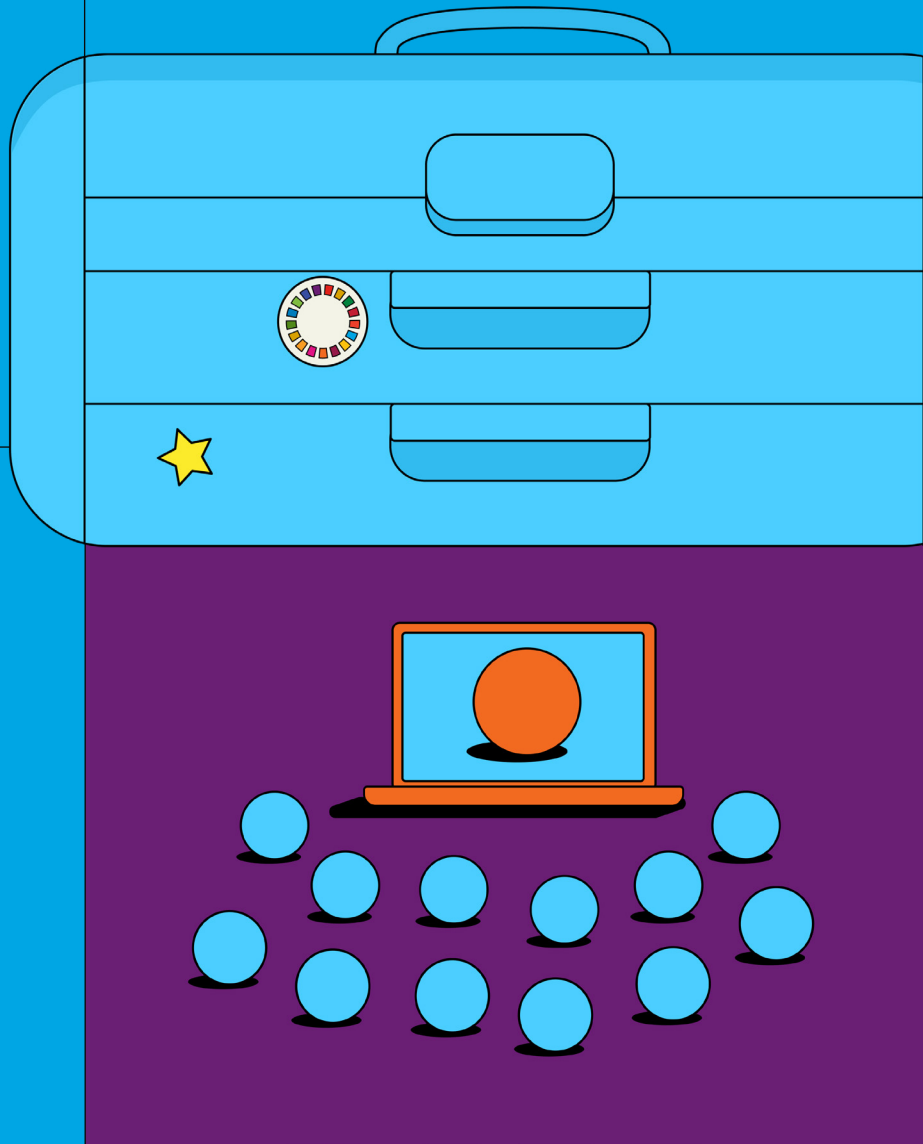
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SUPERSTAR TEACHER TOOLBOX

DIGITAL PEDAGOGY



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Calling all educators diving into the realm of digital teaching!

* Are you looking to incorporate technology into your classroom?
* Do you have questions about how to integrate education apps into your lessons?
* Unsure how to leverage technology for your students with maximum impact?
* Or perhaps you're a digital talent, but still have questions on how to take your tech-savvy teaching to the next level?

If so, you've come to the right place! Welcome to the **Digital Pedagogy Tool**, your go-to guide for answers and insights on your digital teaching journey. It's part of the Superstar Teachers Toolbox, and provides practical guidance for teachers and school leaders on their journey of supporting digital transformation in education.

Digital technology[1] is rapidly transforming the landscape of contemporary education, revolutionising the way we connect and access information. With the help of digital tools, it can boost learners' motivation, interest, skills, and overall academic achievement. But here's the key: **your role as a teacher is the game-changer.**

Digital pedagogy isn't rocket science. By making the shift from teacher-centred to learner-centred practices, your students actively participate and construct meaning through shared experiences. It's not just about tossing tech into the classroom; with the perfect blend of traditional education, digital-know-how, and understanding how learners 'tick', digital tools can **supercharge your teaching.**

The **Digital Pedagogy Tool** is your recipe for success. It aims to facilitate the seamless integration of technology into the teaching and learning process, ensuring that instructional delivery is both effective and rooted in solid digital pedagogy principles. Let's make digital technology more than just a buzzword in your classroom. Your students are waiting for an adventure, and you're their guide!

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1 The term "Digital technology" is used in this work as an umbrella term for a variety of digital tools like information and communication technology (ICT) and Information technology (IT).

The aim

The Digital Pedagogy Tool aims to **empower you, the educator**, by:

- ✓ Equipping you with the means to plan more strategically for the integration of digital tools in the classroom;
- ✓ Helping you to prioritise pedagogical actions and principles over the use of stand-alone technology, both in the planning and preparation stages, and during the active use of digital tools in teaching;
- ✓ Providing you with a comprehensive understanding of the various elements of digital pedagogy necessary for the effective incorporation of digital tools into teaching and learning;
- ✓ Offering deep insight into how the themes of digital pedagogy can be translated into practical and foundational considerations for educational practice.

You'll also be able to explore answers to pivotal questions such as:

1. What are the essential elements of digital pedagogy, and how do they intersect with the processes of teaching and learning?
2. What practical aspects of digital pedagogy should be contemplated by a teacher during the planning phase of teaching and learning?
3. Which digital pedagogy themes can serve as reliable foundations for teachers aiming to create a robust pathway that supports learners in the digital era?

The structure

The toolkit is structured into modules, offering you the flexibility to delve into **sections** aligned with your specific interests, relevance, or areas of curiosity as an educator. Each section centres around a distinct digital pedagogy theme, beginning with a concise introduction that unfolds into a compelling narrative featuring a teacher's example. This design not only provides a tailored and relevant experience, but also invites you to actively engage in the pedagogical realms most pertinent to your teaching journey.

Following this are roughly ten **digital pedagogy considerations,** with insightful reflections and questions pertinent to the theme. These are designed to prompt teachers to examine their own teaching context and consider if further information is needed.

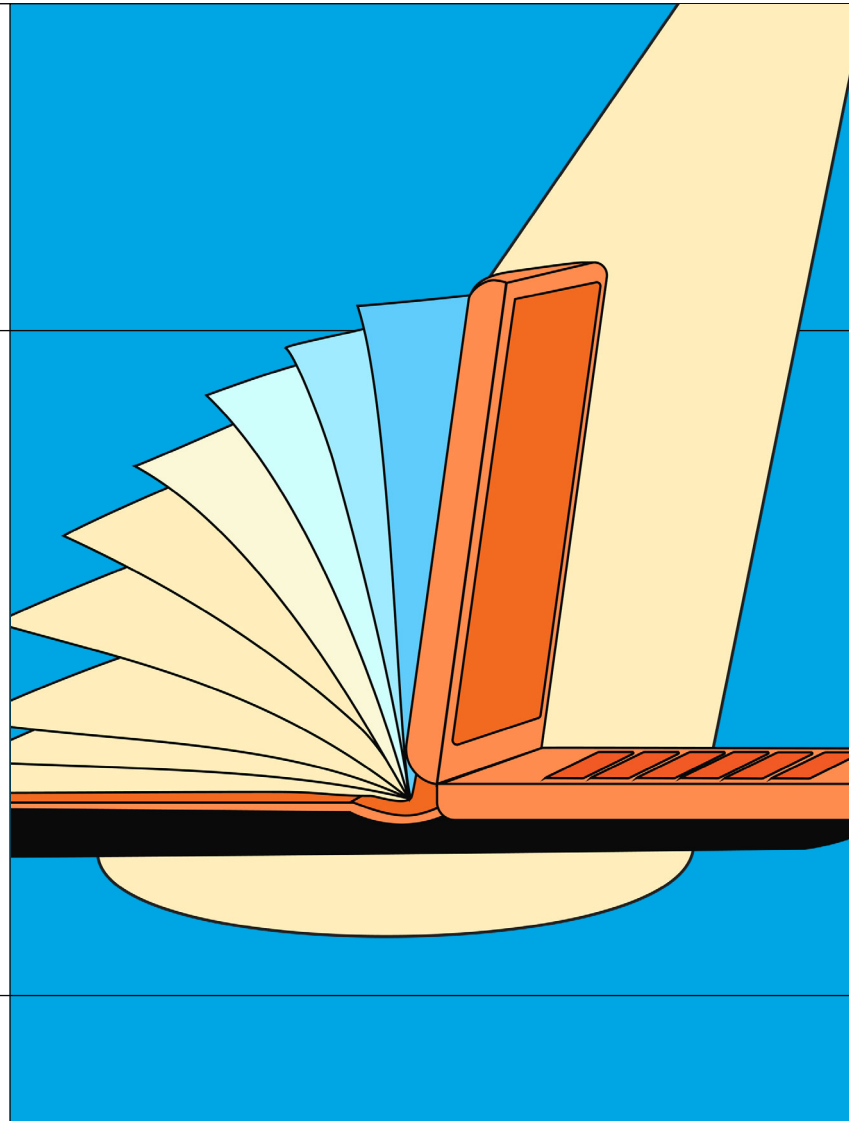
After the digital pedagogy content, the tool gives you a quick low-down on the digital skills linked to the topic of the section. Concluding each section, a creative teacher shares their savvy techniques for effectively navigating the challenges and opportunities of digital pedagogy.

The material is organised into two primary chapters. The first, *1: Planning Teaching with Digital Technologies*, includes sections on *1.1 Setting Learning Objectives, 1.2 Planning Learning Assessment, 1.3 Planning Social Elements, 1.4 Long-term Planning, 1.5 Lesson Planning,* and *1.6 Preparing the Content.* The second chapter, *2: Implementing Digital Pedagogy*, encompasses sections on *2.1 Social & Collaborative Learning, 2.2 Problem-Solving & Critical Thinking, 2.3 Play and Creativity, 2.4 Assessment and Feedback, and 2.5 Learning to Learn.*

After the main two chapters, there is an additional third chapter: *3: Additional Information and Resources,* which contains useful summaries and material for further reading on central digital skills areas and the theoretical aspects of digital pedagogy. The chapter includes content in *3.1 Digital Safety, 3.2 Accessibility & Inclusion, 3.3 Digital Competences, 3.4 AI & Analytics, and 3.5 Digital Pedagogy Theory.*

1

PLANNING TEACHING WITH DIGITAL TECHNOLOGIES



This chapter introduces six sections that provide various perspectives on the potential impact of digital technology on the planning of teaching and learning. Each section encourages the reader to delve into practical aspects that aid in the thoughtful and successful integration of technology prior to its implementation with learners. Readers can also connect with the illustrative, fictional educator stories within each section.

Chapter contents

1.1 Setting learning objectives

1.2 Planning learning assessment

1.3 Planning social elements

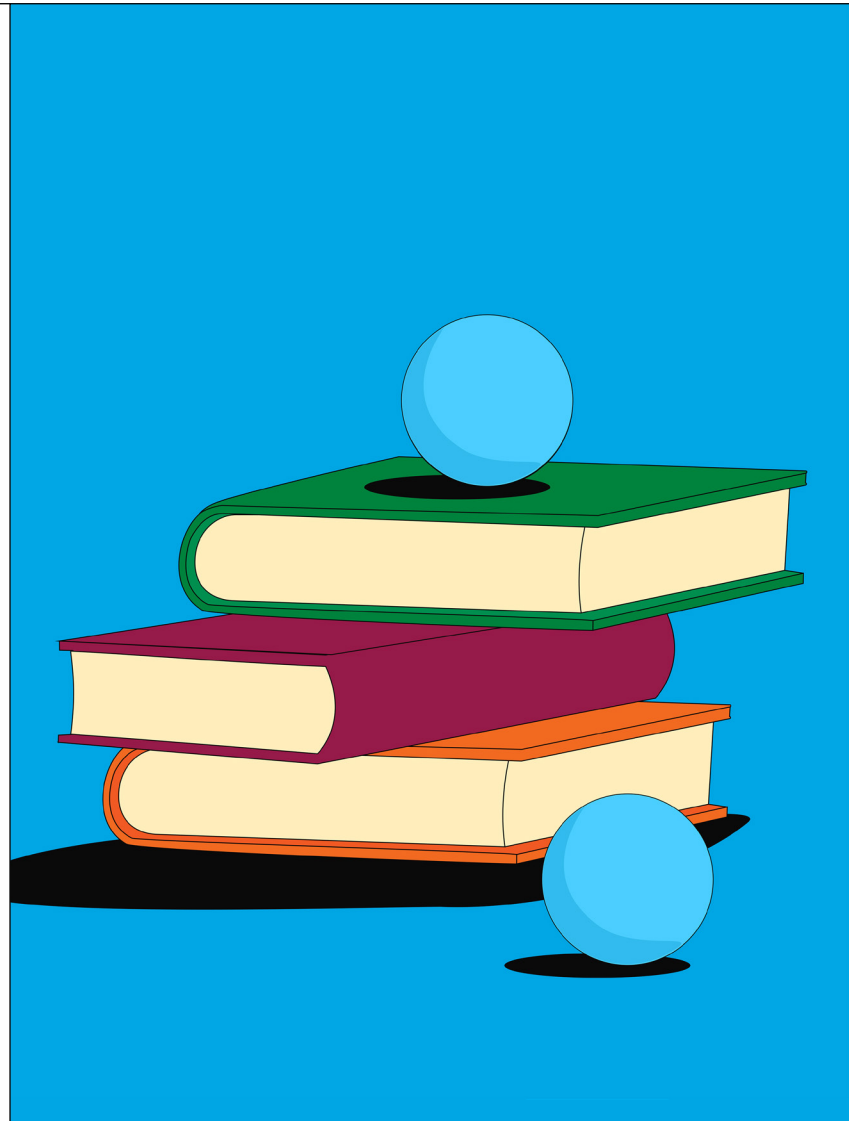
1.4 Long-term planning

1.5 Lesson planning

1.6 Preparing content

1.1 Setting learning objectives

Craft learning objectives in language that resonates with learners and explore how digital tools can reinforce their understanding of – and engagement with – these goals.



> **Clear communication from teachers is crucial in helping students comprehend not only what they need to learn, but also the purpose and advantages of utilising a digital tool to achieve their learning objectives.**

Digital learning tools are intricately crafted with learning objectives at their core, ensuring that goals are not just a checklist, but a central element of the educational experience. It is essential for teachers to exercise authority over these objectives, tailoring them to the unique needs of their learners. By leveraging digital tools, educators can transform abstract objectives into a series of tangible actions, milestones, and rewards, making the learning journey both understandable and rewarding for students.

Digital pedagogy considerations

Rachel, a seasoned teacher of 6- to 7-year-olds, has always been passionate about nurturing literacy. The news of her school adopting a new game-based digital application to enhance literacy skills piqued her interest. Filled with curiosity and optimism, Rachel pondered the potential of this tool within her classroom. How could it complement her teaching style and objectives? Determined to uncover its alignment with the curriculum and her own educational goals, Rachel embarked on a journey to explore the application.

Join Rachel as we delve into key considerations for planning learning objectives with digital tools in mind:

Consideration 1: Source of the objectives. When planning to use a digital tool, determine where the learning objectives originate regarding that tool. They may be drawn from the **official curriculum**, a **digital tool's integrated curriculum**, **content materials**, or your **own custom objectives**. When a digital tool includes its own objectives, it's important to align them with the curriculum's goals.

- **Tip:** While forming learning objectives, resources such as generative AI can aid in crafting and defining the objectives, but it lacks the personal insight into your learners' needs. Only you and your colleagues can ensure that the objectives are suitable for all students.

Consideration 2: Language and experience. When formulating objectives for learners, ensure that the language used is based on their unique world of experience. This approach is a cornerstone of building effective scaffolding[1], enabling students to progressively grasp and pursue objectives with growing autonomy.

- **Tip:** Integrate objectives with learning assignments, transforming them into tangible, achievable student tasks. Digitally, utilise straightforward, shared lists of objectives or rubrics, offering individual learners the ability to interact with them securely. Maintain clear and accessible knowledge sources.

Consideration 3: Examine how the digital tool incorporates the objectives. Are there clear, easy-to-understand objectives for all learners? Can students or teachers modify them if needed? Are the objectives fixed, or do they adapt to the learner´s progress automatically?

- **Tip:** Tools with clear subject material usually have easily identifiable, built-in learning objectives or aims. Games or gamified learning, on the other hand, can have objectives that are revealed incrementally, embedded into the story, levels, and stages.

Consideration 4: Establish a consistent location for learners to access objectives. Learners should be able to understand and discuss the relevance of their learning objectives. It is important to ascertain whether the objectives should be visible within all content and assignments.

- **Tip:** Consider creating a familiar location – digital or analogue – for learners to find or see the learning objectives in relation to their assignments and other actions. Aligning objectives with assignments is always preferable, but it is equally important to avoid overwhelming students with overly complex objectives that may hinder their progress.

Consideration 5: Remember that every digital tool requires a wide variety of digital skills.
Therefore, it is important to consider what digital competencies are needed, and to connect them with learning objectives.

- **Tip:** Don't underestimate the need for very simple practical skills for learners, such as identifying buttons in the user interface (UI), or finding the "front door" to get on board in a digital tool. Critical thinking skills in terms of navigation and narration can be helpful: for example, the learner goes to different places or uses tools with familiar names ("front door", "hallway", "knowledge bank", "fireplace") to do actual things ("Growing knowledge seeds", "treasure hunt" etc.).

Consideration 6: Align objectives with differentiation. When easier or more demanding content is needed for learners, it is important to align the learning goals with the differentiation.

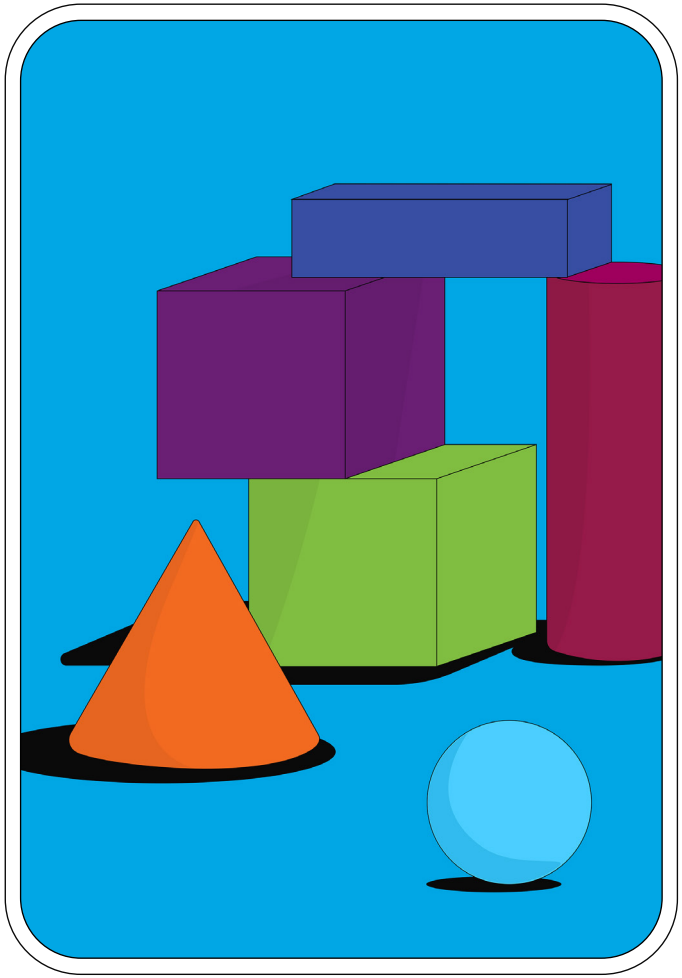
- **Tip:** Digital tools (such as games) might automatically change the level and associated goals for learners, but it's important to ensure that learners still understand the goal and realise their achievement. With games, it is best to initiate discussions about what is being learned and to ensure the game content is aligned with the curricular content.

Consideration 7: Ensure that learners feel a sense of agency. A feeling of agency is simply a realisation from students that their actions can drive and shape their learning journey.

- **Tip:** Learners should have the ability to enhance or create their own objectives, or at minimum, articulate and recognise the objectives and express their feelings when achieving them.

Consideration 8: Consider collegial pedagogical understanding to gain a more comprehensive understanding of learning objectives.
This includes understanding how the specific digital tool's goals align more broadly with the curriculum, and how the objectives can be formulated collaboratively (like in consideration 2) and aligned across all digital tools used to support learning.

- **Tip:** Aim for collaborative sharing and strategical and pedagogical planning with colleagues to collectively address this alignment across different learner age groups, thus avoiding duplicative efforts.



Examples of digital competencies in the context of setting learning objectives

Digital Safety

- Identify personal information related to objectives and ensure it's not shared.
- Monitor the post-use handling of personal information.
- Refer to **"3.1. Digital safety: Key areas"** for further information.

Accessibility & Inclusion

- Make goals accessible and comprehensible for all learners.
- Provide individualised goals and enhancement strategies within the tool.
- Refer to **"3.2 Accessibility & inclusion"** for further information.

Digital Work

- Grasp the learner UI for goal tracking.
- Distinguish between teacher/administrative and learner/learning tools.
- Refer to **"3.3 Digital competence frameworks"** for further information.

AI & Analytics

- Understand the impact of learner identification on data collection.
- Comprehend the construction of continuous learning data.
- Assess the basis for edtech tool suggestions for new goals.
- Master analytical data and graph interpretation and their reliability.
- Refer to **"3.4 AI & Analytics"** for further information.

Practical pedagogical example with Rachel

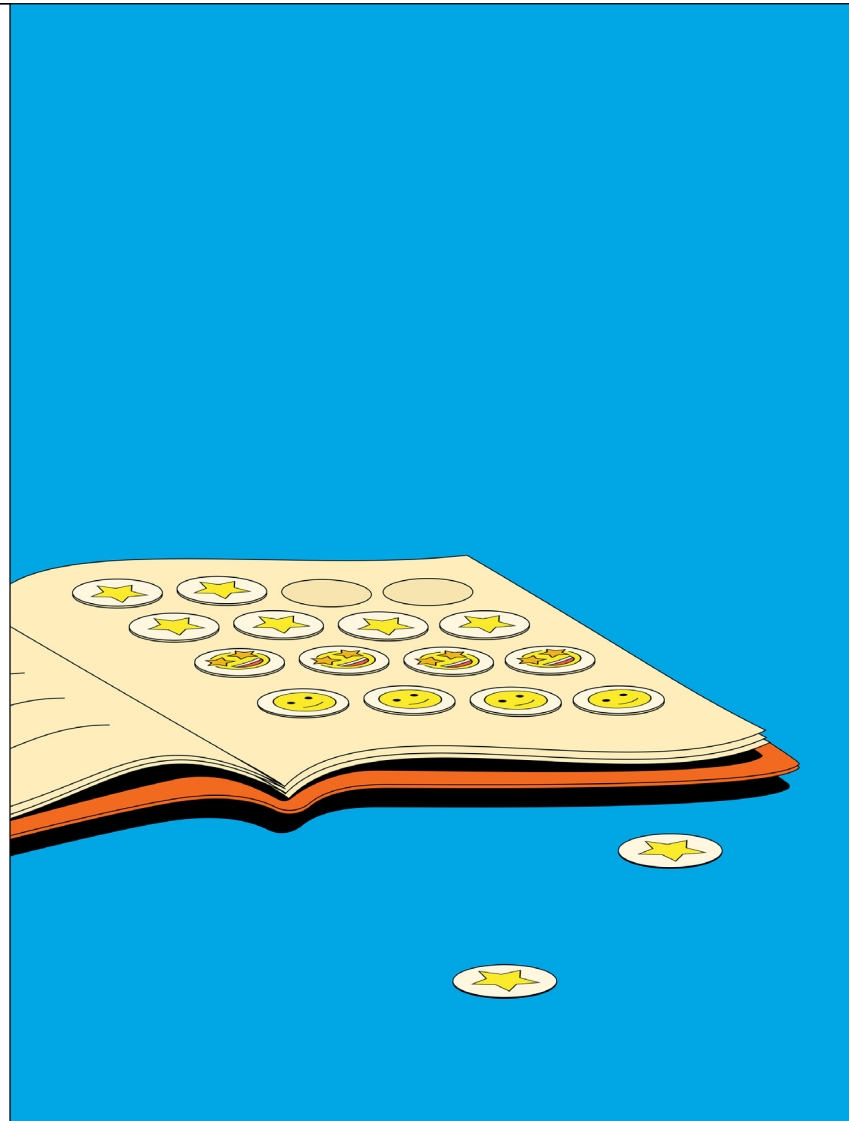
Rachel wanted to make learning objectives clear, so she looked into the new digital literacy game in detail. She was impressed by the beautiful user interface and storyline, where the player learned to read gradually. The game had a personal learning path with constant feedback. She thought that children would master the game quickly on school laptops, but she also planned time for them to practice using a mouse or keyboard. She knew that the game focused on recognising and reading letters and words, but it was not enough to teach reading by itself.

The learning objectives of the game were hidden from the learner, but Rachel soon figured them out. They involved recognising letters, forming words, and reading and writing simple sentences. She compared them with the higher curriculum level objectives, such as: "Children should be able to listen attentively and respond appropriately to stories, rhymes, songs and poems in home language and additional language". She also discussed with her colleagues how they planned to integrate the game into their teaching

She decided to state the objectives by speaking for the learners, such as: "Today we learn how to draw letter A in the air, hear how it sounds, and how can we recognise it". With a series of objectives like this, the curriculum master objectives would be fulfilled. After some group exercises in the classroom, she planned a digital game session with a certain letter, and let the students explore other letters further. She then stopped the game, and they reviewed together what they had learned and achieved.

Rachel created a simple path of objectives to reading skills, where the game was one element to reinforce learning and provide differentiation, and the other elements were the usual classroom methods. The game boosted overall enthusiasm and excitement, but also allowed faster learners to advance and slower learners to repeat. This way, Rachel did not have to give rolling feedback to all students at once, which she knew was an unrealistic goal.

1.2 Planning learning assessment



Using technology to plan how we check what students learn can help us give them custom advice, let them learn at their own speed, and understand their needs better with helpful information.

In the realm of digital education, planning learning assessments is key, as digital tools bring efficiency and vitality to the assessment process, ensuring that learners actively engage with their progress. Rather than limiting assessments to a final numeric scale, digital technologies enable dynamic and formative assessments that align closely with learning objectives from the outset, offering diverse feedback mechanisms and personalised adaptations. However, the linchpin remains the teacher, whose creativity and tacit knowledge are essential in seamlessly connecting learning goals, assessments, and the broader educational context, even within the most advanced AI-enhanced systems.

In this section, we will explore how digital tools can be used to assess student learning outcomes and provide meaningful feedback to students and teachers. Student learning assessment with digital tools can provide precise, data-driven feedback in real-time, while also introducing innovative assessment approaches for a more comprehensive, meaningful experience. It is important to recognise the difference, place, and mechanism of machine-based assessment, and to always connect assessments with the learning objectives.[2]

Digital pedagogy considerations

Carlos is a maths and science teacher who loves to explore the natural world with his 8- to 12-year-old students. He is a fluent user of digital tools and has access to computers with an internet connection at his school. Carlos is planning how he will connect the computers with the learning assessment. The challenge for Carlos is creating a continuum where using a computer in science assignments could also build the formative assessment and feedback. He would also like to reinforce the pedagogical aspects of digital assessment.

Here, you can pause with Carlos at these pedagogical considerations on how the digital tool could be approached in the planning of learning assessment:

Consideration 1: Align learning objectives and assessments by considering the learner's perspective.
Ask how learners can comprehend the relation of assessment with the goals.

- **Tip:** Use clear stages, steps, or rubrics[3] to establish the connection between assessment and goals (see also "**1.1 Setting learning objectives**", considerations 2-8).

Consideration 2: Find diverse methods for providing assessment feedback for learners.
When planning assessment, remember how digital tools can enrich assessment from the learner's view to help create positive feedback, scaffold content learning, and develop self-regulation[4].

- **Tip:** Consider options like gamified quizzes[5], tests, peer discussion forums, asynchronous or real-time teacher feedback, portfolios, online posts, simulations, and automated feedback via intelligent tutoring (see also "**2.3. Play and creativeness**").

Consideration 3: Use digital work to reveal a learner's competencies from various perspectives.
Build an assessment path related to students' core actions regarding key assignments.

- **Tip:** Measuring the level of learner's competence in, for instance, using sources, retaining fundamental knowledge, or sharing information, can be premediated in digital form and set ready to be conducted later (see also "**1.1 Setting learning objectives**", "**1.4 Long-term planning**", and "**2.4 Assessment and feedback**").

Consideration 4: Assess the use of digital tools and digital skills.
You can assess digital skills through peer feedback, discussions, and self-assessment while utilising digital tools. Evaluating the teacher's own competencies is also valuable.

- **Tip:** Recognise that everyone is a learner, and digital skills require the continuous sharing of experiences and knowledge. Teachers should be aware of digital skills frameworks that help to observe and assess core areas (see more in "**3.2 Accessibility & inclusion**").

Consideration 5: Observe machine-based (AI) automated feedback as formative assessment.
It is important to understand how the constant automated feedback works in detail, and how it appears and feels to learners.

⊕ **Tip:** Anticipate the learner's emotional reaction to feedback and plan how to fill in the gaps of emotional or informative content from automated feedback systems.

Consideration 6: Allow humane formative assessment and peer-assessment.
In addition to utilising technology-based assessment methods, teachers should consider the importance of including empathy, personal discussions, alignment with wider goals, and other humane aspects in their feedback to students.

⊕ **Tip:** Digital tools provide multiple possibilities for peer-assessment, and in the form of written feedback, the receiver has more time to process it. Digital peer-assessment can also involve face-to-face (F2F) discussion, i.e., digital first, followed by F2F talk or vice-versa (see consideration 2, and more on peer feedback in "**1.3 Planning social elements**", considerations 4-5).

Consideration 7: Provide students with self-assessment and self-directed learning opportunities.
Self-assessment can be a very demanding task, but it is a valuable tool for enhancing self-awareness and the desire for continual learning.

⊕ **Tip:** In a digital environment, you could provide a simple questionnaire for learners to complete after every task. It can be a basic, emoji face-based Likert-scale assessment regarding different aspects of working, such as "I concentrated on the task well." The power of digitality lies in the data forming a larger picture that can be referred to later to map out learner tendencies.

Consideration 8: Promote learner agency and self-paced and self-regulated[6] learning.
Digital tools often enable self-paced learning with real-time feedback, facilitating the student's journey forward in the learning process. Remember to think about how caregivers can be part of the learning process.

⊕ **Tip:** Plan well-structured instructions aligned with the learning goals, and consider gamified[7] elements. However, be mindful of whether the content volume and allocated time are manageable for effective independent learning.

Consideration 9: Collaborative collegial planning of digital assessment.
Developing a cohesive vision towards implementing digital assessment techniques, materials, and criteria in specific subjects and age groups is crucial in achieving fair, objective evaluation methods within the curriculum.

Examples of digital competencies in the context of planning assessment

Digital Safety

- Ensure assessment data is handled securely and understand how it is protected.
- Recognise the risks of dependency on machine feedback for children.
- Acknowledge the long-term effects of digital footprints.
- Prevent cyberbullying in online assessments.
- Refer to "**3.1. Digital safety: Key areas**" for more information.

Accessibility & Inclusion

- Offer alternative formats for diverse learning needs.
- Perform user testing to identify specific learner requirements.
- Guarantee tool compatibility with assistive technologies.
- Address the digital divide in assessment access.
- Refer to section 3.1 for more information.

Digital Work

- Utilise key edtech tools for comprehensive assessments.
- Employ digital recognition to encourage learners.
- Implement measures to deter cheating in digital assessments.
- Refer to section 3.1 for more information.

AI & Analytics

- Understand adaptive learning mechanisms.
- Explore AI-driven assessment strategies and question their decisions.
- Be conscious of ethical considerations and AI limitations, ensuring human oversight.
- Refer to section 3.1 for more information.

Examples of digital competencies in the context of planning assessment

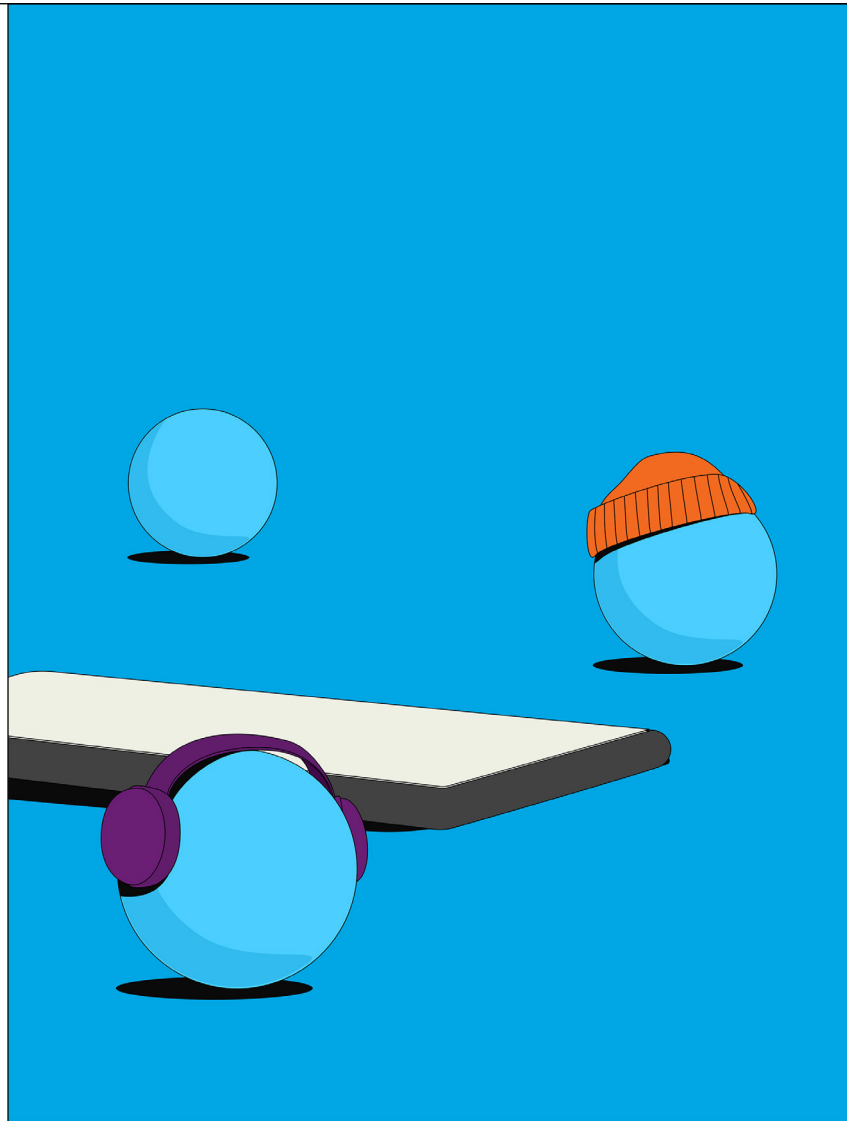
Carlos is determined to integrate computers and a Learning Management System (LMS) into his science teaching and assessment. He envisions a classroom where digital work and hands-on activities are clearly delineated, recognising that computers may not always be available.

Carlos plans to consult his students about their current knowledge and learning desires, and to share his expectations and criteria, which are informed by both his curriculum plans and student preferences. He intends to develop a rubric based on this collaborative input and use it to direct his instruction and feedback. The rubric will allow students to understand the objectives of each assignment, which will remain consistent, and the summative assessment will be the same for all.

He will design assignments that require various types of work, such as researching, analysing, presenting, and creating. Carlos will assess core skills within these categories individually, in addition to traditional tests. He also plans to have students evaluate their digital skills weekly, through peer discussion and feedback, either in the LMS or face-to-face. Carlos is aware that his plan is ambitious, but he is prepared to adjust the digital components as necessary.

What excites Carlos the most is the prospect of self-assessment and self-paced learning, which will enable learners to set their own goals and action plans based on the rubric. Each learner's plan and self-assessment will be securely saved in the LMS. As an experienced teacher, Carlos knows that not everything may go according to plan, but he also believes that digital tools will provide essential information to form a comprehensive understanding of each student's learning progress.

1.3 Planning social elements



Create opportunities for students to have important and safe digital encounters with each other and their teachers, which helps build a community where everyone learns together.

Learning, at its core, involves meaning-making and the establishment of new ideas and skills within a social environment. Shared vision, knowledge, and insight are essential components of this process. While learners certainly require personal space for individual exploration, the social, collaborative element plays a vital role in reinforcing learning through active participation. Digital technology not only provides a safe, equal platform for all voices, but also encourages meaningful connections and expressions across diverse social settings. The unique ability of digital technology to enable 'silent communication' further empowers introverted individuals to express themselves confidently.

In this section, we explore how digital technologies present significant opportunities to nurture social learning. Be sure to promote safe and cooperative engagement among learners when utilising digital tools, creating a space where they can exchange ideas respectfully and derive meaningful insights from one another.

Digital pedagogy considerations

Priya, an English and Social Studies teacher for students aged 13-15, is dedicated to a student-centred teaching methodology. In planning the social elements of her curriculum, she considers the digital tools available: primarily, students' own mobile phones and, occasionally, laptops. Priya recognises the critical importance of social interaction in learning, and seeks practical ways to enhance it through digital means. She is careful not to let the technology overshadow the core content and learning objectives. Reflect on these considerations alongside Priya as she strategises the integration of digital social elements into her teaching.

Consideration 1: Link social interaction to learning goals. In group tasks, goals are often shared, not individual, but the personal approach is possible to add.

- **Tip:** Plan which tasks can be achieved through different group sizes. Consider how social interaction can influence the outcome, and how you can support the individual aspects of group work. Participation in group efforts is crucial for content learning and social experience. Aim for learning objectives that encourage introverted learners to participate in group work via channels within which they feel comfortable. Digital tools may also be effective in making less extroverted individuals more visible within group work.

Consideration 2: Foster collaborative work. Emphasise the importance of a collective effort in social interactions through the use of digital tools.

- **Tip:** Use digital platforms to facilitate idea sharing, peer assistance, problem-solving, and co-creation. Aim for group work benefits like efficiency, idea diversity, and a sense of empowerment among participants.

Consideration 3: Prioritise safety and digital citizenship. Research ways to moderate digital social encounters, but where possible, aim for minimal intervention to support the development of the learner´s self-regulation.

- **Tip:** Discuss social etiquette with learners and create a group solution for applying the rules to digital encounters (see also consideration 6).

Consideration 4: Cultivate diversity and inclusion. Create a learning space where diverse perspectives are appreciated, and every student feels valued.

- **Tip:** Through the use of digital tools, everyone has the opportunity to have their individual perspectives and thoughts represented equally. This can be done, for instance, via secure class discussion forums or chat areas.

Consideration 5: Encourage spontaneous social interaction. Digital tools can facilitate unscripted peer interactions that bolster support and motivation.

- **Tip:** Set up a digital discussion space for learners to exchange ideas on topics of interest, fostering responsible online communication. Such interactions can be a valuable part of the learning process as they remain accessible for reflection and revisiting.

Consideration 6: Facilitate peer feedback. Peer feedback is vital for social integration and self-awareness.

- **Tip:** Remember that peer feedback can induce strong emotional effects that are hard to anticipate. Rehearse giving feedback: for instance, by letting students share their simple factual perceptions of sample work given by the teacher (see also "**1.2 Planning learning assessment**", consideration 6).

Consideration 7: Ensure emotional safety in feedback.
Create a system for learners to offer constructive feedback on shared work.

- **Tip:** For instance, use a safe class forum to post photos of student work, like artwork, for peers to give constructive feedback. While anonymous feedback may be used occasionally, be cautious of potential misbehaviour risks.

Consideration 8: Promote collaborative planning among educators.

Strive for a shared understanding with colleagues on utilising social features of digital tools for different age groups.

- **Tip:** You can create a collegial library of the most important social methods to be used with certain tools.

Examples of digital competencies in the context of planning social elements

Digital Safety

- Manage social data safely and effectively.
- Discuss content rights and information sharing.
- Moderate discussions and promote digital citizenship.
- Address online harassment.
- Refer to "**3.2 Accessibility & inclusion**" for further information.

Accessibility & Inclusion

- Utilise assistive technologies for social engagement.
- Embrace cultural diversity and inclusivity.
- Facilitate diverse social interactions with digital tools.
- Foster a safe and respectful digital space.
- Refer to section 3.2 for further information

Digital Work

- Use digital platforms for collaboration.
- Communicate effectively via email, chat, and video.
- Express ideas through various online media.
- Build and maintain a professional learning network.
- Refer to "**3.4 AI & Analytics**" for further information.

AI & Analytics

- Leverage AI for social personalisation.
- Employ NLP tools for communication.
- Understand AI feedback mechanisms and their scope.
- Analyse social interactions with AI tools.
- Refer to section 3.4 for further information.

Elements of planning social elements

Priya will select an English learning application that is suitable for her students' age group, engaging, interactive, and adaptive to individual learning needs. She will create a secure **messaging group** for her students, which they can access through their mobile phones or computers, to encourage group discussions and peer learning.

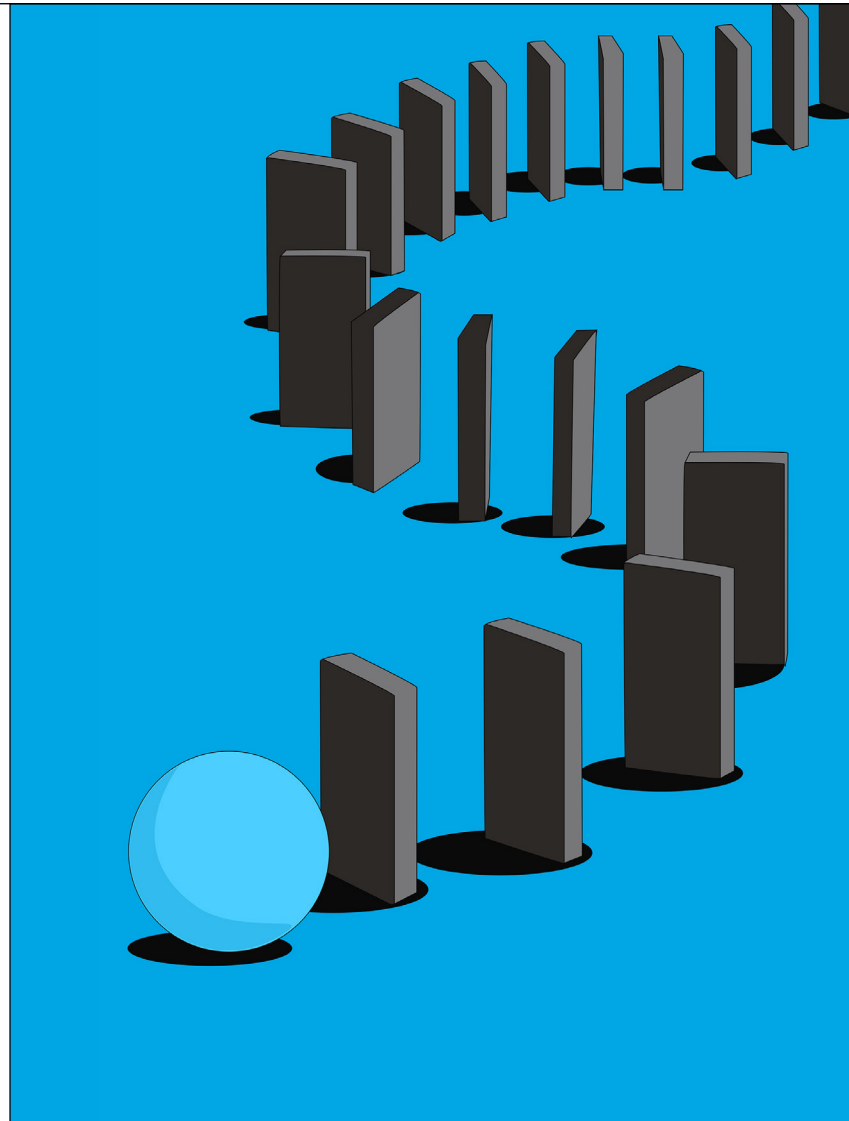
Together, they will establish ground rules for safe and respectful communication within the group, prohibiting bullying, spamming, swearing, and the sharing of sensitive personal information. Priya will encourage her students to use the messaging group as a space to share their experiences with the learning application, support one another, and provide feedback. She will regularly monitor the group and intervene when necessary.

Priya's aim is for her students to use English not just in the classroom, but also in their everyday lives. She will ask them to use the messaging group to share instances of how they engage with English in various contexts, such as while watching movies, listening to music, reading books, playing games, or travelling. She will also assign creative tasks that require an authentic use of English, like sharing artwork, making podcasts, or creating videos.

The students will learn to provide peer feedback and gain self-confidence. Priya anticipates that even the quieter students in the classroom will show creative and active participation in the online discussions, which will, in turn, lead to increased involvement in face-to-face interactions.

1.4 Long-term planning

In digital pedagogy, it's really important to carefully include tech tools in the big picture of teaching and learning.



> **It is essential to understand how different technologies might fit into longer-term planning and our understanding of the bigger picture. Amid the rapid introduction of digital tools, taking a moment for deliberate implementation is crucial to avoid hasty incorporation without considering the deeper and broader implications. This planning phase delves into the critical aspects of data security, the tool's long-term impact on learners, and the full utilisation of its potential, ensuring a thoughtful and comprehensive approach to integrating technology into the learning journey.**

In this section, we delve into the significance of period and long-term planning within digital pedagogy. Thoughtful planning over extended periods is essential for seamlessly integrating digital technology into all facets of the learning journey. This includes goal setting, assessment, work-life balance, and ensuring accessibility for all learners.

Digital pedagogy considerations

Samuel, an enthusiastic new teacher of Swahili language and maths for children aged 6-12, is excited about the prospect of incorporating the school's new tablets and laptop computers into his curriculum. As term 1 commences, he is eager to integrate these devices into his term plan, utilising a specialised app designed to teach Swahili vocabulary and expressions, as well as math skills. This marks Samuel's first opportunity to use the school's devices with his students, prompting him to carefully consider how to effectively implement this digital tool over the course of the term. He recognises the need to reflect on key questions and gather suggestions that will guide him in this new digital endeavour. Join Samuel as he navigates through the essential aspects of planning for the long-term use of digital tools in education.

Consideration 1: Digital tool for planning teaching and learning.
Get acquainted with the organisational features of digital tools. Weigh the advantages, such as structured layouts and preset tasks, against potential dependencies and required permissions.

- **Tip:** Centralise information and tools to simplify the user experience for children. Allocate ample time for tool familiarisation.

Consideration 2: Structural considerations:
Evaluate the role of each digital tool within the curriculum. Is it a core component throughout the school year, a tool for specific periods, or used only occasionally?

- **Tip:** Assess the compatibility and collective impact of different digital tools early on. Understand their significance in relation to learning objectives and other tools. Integrate digital tools into the learning process as more than just rewards; consider their potential to enrich content understanding and develop digital skills.

Consideration 3: Collegial or other staff member support:
How many staff members might there be in your classroom, and how can you share the central aspects of using digital tools in teaching and learning? Consider shared pedagogical planning (i.e., goals, assessment, contents, assignments, differentiation), testing the tool, rehearsing it with learners, technical maintenance, reporting problems and so on.

- **Tip:** Work together to map out the digital resources available, identifying how they can enhance learning across various subjects or age groups. Prioritise careful planning to determine potential areas where the teacher may require extra classroom assistance when using a particular tool.

Consideration 4: Assessment strategy:
Explore how digital tools can enrich assessment practices and pinpoint ideal moments for digital assessments within the term.

- **Tip:** Pinpoint key tasks that could benefit from digital learning assessment methods. Learn about the automated feedback capabilities of digital tools (refer to "**1.2 Planning learning assessment**" and "**2.4 Assessment and feedback" for more on assessment**).

Consideration 5: Self-paced learning & game-based learning:
Design a framework for self-paced learning opportunities that promote student empowerment and autonomy across their educational journey.

- **Tip:** Establish learning paths that cater to individual interests, ensuring foundational knowledge is in place for subjects that require it. In parallel, consider incorporating game-based learning to provide an engaging, interactive way for students to reinforce concepts and skills at their own pace.

Consideration 6: User identification and digital skills:
Streamline the onboarding process for digital tools and practice essential skills.

- **Tip:** Allocate time for practical training, and foster accountability for device upkeep.

Consideration 7: Inclusivity:
Ensure that all learners have equal access to lessons, materials, assignments, social collaboration, assessment, and support. Learning objectives should be rooted in pedagogy and the curriculum, not personal preferences.

- **Tip:** Use digital tools to display objectives clearly, promoting transparency and equal access for every student (see more in **"3.2 Accessibility & inclusion"**).

Consideration 8: Accessibility:
Recognise the necessity of assistive technology for some learners.

- **Tip:** Invest time in mastering accessibility features that can benefit all students, not just those with specific needs (see more in section 3.2).

Consideration 9: Analytical information use:
Prepare to utilise and evaluate data obtained from digital tools, such as examining trends in learning success levels, or gaining insights into what the data may not explicitly capture, such as a student's personal emotional experiences.

- **Tip:** Understand that meaningful analytics may take time to develop. Learn to effectively read and interpret this data to inform your teaching and to make data-driven decisions.

Consideration 10: Preparedness for unexpected situations:
Ensure you are equipped for unforeseen events like power outages or security issues.

- **Tip:** Always have a backup plan that doesn't rely on digital tools. Establish protocols for saving and sharing student work during poor network connectivity scenarios.

Examples of digital competencies in the context of period / long-term planning

Digital Safety

- ✓ Understand data storage, saving, and sharing protocols.
- ✓ Determine whether tools are free or purchased, and how they handle learner data.
- ✓ Ensure data management and security responsibilities are clear.

Accessibility and Inclusion

- ✓ Be proactive about assistive technologies based on student needs.
- ✓ Explore assistive features in key digital tools.

Digital Work

- ✓ Familiarise yourself with a range of digital tools, including cloud services, LMS, presentation software, and collaboration tools.
- ✓ Develop skills to navigate the internet, evaluate information, and create digital content.
- ✓ Understand the UI from a learner's perspective and details of learner onboarding (e.g., password management).
- ✓ Prepare for technical issues like internet or electricity outages, malfunctions, and security risks.

AI & Analytics

- ✓ Learn how AI/analytics can tailor content, aid in differentiation, and offer feedback.
- ✓ Understand how AI can assist in lesson planning and identifying focus areas in learning or content.

Practical pedagogical example with Samuel

As Samuel meticulously plans for the upcoming term, he is mindful of the diverse needs of his students. Among them is a bright-eyed pupil with low vision, whose eagerness to learn Swahili is as profound as that of his peers. Samuel is determined to ensure that the digital language tool that will be used with their tablets and laptops is not only a gateway to cultural exploration, but also, a beacon of inclusivity. Samuel is grateful for the support he is receiving from teaching assistant Amina, who will be primarily aiding the student with low vision, while also monitoring the performance of the other pupils.

Samuel and Amina delve into the **accessibility features** of the digital tool, learning to adjust font sizes, contrasts, and audio descriptions, ensuring that their student with low vision can navigate the platform with ease. Samuel's and Amina´s commitment to inclusivity is unwavering, as they believe that every child deserves equal access to the wonders of education.

With the digital tool now thoroughly explored, Samuel uses a thoughtful letter to the students' caregivers that was created in the previous term by another colleague. He makes his own additions, articulating the **educational benefits** and the **safety features** of the tool and emphasising its adherence to non-discriminatory practices and stringent privacy standards.

Samuel plans to incorporate the tool into his lessons during term 1. He chooses to focus on specific themes of Swahili vocabulary, such as greetings, colours, animals, and food. His students are assigned to use the tool independently to practice their reading, writing, and listening skills. With Amina's guidance and the aid of the analytical information provided by the tool, the group will be divided into smaller units to monitor their students' progress and performance more closely. Additionally, they will supplement the app's automatic feedback with Samuel's personalised feedback and encouragement.

The key concept of utilising the digital tool is to engage students with the app, which in turn allows Samuel and Amina to offer more dedicated, personalised support to the students. This strategy also enhances their comprehension and communication abilities. With these skills in mind, Samuel aims to later develop supplementary materials for math that integrate Swahili vocabulary also into the math exercises.

1.5 Lesson planning

Designing each lesson with digital tools is like a carefully choreographed dance of teaching methods, where every move is thoughtfully planned to fit into the whole year's learning journey.



> **The rhythm of a single lesson beats to the drum of the learner's engagement, where digital tools serve as the supportive accompaniment to their academic journey. Recognising the multifaceted roles these tools play – from sparking motivation to providing structured exercises and personalised feedback – is essential in creating a lesson that resonates with every student's unique learning tempo.**

Digital pedagogy considerations

In Maria's classroom, the limited number of tablets is not a constraint, but an opportunity for targeted learning. As a teacher of Portuguese and music, she sees these devices as more than just incentives –they are keys to unlocking a richer, more dimensional educational experience. With only a handful of tablets available, Maria is strategic in her approach, planning to incorporate them into her lessons to deepen her students' engagement with both subjects. She contemplates the best use of technology to support her teaching: which digital resources can transform the learning of Portuguese and music into an interactive and enjoyable journey? How can the tablets facilitate a more profound connection with the material? Maria's vision is clear: a lesson where each tablet is utilised with intention, guiding her students through musical and linguistic landscapes in a way that is both enlightening and captivating.

Consideration 1: Finding the meaning of digital tools in a lesson is paramount to applying them effectively. It is fruitful to view digital pedagogy as a series of separate tasks that involve different levels of interaction with one or more digital tools. At the core of digital pedagogy is its ability to encompass the bigger picture: the ultimate objectives are always consistent with the tasks and assessments at hand.

- **Tip:** During a lesson, digital actions may vary from watching a video, taking notes, searching for information, playing a game, working on a shared document, or attending an online distance lesson. A single task in a digital tool may be a crucial part of the whole structure of learning. Not everything needs to be digital in digital pedagogy.

Consideration 2: The larger meaning of a digital tool in learning is in relation to the depth of a cognitive action aimed at learning.

- **Tip:** One good source for understanding the meaning of technology in a learner's cognitive actions is Bloom's digital taxonomy. It has clearly connected digital actions and the levels of higher cognitive learning actions (see more in "**3.5 Digital pedagogy theory**").

Consideration 3: Is there a potential collegial support during the lesson? It is beneficial to plan how other colleagues or staff members would help you in carrying out your plans with digital pedagogy. Are they also familiar with the intended digital tools and pedagogical objectives you might have in mind?

- **Tip:** If it's possible to have additional staff members, it is suggested to break the group into smaller sub-groups to provide more personal help with the digital tools in use. On the other hand, support staff can help observe and take care of the technical elements, while the teacher takes care of the pedagogical side.

Consideration 4: Digital Skills: Using digital tools during a lesson involves learning about the tool itself – for the teacher as well.

- **Tip:** Let learners discuss and express themselves, providing space to share frustration, questions, experiences, and findings. Additionally, aim for a collective understanding of digital tools, where the teacher is also an active learner.

Consideration 5: Does a digital tool inherently aid lesson planning? Some digital tools may provide the option of creating and sharing lesson plans, or to evaluate about the overall structure of the lesson. Other tools, like learning management systems, may provide different ways to provide a lesson structure for the pupils, where you can create discussions and share materials or assignments.

- **Tip:** Some tools or digital learning materials have inherent tips for teachers, like pacing, reflective questions, or suggestions for learner work. These are good to revise and consider beforehand. Other digital tools, like educational games, can serve as a lesson plan itself, but be mindful that there should always be a more comprehensive plan in place that can address the simple question of why the game is being played at a particular moment.

Consideration 6: Flipped learning is a useful practice in supporting meaningful digital work and enabling additional time for teacher-learner interaction. In flipped learning – with the help of a digital environment – the teacher creates little portions of material that students can learn in advance, either independently or in small groups. During the lesson, the teacher can then provide differentiated personal support to individuals based on their understanding of the pre-learned material, rather than spend the time teaching the content to the class as a whole.

- **Tip:** Recording short videos to explain content to learners and sharing it with them to be pre-learned at home is a proven functional example. The most important thing in flipped classrooms is to be attentive to individual learners who may find the content challenging (see more in "**3.5 Digital pedagogy theory**").

Consideration 7: Time spent on technology during a lesson is tied to the tool's purpose. Learning is rarely limited to a single digital tool, but rather, it encompasses a variety of tasks that may require digital assistance.

- **Tip:** Plan time for engagement with digital tools, but balance it with breaks to ensure rest for eyes, mind, and body. Furthermore, always be ready to work without technology. For example, writing with pen and paper can be combined with a digital tool, where pen and paper are used for the planning of a story, and the digital tool is used to produce it.

Consideration 8: Bridging the gap between digital and analogue: Plan to bridge the gap between digital and analogue work environments to help students perceive a digital tool´s role in their learning.

- **Tip:** Especially with younger learners, use digital game characters in analogue teaching – or craft visual analogue representations of digital environments – to help them better understand and integrate technology into their daily lives. For instance, create together with students a house-like representation of the digital environment with "rooms and hallways", or assign real-life names to digital tools, e.g., referring to a chat space as a "campfire".

Examples of digital competencies in the context of lesson planning

Digital Safety

- Ensuring caregiver consent on digital tools using child data is correctly obtained.
- Understanding and moderating open discussions for social safety.
- Safeguarding student data and personal information.
- Guiding students in strong password creation and management.
- Responding to digital safety emergencies or incidents.
- Using safety tools like content filters for online protection
- Refer to "**3.1. Digital safety: Key areas**" for further information.

Accessibility & Inclusion

- Using assistive technologies for accessibility.
- Knowing the core accessibility features in the digital tools used.
- Ensuring digital tools are accessible to all learners.
- Refer to "**3.2 Accessibility & inclusion**" for further information.

Digital Work

- Recognising physiological effects and risks of digital work.
- Utilising everyday digital work tools.
- Understanding user interfaces from a learner's perspective.
- Guiding students in safe digital work practices.
- Refer to "**3.3 Digital competence frameworks**" for further information.

AI & Analytics

- Using analytical data for learner performance insights.
- Employing AI for assessment and analysis.
- Evaluating AI outputs for potential biases.
- Refer "**3.4 AI & Analytics**" for further information.

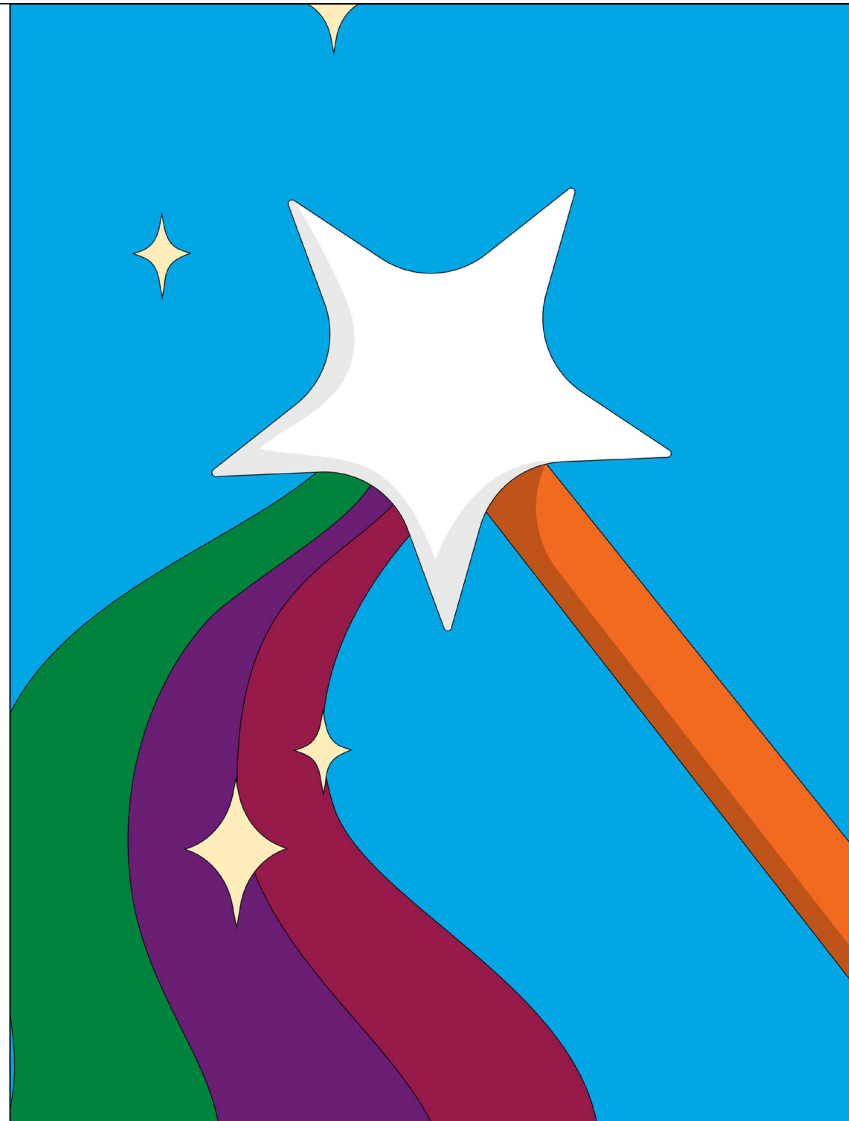
Example of digital competencies in the context of lesson planning

In Maria's classroom, the tablets became more than just tech gadgets; they were the canvas for her students' rhythmic and linguistic artistry. Opting for tablets was a deliberate choice, enabling the recording of both video and audio – a crucial feature for the musical task at hand.

Maria's plan was simple yet effective: divide the class into three, each group mastering a unique rhythm pattern. With a tablet in hand, they'd find a quiet corner to capture a one-minute performance, introducing themselves and delving into the rhythm's Portuguese roots.

Maria realised that the digital tool was essential for making the group task both possible and successful, even though the tool itself was not the central part of the content. The tool enabled her to capture and document the students' learning process and outcome. It also motivated the students to practice and perform their best, knowing they would share and watch their videos later. Tablets also facilitated spontaneous peer feedback and learning, as the students could comment and learn from each other's videos. Maria was amazed by the results, and so were her students. They enjoyed watching and commenting on each other's videos and appreciated the diversity and creativity of their performances.

1.6 Preparing the content



Grasping the symbiotic relationship between digital teaching methods and content can have a big impact, enriching learning and fostering deeper student comprehension and connections.

The pivotal role of preparing content in digital education revolves around determining the desired knowledge to be imparted and learned, emphasising the teacher's central role in structuring the learning experience.

Content is the cornerstone of education, posing the essential question: what is to be learned? Digital pedagogy presents content in two distinct ways: as the core substance of learning, and as a component of the digital learning environment itself. The range of content delivery through digital tools spans from traditional, teacher-led instruction to advanced, automated systems tailored to individual learners. Despite the method, the importance of teacher oversight remains paramount, ensuring that technology serves as a bridge to knowledge rather than a barrier.

Digital pedagogy considerations

Fatima, a talented Arabic and French teacher, embraces the role of an early adopter for a novel digital language learning game at her school. With a reputation for efficiency, the application promises an automated learning structure complete with personalised feedback. Yet, Fatima harbours concerns about the breadth of content; she fears it may be overly focused on a singular theme or lacks the cultural depth found in songs, stories, and traditions. To address these concerns, Fatima must meticulously examine the app's content delivery and consider various aspects crucial for planning its integration into her lessons, ensuring it aligns with the diverse educational needs of her young students.

Consideration 1: Align the content with the learning objectives. Evaluate digital resources like games or simulations to ensure learning objective alignment. Consider the learner's perspective and identify any gaps or excesses in content.

- **Tip:** Collaborate with colleagues to share insights and reduce the need to design content from scratch.

Consideration 2: Adaption of ready-made digital content, like e-books, to be suitable or flexible for different learner needs is essential to evaluate in advance.

- **Tip:** The ability to differentiate content and break it down into manageable units is key. Reusing and sharing resources with colleagues is encouraged.

Consideration 3: Analyse the automated content. Understand how gamified learning applications personalise content based on user data.

- **Tip:** Look out for phases within the content where learners excel or struggle.

Consideration 4: Creating your own content. Ensure your content is based on reliable sources and provides references.

- **Tip:** Encourage students to create content using both their imagination and reliable sources, keeping content ownership rules in mind. If utilising generative AI for content creation, be aware of potential output inaccuracies.

Consideration 5: Engaging content is key to motivation and engagement. Incorporating exciting narratives, gamification, and multimodal elements like videos, audio, and animations can enhance the learning experience.

- **Tip:** Explore the understanding of digital citizenship, including content ownership and proper use of others' work.

Consideration 6: Teachers must critically evaluate the trustworthiness and cultural appropriateness of materials for their learners. Reliability is the most crucial aspect of content, and it must be checked well before use.

- **Tip:** It's wise to consistently validate content sources, and when assessing materials, it's valuable to collaborate within a professional network.

Consideration 7: The digital environment itself is a learning target. Effective use of digital tools requires continuous learning and technological awareness.

- **Tip**: Identify different usage patterns and phases, and organise brief "rehearsal camps" for learners, or encourage peer teaching for better understanding and skill development.

Examples of digital competencies in the context of preparing the content

Digital Safety

- Understanding of copyright laws and fair use.
- Guidance on safe internet browsing and source verification.
- Response strategies for inappropriate content sharing.
- Use of content filters and privacy tools.

Accessibility & Inclusion

- Reviewing digital content for accessibility.
- Creating accessible documents with proper formatting.
- Adding closed captions and transcriptions for audio-visual content.
- Utilising AI tools for accessibility tasks.

Digital Work

- Creation of various digital materials including presentations, videos, and interactive content.
- Curation of digital resources from online platforms.
- Integration of storytelling and multimedia for engaging content.
- Ensuring content accessibility across different devices.

AI & Analytics

- Use of adaptive tools for personalised content.
- Monitoring student engagement and progress with analytics.
- Evaluation of AI-driven content for effectiveness.

Example of preparing digital content

Fatima, with years of experience teaching Arabic and French to young learners, was selected to pioneer the use of a new digital language learning game at her school. The tool, known for its automated learning structure and personalised feedback, initially seemed promising. However, as Fatima explored the application, she realised it was heavily focused on vocabulary, grammar, and pronunciation, neglecting the rich cultural and historical contexts that bring a language to life.

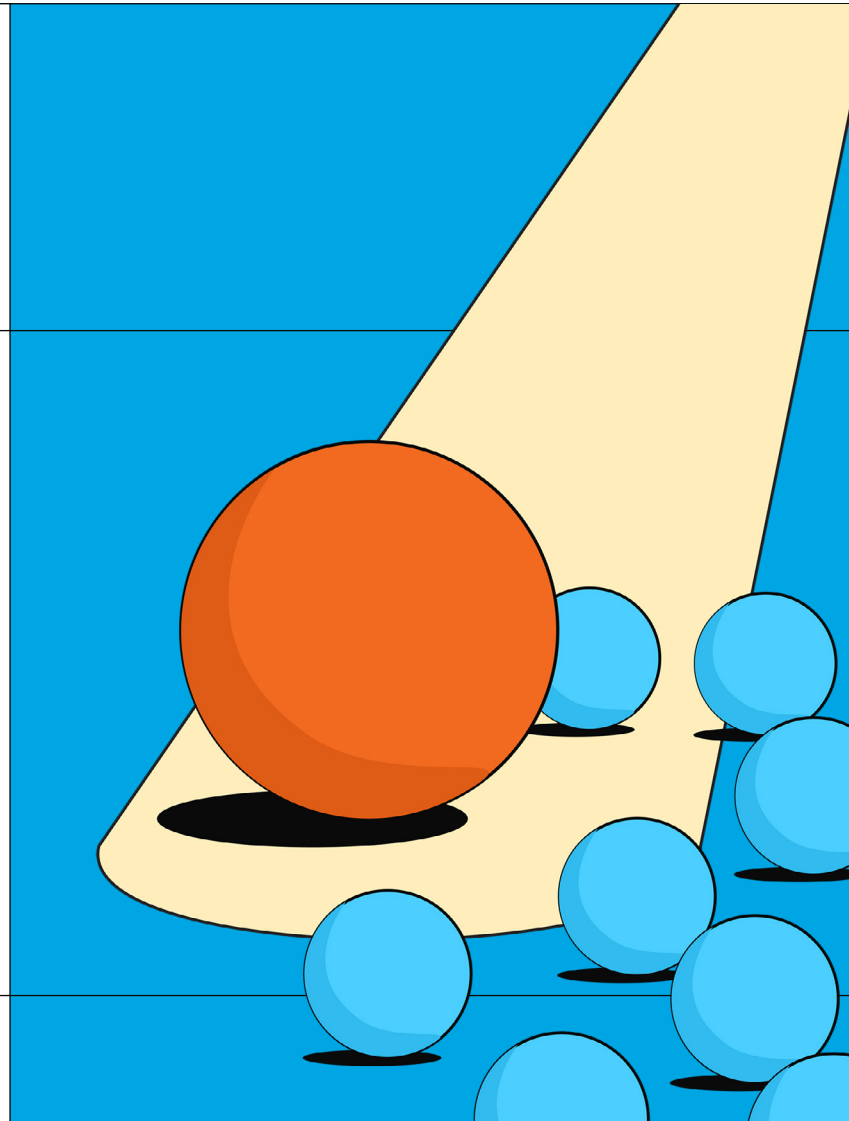
Concerned that her students would miss out on the traditions, values, and stories integral to language learning, Fatima took it upon herself to fill this gap. She began by supplementing the digital tool with a carefully selected collection of schoolbooks and online resources. She introduced her students to traditional Arabic tales, providing translations and explanations to bridge language and culture. Fatima also scoured the internet for authentic texts and media – poems, songs, videos, and articles – that would immerse her students in the languages' cultural heritage.

To integrate these resources with the digital tool, Fatima designed special research assignments that prompted her students to seek out additional information. This approach turned the classroom into a dynamic learning environment where students actively contributed to a growing library of cultural knowledge. Their explorations didn't stop there; they began to share their discoveries in an online blog, transforming it into a vibrant forum where they taught each other about the nuances of Arabic and French cultures.

The digital game, while not the sole focus, became a catalyst for confidence-building. It encouraged students to become more independent and bolder in their language use, setting the stage for a deeper, more comprehensive understanding of the languages they were learning. Fatima's dedication to a well-rounded educational experience demonstrated the power of combining digital tools with teacher-curated content to create a rich, multifaceted approach to language learning.

2

IMPLEMENTING DIGITAL PEDAGOGY



Digital pedagogy practices serve as the cornerstone of effective learning in a technology-driven educational landscape. This chapter delves into the critical domains of digital pedagogy, offering educators a comprehensive understanding of its fundamental components. More than just an overview, it provides a strategic framework for educators to personalise and apply these practices, equipping them with practical insights to navigate and optimise each area of digital pedagogy in their teaching.

Chapter contents

2.1. Social & collaborative learning

2.2 Problem-solving & thinking

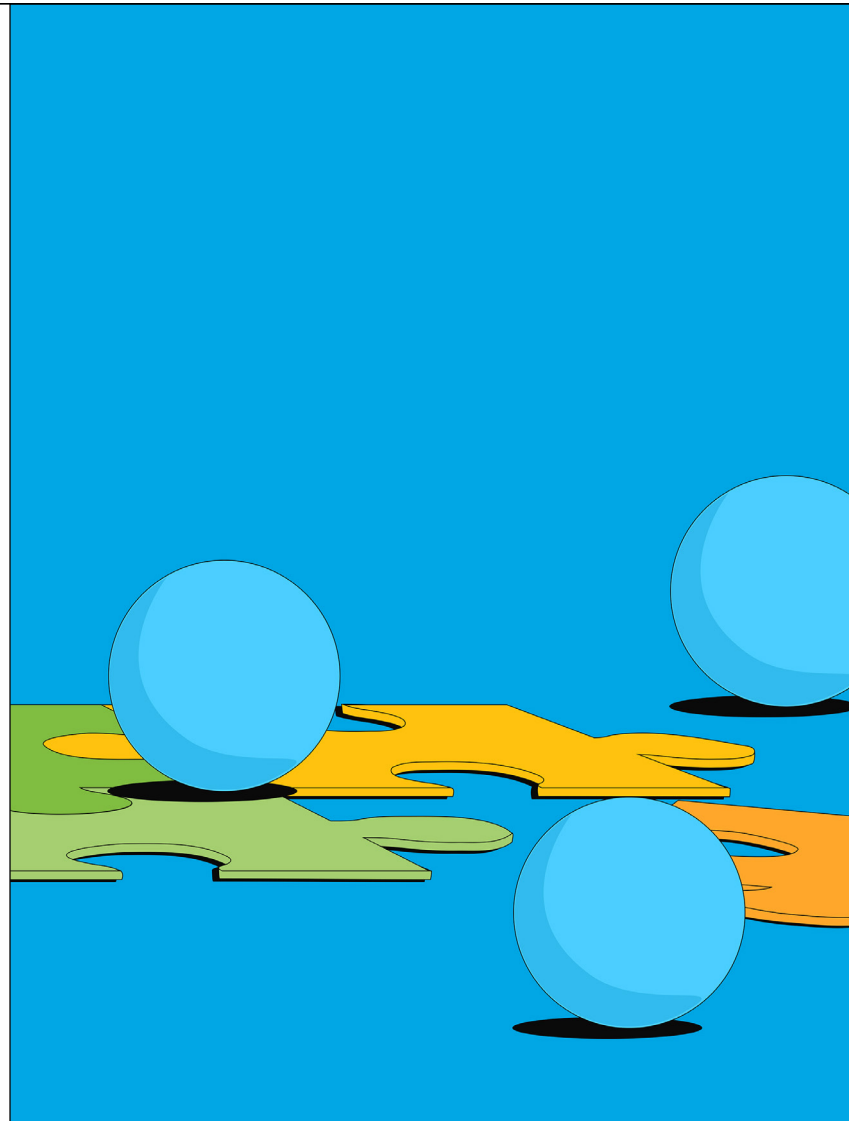
2.3 Play and creativeness

2.4 Assessment and feedback

2.5 Learning to learn

2.1 Social & collaborative learning

Help students communicate and collaborate in a safe and logical manner, strengthening their teamwork skills and collective intelligence



This section underscores the fundamental role of group work in acquiring crucial digital skills. It emphasises the individual learner's right and opportunity to engage in collaborative experiences, especially when incorporating technology into the teaching-learning experience.

Leveraging educational technologies can facilitate meaningful exchanges between students, nurturing their ability to collaborate digitally. By sharing their work, insights, and feedback in a secure environment, they not only learn to navigate the digital landscape, but also develop the confidence to express themselves and work effectively, whether solo, in pairs, or as part of a team.

Digital pedagogy considerations

Nguyen, a dedicated class teacher for two years, faces the challenge of integrating technology into his bustling classroom of 38 eager 8- to 9-year-olds. With a limited number of laptop computers at his disposal, he ponders over their potential to enhance social learning. Each device is like a portal for two students, a shared window into a world of digital collaboration. As Nguyen contemplates the best approach to foster meaningful connections through these screens, let's join him in exploring the various digital pedagogy considerations that can transform his classroom into a hub of interactive learning.

Consideration 1: Supporting learner emotional safety: In interactive digital environments, it's vital to ensure the emotional well-being of learners. The digital setting should promote focus, and not detract from learner concentration.

- **Tip:** Engage in dialogue with learners about the appropriateness and responsibility of digital and F2F social interactions. Collaboratively create house rules that recognise the value of constructive disagreements and discussions. Practice providing and evaluating digital feedback, which can later be reviewed for quality.

Consideration 2: Optimising timing and placement of digital interaction: Digital collaboration is typically associated with distance learning, but in a traditional classroom setting, it can also provide a platform for for written discussions, where ideas can be articulated more clearly and participants have time to fully absorb the content. Both written and spoken language can be used, and silent digital discussions can be especially effective in larger classes.

- **Tip:** Utilise the social element to enhance motivation, share knowledge and experiences, facilitate problem-solving, collect information, or conduct peer feedback (see also consideration 4, and Bloom's digital taxonomy in "**3.5 Digital pedagogy theory**"for further reading).

Consideration 3: Develop strategies to help learners engage with each other's work and ideas, fostering a collaborative environment for knowledge building.

- **Tip:** Collaborative group learning activities that involve finding and attaching new information to create, for instance, mind-maps, presentations, podcasts, or video scripts are excellent for practising collaboration and knowledge analysis. Encourage systematic and repetitive use of digital tools to help in processes such as information gathering. This also enables remote participation if needed.

Consideration 4: Use digital tools as supplementary channels for communication, enhancing dialogue among learners.

- **Tip:** Remember that technology facilitates various means of expression not limited to text. Emojis, images, videos, and audio can all be part of the communication toolkit, offering diverse means for learners to convey their thoughts and ideas. This may prove to be especially beneficial for younger learners.

Consideration 5: Consider the formality, the tone, and the borders of the social interactions. Determine whether digital interactions are confined to school premises or if they can extend beyond them, and whether they are always monitored.

- **Tip:** In class, discuss the different contexts for digital interactions, likening them to various rooms in a building, and create guidelines for each 'room'. Offer private channels for learners to communicate with teachers, particularly in remote learning scenarios. If appropriate and with consent, explore the use of actual social media channels in education, while respecting individual choices regarding the use of commercial platforms.

Consideration 6: Monitor the impact of digital tools on face-to-face interactions both in and out of the classroom.

- **Tip:** The goal of using digital tools in the classroom is to enhance – not replace – face-to-face dialogue. They should serve to broaden discussions and allow for personal expression within a safe group setting. Additionally, digital tools can sometimes lead to an increase face-to-face conversation when, for instance, an initial digital assignment or conversation holds very interesting, relatable, or otherwise motivating content for learners.

Consideration 7: Cultivate a professional network among teaching colleagues.

- **Tip:** Building connections with local and remote colleagues is vital. Local networks can facilitate collaborative teaching planning, while broader networks can offer support with technical issues and the exchange of effective digital pedagogical practices. Often, many colleagues are thinking exactly the same questions as you are, and the answers might sometimes be very simple, yet effective.

Examples of digital competencies in the context of social & collaborative learning

Digital Safety

- Understand safe identification and login processes for learners, including who has the authority to edit credentials such as real names, nicknames, pseudonyms, or photos.
- Ensure that learners' personal expressions are safeguarded from reaching the open internet or any broader digital social space unless explicitly necessary.

Accessibility & Inclusion

- Perform user testing with platforms or tools prior to full implementation, ensuring compatibility with assistive technologies for social interaction.
- Confirm that interactions can be conducted through various formats, including text, videos, and audio, to accommodate diverse needs.

Digital Work

- Gain a thorough understanding of user interfaces (UIs) from the learner's perspective, identifying key steps to help learners become acquainted and feel secure.
- Determine whether the social elements of a tool require an Internet connection, or if they can be facilitated differently in areas with limited connectivity.

AI & Analytics

- Stay informed about how AI and analytics respond to social interactions, and whether they can provide measurable and reliable data of for instance on student participation in social activities
- Utilise AI tools for moderating social interaction content and for assisting with translations during discussions.

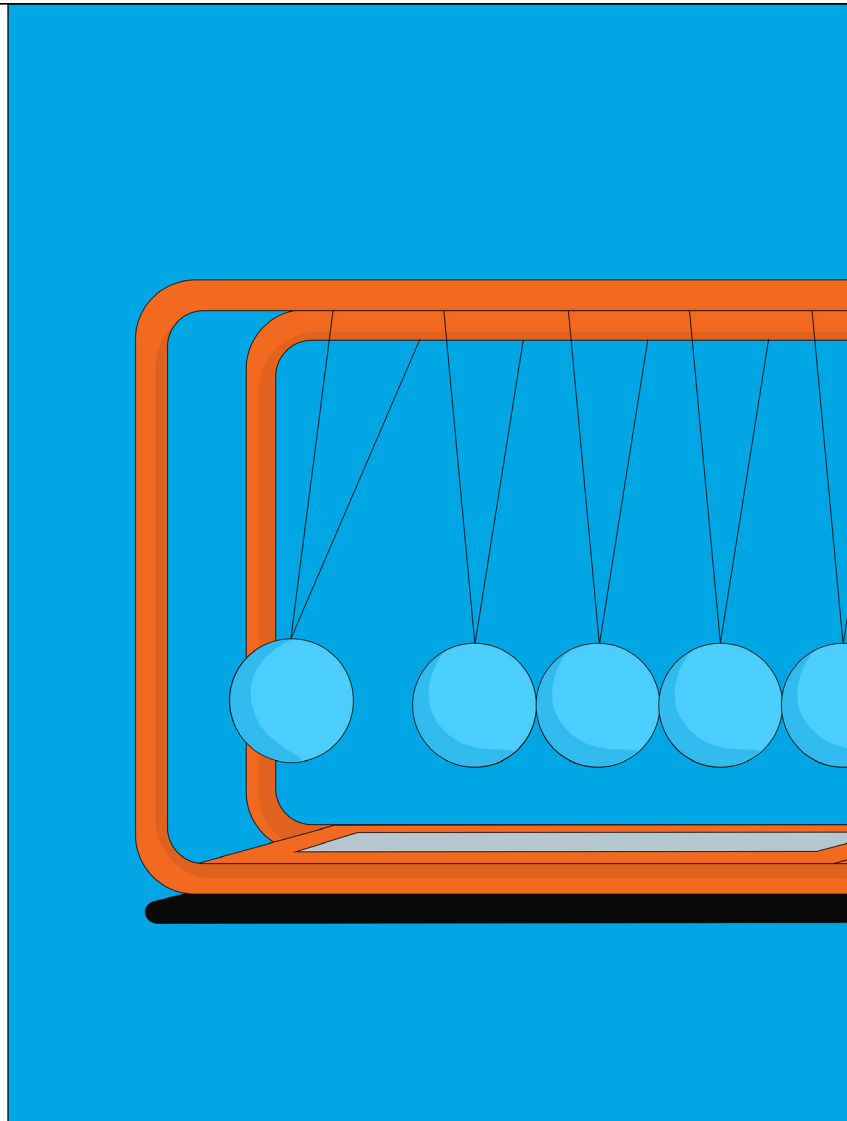
Example of digital competencies in the context of social & collaborative learning

Nguyen has found that incorporating laptops into his classroom has significantly bolstered his students' social learning skills and overall academic performance. With a class of 38 students and 20 laptops at his disposal, he strategically pairs students to work collaboratively on curriculum-related topics. Embracing a flipped learning model, Nguyen provides a variety of materials – ranging from traditional textbooks to digital resources and AI-generated content – allowing students to engage with new concepts during class. This approach not only facilitates peer-to-peer interaction, but also enables Nguyen to offer focused support to those who need it most.

As he observes his class, Nguyen notes a marked increase in student engagement and curiosity. The flipped classroom method proves to be a success, accommodating individual learning paces and fostering mutual assistance among students. Despite his wish for each student to have their own device, Nguyen occasionally allows the use of mobile phones to access pre-prepared materials, further personalising the learning experience.

The use of laptops has also enhanced the students' confidence, creativity, and focus, particularly in problem-solving tasks and self-expression. While Nguyen ensures the availability of analogue materials for those who prefer them, he appreciates the quiet, digital discussions that technology facilitates in his large class. Pleased with the outcomes, Nguyen is committed to continuing the use of laptops as a tool for enriching the educational journey of his students.

2.2 Problem-solving & thinking



Learners must be fully engaged and involved in their learning to succeed. Tech tools can help by giving them custom tasks, encouraging teamwork to solve problems, and making it easier to share thoughts.

> **Digital tools serve as a means for learners to express their thoughts in varied forms and address their need for stimulating tasks and assignments, which ultimately boosts motivation. With the help of these resources, including games and art, learners are provided with the opportunity to explore these exciting possibilities and fulfil their thirst for dynamic learning.**

Technology enhances engagement with learning materials and aids in the comprehension and organisation of complex subjects. It offers clear motivational benefits, allowing educators to assist students in concentrating on and thoroughly engaging with content that is personalised to their individual needs.

Digital pedagogy considerations

Aisha, a teacher of 7- to 9-year-old students, is dedicated to enriching her class's learning experience by integrating literacy, math, and geography. She utilises the rich tapestry of natural resources – mountains, deserts, rivers, and coasts – as a backdrop to enhance literacy skills. With just one computer and a projector at her disposal, Aisha is exploring ways to digitally support problem-solving and critical thinking. Let's join her in thinking about some digital pedagogy considerations that could be useful in leveraging technology effectively.

Consideration 1: Align learning objectives with the learner's perspective: Ensuring that the challenges within assigned tasks are relevant to real-world problem-solving is particularly useful here. Multidisciplinary approaches can ignite learners' imagination, opinions, and discussions, fostering a thirst for knowledge and solutions.

- **Tip:** Provide structured learning goals that are attainable and encourage active participation. Consider setting goals for pairs or groups for larger problems, ensuring each learner feels the satisfaction of contributing to more challenging tasks (see also "**1.1 Setting learning objectives**").

Consideration 2: Recognise writing as a high-level cognitive activity. Digital tools may enhance the quality or ease of writing experiences, and assist in building efficient support memory strategies.

- **Tip:** Offer learners partially completed digital files, instructions, or problem statements to help them commence tasks like report writing, note-taking, or storytelling. Writing often serves as the initial step in task planning, including the creation of artistic content.

Consideration 3: **Stay informed about the challenge level presented by automated learning tools**. When using an adaptable technology (like gamified learning), understand how the challenge level changes.

- **Tip:** Discover how a tool adjusts the difficulty level for learners, allowing you to anticipate, monitor, and adjust as needed, even if the tool is preset to the optimal challenge level.

Consideration 4: Assess whether technology encourages learners to think critically. Include tasks that require analysis, evaluation, and drawing conclusions.

- **Tip:** Encourage learners to question assumptions and think critically about the subject matter. Often simple, teacher-led discussions in the classroom that are then extended onto a digital platform (or vice versa) can help learners find their voice in a group.

Consideration 5: Practice digital information searches, and support learners in managing complex material and mitigating potential overwhelm. When using generative AI, verify sources and watch for errors or biases.

- **Tip:** Create digital mind-maps together with students to help learners rephrase information in their own words, using age-appropriate resources. Introduce generative AI gradually, focusing on content that can be cross-checked with reliable sources.[8]

Consideration 6: Explore whether digital tools allow learners to transform their thoughts into various formats such as writing, drawing, speaking, photos, or videos, enabling them to create and share personal ideas.

- **Tip:** Assign appropriately sized tasks that learners can complete within a reasonable timeframe, allowing their individuality to shine through in their work.

Consideration 7: Digital tools should facilitate collaborative problem-solving, recognising the value of tackling challenges together. Problem-solving requires a blend of ideas, perspectives, information, skills, and negotiation, particularly with open-ended issues.

- **Tip:** Many edu-tech games offer group problem-solving opportunities. Investigate and analyse these options, finding ways to incorporate the benefits of group discussion/brainstorming even where the tool is not inherently collaborative.

Consideration 8: Leverage the digital technology of immersive game-like or virtual or extended reality possibilities to achieve problem-solving to be closer to real-life problems to tackle.

- **Tip:** When using, for instance, immersive films, games, or 360° videos of real-life scenarios, it allows for real-life problem-solving in a safe and engaging way.

Examples of digital competencies in the context of problem-solving & thinking

Digital Safety

- Ability to recognise how learners are identified in digital environments.
- Knowledge of secure data storage and management practices.

Accessibility & Inclusion

- Recognition of accessibility features that support various learning needs.
- Understanding that accessibility tools can benefit all users, not just those with specific needs.

Digital Work Skills

- Familiarity with essential digital resources for effective tool utilisation.
- Capability to create and manage digital notes, written content, and multimedia.
- Proficiency in navigating user interfaces from the learner's perspective.
- Understanding of key steps for learners to become comfortable with digital tools.

AI & Analytics

- Awareness of automated or AI-driven data collection features within solutions.
- Understanding of data monitoring interfaces and their accessibility to learners.
- Knowledge of whether learners can view and track their own data.

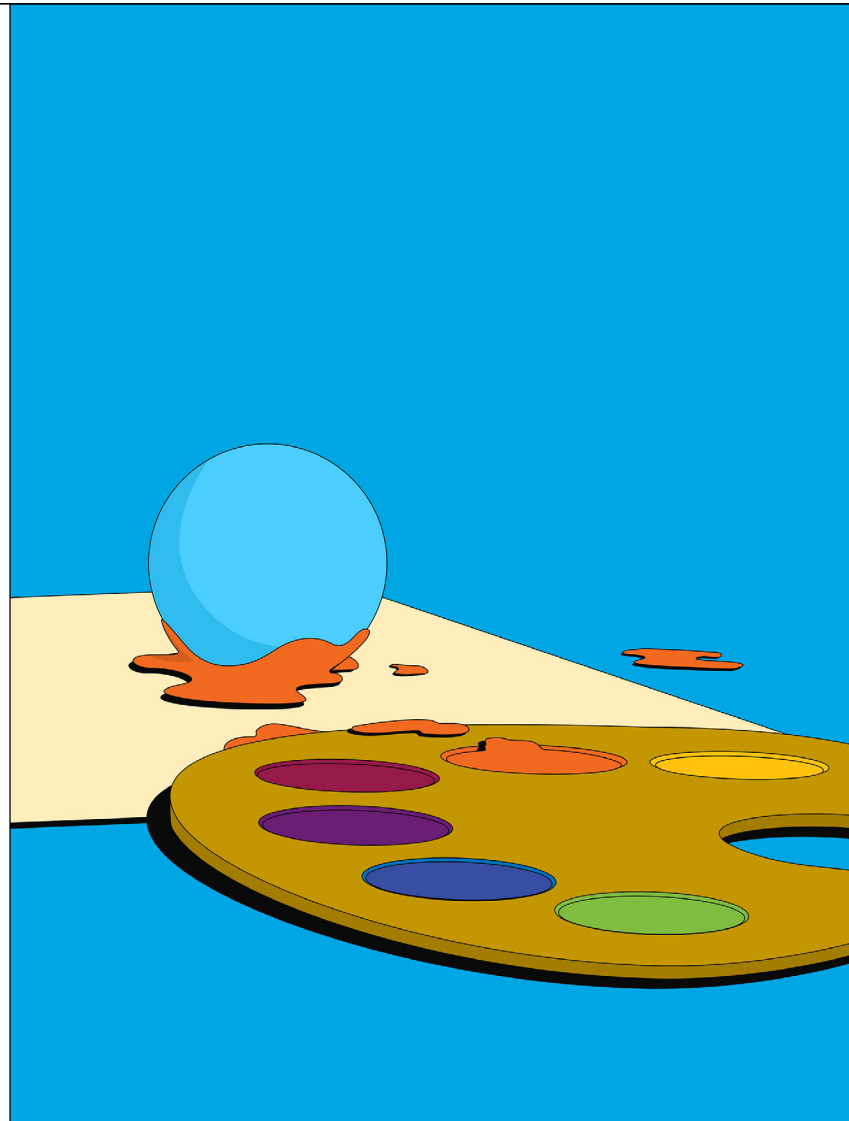
Example of digital competencies in the context of problem-solving & thinking

Aisha is intent on improving her students' problem-solving and thinking skills with the aid of a single computer and projector. Her classroom is bustling with 30 students between the ages of 7 and 9. She's chosen to adopt a project-based learning approach, where she presents her students with real-life problems, challenging them to find solutions or, if not solutions, then to gather more information about the topic.

She has devised a three-step plan to implement her approach. First, she aims to develop collective critical thinking by using appropriate real-life examples – such as student-made photos from their personal or family mobile devices – as problem statements, insightful notions, needs for improvement, and points of gratitude. Second, she assists students in collaboratively finding possible solutions, gathering more information about the issue, or making connections to curriculum subjects or themes. Third, she ensures that the overarching objective of using digital tools to facilitate practical, collaborative construction is achieved – a mind map, a presentation, a story, a photo collection, or a collaborative expression of a thought.

Aisha has observed that her students are more engaged and motivated when they interact with the computer and projector, and has found that the project-based learning approach is effective in her classroom. The students can meaningfully apply their problem-solving and thinking skills to real-life situations, learning from both each other and the various resources available to them.

2.3 Play and creativeness



Students become more motivated and engaged when they learn with tech that includes storytelling, game-like activities, topics that matter to them, and rewards that match the level of difficulty involved.

While play and creativity are integral to learning, this section highlights specific aspects of digital pedagogy that teachers should consider when aiming for optimal levels of playfulness and pure creative curiosity.

Children develop their abstract thinking best via practical actions that fire their natural enthusiasm for asking questions and finding answers. Nurturing this intrinsic active learning involves identifying the zone of proximal development, where a learner can comfortably grasp new concepts at just the right level of difficulty. With digital technologies, we can uncover an endless stream of nuances and possibilities to leverage this natural curiosity.

Digital pedagogy considerations

José Luis, a seasoned educator, teaches mathematics and physical education at a school well-equipped with digital resources. His students, ranging in age from 12 to 15, are on the cusp of an exciting technological venture. The school is poised to receive a generous donation that will open the door to the world of robotics, where students will have the opportunity to construct and program their very own toy robots. Despite his extensive teaching experience, José Luis harbours reservations; he recognises the complexities of coding and contemplates its true educational value. As he navigates the digital pedagogical landscape, he ponders the role of play and creativity in such a technologically enriched environment.

Consideration 1: Enhance learner motivation through gamified and game-based learning. Elevating curiosity and intrinsic motivation with digital tools means fostering a drive to explore and discover new concepts or perspectives to overcome a particular challenge.

- **Tip:** Incorporate gamified elements with digital tools, such as designing a scavenger hunt-style active learning experience, where learners navigate physically and digitally to solve problems and earn rewards.

Consideration 2: Maker-learning stimulates natural curiosity. Maker-learning[9] often involves hands-on activities like assembling a robot kit or creating some automated, functional, or artistic digital gadget, thereby enriching knowledge in physics or related subjects. The goal is to encourage experimentation and tactile learning, akin to learning through play, while maintaining focus on the objectives and desired outcomes.

- **Tip:** Maker learning can be combined with digital tools in various ways, such as using a digital tool for scientific measurements, or crafting a 3D plan.

Consideration 3: Multimodal content and creativity are essential components of digital pedagogy. Today's learners can convey stories, emotions, new knowledge, and thoughts through various means such as writing, drawing, speaking, singing, or using tools like pictures, videos, music, voices, emojis, symbols, drama, movies, games, etc.

- **Tip:** The essence of digital pedagogy lies not merely in the digital nature of these actions but in the ability to save, share, and collaboratively create, as well as in assessing the related learning experiences that can be analogue or digital.

Consideration 4: Encourage learners to embrace interdisciplinary perspectives. Digital tools offer effective and engaging ways to access diverse content and explore different viewpoints on challenges in nature, society, engineering, technology, art, language, and more.

- **Tip:** Due to the vast expanse of knowledge available, teachers should establish structured pathways and steps to guide learners and mitigate interdisciplinary information overwhelm.

Consideration 5: Mobile learning can give new perspectives on learning outside the classroom. Mobile handheld devices often have excellent cameras and tools to write, record, save, and share the work.

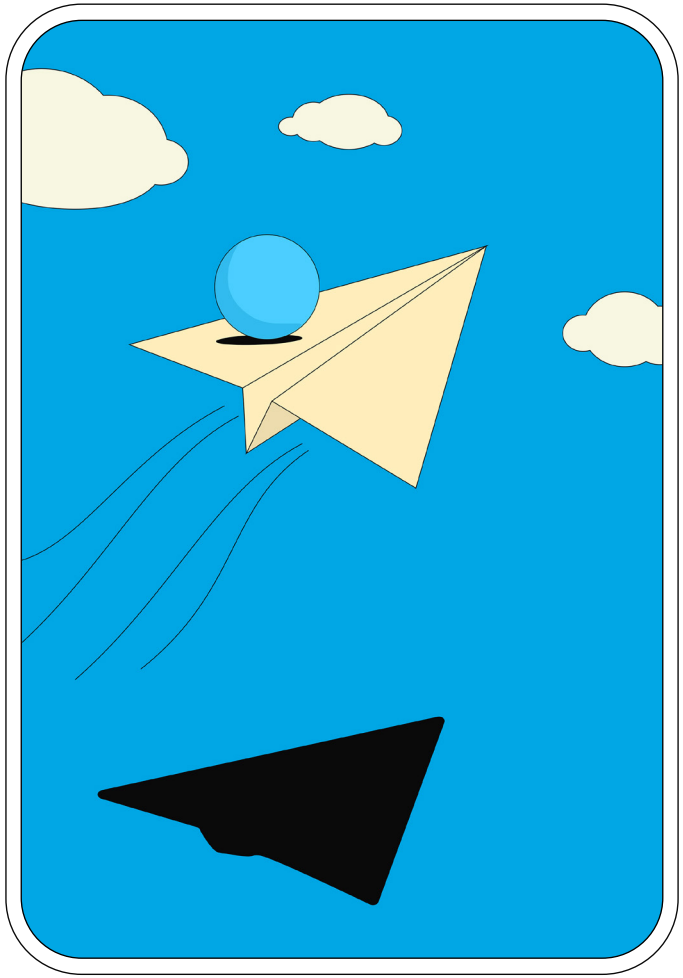
- **Tip:** Add a fresh perspective to the concept of gathering and storing information by utilising a mobile device; for example, via taking the same photo every day at the same place, measuring speed, keeping a class diary, taking macro pictures of nature artefacts, recording audio or video, using a translator, leveraging instant messaging, or simply letting students choose their preferred place for digital work.

Consideration 6: Fostering fun together builds community and social connections. Young learners often enjoy sharing their work both with peers and beyond the typical school sphere, such as with family members.

- **Tip:** Sharing enjoyable experiences or the outcomes of specific projects can extend digitally to caregivers or others outside the classroom, or even across the globe. It's important that sharing is self-motivated, and that the process is always guided by safety considerations.

Consideration 7: Leveraging technology in arts education for enhanced creativity and assessment. In arts education, technology serves as a bridge between traditional artistic expression and modern digital media. It offers a platform for students to not only showcase their artwork, but also to effectively engage with the creative process by using the tools available to them, such as smartphones and cameras.

- **Tip:** Begin by establishing a digital portfolio assessment environment where students can document their artistic growth and gather evidence of their learning path. Encourage them to utilise the cameras and editing apps on their phones to create images, videos, and other forms of digital publication regarding their artwork.



Examples of digital competencies in the context of play and creativeness

Digital Safety

- Understand the mechanisms of digital identification for learners and the protocols for saving their work securely.
- Recognise and manage content that may be overly emotional or sensitive.

Digital Work

- Identify the necessary digital information sources for effective learning.
- Enable learners to create various forms of digital content, including notes, writings, visuals, and audio.
- Gain proficiency in user interface (UI) navigation from the learner's perspective, emphasising the key steps to becoming comfortable with the technology.

AI & Analytics

- Confirm if the educational solution provides automated or AI-driven data collection, along with an interface for monitoring the data.
- Ensure that learners have the ability to view and track their own data.

Accessibility & Inclusion

- Verify that the digital tools offer accessibility features that support focus, visual assistance, auditory support, and so on.
- Guarantee that every learner has an equal opportunity to both engage with and enjoy the creative process.

Example of digital competencies in the context of play and creativeness

José Luis decides to embark on an ambitious project with his students: constructing and programming robots from a kit provided by the recent grant. Initially, José Luis had doubts about the relevance of coding in his curriculum and its perceived complexity. He worried that the abstract nature of coding might disengage his students, particularly those who struggle with math.

Despite his reservations, José Luis decides to proceed with the project. He leads his students through the assembly of the robots and introduces them to a user-friendly coding platform. This platform enables the students to animate their robots with various movements and tasks. To José Luis's astonishment, the project ignites a spark of enthusiasm among the students. Some students prefer building the robots; others love to make the robots their performance circuits from cardboard. Students eagerly apply coding to direct their robots in very simple activities such as line-following and obstacle navigation. Eventually, they create a robot performance accuracy competition in student groups, where groups can name their robot and develop their secret performance code.

As the project unfolds, José Luis observes a seamless blend of the physical and digital worlds, revealing the intricate layers of robotics. The endeavour brings forth a wave of creativity and problem-solving skills, particularly from students who typically find maths challenging. José Luis comes to a valuable realisation: the importance of embracing mistakes as learning opportunities. He discovers that coding is not just a tool for teaching maths and logic; it's a creative and enjoyable pathway to try out new ideas.

2.4 Assessment and feedback

Students should receive feedback that matches their learning objectives, assisting them in the development of effective learning strategies.



Assessment, when rooted in well-defined goals and tailored to a learner's capabilities, transforms into a powerful instrument. The integration of technology, including AI and analytics, enhances both summative and formative assessments by delivering accurate and prompt feedback tailored to each individual. Social and teacher feedback serve as vital counterparts, offering a reflective balance to the technological insights.

Digital pedagogy considerations

With a decade of teaching experience, Nana educates students between 6 and 10 years old. Her expertise lies in early education, with a focus on the Akan language and mathematics. Although familiar with digital assessment in the context of older students, Nana is keen to explore its advantages for her younger learners. She has access to laptops and tablets, which could be instrumental in this endeavour. However, Nana is now tasked with identifying the right pedagogical approaches to digital assessment that would best serve her students' needs. Here, you can look at different digital pedagogy considerations with Nana, and consider which you feel would be the most important.

Consideration 1: Presentation of learning objectives. It's essential to make learning goals clear and visible throughout the educational process.

- **Tip:** Discussing and breaking down goals into smaller, manageable steps can help learners grasp them more practically (see also "**1.1 Setting learning objectives**" and "**1.2 Planning learning assessment**").[10]

Consideration 2: Digital and analogue formative assessment. While teachers often provide continuous verbal feedback, structured and timely feedback through digital tools can be highly beneficial.

- **Tip:** Digital tools can reflect students' self-awareness by using short questions, rewards, or other goal-related incentives (see also "**1.2 Planning learning assessment**", considerations 4-7).[11]

Consideration 3: Formative assessment for goal refinement. Formative assessment can be a simple yet effective way for learners to obtain information on the learning process. One example is to use digital tools to ask quick, pulse-type questions before and after assignments to form a longer-term picture as a knowledge base to uncover the best working habits.

- **Tip:** Utilising this data during discussions about student progress lays a solid foundation for setting new, personalised goals informed by the learner's own actions, not just on the teacher's suggestions based on the memory or notes made in a busy classroom.

Consideration 4: Differentiation is key to catering to the varied pace of learners. Differentiation involves making content challenging enough for faster learners, or conversely, easy enough for slower-paced learners.

- **Tip:** Digital game-based learning environments often provide automated differentiation, which is vital to keep up intrinsic motivation in learners. Teachers need to keep track of this via the digital data provided, or via analogue discussions on what the students are achieving and where they might need extra help, thus providing deeper foundations of knowledge than the technology can provide.

Consideration 5: Summative assessments should be more than just recitations of memorised facts; they should be opportunities for learners to articulate their thinking. Rehearsing memorisation is very important, but with digital tools, summative assessment can be divided into different measurements that are directly connected with learning goals.

- **Tip:** Create an objective, quantifiable framework for working with learning material, whereby students prepare and present their own thoughts, solve problems, answer quizzes, or complete project work. A useful means to achieve this is to provide an assessment rubric where all learners can follow what competencies are being assessed and when (see also "**1.2 Planning learning assessment**", consideration 1).[12]

Consideration 6: Feedback should extend beyond content knowledge to include digital tool proficiency. It is essential to master the use of digital learning tools. This could involve following a separate digital skills plan or strategy, or organising group discussions and support systems that encourage the sharing of new discoveries, abilities, and expertise.

- **Tip:** Consider creating a 'tip of the week' channel, or a forum for students to share their technological challenges and successes, fostering a community of learning and skill-sharing (see also "**1.2 Planning learning assessment**", consideration 4).

Examples of digital competencies in the context of assessment and feedback

Digital Safety

- Being aware of how a learner is identified digitally and how and where the work is saved.
- Being aware of too addictive content in gamified or otherwise affective digital tools

Digital Work

- Understand what kind of digital information sources are needed for successful use.
- Can a learner make digital notes, writing, visual, or audio content or others?
- Take steps to thoroughly understand and familiarise yourself with the UI from the learner´s perspective.

AI & Analytics

- Does the solution offer automated or AI-based data collection with a possibility to follow the data via an alternate interface?
- Can a learner see or follow the data also?

Accessibility & inclusion

- Does the solution have an accessibility function that can help in concentration, visual aid, listening, etc.?

Example of assessment and feedback

Nana was intrigued by the concept of using digital formative feedback to improve students' working skills, as many students were not aware of the necessary steps required to enhance their practical learning, such as asking for assistance from classmates, or refraining from talking when it disrupts others.

She allocated a certain time of the week when, after some work, she would ask her students to fill out a very simple questionnaire about how they felt about their own work in relation to certain assignments. It was important that the students could fill out the form without needing to read. Nana used a simple version of their school's Learning Management System (LMS) to create a safe user profile for each learner. With the LMS, she also made sure that the answers to the questions referred to the correct date and assignment. The first thing students needed to learn was how to get on board with the LMS, but immediately after the initial session, students found it easy to manage. Sometimes, the internet connection was slow, but it did not affect task performance as the tool also worked offline, seamlessly syncing the data once the connection was restored.

Nana knew that self-assessment is a very demanding task for any learner, so she needed to ensure that the questionnaire was very light and easy to complete again and again. For example, students would answer digitally to one simple question: "I managed to ask for help when I needed it" with one star (almost succeeded), two stars (yes, I did), or three stars (easily). Of course, all these sentences were also in picture format.

Within the teacher profile in the LMS, Nana was able to view the rapidly accumulating results week after week, allowing her to show students both their progress and potential obstacles. She could also show the anonymised results to the class, which was a great way to start a spontaneous discussion on the themes students were now very familiar with. This way, Nana felt that by making certain aspects of the schoolwork visible that would normally stay hidden, she could potentially prevent the development of cumulative problems or negative attitudes that could otherwise develop. Furthermore, she could more meaningfully praise the students for their positive attitude and competencies regarding their schoolwork.

2.5 Learning to learn

The goal of digital teaching is to give students the ability to learn on their own, using a variety of methods to promote a lasting and upbeat attitude towards learning along with all the effort that goes with it.



This section synthesises our earlier discussions, while introducing novel areas where digital technology can significantly support individual learners in cultivating self-awareness, social interaction, and goal-focused learning, emphasising the transformative role of digital pedagogy in the broader journey of developing effective learning skills.

Educational technology has the potential to significantly enhance learner engagement and motivation, streamline the organisation of educational materials, and enrich personal understanding of complex concepts. It's crucial to critically evaluate the role of digital tools in the classroom, ensuring they are reliable and beneficial, while also understanding that technology is just one part of a student's holistic growth.

Digital pedagogy considerations

Ahmad, a seasoned computer science teacher of 12- to 14-year-olds, is well-versed in a plethora of digital applications, learning platforms, and a myriad of digital educational resources. He adeptly navigates various online tools and examples, offering his students a virtually limitless array of online learning opportunities. Yet, there are moments when Ahmad ponders the true impact of these digital tools on grasping the nuances of each student's individual learning journey. Eager to uncover practical digital strategies that empower his students as self-aware learners, Ahmad is on the quest for insights. Join Ahmad as he explores diverse aspects of digital pedagogy in the pursuit of a transformative path towards enhanced self-awareness in education.

Consideration 1: Digital tools and learning strategies. Digital tools offer vast resources for empowering students to explore self-directed learning, enabling them to develop the skills needed to identify learning objectives and regulate their work accordingly. Learners should also explore methods of gathering and retaining information that works best for them in problem-solving and task management.

- **Tip:** Set a goal with a clear digitally performed action around simple content for learners to get started. For instance, "Find information about X and use it in a short message to your class." When the assignment is simple, it is easier for learners to discuss afterwards how they felt about the work and how the goal guided them through the task.

Consideration 2: Data-backed self-assessment and timely formative assessment. Digital tools enable a variety of possibilities in self-assessment and reflection in learning based on cumulative information, such as automated feedback, questionnaires, tests, or action measures.

- **Tip:** Data can be a powerful tool for sturdents to assess the strengths and weaknesses in their learning, as well as to meaningfully evaluate what went smoothly and what pos ed any difficulties. The important thing is not the information per se, but what the learner can make out of both recognising the positive developments, and finding explanations or reasoning for any learning obstacles, other than simply feeling like a "bad learner" (see also "**1.1 Setting learning objectives**").

Consideration 3: The essence of social collaboration. The learning process thrives on social collaboration. Echoing the principles discussed in "**1.3 Planning social elements**" and "**2.1 Social & collaborative learning**", the heart of digital pedagogy beats to the rhythm of collective effort. It's imperative for learners to immerse themselves in environments where digital interaction fosters task delegation, the melding of diverse ideas, and the creation of a shared digital space.

- **Tip:** Social learning can be challenging, as each learner bears individual responsibility for a united piece of work. Incorporating simple self-assessments at different stages of collaborative work can help learners understand their own role. Digital self-assessment provides data that can be discussed with the learner or group, especially when there's a discrepancy between individual performance and group results.

Consideration 4: Navigating the digital deluge. We live in a time where digital tools inundate students with information. As such, learners need to master how to recognise the difference between information and knowledge, as well as understand that collecting information involves many factors that may be challenging to handle in the online world.

- **Tip:** Encourage learners to question all sources (schoolbooks, newspapers, websites, videos, speeches, etc.) with respect, and assist them in formulating ideas on how to evaluate the reliability of the information or knowledge.

Consideration 5: Digital skills and feeling of "I can do it". The journey towards digital literacy is marked by the acquisition of digital skills and the trust in one´s own abilities.

- **Tip:** When guiding younger learners, it's beneficial to initially concentrate on a select number of tools only. Begin with basic functionalities, and progressively introduce more complex features, ensuring the pace aligns with the learners' comfort levels.

Consideration 6: Understanding the role of digital tools with cognition and student´s actions. The true value of digital tools emerges when we consider their role in the learners' educational journey. What do students accomplish with these tools? How do they integrate them into their learning process?

- **Tip:** Evaluate the purpose of each digital tool. Is it designed to educate, entertain, or develop specific subject skills? Does it help students organise their work and foster the creation of new knowledge? Or is its primary function to act as assistive technology? (see also section "**1.5 Lesson planning**", consideration 1; and "**3.5 Digital pedagogy theory**" – Bloom's Digital Taxonomy)

Consideration 7: Explore the idea of self-paced learning. The adoption of self-paced learning methodologies nurtures independence and places the learner at the forefront of their educational journey. In self-paced learning, digital tools empower students to advance at a comfortable rhythm and chart their unique educational paths. However, such freedom still requires very strong structured guidance from educators, as students can easily experience feelings of abandonment when left with content that is too challenging for them.

- **Tip:** Employ digital games or gamified learning experiences to create an engaging and adaptable learning atmosphere that encourages students to learn at their own pace. It's important to observe student engagement and assess whether the gamified activities genuinely contribute to their educational growth and evolution as learners.

Examples of digital competencies in the context of learning to learn

Digital Safety

- Grasping the principles of safely organising and sharing information, along with a deep understanding of the structure and origins of digital knowledge.
- Awareness of the privacy and accessibility of personal work and learning-related information in digital environments: discerning who has access and the reasons behind it.
- Comprehending the workings of AI in education, recognising potential risks such as threats to personal data, the prwopagation of biased information, or the dependency on AI that may overshadow the critical thinking skills of learners and teachers.

Accessibility & Inclusion

- Recognising how digital learning can be made more inclusive through:
- Adherence to W3C Standards (see section 3.2 for more)
- Utilisation of assistive technologies.
- Possessing robust resources to continually enhance skills in areas such as operability, text alternatives, time-based media alternatives, adaptability, distinguishability, and accessibility, including the use of accessibility validation tools.

Digital Work

- Mastery of digital communication skills and a structured approach to basic digital literacy, including the use of devices, navigation of operating systems, and the ability to access and critically evaluate online resources.

AI & Analytics

- Understanding the pivotal roles of AI in education:
- AI as a facilitator of personalised automated learning.
- AI as an aid for teachers in planning and executing formative assessments.
- AI as a productive tool for learners, serving as a personal prompt while acknowledging its limitations.

Example in the context of learning to learn

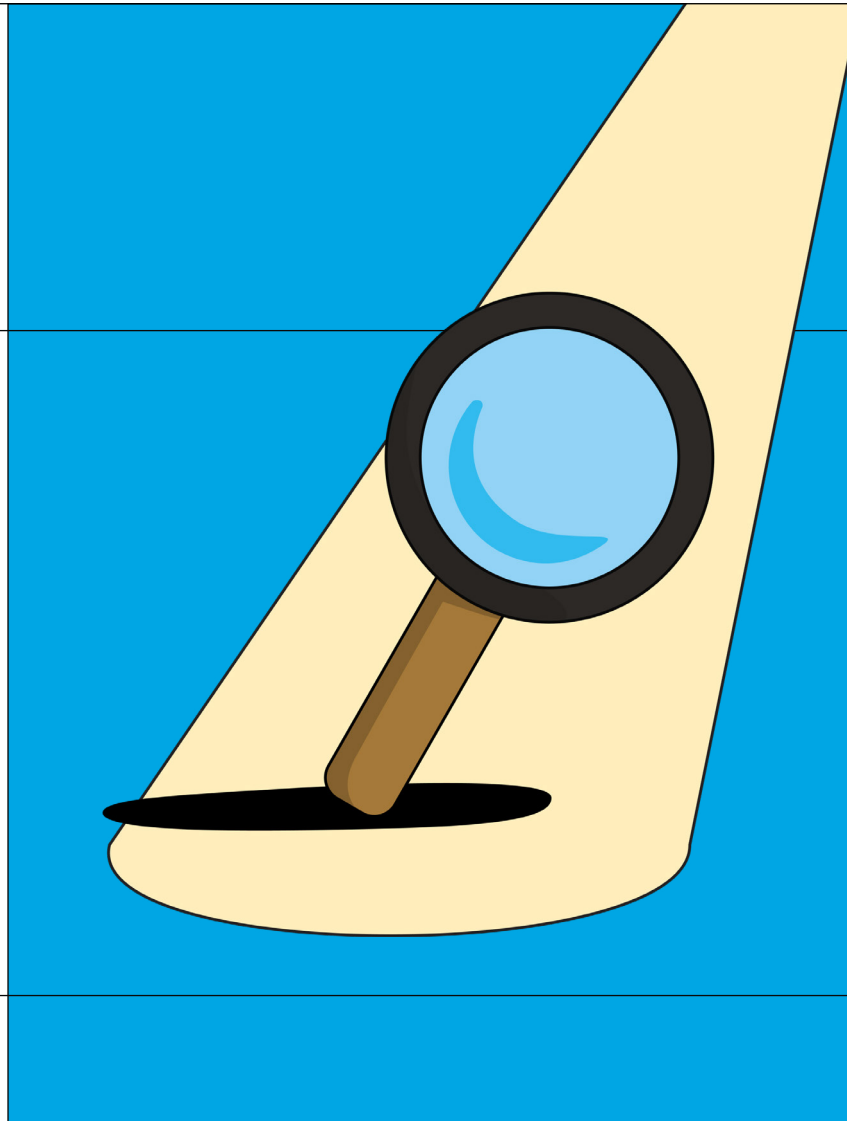
Ahmad decided to cut every unnecessary digital tool and concentrate in using a single, simple and safe digital learning management system that allows him to assign tasks, set deadlines, and give feedback to his students. He also asked his students to use the online calendar to plan their own work, create a material list, and track their progress. He also explained to them how to use digital task managers – such as mind-maps or online whiteboards – to break down the information into manageable pieces and thereby assist students in organising their learning.

Ahmad is amazed by the results. He discovers that his students are more engaged and motivated in their learning. They can see their goals and achievements clearly, and they can rehearse managing their time, information, and resources effectively.

He can also see how the familiar digital environment works as a school building: it stays solid and provide shelter, even if the content evolves and the information changes. Ahmad can now also effectively identify which areas the learners really need help with, as well as provide more timely, personalised feedback.

3

ADDITIONAL INFORMATION AND RESOURCES



In this additional chapter, we turn our attention to the foundational elements of digital skills that have been briefly raised in previous sections – Digital Safety, Accessibility & Inclusion, Digital Competencies, and AI & Analytics – as well as the overarching principles of Digital Pedagogy Theory. These additional sections offer brief overviews rather than deep dives, serving as signposts that point educators towards key resources and concepts that support a robust and responsible approach to digital teaching. Educators can use these concise summaries as a launchpad for further exploration and mastery of these critical educational themes.

Chapter contents

3.1 Digital safety

3.2 Accessibility and inclusion

3.3 Digital Competences

3.4 AI & Analytics

3.5 Digital pedagogy theory

3.1 Digital safety: Key areas

Cyber Security Awareness

- Password security
- Malware and phishing protection
- Authentication
- Using secure and encrypted connections (e.g., VPNs)
- Recognising and avoiding unsafe websites and downloads.

Data Privacy Awareness

- Informed consent
- Definition of personal data
- Data collection
- Data storage and protection laws
- Third-party data handling
- Privacy settings

Digital Identity Management

- Awareness of personal data and online presence
- Understanding online profiles
- Privacy settings and account security
- Online reputation/cyberbullying

Digital Literacy, Online Etiquette & Digital Citizenship

- Safe browsing habits
- Social engineering recognition
- Online persona and real identity
- Critical evaluation of online information sources
- Distinguishing between credible and unreliable digital content
- Social media safety

Useful sources

- **Strategies for promoting digital citizenship and device ownership:** Adcock, C. (2023). Six ways to promote digital citizenship and device ownership. TCEA Tech Notes Blog. Six Ways to Promote Digital Citizenship and Device Ownership • TechNotes Blog (tcea.org)

- **Discussion of the role of education systems in protecting children in both the physical and digital environment:** Gottschalk, F. and T. Burns (2020), "Education and child safety", in Burns, T. and F. Gottschalk (eds.), Education in the Digital Age: Healthy and Happy Children, OECD Publishing, Paris, https://doi.org/10.1787/421bcc05-en.

- **Information, tools, and good practice to support the development of competences to empower and protect children:** Council of Europe. (2022). Digital Citizenship Education Handbook. Council of Europe. 168093586f (coe.int)

- **A comprehensive guide that provides information, tools, and good practice to support the development of competences to empower and protect children in the digital age.** Council of Europe. (2022). Digital Citizenship Education Handbook. Council of Europe. 168093586f (coe.int)

- **A set of guidelines to tackle disinformation and promote digital literacy in educational settings:** European Commission, Directorate-General for Education, Youth, Sport and Culture, Guidelines for teachers and educators on tackling disinformation and promoting digital literacy through education and training, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2766/28248

- **A list of resources for teaching digital citizenship:** Krueger, N. (2020). 9 Resources for Teaching Digital Citizenship. ISTE (2020): 9 resources for teaching digital citizenship

- **Explores the subject of digital citizenship in all of its complexity, including the competencies to actively, responsibly, and positively engage in online and offline communities:** OECD (2019), "Empowering an active and ethical (digital) generation", in Burns, T. and F. Gottschalk (eds.), Educating 21st Century Children: Emotional Well-being in the Digital Age, OECD Publishing, Paris, https://doi.org/10.1787/75e2c8d8-en.

- **How teaching students to develop an awareness of data security, online etiquette, and cyberbullying helps them make better decisions online:** Poth, R. D., (2023) Developing Students' Digital Citizenship Skills. Edutopia (2023): Teaching Digital Citizenship Skills | Edutopia

3.2 Accessibility & inclusion

Accessibility standards are guidelines and practices designed to ensure that digital content is accessible to all users, including those with disabilities. These standards are developed by international organisations such as the World Wide Web Consortium (W3C), which develops web standards like HTML, CSS, and many more. The general aim is to provide web content that is *Perceivable, Operable, Understandable, and Robust.*[13]

Inclusive education is a teaching approach that adapts to the diverse needs of all students, ensuring that everyone, regardless of their abilities or backgrounds, has an equal opportunity to participate in and benefit from educational experiences. It emphasises the importance of creating supportive and welcoming learning environments where differences are respected and valued. Inclusive education involves modifying teaching methods, curricula, and classroom structures to meet the unique needs of each student, promoting a sense of belonging and fostering social cohesion. It is a fundamental right, and a means to achieve high-quality education for all.[14]

Universal Design for learning (UDL) is an innovative approach to teaching and learning that aims to provide all students with an equal opportunity to succeed. It is not about finding one way to teach all students, but rather about using a variety of teaching methods to remove any barriers to learning. It seeks to build in flexibility that can be adjusted for every person's strengths and needs.[15]

Useful sources

- **"Digital Culture Network" provides guidance on how to make digital content accessible to all audiences:** Digital Culture Network. (n.d.). How to Make Your Online Content Accessible. Retrieved from https://digitalculturenetwork.org.uk/knowledge/how-to-make-your-online-content-accessible/

- **A guide on inclusive teaching, learning and assessment, detailing why it is important and with tips on how to enhance inclusivity in your classroom.** It defines inclusive teaching, learning and assessment as the ways in which pedagogy, curricula, and assessment are designed and delivered to engage students in learning that is meaningful, relevant, and accessible to all.

  Inclusion in education: UCL. (2020, April 27). Inclusive teaching, learning and assessment. Retrieved from https://www.ucl.ac.uk/teaching-learning/publications/2020/apr/inclusive-teaching-learning-and-assessment

- **A comprehensive checklist for creating accessible digital content,** including guidelines such as using high contrast colours, not relying on colour alone to convey meaning, writing alternative text for images, using text instead of images of text, structuring content with headings, lists, and table headers, and providing captions or transcripts for video and audio: https://accessibility.princeton.edu/checklist

- **"Accessibility check if you cannot do a detailed one"** provides guidance on how to evaluate the accessibility of your website if you do not have an accessibility expert in your organisation and cannot pay for a third-party auditor: https://www.gov.uk/government/publications/doing-a-basic-accessibility-check-if-you-cant-do-a-detailed-one/doing-a-basic-accessibility-check-if-you-cant-do-a-detailed-one#interactive-tools-and-transactions

3.3 Digital competence frameworks

DigCompEdu

DigCompEdu[16] is a framework that details the digital competences educators need to teach effectively in the 21st century. It is directed towards educators teaching 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. The focus is not on technical skills, but rather, it aims to detail how digital technologies can be used to enhance and innovate education and training.

DigCompEDU covers six key areas of competences:

- Professional engagement
- Digital resources
- Assessment
- Teaching and learning
- Assessment, empowering learners
- Facilitating learners' digital competence.

DigCompEDU is based on The Digital Competence Framework for Citizens, also known as DigComp, which provides a common language to identify and describe the key areas of digital competence. The DigComp 2.2 update incorporates key new areas such as AI, the Internet of Things, and teleworking.

UNESCO ICT Competency Framework

UNESCO's ICT Competency Framework for Teachers[17] is a tool designed to guide pre- and in-service teacher training on the use of digital technologies in both formal and informal education systems, from K-12 to tertiary level. It provides a framework within which digital competencies can be identified and used to inform ICT in education policy directives, curriculum design, and pre- and in-service training recognises the digital competencies in the following areas:

- Understanding ICT in education
- Curriculum & Assessment
- Pedagogy
- Digital Skills
- Organisation and Administration
- Professional Teacher Learning

UNICEF Digital Competence Framework

UNICEF provides the Educators' Digital Competence Framework[18]: a set of guidelines that can be adapted to different needs and tailored to the specific requirements of different educational contexts, countries, regions, or localities. The framework revolves around these topics:

- Knowledge Development (teacher´s digital competence)
- Knowledge Application (student´s digital competence)
- Knowledge Sharing
- Knowledge and Communication

3.4 AI & analytics

Artificial Intelligence (AI) in education refers to the use of machine learning algorithms and intelligent systems to create adaptive and personalised learning experiences. AI algorithms can analyse vast amounts of data, identifying patterns and trends to develop effective learning strategies.

Data and analytics focus on collecting and analysing educational data, including a student's learning activities, engagement levels, and learning outcomes. Analytics provide teachers with valuable insights into the learning process, enabling evidence-based decision-making to support learning.

AI, data, and analytics work together symbiotically, but they can also function independently. A system using AI may not necessarily gather data on a student's learning, and a system focused on data analytics may not leverage AI. When combined, AI and analytics can create highly optimised teaching and learning processes.

For educators, it's crucial to

- ✓ Understand the concept of machine learning.
- ✓ Recognise when and how to use AI, data, and analytics to benefit learning – as well as the tools that use them – being careful to avoid any detrimental effects.
- ✓ Understand the fundamental principles of technical functionality, including the basic operating principles, teacher's influence, personalisation of the learning experience, data collection and protection, and secure data management.
- ✓ Distinguish between machine and human interactions in different learning and tutoring situations, and interpret the intrinsic value of a student's data.

Useful sources

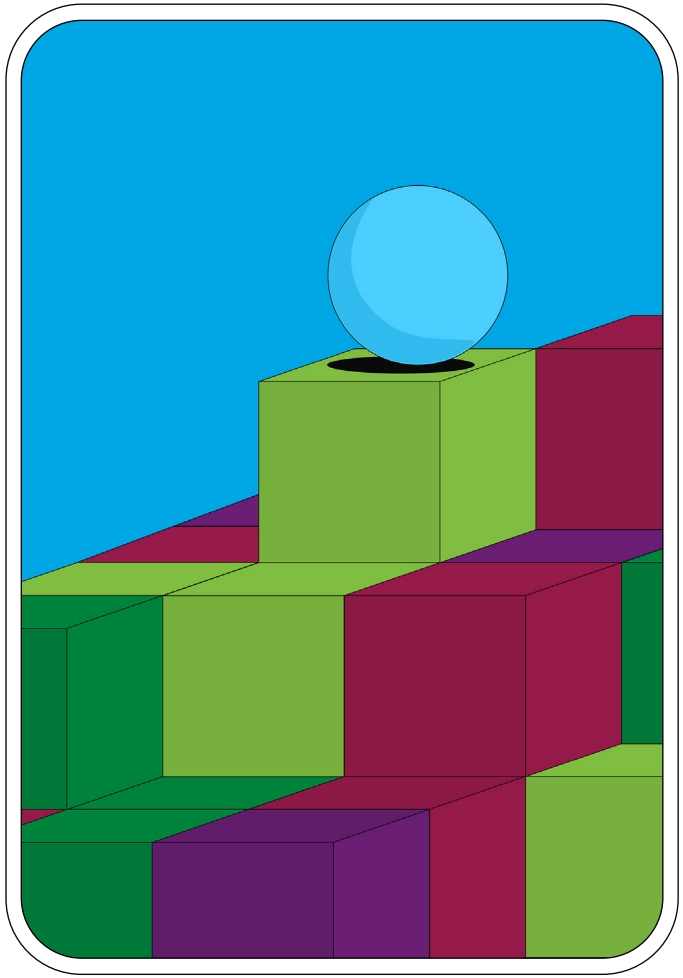
- In 2022, the European Commission published a set of ethical guidelines for educators on the use of AI and data in education. These guidelines are intended for primary and secondary teachers, and can be used by educators with little or no experience with digital education: https://education.ec.europa.eu/news/ethical-guidelines-on-the-use-of-artificial-intelligence-and-data-in-teaching-and-learning-for-educators
- UNESCO Guidance for Generative AI in education and research: Guidance for generative AI in education and research - UNESCO Digital Library
- Education in the age of Artificial intelligence – The UNESCO Courier collection of articles (October-December 2023): Education in the age of artificial intelligence - UNESCO Digital Library
- UNICEF AI For Children-project: AI for children | UNICEF Office of Global Insight & Policy
- **Free,** practical, and ethical guides for engaging students in AI creation in different educational levels, with several thematically relevant articles and blog posts: ISTE | Artificial Intelligence in Education
- Learners Guide to Artificial Intelligence: ISTE Mini Ebook
- Free AI Course: IBM SkillsBuild
- **University** of Helsinki: Elements of AI: A free, comprehensive course introducing learners to AI, its applications, and its implications. A valuable resource for anyone interested in learning about AI, regardless of their background.

3.5 Digital pedagogy: theory and concepts

Teachers are essential in the creation of a positive learning environment for students in their endeavour to make the best use of technology. As digi-tech continues to rapidly evolve, it offers a myriad of benefits, opportunities, and gateways for both teachers and students. Digital tools facilitate effective communication and easy access to information, as well as increase student motivation, curiosity, skills, and learning outcomes. However, it is not a silver bullet; rather, a tool that can enhance or hinder learning depending on the quality of the teaching and associated learning processes.[19]

The manner in which teachers think and feel about teaching and learning affects how they use technology in their classrooms. Similarly, how people both learn and perceive their learning is key when using technology for education.[20] Modern learning theories centre around two main components: the first focuses on how learners interact with their surroundings, including people, culture, and things. They learn new things by connecting them to what they already know. The second refers to how learners use their minds, emotions, and social skills. The mind means knowledge and abilities; emotions signify interest and feelings; and social skills refer to working with others.[21] As such, learning can be seen as a process of constructing meaning through social interaction and shared experiences.[22]

Digital pedagogy merges critical elements from the realms of learning, the digital environment, and the role of teachers. Academic perspectives[23] on digital pedagogy propose a thoughtful, holistic approach, where digital pedagogy is seamlessly integrated into the learning process to facilitate and enrich the learner's educational journey. Recent research suggests that digital pedagogy can be understood at different levels, from the overall theoretical and personal beliefs on learning (pedagogical orientation), to the specific practices (pedagogical practices), and the skills required when using digital technologies to enhance learning (pedagogical competencies). Consequently, reducing the concept of digital pedagogy to a singular definition is challenging; nonetheless, it essentially refers to the educator's



ability to embed digital technologies into teaching in a meaningful way.[24]

Extant literature frequently describes the development of teachers' digital pedagogy skills as a process of moving through different stages of using digital tools to support learning and becoming more digitally proficient. This evolutionary process often begins when teachers first become aware of the existence and potential of digital tools. The ultimate objective is to progress to the final stage where, with sufficient digital and pedagogical maturity, educators can integrate digital tools seamlessly, critically and creatively into a broader learning environment of problem-solving and social learning.[25]

The TPACK[26], SAMR[27], and RAT[28] models are the most influential theoretical frameworks for analysing the synergy between digital pedagogy and education. The Technology, Pedagogy, and Content Knowledge (TPACK) model is perhaps the most used and well-known resource that explains how different types of educator knowledge are combined in desired technology use in teaching. TPACK also has a recent rendition in light of generative AI, delineating the new realm of contextual knowledge (XK) in relation to understanding how AI may influence education.[29] The RAT model is a tool that helps teachers evaluate how technology affects their teaching and learning, based on three goals: replace the traditional with technology, amplify the technology usage, or transform the learning with technology. Finally, the SAMR model is a guide for educators to use technology to improve teaching and learning, based on four levels of gradual development in using the technology in teaching: 1) *substitute*, where the traditional tool is directly replaced with a digital one; 2) *augmentation*, in which a digital tool is used to enhance a task; 3) *modification*, where the digital tool is used to change a task; and 4) *redefinition,* where digital tools make it possible to achieve something previously impossible.[30]

Incorporating technology into education is a challenging endeavour, with teachers facing many choices that are not easy to make. Digital education means that teachers and students should have access to the tools they need to optimise learning; however, the primary hurdle lies in how to do this, as it is more than just harnessing technology. Simply installing technology in classrooms will not make education more fun and interactive; the real point of difference lies in the quality of teaching.[31] That is why we made this tool — to assist teachers with incorporating digital technology into their teaching and learning methodologies, ultimately resulting in a better educational experience for all.

Concepts often related to digital pedagogy and educational technology

Technology is transforming the way we teach and learn. There are many concepts, ideas and frameworks that can help us understand and use digital pedagogy and educational technology more effectively. In this section, we will dive into some of these perspectives, offering a brief overview of each, along with some resources for further reading.

Adaptive learning

An example of adaptable digital technology for learning is the use of adaptive learning algorithms and artificial intelligence (AI). These technologies can tailor the learning experience to meet individual students' needs. They analyse a student's performance and reactions to digital content in real time, and modify lessons based on that data of learning analytics.[32]

Blended Learning

Blended learning is a form of education that blends in-person and online sessions in a flexible schedule that adapts to the needs of students and teachers with online materials, e-learning methods, and face-to-face learning activities. It can be used in schools and to increase retention, personalisation, and flexibility.[33]

Bloom's Digital Taxonomy

Benjamin Bloom created a taxonomy framework in 1953 for classifying different levels of cognitive skills in learning, from remembering to creating. In 2001, Andrew Churches revised the taxonomy to include the new behaviours, actions and learning opportunities that emerge from technology, and it has since been used for everything from framing digital tasks and evaluating apps to writing questions and assessments.[34]

Digital Literacy

Traditional literacy has expanded beyond reading and writing to include digital skills and practices developed by users. Originally, media literacy discussed the nature of various media genres, and information literacy pertained to how information is accessed and evaluated. The term digital literacy – and often, multimodal literacy – generally encompasses the diverse skills children need across digital tools, technologies, and media, reflecting the multifaceted nature of contemporary literacy practices.[35]

Flipped learning

Flipped learning is a pedagogical approach in which the conventional notion of classroom-based learning is inverted so that students are introduced to the learning material before class, with classroom time then being used to deepen understanding through discussion with peers and problem-solving activities facilitated by teachers.[36]

Game-based Learning

Game-based learning (GBL) is a teaching method that uses games and storytelling to enhance engagement and contextualise learning objectives. Games can have elements such as engagement, rewards, competition, rules, and goals to motivate and measure learners' progress and mastery.[37]

Learning Design

Learning design is the process of making informed decisions about the various elements that go into creating effective and engaging learning experiences for learners, based on educational theory and the science of how people learn. It involves choosing the content, structure, sequence, activities, strategies, assessments, and technology that support learning. One particularly important aspect of learning design is to facilitate inclusive education by creating a Universal Design for Learning (UDL).[38]

Maker Learning/Education

Maker education offers a transformational approach to teaching and learning that positions agency and student interest at the centre, asking students to become more aware of the design of the world around them, and to begin to see themselves as people who can tinker, hack and improve that design. Often, coding education is linked with the Maker movement, as well as the interdisciplinary views of science, technology, engineering, arts, and mathematics (STEAM).[39]

Mobile Learning

Mobile learning has had its peak during the last decade, but still it is evident that handheld and other evolving mobile technologies (mostly phones, tablets, laptops) provide all the functionalities needed to perform as a device to help teachers to facilitate learning wherever the learner is. In mobile learning, the learning does not necessarily happen in the classroom or at the table either: mobile devices allow users to leverage the possibilities to take the device where the learning can happen most efficiently, such as gathering natural information outdoors.[40] Another aspect is the use of mobile phones in areas where schooling is hard to access for learners due to catastrophic events or long distances, rendering traditional schooling is impossible (see more in the Superstar Teacher Toolkit: Mobile Messaging Teaching Toolkit).

21st Century Skills

There are several frameworks for 21st-century learning. Well-known resources include *Battelle-forKids P21*[41] (former Partnership for 21st-century skills), *OECD Future of Education and Skills*[42], *Digital Agenda for Europe (EU)*[43], *The ISTE Standards*[44], and the *ICDL Asia*.[45] The Digital Agenda for Europe framework has also spread in Asia, and ICDL Asia is actively promoting the skills via the ICDL Workforce program. The content varies very little from one framework to another, but the main skills are as follows: critical thinking, problem-solving, communication, creativity and innovation, collaboration, contextual learning, ICT literacy, and information management. The 21st century skills movement emerged from the notion that more high-level cognitive skills will be needed in the digitally developed world, and that education providers should support students in cultivating a deeper level of knowledge and comprehension.

For additional information, refer to the Learning Passport Blended Learning Handbook. The Blended Learning Handbook is a practical guide designed for teachers of all subjects and age groups, looking to enhance their teaching practices with blended learning techniques.

Resources: Endnotes

1 Scaffolding is a teaching technique that involves providing support and guidance to students as they learn new concepts or skills, and gradually removing the support as they become more independent and competent. Spadafora, N. & Downes, T. (2020).
2 Webb, M., & Ifenthaler, D. (2018), 583-584.
3 See more on rubrics in education via the Australian Government's guide: https://www.digitaltechnologieshub.edu.au/media/o43pfnlb/guides-and-templates_rubric-guide.pdf or Tshering, & Phu-ampai, S. (2022). https://eip.sce.edu.bt/index.php/eip/article/view/13
4 Webb, M., & Ifenthaler, D. (2018), 607.
5 Find more on gamified learning in section 3.5.
6 Webb, M., & Ifenthaler, D. (2018), 591-592.
7 See section 3.5. for gamified learning resources.
8 See, for example: "Generative AI and teaching", Mishra P., Warr, M. & Islam, R. (2023).
9 See more in section 3.5.
10 On formative assessment, see Bates, B. (2019), 253.
11 Ibid.
12 On summative assessment, see: Bates, B. (2019), 255.
13 https://www.w3.org/WAI/WCAG22/quickref/?versions=2.1
14 For more examples, see: UNICEF. (n.d.). Inclusive Education: https://www.unicef.org/education/inclusive-education; Inclusion International (n.d.): https://inclusion-international.org/; Voogt et all (2018) section XI, 983.
15 See more: https://udlguidelines.cast.org/
16 See more: Redecker, C. (2017) DigCompEdu (europa.eu); Vuorikari et al. (2022) JRC Publications Repository - DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes (europa.eu)
17 Look for more here: UNESCO's ICT Competency Framework for Teachers | UNESCO
18 UNICEF. (n.d.). Educators' Digital Competence Framework. Retrieved December 3, 2023, from https://www.unicef.org/eca/reports/educators-digital-competence-framework
19 Hattie, J. (2008); Woogt, J. (2018)
20 V. P. Dennen et all (2018); Tondeur et all (2016).
21 Illeris, K. (2010).
22 Woogt (2018), p. 6; Dennen, Burner, and Cates, (2018).
23 Montebello, M. (2018); Väätäjä, J. O., & Ruokamo, H. (2021).
24 Väätäjä, J. O., & Ruokamo, H. (2021).
25 Niederhauser, D.S., Lindstrom, D.L. (2018); Howell, J. (2022); Dennen & All; Väätäjä, J. O; Mishra, P., & Koehler, M. J. (2006).
26 Mishra et all. (2006).
27 Terada, Y. (2020).
28 Read, M. F. (2020).
29 Mishra, P. et all (2023); Mishra, P. et all. (2006).
30 Terada, Y. (2020).
31 Hattie, J. (2008).
32 Martin, F., Chen, Y., Moore, R.L. et al. (2020)
33 Dziuban, C., Graham, C.R., Moskal, P.D. et al. (2018)
34 Churches, A. (2008); Cosgun Ögeyik, M. (2022).
35 Ala-Mutka, K. (2011); Lim Fei V., Tan-Chia L. (2022).
36 Roehling, P. & Bredow, C. (2021); Eppard J. & Rochdi A. (2017).
37 Voogt et all 2018. Section X, p. 877-981; Adipat, S., Laksana, K., Busayanon, K., Asawasowan, A., & Adipat, B. (2021); Sefton-Green J. (2020); Borovoy, A. (2015).
38 Navaitienė, J., Stasiunaitienė, E. (2021).
39 Voogt et al. (2018). Section X, p. 921-981.
40 Voogt et al. (2018). Section IX, p. 777-876.
41 https://www.battelleforkids.org/networks/p21
42 https://www.oecd.org/education/2030-project/
43 See more: European Commission (2010).
44 https://www.iste.org/iste-standards
45 https://icdlasia.org/

References

Adcock, C. (2023) Six ways to promote digital citizenship and device ownership. TCEA Tech Notes Blog. Available at (Accessed: 11 December 2023).

Adipat, S., Laksana, K., Busayanon, K., Asawasowan, A. and Adipat, B. (2021) 'Engaging students in the learning process with game-based learning: The fundamental concepts', International Journal of Technology in Education (IJTE), 4(3), pp. 542-552. doi: 10.46328/ijte.169.

Ala-Mutka, K. (2011) Mapping Digital Competence: Towards a Conceptual Understanding. Available at (Accessed: 11 December 2023).

Alemán de la Garza, L., Anichini, A., Antal, P., Beaune, A., Bruillard, E., Burke, D. and Tsinakos, A. (2019) Rethinking Pedagogy: Exploring the Potential of Digital Technology in Achieving Quality Education. New Delhi, India: Mahatma Gandhi Institute of Education for Peace and Sustainable Development. Available at (Accessed: 11 December 2023).

Borovoy, A. (2015). Game-Based Learning: Resource Roundup. Game-Based Learning: Resource Roundup | Edutopia. Edutopia. Updated 8-10-2015.

Bates, B. (2019). Learning Theories Simplified: …and how to apply them to teaching. SAGE Publications Ltd.

Burns, T. and Gottschalk, F. (eds.) (2020) Education in the Digital Age: Healthy and Happy Children, Educational Research and Innovation. Paris: OECD Publishing. doi: 10.1787/1209166a-en.

Carretero Gomez, S., Vuorikari, R. and Punie, Y. (2017) DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-68006-9 (pdf), 978-92-79-68005-2 (print), 978-92-79-74173-9 (ePub). doi: 10.2760/38842 (online), 10.2760/836968 (print), 10.2760/00963 (ePub).

Churches, A. (2008) 'Bloom's digital taxonomy', Bloom's Revised Digital Taxonomy. Available at 1 (Accessed: 11 December 2023).

Cosgun Ögeyik, M. (2022) 'Using Bloom's Digital Taxonomy as a framework to evaluate webcast learning experience in the context of Covid-19 pandemic', Educ Inf Technol, 27, pp. 11219–11235. doi: 10.1007/s10639-022-11064-x.

Council of Europe (2022) Digital Citizenship Education Handbook. Council of Europe. Available at 2 (Accessed: 11 December 2023).

Crompton, H. and Cykora, J. (2020) 'The Role of the Teacher in Mobile Learning: A Literature Review', Journal of Interactive Learning Research, 31(2), pp. 133-160. Available at 3 (Accessed: 11 December 2023).

Dede, C. (2009) 'Comparing Frameworks for "21st Century Skills', Harvard Graduate School of Education. Available at (Accessed: 11 December 2023).

Dennen, V. P., Burner, K. J. and Cates, M. L. (2018) 'Information and Communication Technologies, and Learning Theories: Putting Pedagogy into Practice', in Voogt, J., Knezek, G., Christensen, R. and Lai, K. (eds.) Second Handbook of Information Technology in Primary and Secondary Education. Cham: Springer, pp. 144-158. ISBN 978-3-319-71053-2. doi: 10.1007/978-3-319-71054-9_9.

Dennen, V., Burner, K. and Cates, M. (2018) 'Information and Communication Technologies, and Learning Theories: Putting Pedagogy into Practice', in Voogt, J., Knezek, G., Christensen, R. and Lai, K. (eds.) Second Handbook of Information Technology in Primary and Secondary Education. Cham: Springer, pp. 387-403. doi:10.1007/978-3-319-71054-9_23

Digital Culture Network (n.d.) How to Make Your Online Content Accessible. Available at (Accessed: 11 December 2023). https://digitalculturenetwork.org.uk/knowledge/how-to-make-your-online-content-accessible/

Fengchun, M. (2023) Guidance for generative AI in education and research. UNESCO. Available at 1 (Accessed: 11 December 2023).

Knezek, G., Christensen, R. and Lai, K. (2018) Second Handbook of Information Technology in Primary and Secondary Education. Cham: Springer. ISBN 978-3-319-71053-2.

Dziuban, C., Graham, C.R., Moskal, P.D. et al. (2018) 'Blended learning: the new normal and emerging technologies', Int J Educ Technol High Educ, 15(3). doi: 10.1186/s41239-017-0087-5.

Eppard, J. and Rochdi, A. (2017) A Framework for Flipped Learning. Available at 2 (Accessed: 11 December 2023).

Erstad, O., Kjällander, S. and Järvelä, S. (2021) 'Facing the challenges of 'digital competence' a Nordic agenda for curriculum development for the 21st century', Nordic Journal of Digital Literacy, 16(2), pp. 77–87. doi: 10.18261/issn.1891-943x-2021-02-02.

European Commission (2022) Increasing student engagement in STEAM education. Available at 3 (Accessed: 11 December 2023).

European Commission, Directorate-General for Education, Youth, Sport and Culture (2022) Guidelines for teachers and educators on tackling disinformation and promoting digital literacy through education and training. Luxembourg: Publications Office of the European Union. ISBN 978-92-76-36267-0. doi: 10.2766/28248.

European Commission (2010) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: A Digital Agenda for Europe. COM/2010/0245 final.

Gottschalk, F. and Burns, T. (eds.) (2020) Education in the Digital Age: Healthy and Happy Children, Educational Research and Innovation. Paris: OECD Publishing. ISBN 978-92-64-31398-9. doi: 10.1787/421bcc05-en.

Howell, J. and McMaster, N. (2022) 'What Is Digital Pedagogy and Why Do We Need It?', in Howell, J. (ed.) Teaching with Technologies: Pedagogies for Collaboration, Communication, and Creativity, 2nd Edition. Melbourne: Oxford University Press, pp. 1–18. ISBN 978-0-19-559839-1.

Hattie, J. (2008) Visible Learning: A Synthesis of Over 800 Meta-Analyses Relating to Achievement. London: Routledge. ISBN 978-0-415-47618-8.

Hester, S. van de Kuilen, Kosar Altinyelken, H., Voogt, J. and Nzabalirwa, W. (2019) 'Policy adoption of learner-centred pedagogy in Rwanda: A case study of its rationale and transfer mechanisms', International Journal of Educational Development, 67, pp. 1–10. ISSN 0738-0593.

Illeris, K. (2010) Contemporary Theories of Learning: Learning Theorists ... In Their Own Words. London: Routledge. ISBN 978-0-415-47718-5.

Illeris K. (2003) Towards a contemporary and comprehensive theory of learning, International Journal of Lifelong Education, 22:4, 396-406, DOI:10.1080/02601370304837

Law, N., Woo, D. and Wong, G. (2018) A Global Framework of Reference on Digital Literacy Skills for Indicator 4.4.2. UNESCO. Available at 1 (Accessed: 11 December 2023).

Lewin, D. and Lundie, D. (2016) 'Philosophies of Digital Pedagogy', Stud Philos Educ, 35, pp. 235–240. doi: 10.1007/s11217-016-9514-7.

Lim, F. V. and Tan-Chia, L. (2022) Designing Learning for Multimodal Literacy: Teaching Viewing and Representing. Milton: Taylor & Francis Group. ISBN 978-0-367-68561-5.

Krueger, N. (2020) 9 Resources for Teaching Digital Citizenship. ISTE. Available at 2 (Accessed: 11 December 2023).

Martin, F., Chen, Y., Moore, R.L. et al. (2020) 'Systematic review of adaptive learning research designs, context, strategies, and technologies from 2009 to 2018', Education Tech Research Dev, 68, pp. 1903–1929. doi: 10.1007/s11423-020-09793-2.

Mishra, P., Warr, M. and Islam, R. (2023) 'TPACK in the age of ChatGPT and Generative AI', Journal of Digital Learning in Teacher Education, 39(4), pp. 235-251. doi: 10.1080/21532974.2023.2247480.

Mishra, P. and Koehler, M. J. (2006) 'Technological pedagogical content knowledge: A framework for teacher knowledge', Teachers College Record, 108(6), pp. 1017–1054. ISSN 0161-4681.

Montebello, M. (2018) 'The Future of Education: AI for Personalized Learning', in Montebello, M., Camilleri, V. and Dingli, A. (eds.) The Future of Digital Education. Cham: Springer, pp. 1–14. ISBN 978-3-319-97934-2.

Navaitienė, J. and Stasiunaitiene, E. (2021) 'The Goal of the Universal Design for Learning: Development of All to Expert Learners', in Galkiene, A. and Monkeviciene, O. (eds.) Improving Inclusive Education through Universal Design for Learning. Cham: Springer, pp. 13–24. ISBN 978-3-030-80658-3.

Niederhauser, D.S. and Lindstrom, D.L. (2018) 'Instructional Technology Integration Models and Frameworks: Diffusion, Competencies, Attitudes, and Dispositions', in Voogt, J., Knezek, G., Christensen, R. and Lai, K. (eds.) Second Handbook of Information Technology in Primary and Secondary Education. Cham: Springer, pp. 143–159. ISBN 978-3-319-71053-2.

OECD (2019) 'Empowering an active and ethical (digital) generation', in Burns, T. and Gottschalk, F. (eds.) Educating 21st Century Children: Emotional Well-being in the Digital Age. Paris: OECD Publishing, pp. 77–94. ISBN 978-92-64-31398-9.

Poth, R. D. (2023) Developing Students' Digital Citizenship Skills. Edutopia. Available at 3 (Accessed: 11 December 2023).

Poth, R. D. (2023) '7 AI Tools That Help Teachers Work More Efficiently', Edutopia. Available at 4 (Accessed: 11 December 2023).

Read, M. F. (2020) 'RAT: The RAT technology integration model', in West, R. E. (ed.) Encyclopedia of educational technology. Available at 5 (Accessed: 11 December 2023).

Redecker, C. (2017) European Framework for the Digital Competence of Educators: DigCompEdu. Luxembourg: Publications Office of the European Union. ISBN 978-92-79-73494-6.

Roehling, P. and Bredow, C. (2021) 'Flipped learning: What is it, and when is it effective?', Brookings. Available at

Salin and Mahmor 2017

Sefton-Green, J. (2020) 'Play and learning in the digital age', in UNESCO: Education in the Digital Age. Paris: UNESCO. Available at 1 (Accessed: 11 December 2023).

Spadafora, N. and Downes, T. (2020) 'Scaffolding in Learning', in Shackelford, T. and Weekes-Shackelford, V. (eds.) Encyclopedia of Evolutionary Psychological Science. Cham: Springer. ISBN 978-3-319-16999-6. doi: 10.1007/978-3-319-16999-6_1350-1.

Shabani, K., Khatib, M. and Ebadi, S. (2010) 'Vygotsky's zone of proximal development: Instructional implications and teachers' professional development', English Language Teaching, 3(4), pp. 237-248. ISSN 1916-4742.

Terada, Y. (2020) 'SAMR: A Powerful Model for Understanding Good Tech Integration', Edutopia. Available at 2 (Accessed: 11 December 2023).

Tondeur, J., Braak, J. v., Ertmer, P. A. and Ottenbreit-Leftwich, A. (2016) 'Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence', Educational Technology Research & Development, 65(3), pp. 555–575. ISSN 1042-1629. doi: 10.1007/s11423-016-9481-2.

Tshering and Phu-ampai, S. (2022) 'Effects of Using Rubrics on the Learning Achievement of Students in Educational Assessment and Evaluation', Educational Innovation and Practice, 3(1), pp. 75–88. ISSN 2709-256X. Available at 3 (Accessed: 11 December 2023).

UNESCO (2023) What you need to know about digital learning and transformation of education. Available at 4 (Accessed: 11 December 2023).

Van Laar, E., Van Deursen, A., Van Dijk, J. and de Haan, J. (2017) 'The relation between 21st-century skills and digital skills: A systematic literature review', Computers in Human Behavior, 72, pp. 577-588. ISSN 0747-5632. doi: 10.1016/j.chb.2017.03.010.

Voogt, J., Knezek, G., Christensen, R. and Lai, K. (eds.) (2018) Second Handbook of Information Technology in Primary and Secondary Education. Cham: Springer. ISBN 978-3-319-71053-2.

Vuorikari, R., Kluzer, S. and Punie, Y. (2022) DigComp 2.2: The Digital Competence Framework for Citizens - With new examples of knowledge, skills and attitudes. Luxembourg: Publications Office of the European Union. ISBN 978-92-76-48883-5. doi: 10.2760/490274.

Webb, M. and Ifenthaler, D. (2018) 'Assessment as, for, and of Twenty-First Century Learning Using Information Technology: An Overview', in Voogt, J., Knezek, G., Christensen, R. and Lai, K. (eds.) Second Handbook of Information Technology in Primary and Secondary Education. Cham: Springer, pp. 387-403. ISBN 978-3-319-71053-2.

UNICEF (n.d.) Inclusive Education. Available at 5 (Accessed: 11 December 2023).

UNICEF (n.d.) Educators' Digital Competence Framework. Available at (Accessed: 11 December 2023).

Väätäjä, J. O. and Ruokamo, H. (2021) 'Conceptualizing dimensions and a model for digital pedagogy', Journal of Pacific Rim Psychology, 15. doi: 10.1177/1834490921995395.

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