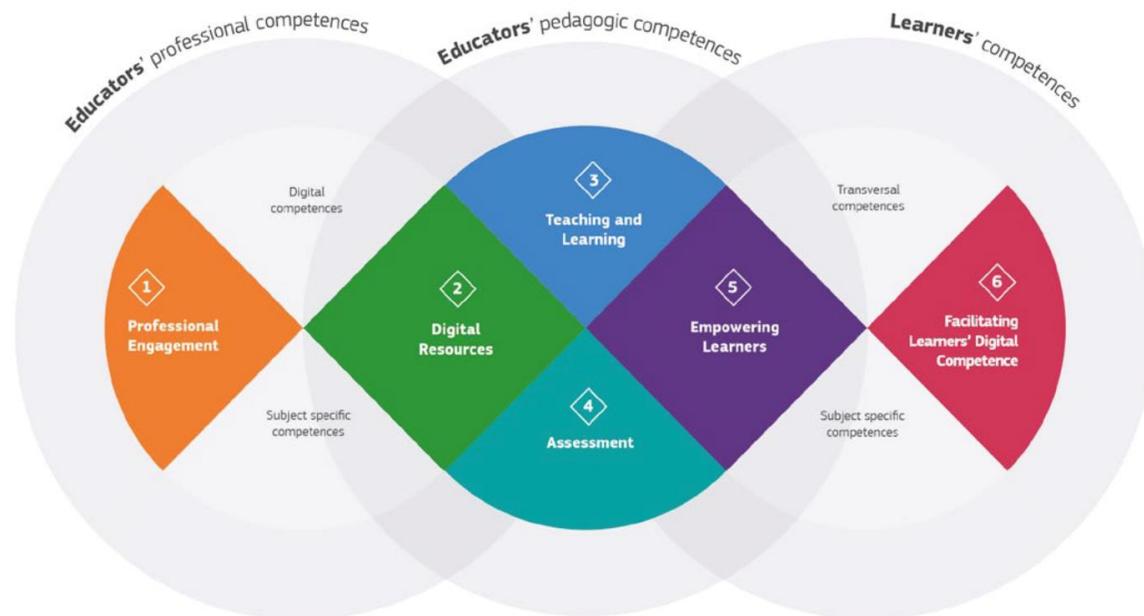


FIGURE 2: DIGCOMPEDU AREAS AND SCOPE



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. For each competence, a title and a short description are provided, which serve as the main point of reference.

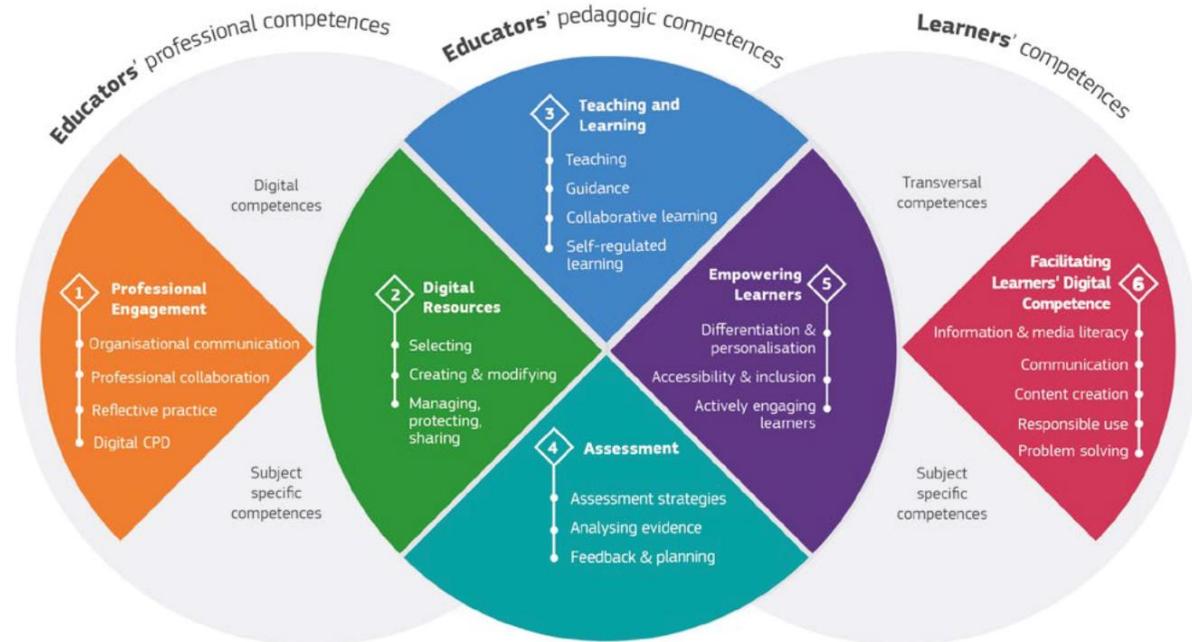


FIGURE 4: SYNTHESIS OF THE DIGCOMPEDU FRAMEWORK



1.2.1 Professional Engagement

1.2.1.1 Organisational Communication

Use digital technologies to enhance organisational communication with learners, parents and third parties. To contribute to collaboratively developing and improving organisational communication strategies.

1.2.1.2 Professional Collaboration

Use digital technologies to engage in collaboration with other educators, sharing and exchanging knowledge and experiences and collaboratively innovating pedagogic practices.

1.2.1.3 Reflective Practice

Reflect on, critically assess and actively develop one's own digital pedagogical practice and that of one's educational community.

1.2.1.4 Digital Continuous Professional Development (CPD)

Use digital sources and resources for continuous professional development



1.2.2 Digital Resources

1.2.2.1 Selecting Digital Resources

Identify, assess and select digital resources for teaching and learning purposes

When selecting digital resources and planning their use, consider specific learning objectives, context, pedagogical approach, and learner group

1.2.2.2 Creating and Modifying Digital Resources

Modify and build on existing openly-licensed resources and other resources where this is possible.

Create or support the creation of new digital educational resources

When designing digital resources, also take into consideration specific learning objectives, context, pedagogical approach, and learner group

1.2.2.3 Managing, Protecting and Sharing Digital Resources

Organise digital content and make it available to learners, parents and other educators.

Make sure to protect sensitive digital content.

Follow and abide by privacy and copyright rules.

Understand the use and creation of open licenses and open educational resources, including their proper attribution.



1.2.3. Teaching and learning

1.2.3.1 Teaching

Plan for and incorporate digital devices and resources in the teaching process to enhance its effectiveness.

Appropriately manage digital teaching interventions. Experiment with and develop new formats and pedagogical methods of instruction.

1.2.3.2 Guidance

Use digital technologies and services to enhance the interaction with learners, on both individual and group level, during and outside of learning hours.

Use digital technologies to offer timely guidance and assistance.

Experiment with and develop new forms and formats for guidance and support.

1.2.3.3 Collaborative learning

Use digital technologies to foster and enhance learner collaboration.

Motivate the learners to use digital technologies for assignments, as a means of enhancing communication, collaboration and knowledge creation.

1.2.3.4 Self-directed learning

Use digital technologies to support self-regulated learning processes, i.e. to enable learners to plan, monitor, and reflect on their own learning process, provide evidence of progress, share insights, and come up with creative solutions.



1.2.4. Assessment

1.2.4.1 Assessment Strategies

Use digital technologies for formative and summative assessment.

Enhance the diversity and suitability of assessment formats and approaches.

1.2.4.2 Analysing Evidence

Generate, select, critically analyse, and interpret digital evidence of learner's activity, performance, and progress.

1.2.4.3 Feedback and Planning

Use digital technologies to provide targeted and timely feedback to learners. Adapt teaching strategies and based on the generated evidence provide support

Enable learners and parents to understand the evidence provided by digital technologies and use it for decision-making.



1.2.5 Empowering learners

1.2.5.1 Accessibility and Inclusion

Ensure accessibility to learning resources and activities, for all learners, including those with disabilities.

Consider and respond to learners' (digital) expectations, abilities, and misconceptions, as well as contextual, physical or cognitive constraints to their use of digital technologies.

1.2.5.2 Differentiation and Personalisation

Use digital technologies to address learners' diverse learning needs, by allowing learners to advance at different levels and speeds, and follow individual learning pathways and objectives.

1.2.5.3 Actively Engage Learners

Use digital technologies to foster learners' active and creative engagement with a subject matter. Use digital technologies within pedagogic strategies that foster learners' transversal skills, critical thinking, and creative expression.

Explore new learning contexts where learners take part in hands-on activities, scientific investigation or complex problem-solving or other activities that may increase learners' active involvement in complex subject matter.



1.2.6. Facilitating Learners' Digital Competence

1.2.6.1 Information and Media Literacy

Incorporate learning activities, assignments, and assessments which require learners to find information and resources online; to organise, process, analyse, and interpret information; and to compare and critically evaluate the credibility and reliability of information and its sources.

1.2.6.2 Digital Communication & Collaboration

Incorporate learning activities, assignments, and assessments which require learners to effectively and responsibly use digital technologies for communication, collaboration and civic participation.

1.2.6.3 Digital Content Creation

Incorporate learning activities, assignments, and assessments which require learners to express themselves by digital means, and modify and create digital content in different formats.

Teach learners how copyright licenses apply to digital content and how to reference sources.

1.2.6.4. Responsible Use

Take measures to ensure learners' physical, psychological, and social wellbeing while using digital technologies.

Empower learners to manage risks and safely and responsibly use digital technologies.

1.2.6.5 Digital Problem solving

Incorporate learning activities, assignments, and assessments which require learners to identify and solve technical problems, or transfer technological knowledge to new situations in a creative way.

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), an educator obtains new information and develops basic digital practices. At the Integrator (B1) and Expert (B2) stages, the educator applies and further expands upon their digital practices. As Leader (C1) and Pioneer (C2), they pass on their knowledge, critically assess existing practices and develop new ones.

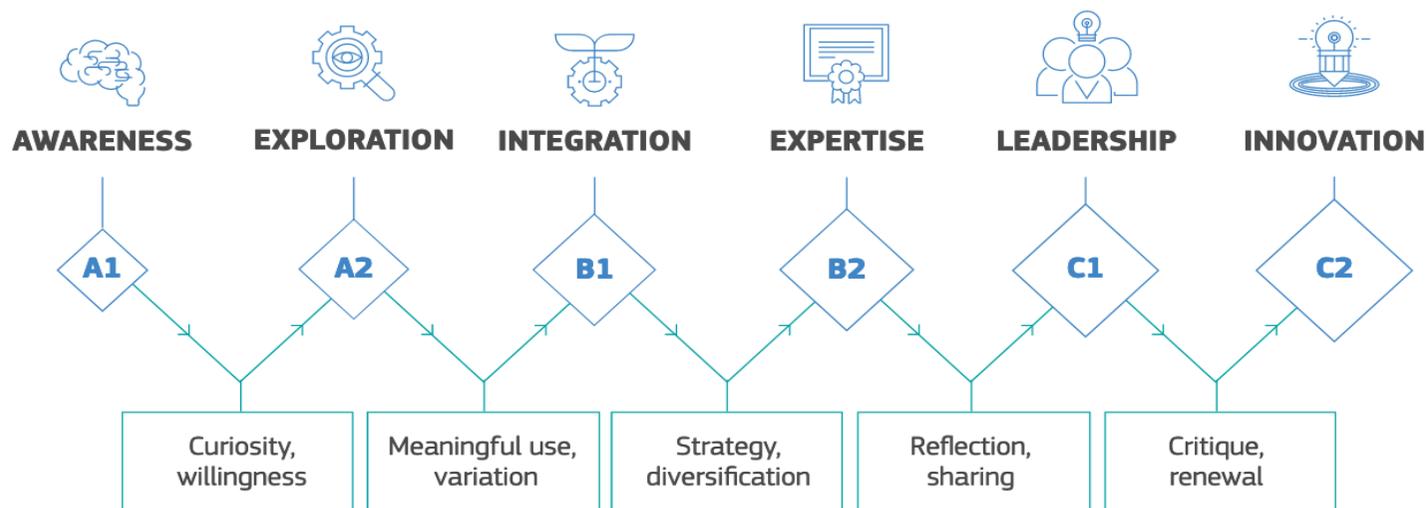


FIGURE 5: DIGCOMPEDU PROGRESSION MODEL



Sources:

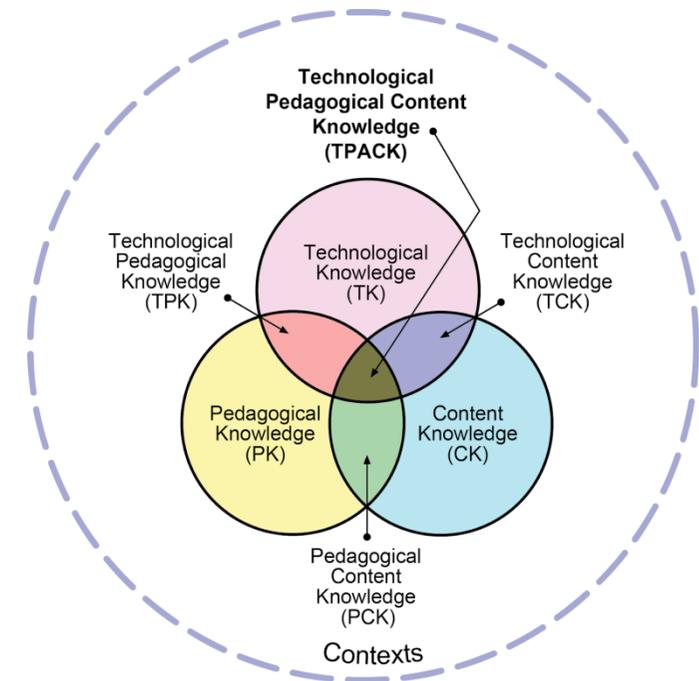
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1.3 Technological Pedagogical Content Knowledge (TPACK)

At the heart of the TPACK framework is the complex interplay of three primary forms of knowledge: Content (CK), Pedagogy (PK), and Technology (TK). The TPACK framework emphasises the types of knowledge at the intersections of the three primary forms: Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), Technological Pedagogical Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK).

Effective integration of technology in pedagogy around specific subject matter requires developing sensitivity to the dynamic and transactional relationship between these components of knowledge situated in unique contexts. Since no situation is unique and factors such as grade-level, school-specific factors, demographics, culture, and other influence any given situation, no single combination of content, technology, and pedagogy will apply for every teacher, every course or every way of teaching.





- **Content Knowledge (CK)** – “Teachers’ knowledge about the subject matter to be learned or taught. The content to be covered in middle school science or history is different from the content to be covered in an undergraduate course on art appreciation or a graduate seminar on astrophysics... As Shulman (1986) noted, this knowledge would include knowledge of concepts, theories, ideas, organizational frameworks, knowledge of evidence and proof, as well as established practices and approaches toward developing such knowledge” (Koehler & Mishra, 2009).
- **Pedagogical Knowledge (PK)** – “Teachers’ deep knowledge about the processes and practices or methods of teaching and learning. They encompass, among other things, overall educational purposes, values, and aims. This generic form of knowledge applies to understanding how students learn, general classroom management skills, lesson planning, and student assessment.” (Koehler & Mishra, 2009).
- **Technology Knowledge (TK)** – Knowledge about certain ways of thinking about, and working with technology, tools and resources. and working with technology can apply to all technology tools and resources. This includes understanding information technology broadly enough to apply it productively at work and in everyday life, being able to recognize when information technology can assist or impede the achievement of a goal, and being able continually adapt to changes in information technology (Koehler & Mishra, 2009).
- **Pedagogical Content Knowledge (PCK)** – “Consistent with and similar to Shulman’s idea of knowledge of pedagogy that is applicable to the teaching of specific content. Central to Shulman’s conceptualization of PCK is the notion of the transformation of the subject matter for teaching. Specifically, according to Shulman (1986), this transformation occurs as the teacher interprets the subject matter, finds multiple ways to represent it, and adapts and tailors the instructional materials to alternative conceptions and students’ prior knowledge. PCK covers the core business of teaching, learning, curriculum, assessment and reporting, such as the conditions that promote learning and the links among curriculum, assessment, and pedagogy” (Koehler & Mishra, 2009).



- **Technological Content Knowledge (TCK)** – “An understanding of the manner in which technology and content influence and constrain one another. Teachers need to master more than the subject matter they teach; they must also have a deep understanding of the manner in which the subject matter (or the kinds of representations that can be constructed) can be changed by the application of particular technologies. Teachers need to understand which specific technologies are best suited for addressing subject-matter learning in their domains and how the content dictates or perhaps even changes the technology—or vice versa” (Koehler & Mishra, 2009).
- **Technological Pedagogical Knowledge (TPK)** – “An understanding of how teaching and learning can change when particular technologies are used in particular ways. This includes knowing the pedagogical affordances and constraints of a range of technological tools as they relate to disciplinarily and developmentally appropriate pedagogical designs and strategies” (Koehler & Mishra, 2009).
- **Technological Pedagogical Content Knowledge (TPACK)** – “Underlying truly meaningful and deeply skilled teaching with technology, TPACK is different from knowledge of all three concepts individually. Instead, TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students’ prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge to develop new epistemologies or strengthen old ones” (Koehler & Mishra, 2009).



There is another interpretation of the TPACK model:

The Technological Pedagogical Content Knowledge (TPACK) model consists of three knowledge areas that are relevant in teaching: technological (T), pedagogical (P) and content (C) knowledge (K).

- **Technological knowledge(TK)** includes the knowledge of how to use technologies. This Includes everything from tablets to the Internet to software applications. The main component of this knowledge, however, is that you keep up with the technology trends, recognise, and also constantly explore new developments and possibilities of technology.
- **Pedagogical knowledge (PK)** refers to the understanding of teaching and learning processes. This includes teaching methods as well as knowledge about how your students learn or how to motivate them. This means that you can design the teaching content to suit each learning group and convey it in an appealing way. For teaching, this means that knowledge is presented in a way that is easy for the learners to understand.
- **Content knowledge (CK)** refers to subject knowledge. The subject knowledge makes you an expert in your field. It includes general facts as well as subject-specific knowledge. For example, when music theory knowledge is accompanied by musicianship-related competences.
- **Pedagogical content knowledge (PCK)** includes the knowledge of how to convey a certain content to learners.
- **Technological-pedagogical knowledge (TPK)** comprises the knowledge about the possibilities and limitations that a pedagogically motivated inclusion of digital media entails.
- **The technological-content knowledge (TCK)** refers to the knowledge of how technology can be used and what possibilities it offers to teach new content.



Finally, the intersection of the three areas of knowledge is technological-pedagogical content knowledge. This knowledge refers to the knowledge and understanding of the interplay of all the above areas. All three areas of knowledge influence each other and should be combined.

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2 Educator skills and learning objectives

In order to get a feeling for how Artificial Intelligence (AI) works in practice, a workshop - more specifically an AI Bootcamp - with group work will be developed and organised in a pilot activity. It will be an experimental training for which the IO lead partner will design the training concept and sample material.

Therefore, skills and learning objectives for the educators about digital competence will be further explained on the following pages.

The skills which will be acquired after accomplishing a module are assigned to the **P21 - 21st century skills** subcategories.

For the successful implementation of the module units, learning objectives were created. Each of them defines skills each learner is expected to acquire at the end of the module. Learning objectives and skills follow the progression model of the **DigCompEdu Framework** and its first four stages from A1 (Newcomer) to B2 (Expert).



To reach a certain level of proficiency, and define the learning objectives in more detail, we have created a table. It includes:

P21 - 21st century skills	Stage (DigCompEdu Framework)	Operators	Required action
learning and innovation skills/ information, media and technology skills/ life and career skills	A1 Newcomer Has had very little contact with digital tools and needs guidance to expand their repertoire	gains an overview	basic orientation on the topic of AI without a deeper reflection
	A2 Explorer Uses digital tools without having a comprehensive or consistent approach	knows	has knowledge and experience using AI as well as learning and working methods at their disposal
	B1 Integrator Uses and experiments with digital tools for a range of purposes, trying to understand which digital strategies work best in which contexts.	transfers	uses knowledge and experience about facts and connections of AI in comparable contexts
	B2 Expert Uses a range of digital tools confidently, creatively, and critically to enhance their professional activities	masters applies	uses courses of action associated to AI in familiar situations uses knowledge and experiences about facts and connections of AI in unknown contexts



Next to the learning objectives, possible proposals give an idea about their implementation via three didactical approaches, i. e.:

- HaptA: haptical approach
- LingA: linguistic approach
- AbstrA: abstract approach

These approaches allow a differentiating work on the modules with regard to the target groups of primary school (students between 6 and 10 years), high school (students between 10 and 14 years), grammar school (students between 14 and 18 years) and adult education (students older than 18 years). The educators are free to choose the didactical approach they find optimal for their target group. They are also free to include further content to any part as they know their students and preconditions (age appropriateness, previous knowledge...) best in order to gain a maximum of understanding for AI. .

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