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Digital Education: Theoretical Frameworks and Best Practices for Teaching and Learning in the Security and Defence Area

In today's fast-paced world, education is evolving at a rapid rate, driven by advancements in technology. Digital tools have become an integral part of modern education, transforming teaching methodologies and empowering educators to create engaging and interactive learning experiences for their students. It is very important to guide teachers in the transition to innovative teaching methodologies that utilise digital tools effectively. With the adoption of digital tools and innovative methodologies, educators can enhance student engagement, promote critical thinking and foster creativity. From online resources to virtual classrooms, technology offers a lot of opportunities to enhance teaching approaches that can engage, inspire and empower students, promote collaboration and encourage critical thinking.

Introduction

There are several strategies and best practices that have been studied and that can be used to incorporate effective technology into teaching practice. Both educators and students can benefit from technological innovation, transforming the way students and teachers learn, teach and communicate: in fact, educators can reach students in new and innovative ways. Technologies can provide access to different kinds of resources, facilitate collaboration and promote active student participation. Technologies can provide students with a personalised learning experience, tailored to their unique needs and learning styles. Furthermore, educators collect a wealth of data and analytics can be used to assess student

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progress, identify areas for improvement, and adapt instruction to meet individual learning styles and needs. By utilising these data-driven insights, educators can create a more personalised learning experience, promoting student engagement and achievement. Moreover, digital tools can offer real-time feedback, track student progress and support data-driven decision-making, not just for teachers and students, but also for policymakers and administrators. Understanding these benefits is crucial for teachers to embrace the potential of digital tools fully. With the abundance of digital tools available, it is essential to avoid overwhelming teachers and students; the important matter is quality rather than quantity. In the next sessions, different perspectives about the integration of digital technologies and innovative methodologies will be discussed, providing tips for selecting and implementing educational technology tools, and offering insights on how technology can be used to enhance student engagement, improve learning outcomes and promote collaboration.

Models and frameworks for modern education

Several frameworks provide guidelines to educators to integrate digital tools and innovative methodologies into their teaching practices. The analysis of educational methodologies also concerns the role of technologies in planning the learning activities. One of the models that describe the pervasiveness of technologies in education is the SAMR model,[3] which stands for Substitution, Augmentation, Modification and Redefinition. It is a model adopted to classify educational materials provided according to the technologies involved. This model includes four different approaches to new technologies. It is hierarchical, from low to high integration of technology, with every step representing an improvement in learning outcomes and students' engagement:

– Substitution refers to using technology to replace a face-to-face teaching method. One of the easiest examples of Substitution is simply substituting face-to-face lectures with online live meetings where students can interact. This approach does not cause any actual change in the educational offer, and it does not involve any improvement in the teaching methodology: the traditional setting is simply shifted from the physical class to the online platform together with the synchronous explanation of the teacher. Beyond

[3] Puentedura 2013.

the advantages for those students who cannot be physically present during classes, the overlap between online teaching and synchronous activities also implies some recurrent disadvantages, such as the unavailability of a strong connection or the impossibility of using an appropriate device during classes for some of the students.

- Augmentation refers to using technology to enhance a face-to-face teaching method. In this case, students may be provided with the resources, with uploaded recorded video lectures specifically designed for asynchronous fruition and other activities that may promote effective e-learning. These didactic materials allow the students to autonomously access resources with the further advantage of the teacher's oral explanation, which promotes more effective comprehension and mastery. Resources and activities are planned to improve students' fruition through the possibility of self-management of materials and time and individualisation of the learning process. Another example is given by a teacher opening a personal channel on various social accounts, which is now a very common practice: teaching in this way is almost a substitution, but some features of the technology provided by the streaming service may enhance the learner's capabilities. Other relevant examples of online learning as Augmentation are the use of forums for questions and doubts about the disciplines to which students themselves were able to answer, and the use of Automatic Assessment Systems for the formative evaluation, provided as online drills and followed by personalised feedback. This model of online learning brings about actual and relevant improvements to the learning processes, the most significant being the increase of students' engagement.[4]
- Modification refers to using technology to redesign a teaching method: the activities are redesigned to consider the potentiality of technologies. An example of Modification is the adoption of remote online exams and the necessity of new forms of assessment: policymakers have to provide professors and stakeholders with guidelines on the best evaluation systems. In this case, it is not just a matter of technology adoption: teachers have to redesign examination procedures in order to avoid cheating or other issues, teachers may need to modify exams previously structured in open questions or multiple-choice questions as, for example, open book exams,

[4] Barana et al. 2020.

focused on papers or works to be submitted. The advantage of open book exams, which allow the students to freely access educational materials and manage the execution time, consists in the possibility of avoiding the difficulties presented by simultaneous tests, such as cheating or technical issues caused by the synchronous use of online tools. Moreover, the use of specific tools that allow professors to add comments and assess students' submissions must be promoted. Since the assessment phase fully involves the didactic planning of a course, this is a relevant example of technology acting not only as a direct substitute for functional improvements, but also as an actual "modification" of traditional methodologies. Professors were invited to also use formative assessment and to use the examples of final assessments available on the platform in order to help students better prepare for them,[5] more details on assessment will be shown afterwards.

– Redefinition refers to using technology to create a new teaching method that was not possible before. This is the most pervasive use of technology. The redefinition must be carefully designed in order to achieve learning goals, the starting point of education. For example, teachers can design and generate interactive experiences for students, or make them elaborate large quantities of data, something that would take an enormous amount of time without technology, or make students submit a project to disseminate and communicate what they learned through social media. However, a lot more can be done. This step of the framework is the most advanced and projected into education in the next few years.

The technology itself cannot guarantee effective teaching: in a study comparing the function of teachers in face-to-face and the online teaching mode,[6] the report finds no important differences, and they continue by saying that "if these differences do exist, they are likely to be due to the teacher's involvement and the institution's commitment in the programming of the learning process". This happens because online courses are used only as an alternative or a replacement for face-to-face ones, but they should also be an addition, an integration. Thinking in terms of transition is useful to explain the journey of university professors, but in the end face-to-face teaching and online teaching influence and change each other, none of the two is better than the other. Beyond the possible applications

5 Barana et al. 2020.

6 Díaz–Entonado 2009: 342.

of technologies in education, it is very important to make a distinction about the context where learning happens. The literature shows that the transition between face-to-face to blended[7] (a mix of face-to-face and online teaching) and online teaching is quite challenging, since teachers' roles change.[8] Both Redmond[9] and McQuiggan[10] notice that many experienced teachers find themselves as novices when first approaching online teaching, and this may result in resistance towards online teaching. In addition, the transition to online teaching and learning from a traditional face-to-face approach challenges the expectations and roles of both instructors and learners.[11] Later, Berge, Feiertag and Berge[12] and Alvarez et al.[13] proposed a model for the instructor's role based on four categories: pedagogical, social, managerial and technical. Thus, teachers do not only have to learn new approaches, new methods and new technology, but they also have to take on new roles. Redefining professional identity and teaching practices takes time and training, otherwise many instructors run the risk of replicating existing course design and pedagogical practices when they move from face-to-face teaching to blended or online teaching.[14] In Ammenwerth,[15] the author points out that these traditional approaches may not be adequate for online teaching and that if we evaluate online teaching following the Technology, Pedagogy and Content Knowledge (TPACK) model, university teachers appear to have high expertise in content knowledge and a weaker one in technology and pedagogy knowledge.[16] Technological knowledge refers to the knowledge of different technologies that can be used in education. Pedagogical knowledge refers to different teaching strategies. Content knowledge refers to the knowledge of the subject matter that is being taught. The TPACK framework states that effective technology integration in teaching requires teachers to have a deep understanding of the interaction and integration between technology, pedagogy and content knowledge. These results may suggest that university professors lack expertise in pedagogy. In addition, the

7 Ossiannilsson 2017.
8 Coppola et al. 2002.
9 Redmond 2011.
10 McQuiggan 2007.
11 Meloncon 2007; Redmond 2011.
12 Berge 1995; Feiertag–Berge 2008.
13 Alvarez et al. 2009.
14 Bonk–Dennen 1999.
15 Ammenwerth 2017.
16 Mishra–Koehler 2006; Koehler–Mishra 2009.

recent emergence of EMI (English Medium Instruction) in universities all around the world has posed a number of linguistic and pedagogical challenges for university professors who teach their courses in English, mainly for internationalisation purposes. Many studies report that in EMI contexts around the world, there is a lack of well-defined and structured EMI teacher training and development opportunities[17] to help with both language-related challenges, such as the lack of proficiency, and pedagogy-related ones, such as the lack of awareness when it comes to understanding students' learning styles and preferences.[18] However, universities are implementing transnational policies for quality assurance, which frequently include the establishment of language assessment methods and teacher training programs.[19] Another major challenge identified by Yang and Cornelious[20] for instructors who are used to a teacher-directed face-to-face environment to an online one is to redesign learning with a constructivist approach. Especially in universities, where student numbers in a classroom can reach 300 participants, learner-centred, inclusive and interactive approaches are very difficult to put into practice. This shift in the teacher's role has already changed the way secondary school teachers teach,[21] but university professors are still struggling with the adoption of a new approach as "designers and facilitators of learning"[22] or as coaches in their students' learning process.[23] Another very common concern among university professors is that teaching online may affect their image or prestige.[24] Nevertheless, there is evidence that academics may be ready to become reflective practitioners in the pedagogy of the subject they teach,[25] and that learning to teach online may fuel further self-reflection and evaluation of current teaching practices;[26] some of these worries and aspects also apply to college teachers.[27] In addition, researchers have found that teaching online changes the way teachers think and approach teaching, course design and

17 Costa 2015; Macaro et al. 2018.
18 Alhassan 2021.
19 Christison et al. 2022; Lasagabaster 2022; Macaro 2020.
20 Yang–Cornelious 2005.
21 European Commission 2019.
22 Hlynka–Jacobsen 2009.
23 Ammenwerth 2017; Alvarez et al. 2009.
24 Wingo et al. 2017.
25 Laurillard 2002.
26 McQuiggan 2007.
27 Dietrich 2015.

their relationships with students.[28] An interesting model to smooth the transition between traditional and online teaching is the "training the trainers" one[29] promoted by the field of instructional design based on constructivist principles and aimed at creating a stimulating and interactive learning environment. The goal of instructional design is to teach teachers how to create the resources they need and how to use the technology at their disposal to accomplish their educational objectives.[30] Speaking less of technology and more of the educational activities as a whole, a helpful framework is the ADDIE model which stands for Analysis, Design, Development, Implementation and Evaluation.[31] It is a widely recognised instructional design framework that guides the development of effective learning experiences. This model provides a systematic approach to designing, developing and implementing instruction, ensuring that learning objectives are achieved and learners' needs are met. Let us explore each phase of the ADDIE model in detail.

1. *Analysis.* During this phase, instructional designers gather information about the learning needs, target audience and desired learning outcomes. This involves conducting a thorough analysis of the learning context, identifying the knowledge and skills that learners need to acquire, and understanding any constraints or limitations. The goal is to determine the gap between the current and desired states of learning.
2. *Design.* Instructional designers use the information gathered in the *Analysis* phase to develop a blueprint for the instructional solution. This includes defining clear learning objectives, selecting appropriate instructional strategies, and designing the structure and sequence of the learning materials. Design decisions are guided by educational theories, learning principles and best practices in instructional design, considering the use of multimedia, technology and interactive elements to enhance the learning experience.
3. *Development.* Once the instructional design plan is in place, it is time to create the actual learning materials and resources. This includes developing content, designing assessments and creating multimedia elements such as videos, interactive simulations, or online activities. Instructional designers work closely with subject matter experts and other stakeholders

[28] Major 2010.
[29] Biggs–Tang 2011.
[30] Marchisio et al. 2019b.
[31] Dick et al. 2009; Morrison et al. 2013; Smith–Ragan 2005.

to ensure the accuracy, relevance and quality of the learning materials. Iterative review and feedback processes are often employed to refine and improve the instructional materials.

4. *Implementation.* The designed instruction is delivered to the learners, in whatever modality: face-to-face, online, synchronously, asynchronously, blended (mixing face-to-face and online learning and adopting suitable methodologies) or hybrid (mixing face-to-face with remote learners and adopting suitable methodologies). Instructional designers collaborate with teachers, trainers, or facilitators to ensure smooth delivery of the instruction. They may also provide training or support to instructors, if needed, to ensure effective implementation of the instructional materials and activities.
5. *Evaluation.* This phase is crucial for assessing the effectiveness of the instruction and making data-driven improvements. Evaluation methods may include assessing learner performance by gathering feedback from learners and instructors. Multiple levels of evaluation are typically conducted, including formative evaluations, in which students learn while performing assessments providing teachers with real-time data about students' understanding, and summative evaluations, a standardised type of assessment in which the teacher measures the student's performance with grades. These types of assessment will be analysed later. The use of data in education for evaluation is also known as Learning Analytics. They refer to the process of collecting, analysing and interpreting data generated during the learning process to gain valuable insights into learners' behaviours, progress and overall performance. The findings from the evaluation phase inform revisions and refinements to the instructional design, ensuring continuous improvement of the learning experience. By leveraging data analytics techniques, educators and institutions can identify patterns and trends, understand how students engage with the content, identify areas that need improvement, reflect on the effectiveness of different tools and instructional strategies, and seek feedback from students and colleagues to continuously improve teaching practices, use data-driven insights to make informed decisions about the integration of digital tools. The aim is to harness the vast amounts of data generated by digital learning tools, such as learning management systems, online assessments and interactive learning platforms. Learning analytics enables

> the creation of personalised learning experiences, tailoring instructional strategies to meet individual needs, and offering timely interventions for struggling students. Furthermore, this data-driven approach empowers educators to make informed decisions regarding curriculum design, instructional methodologies and resource allocation, ultimately enhancing the overall learning outcomes and fostering a more effective and adaptive educational ecosystem. As learning analytics continues to advance, it holds great promise in transforming education by optimising the learning process and promoting continuous improvement in teaching and learning methodologies.

Thus, there are several models that help educators in teaching now and in the prospective years, also when level transitions such as from secondary school to university are involved.[32] However, it is not enough to know those frameworks, since the practice implies the use of digital tools and the need for competencies, which is the topic of the next section.

Digital competencies of educators

Teachers are primarily subject experts and they often receive little pedagogical and technical training, as Ammenwerth[33] notices. Professional development programs are essential for promoting high-quality instruction, encouraging a culture of continuous improvement, assisting faculty career development, catering to the requirements of different student populations and advancing institutional goals.[34] Depending on the institution and its aims, this could take many different forms, but the objective is always to give instructors the assistance they require to maintain their teaching proficiency and keep up with the most recent developments in higher education.[35] There are several models for the digital competencies of teachers and students. These models provide a holistic approach to understanding the digital competencies to integrate technology

[32] Bruschi et al. 2018.
[33] Ammenwerth 2017.
[34] Robinson–Hope 2013.
[35] Fernandes et al. 2023.

effectively in teaching and learning. Digital literacies are well known in the scientific community: they refer to the skills, knowledge and dispositions that enable individuals to effectively use digital technologies for communication, collaboration and learning.[36] Digital literacies encompass a range of competencies, including information literacy, media literacy, and digital citizenship. These competencies are essential for teachers and students who are working in digital environments. A known criticality is that the stakeholders tend to overestimate their digital abilities: this leads them to believe that the knowledge they possess is enough for their purposes, and that they can always rely on others who are more skilled with tools if they need help beyond their capabilities. Both students[37] and teachers[38] are inclined to this misbelief; as a consequence, there is a reduced focus on the significance of acquiring sufficient digital competencies. There are also institutional frameworks that must be considered when dealing with digital competencies: firstly, developed by the European Commission, there is the DigComp,[39] a framework that is useful for all citizens to provide a common understanding of what a digital competence is. It classifies digital competencies into five areas: information and data literacy, communication and collaboration, digital content creation, safety and problem-solving.[40] Information and data literacy refers to the ability to find, evaluate, manage and use information collected from web searches effectively. Communication and collaboration refer to the ability to interact, communicate, share and collaborate effectively with other people using digital tools. Digital content creation refers to the ability to develop and re-elaborate digital content using different tools with a close eye on copyright issues. Safety refers to the ability to use digital tools safely and responsibly, especially when dealing with personal and sensitive data: protection must act on two levels, the one of devices (hardware) and the one of cyber threats (software). Problem-solving refers to the ability to use digital tools in different ways to make life easier: being able to solve technical problems, and identifying needs and gaps. The framework is refined when dealing with education in the Digital Competence Framework for Educators, the DigCompEdu framework.[41]

36 Hague–Payton 2010.
37 Buffardi–Taddeo 2017.
38 Tomczyk 2021.
39 Vuorikari et al. 2022
40 Ferrari 2013.
41 Punie–Redecker 2017.

It provides a comprehensive set of competencies that teachers need to possess in order to effectively integrate digital technologies into their teaching practice. The framework identifies 22 competencies organised into six categories such as:

1. Professional Engagement
2. Digital Resources
3. Teaching and Learning
4. Assessment
5. Empowering Learners
6. Facilitating Learners' Digital Competence

More on the institutional point of view, the European Commission also developed the Digital Education Action Plan (DEAP)[42] to provide guidelines for European educational systems for a common vision of high-quality, inclusive and accessible digital education in Europe.[43] The DEAP proposes two main priorities; priority 1 works on fostering the development of a high-performing digital education ecosystem. Priority 2 works on enhancing digital skills and competences for the digital transformation. The priorities are sub-divided into actions that target specific objectives that need to be achieved:

- Remember that integrating digital tools may come with technical challenges.
- Ensure reliable access to the internet and appropriate hardware devices.
- Familiarise with the tools and troubleshoot common technical issues.
- Collaborate with the school's IT department or technology coordinator to seek assistance when needed.
- Provide students with guidelines and resources to overcome technical difficulties they may encounter.
- Collaborate with colleagues to share best practices, ideas and resources.
- Reflect on teaching practices and seek feedback from peers to improve instructional strategies.

In order to do this, teachers must stay updated with the latest trends, attend workshops, conferences and webinars, and actively participate in online communities of educators.

[42] European Commission 2020.
[43] European Commission 2020.

Setting learning outcomes

Before integrating digital tools into teaching, it is important to define clear learning outcomes. Teachers need to consider the desired outcomes (skills, knowledge, responsibility, autonomy) for students to acquire, then teachers may determine how digital tools can enhance those outcomes and ensure alignment with curriculum standards. By setting clear goals, teachers can effectively select appropriate tools and design activities that align with the teaching methodologies. In order to select learning outcomes effectively, the most important work that one must consider is Bloom's Taxonomy,[44] which provides a hierarchical framework for classifying learning objectives based on cognitive levels, ranging from remembering and understanding to applying, analysing, evaluating and creating. These cognitive levels help educators design learning experiences that promote critical thinking and deeper understanding.

- At the lowest level of the taxonomy – remembering – learning objectives involve the recall of factual information. For example, a learning objective might be for students to recall the main events of a historical event or define key scientific terms. This level focuses on the foundational knowledge necessary for higher-order thinking.
- Moving up the taxonomy, understanding involves comprehending and explaining concepts. Learning objectives at this level may require students to summarise a text, interpret data, or explain cause-and-effect relationships. Understanding encourages students to make connections and deepen their comprehension.
- Applying refers to the use of knowledge and skills in new situations. Learning objectives at this level require students to apply their understanding to solve problems, complete tasks, or make predictions. For instance, a learning objective might require students to use mathematical concepts to solve real-world problems or apply scientific principles to design an experiment.
- Analysing involves breaking down information into its component parts and examining the relationships between them. Learning objectives at this level prompt students to analyse data, identify patterns and draw conclusions. They may involve tasks such as comparing and contrasting different perspectives or evaluating the strengths and weaknesses of an argument.

[44] Bloom 1956.

- Evaluating requires students to make judgments based on criteria and evidence. Learning objectives at this level involve assessing the validity of arguments, justifying opinions, or evaluating the quality of a product or performance. Students engage in critical thinking and decision-making processes.
- Finally, creating represents the highest level of Bloom's Taxonomy. At this level, learning objectives involve the synthesis of knowledge and skills to produce original work. Students may be tasked with designing, constructing, or inventing something new. These objectives foster creativity, innovation and the application of learning in novel ways.

By aligning learning objectives with cognitive levels, teachers can design learning experiences that promote higher-order thinking and deeper understanding. The use of Bloom's Taxonomy encourages educators to move beyond rote memorisation and foster critical thinking, problem-solving and creative skills in their students. Furthermore, it provides a framework for assessing student progress and achievement, as different levels of the taxonomy require different types of evidence and demonstrations of learning. The literature also provides more specific guidelines, regarding for example the number of learning outcomes. Although it certainly depends on the size of a given module, it is generally agreed that instead of having an abundance of minor learning outcomes, it is advisable to have a few significant ones.[45] In addition to the desirable qualities of being observable, measurable and assessable, learning outcomes must also be clearly and unambiguously stated. Bloom's taxonomy provides a list of "measurable verbs" that may be used for writing learning outcomes, with an emphasis on active, concrete verbs. Fry et al. and Gosling and Moon[46] among others, give further practical advice insisting on the importance of clarity, simplicity and straightforwardness in the vocabulary used. The key role of Bloom's taxonomy is further stressed in the revision of Anderson et al., in that it helps teachers translate standards into a common language for comparison with what they personally hope to achieve.[47] When it comes to learning outcomes, one of the biggest challenges for teachers is to make sure that teaching strategies, assessment methods, assessment criteria and learning outcomes are consistent and

[45] Kennedy et al. 2007.
[46] Fry et al. 2000; Gosling–Moon 2001.
[47] Anderson et al. 2001.

aligned with one another in order to increase the transparency and significance of students' overall educational experience.[48] Ramsden further points out that students' clear understanding and expectations of evaluation techniques and criteria are connected with a higher satisfaction and performance.[49]

Designing learning experiences

Setting the Learning outcome is the first step before the choice of the most suitable technology. The market is flooded with a wide variety of digital tools designed for education. The most suitable ones are Digital Learning Environments (DLEs). The DLE is defined as a virtual framework in which teaching and learning occur together with the development of competencies. Its human component, consisting of one or more learning communities, is focused on the interactions between teachers and students and among students themselves, but also other interactions with other figures in education (tutors, instructors, facilitators, administrators, policymakers) play an important role. Its technological component includes a Learning Management System along with other integrated tools, based on the educational need. These tools allow the adoption of specific methodologies, such as problem-solving or formative practices. To choose the right tools, first the learning outcomes must be considered. Then, instructors should also consider student needs and the specific subject area. The evaluation of the most appropriate tools should be based on their usability, functionality, compatibility, data privacy and security features. Consider seeking recommendations from colleagues, attending professional development sessions, and exploring online communities to discover effective tools that have been tried and tested. When selecting educational technology tools, it is important to consider the students' needs and learning styles, as well as the specific learning outcomes that need to be achieved. There are a wide variety of educational technology tools available, ranging from online learning platforms to virtual reality applications, each offering unique benefits and drawbacks. Content aggregators and repositories are also an important source of materials and ideas. Following Dringó-Horváth et al.[50] they may be grouped as follows:

[48] Kennedy et al. 2007.
[49] Ramsden 2003.
[50] Dringó-Horváth et al. 2021.

- educational portals
- digital libraries and archives
- image, audio and video sharing services
- presentation services

Especially when consisting of OERs (Open Educational Resources) with Creative Commons licences, these resources can be used, reused, modified and built on according to one's needs, allowing teachers to save time without having to prepare materials from scratch. To complement this, the selection and the production of materials can be performed with an interdisciplinary perspective where appropriate, through the use of versatile modules. The use of OERs is pivotal in devising Open Educational Practices (OEPs), that blend using those resources with adopting innovative pedagogical models, and engaging both educators and learners in learning settings either formal or informal.[51] Indeed, the implementation of "practices which support the (re)use and production of OERs through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning path", as one of the most used definitions of OEPs spells out,[52] allows for giving a methodological basis to the use of OERs. This goes beyond the open nature, which is necessary, but not sufficient since it is also important to facilitate changes in educational approaches, institutional policies and pedagogies. Namely, the production, management and re(use) of OERs have to be accompanied by:[53]

- The development and the application of open pedagogies in teaching practice, to support students and educators and make valuable contributions to the pool of public knowledge resources.
- Open and peer-to-peer learning, with open accreditation of students.
- Open scholarship: in researching, in disseminating data, in publishing *open access.*
- Open sharing: outcomes, teaching ideas, examples of teaching practice.
- The use of open technologies and tools, beyond educational resources.

[51] Marchisio et al. 2020.
[52] Ehlers 2011.
[53] Beetham et al. 2012.

It follows that OEPs can influence the design of learning experiences under several points of view, which can be summarised as follows:[54]

- Cultural: knowledge and curricula can be composed with more versatility, if open resources are available and open practices are implemented.
- Legal: the open licences, such as Creative Commons, generally allow more (re)usability with respect to the rigid copyrighted materials, albeit some limitations can still exist.
- Pedagogical: students can be engaged and assessed in new ways.
- Technical and technological: open formats can permit better interoperability and connectivity, since they are usually designed to be multiplatform, without artificial limitations put in place for commercial reasons. This could be also an advantage under the financial perspective, preventing institutions from acquiring expensive hardware or software for reaching goals in all respects attainable also at a lower cost.

A potential drawback to the use of open instruments is the possibility of having less support: sometimes, if problems arise, it is easier to resort to a business customer service than to try solving them in a community made by users. Practically, a proper compromise has to be made. This brings us back again to the initial question: how to choose the proper tools for education? To select the best educational technology tools for the students, consider the following factors:

- Learning Outcomes: What are the specific learning outcomes to be achieved? Do critical thinking, collaboration, or creativity need to be promoted?
- Student Needs: What are the specific needs of students? Are they struggling with a particular concept or subject area? Are they visual learners, auditory learners, or kinaesthetic learners? Does it allow for personalisation?
- Accessibility: Is the technology accessible to all students, regardless of their background or ability level? Are there any potential barriers to access that need to be addressed?
- Cost: What is the cost of the technology, and does it fit within the budget? Are there any ongoing costs, such as licencing fees or maintenance costs, that need to be considered?

[54] Hodgkinson-Williams 2014.

- Ease of Use: Is the technology easy to use and implement? Will it require extensive training or technical support?
- Teacher Needs: Does it allow for customisation? Is the technology reliable, relevant and consistent with the desired learning outcomes?

Foshay et al. 2010[55] divide the different kinds of instructional software in three groups, clarifying that a given technology may be used in one way, making the purpose and not the design of the software itself a priority:

- Supplementary: software that supplements instruction already provided in other modalities by adding little to no new content. Electronic substitutes for textbooks, lectures, workbooks, references, drill and practice sessions are a few examples.
- Complementary: software that expands the curriculum with additional material in ways for which often there are no non-electronic alternatives. Some examples are simulations, problem-solving and project design tools, as well as a number of enrichment applications.
- Software that serves as the primary source of initial instruction, as a substitute for non-electronic modalities of instruction, often used in distance education.

By carefully considering these factors, educators can select educational technology tools that are tailored to their students' needs and aligned with their specific learning outcomes. Digital tools should be integrated seamlessly into the curriculum to create engaging learning experiences. When people are new to the use of pervasive technology in education, there are some recommendations and practices that could help in incorporating technology into teaching. At first, educators should start small: incorporating technology into the teaching practice can be overwhelming; it is better to select a few key tools and experiment with how they can be integrated into lessons. Secondly, the integration of technology must be seamless: educators must avoid using technology for the sake of using technology and instead focus on how it can enhance student learning outcomes. Third, technology can be helpful if it fosters collaboration. Technology offers a wealth of opportunities for collaboration and group work. Encourage students to work together, utilising online tools such as virtual whiteboards and collaboration platforms. Fourthly, technology can give us a lot of information that may not

[55] Foshay et al. 2010.

be relevant or incorrect: educators then should emphasise critical thinking, encouraging students to analyse, evaluate and synthesise information, engage with online resources, and evaluate the credibility of information. Digital tools provide opportunities for active student engagement in the learning process. Encourage students to take ownership of their learning by using tools that allow them to explore, research and discover information independently. Incorporate gamification elements to make learning more enjoyable and motivate students to actively participate. Provide immediate feedback through formative assessment tools to guide student progress. Last but not least, it is very important to remember that, since technology in education acts as a means and not as a scope, the order of the operations to be performed is first planning careful instructional design and then using the technology needed, not vice versa.[56] It is clear that technical limitations and merits constitute a factor which has to be necessarily taken into account, but learning experiences have not to be constructed around them, that is designing them by taking as absolute priority to exploit the environment in the best way possible under the technological point of view. Often, it is better to make use of technology up to a certain extent, while keeping solid methodological bases motivating the structure of what educationally produced.

Integrating digital tools into assessment

Assessment plays a crucial role in measuring student learning and progress. According to Astin,[57] from the viewpoints of both teachers and students, assessment defines the whole educational process and provides information that measures its objectives and content, the process of learning and instruction, and the achievements of the learner, while also contributing to a more efficient organisation of teaching and learning. In Dringó-Horváth et al.,[58] the authors call for a revaluation of pedagogical assessment, which in turn implies the development of new strategies with specific objectives, stressing that the selection of digital tools should be dictated by and subordinated to those goals and not vice versa. Digital tools offer innovative ways to assess student understanding and provide valuable insights into their strengths and areas for improvement.

[56] Marchisio et al. 2022.
[57] Astin–Antonio 2012.
[58] Dringó-Horváth et al. 2021.

Utilise online quizzes, interactive presentations and multimedia projects to assess student knowledge. Embrace tools that provide automated grading and analytics to streamline the assessment process and inform instructional decisions. Digital tools can be particularly beneficial for students with diverse learning needs. Provide options for accessibility, such as text-to-speech or closed captioning features. Offer differentiated instruction by selecting tools that allow for individualised pacing and adaptive learning experiences. Ensure that digital tools are inclusive and accessible to all students, regardless of their abilities. Technology offers a wealth of opportunities to provide personalised learning. Consider incorporating interactive multimedia elements such as videos, simulations and virtual reality experiences to enhance student understanding. Design activities that encourage student collaboration, critical thinking and problem-solving. Provide opportunities for students to create, share and present their work using digital tools. One strategy to consider the diverse learning needs is Formative Assessment and feedback. For the construct of Formative Assessment, Black and Wiliam's definition is one of the most recognised in literature.[59] They state that "practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited". Critical to this definition of Formative Assessment is the collection of evidence, and the interpretation and use of the information gathered to act on learning. The mere collection of students' answers, without altering and tailoring the learning path according to the collected data, is not to be considered formative.[60] Among the strategies of Formative Assessment, the provision of feedback is undoubtedly the most distinctive one and the object of in-depth studies. Results on feedback efficacy on learning are controversial.[61] For instance, from an outstanding review of feedback[62] it emerges that in more than one-third of the 607 analysed cases, feedback interventions reduced performance. This means that great attention should be paid to feedback design. Hattie and Timperley[63] provided a model for constructing effective feedback. They define

[59] Black–Wiliam 2009.
[60] Wiliam 2006.
[61] Azevedo–Bernard 1995.
[62] Kluger–DeNisi 1996.
[63] Hattie–Timperley 2007.

feedback as "information provided by an agent, such as a teacher, a peer, or a book, regarding aspects of one's performance or understanding".[64] According to their definition, feedback is a form of communication that aims to bridge the gap between a learner's current understanding or performance and the desired goal. It serves as a mechanism to provide learners with specific information about their strengths and weaknesses, guide them toward improvement, and enhance their future learning. Hattie and Timperley emphasise that effective feedback should be timely, specific and actionable, providing learners with clear guidance on how to close the gap between their current and desired performance. Effective feedback should indicate what the learning goals are; what progress is being made toward the goal; and what activities need to be undertaken to make better progress. Moreover, feedback can work at four levels: at the task level, giving information about task correctness; at the process level, adding details about the main steps needed to accomplish the task; at the self-regulation level, activating metacognitive processes; and at the self level, adding personal evaluations about the learner. While the literature shows that the self level is not effective, or even dangerous,[65] it seems that the only task level feedback alone is not enough: many studies show that elaborated feedback is more useful than the corrective one to improve learning.[66] The great part of elaborated feedback models that the literature proposes is static: students have to read them carefully and compare them with their results. Some studies also show that, more often than expected, students do not read them at all, especially if they perceive the task as too complicated or if they do not receive the feedback timely.[67] It is clear that if the learners do not process feedback, the latter lose all their potential.[68] Modern digital tools for assessment allow for formative assessment and the provision of feedback to be put efficiently in practice. For example, it is possible to provide "adaptive" questions, that are multipart questions in which the path proposed depends on the student's answers, acting as immediate feedback.[69] If the student correctly answers a question in the first instance, then their specific knowledge is ascertained, and the question ends with the first part alone, prompting the student

64 Hattie–Timperley 2007: 81.
65 Kluger–DeNisi 1996.
66 Shute 2008; Timmers–Veldkamp 2011.
67 Timmers–Veldkamp 2011.
68 Sadler 1989.
69 Galluzzi et al. 2021.

to another question. On the contrary, if the student wrongly answers the question in its initial stage, then subsequent parts of it are successively made available, allowing them to reflect on why they did not provide the right answer through a tailored path, which can end with asking again what was asked at the beginning of the question. This fits with the methodology of learning through errors,[70] which predates by decades the advent of the information revolution, highlighting once more how technology can help the implementation of already consolidated methodologies. Another capability of some of the so-called "Automated Assessment Systems" (AAS) is to interface with a computational engine, allowing to compare different forms of the same expression (e.g. a mathematical formula that can be written in several ways) in order to consider all of them as right while assessing. This is useful for scientific subjects, but not only: thanks to advanced capabilities, it is possible to devise tasks also for disciplines belonging to other areas such as Humanities and Linguistics,[71] thus widening the usability spectrum of the tool. It is also possible to construct questions containing randomly generated elements: when a question appears to the student, parameters are generated, and they change if that question is reattempted. This allows students to attempt a question several times, as the various attempts were different questions, thus essentially incrementing the amount of formative materials available to students with a lower effort than traditionally required.

Conclusion

The integration of digital tools into innovative teaching methodologies has the potential to revolutionise education. By embracing these tools, teachers can create engaging learning experiences, promote active student engagement, and facilitate personalised and meaningful instruction. However, it is important to approach this transition thoughtfully and deliberately. By setting clear learning objectives, selecting the right tools, and continuously reflecting on and improving instructional practices, teachers can harness the full potential of digital tools and enhance student learning outcomes. Teaching from a desk and teaching from a computer desktop are two very different ways of teaching: the first is a long-standing tradition, one that professors are familiar with and have

[70] Scriven 1967.

[71] Marello et al. 2019.

mastered throughout years of experience, while the second was born around thirty years ago; the first is a solitary act that typically only involves the teacher's expertise as far as the content, the delivery and the assessment are concerned, while the second is usually a team effort, which requires the collaboration of tutors, technical and managerial staff, and instructional designers. They share a similarity, though: in recent years, the pedagogical assumptions of traditional teaching have been questioned, while moving towards a more learning and learner-centred, constructivist model. This model is one of the foundations of online teaching, where the teacher becomes, more than ever, a facilitator of learning, who therefore must redefine their role. These principles are still very hard to put into practice at the university level in a classroom context, but through the design of online courses, professors are becoming aware of the necessity to "teach the way students learn".[72] However, designing online courses is a time-consuming, challenging process demanding that professors become once again learners too. Not only do they have to redefine their role and rethink their materials, they also have to familiarise with new technology and plan how to use it according to their courses' learning objectives, adapt evaluation to the automatic assessment model, and juggle academic commitments and the preparation of videos, animations, quizzes and other online interactive activities. Work organisation and time management become a priority in teachers' struggle not to be overwhelmed, so it becomes paramount that they are not left alone and are offered the support they need. At the same time, also students have to be taught how to overcome their digital literacy and technical issues, but above all how to become more autonomous and disciplined in order not to lose motivation even in contexts where in-person interaction is diminished or lacking. In addition, to make the transition smoother, teachers need to be constantly supported and universities must be equipped accordingly. Universities need people who are expert in designing online courses together with the teachers, who can find the most suitable solutions, who can show them models and innovative strategies. Providing constant and relevant feedback, together with the employment of multi-modality, gamification tools, setting clear expectations and maintaining an online presence has proved to increase student engagement and motivation and reduce dropout rates. The blended modality (joining face-to-face and online learning) can help the transition, too: by progressively reducing face-to-face teaching and offering stimulating online learning experiences, students are given time to

[72] Kolowich 2013.

become more independent and get accustomed to using the required technology. Despite all these difficulties, after the training most teachers express satisfaction for the work done, give encouraging feedback on the training received, and say they would repeat the experience. At the same time, preparing a blended, hybrid, or online course seems to prompt reflection on traditional teaching, and once the course is completed the integrated use of the classroom course and the online one provides undeniable benefits.

References

Alhassan, Awad (2021): Challenges and Professional Development Needs of EMI Lecturers in Omani Higher Education. *SAGE Open,* 11(4). Online: https://doi.org/10.1177/21582440211061527

Alvarez, Ibis – Guasch, Teresa – Espasa, Anna (2009): University Teacher Roles and Competencies in Online Learning Environments: A Theoretical Analysis of Teaching and Learning Practices. *European Journal of Teacher Education,* 32(3), 321–336. Online: https://doi.org/10.1080/02619760802624104

Ammenwerth, Elske (2017): Envisioning Changing Role of University Teacher in Online Instructional Environments. *The All Ireland Journal of Teaching and Learning in Higher Education,* 9(3), 3121–3129. Online: https://doi.org/10.62707/aishej.v9i3.312

Anderson, Lorin W. – Krathwohl, David R. – Airasian, Peter W. – Cruikshank, Kathleen A. – Mayer, Richard E. – Pintrich, Paul R. – Raths, James – Wittrock, Merlin C. eds. (2005): *A Taxonomy for Learning, Teaching, and Assessing. A Revision of Bloom's Taxonomy of Educational Objectives.* New York: Longman.

Astin, Alexander W. – Antonio, Anthony L. (2012): *Assessment for Excellence: The Philosophy and Practice of Assessment and Evaluation in Higher Education.* Lanham: Rowman & Littlefield.

Azevedo, Roger – Bernard, Roger (1995): A Meta-Analysis of the Effects of Feedback in Computer-Based Instruction. *Journal of Educational Computing Research,* 13(2), 111–127. Online: https://doi.org/10.2190/9LMD-3U28-3A0G-FTQT

Barana, Alice – Marchisio, Marina – Rabellino, Sergio (2019): *Empowering Engagement through Automatic Formative Assessment.* 2019 IEEE 43rd Annual Computer Software and Applications Conference, 216–225. Online: https://doi.org/10.1109/COMPSAC.2019.00040

Barana, Alice – Boffo, Stefano – Gagliardi, Francesco – Garuti, Rossella – Marchisio, Marina (2020): Empowering Engagement in a Technology-Enhanced Learning Environment. In Rehm, Matthias – Saldien, Jelle – Manca, Stefania (eds.): *Project and Design Literacy as Cornerstones of Smart Education.* Singapore: Springer, 75–77. Online: https://doi.org/10.1007/978-981-13-9652-6_7

Beetham, Helen – Falconer, Isobel – McGill, Lou – Littlejohn, Allison (2012): *Open Practices: Briefing Paper.* Online: https://oersynth.pbworks.com/w/page/51668352/OpenPracticesBriefing

Berge, Zane L. (1995): The Role of the Online Instructor/Facilitator. *Educational Technology,* 35(1), 22–30.

Biggs, John – Tang, Catherine S. K. (2011): Train-the-Trainers: Implementing Outcomes-based Teaching and Learning in Malaysian Higher Education. *Malaysian Journal of Learning and Instruction,* 8, 1–19. Online: https://doi.org/10.32890/mjli.8.2011.7624

Black, Paul J. – Wiliam, Dylan (2009): Developing the Theory of Formative Assessment. *Educational Assessment, Evaluation and Accountability,* 21(1), 5–31. Online: https://doi.org/10.1007/s11092-008-9068-5

Bloom, Benjamin S. ed. (1956): *Taxonomy of Educational Objectives. The Classification of Educational Goals.* Handbook 1. Cognitive Domain. Online: https://eclass.uoa.gr/modules/document/file.php/PPP242/Benjamin%20S.%20Bloom%20-%20Taxonomy%20of%20Educational%20Objectives%2C%20Handbook%201_%20Cognitive%20Domain-Addison%20Wesley%20Publishing%20Company%20%281956%29.pdf

Bonk, Curtis J. – Dennen, Vanessa (1999): Teaching on the Web: With a Little Help from my Pedagogical Friends. *Journal of Computing in Higher Education,* 11(1), 3–28. Online: https://doi.org/10.1007/BF02940840

Bruschi, Barbara – Cantino, Valter – Cavallo Perin, Roberto – Culasso, Francesca – Giors, Barbara – Marchisio, Marina – Marello, Carla – Milani, Matteo – Operti, Lorenza – Parola, Alberto – Rabellino, Sergio – Sacchet, Matteo – Scomparin, Laura (2018): Start@unito: A Supporting Model for High School Students Enrolling to University. In Demetrios, G. Sampson – Ifenthaler, Dirk – Isaías, Pedro (eds.): *15th International Conference on Cognition and Exploratory Learning in the Digital Age (CELDA 2018).* Budapest, 21–23 October, 307–312.

Buffardi, Annalisa – Taddeo, Gabriella (2017): The Web 2.0 Skills of Italian Students: An Empirical Study in Southern Italy. *Italian Journal of Sociology of Education,* 9(1), 45–76. Online: https://doi.org/10.14658/pupj-ijse-2017-1-4

Christison, MaryAnn – Crandall, JoAnn (Jodie) – Christian, Donna eds. (2022): *Research on Integrating Language and Content in Diverse Contexts.* New York: Routledge.

Coppola, Nancy W. – Hiltz, Starr R. – Rotter, Naomi G. (2002): Becoming a Virtual Professor: Pedagogical Roles and Asynchronous Learning Networks. *Journal of Management Information Systems,* 18(4), 169–189. Online: https://doi.org/10.1080/07421222.2002.11045703

Costa, Francesca (2015): English Medium Instruction (EMI) Teacher Training Courses in Europe. *RiCognizioni. Rivista di Lingue e Letterature Straniere e Culture Moderne,* 2(4), 127–135. Online: https://doi.org/10.13135/2384-8987/1102

Dick, Walter – Carey, Lou – Carey, James O. (2009): *The Systematic Design of Instruction.* Upper Saddle River: Pearson.

Dietrich, David C. (2015): Observations of a Reluctant Online Instructor: Transitioning from the Classroom to the Computer. *College Teaching,* 63(3), 93–98. Online: https://doi.org/10.1080/87567555.2015.1019824

Díaz, Laura A. – Entonado, Florentino B. (2009): Are the Functions of Teachers in e-Learning and Face-to-Face Learning Environments Really Different? *Educational Technology and Society,* 12(4), 331–343.

Dringó-Horváth, Ida – Dombi, Judit – Hülber, László – Menyhei, Zsófia – Pintér, Tibor M. – Papp-Danka, Adrienn (2021): *Educational Technology in Higher Education – Methodological Considerations.* Online: https://real.mtak.hu/165078/1/Dring%C3%B3-Horv%C3%A1th_et_al_EducationalTechnologyInHigher Education_2021.pdf

Ehlers, Ulf-Daniel (2011): Extending the Territory: From Open Educational Resources to Open Educational Practices. *Journal of Open, Flexible and Distance Learning,* 15(2), 1–10.

European Commission (2019): *Digital Education at School in Europe. Eurydice Report.* Luxembourg: Publications Office of the European Union.

European Commission (2020): *Digital Education Action Plan (DEAP).* European Education Area. Online: https://education.ec.europa.eu/document/digital-education-action-plan

Feiertag, Jeff – Berge, Zane L. (2008): Training Generation N: How Educators Should Approach the Net Generation. *Education and Training,* 50(6), 457–464. Online: https://doi.org/10.1108/00400910810901782

Fernandes, Sandra – Araújo, Alexandra M. – Miguel, Isabel – Abelha, Marta (2023): Teacher Professional Development in Higher Education: The Impact of Pedagogical Training Perceived by Teachers. *Education Sciences,* 13(3), 1–13. Online: https://doi.org/10.3390/educsci13030309

Ferrari, Anusca (2013): *DIGCOMP. A Framework for Developing and Understanding Digital Competence in Europe.* Luxembourg: Publications Office of the European Union. Online: https://doi.org/10.2788/52966

Foshay, Wellesley R. – Quinn, William D. (2010): *Strategies for Evaluating Technology in Education and Training.* New Delhi: Shipra Publications.

Fry, Heather – Ketteridge, Steve – Marshall, Stephanie (2000): *A Handbook for Teaching and Learning in Higher Education. Enhancing Academic Practice.* London: Kogan Page.

Galluzzi, Federica – Marchisio, Marina – Roman, Fabio – Sacchet, Matteo (2021): *Mathematics in Higher Education: A Transition from Blended to Online Learning in Pandemic Times.* 2021 IEEE 45th Annual Computers, Software, and Applications Conference (COMPSAC), 84–92. Online: https://doi.org/10.1109/COMPSAC51774.2021.00023

Gosling, David – Moon, Jenny (2001): *How to Use Learning Outcomes and Assessment Criteria.* Online: https://aec-music.eu/userfiles/File/goslingmoon-learningoutcome-sassessmentcriteria.pdf

Hague, Cassie – Payton, Sarah (2010): *Digital Literacy Across the Curriculum.* Futurelab Handbook. Online: http://www.nfer.ac.uk/publications/FUTL06/FUTL06.pdf

Hattie, John – Timperley, Helen (2007): The Power of Feedback. *Review of Educational Research,* 77(1), 81–112. Online: https://doi.org/10.3102/003465430298487

Hlynka, Denis – Jacobsen, Michele (2009): What Is Educational Technology, Anyway? A Commentary on the New AECT Definition of the Field. *Canadian Journal of Learning and Technology – La revue canadienne de l'apprentissage et de la technologie,* V35(2). Online: https://doi.org/10.21432/T2N88P

Hodgkinson-Williams, Cheryl (2014): *Degrees of Ease: Adoption of OER, Open Textbooks and MOOCs in the Global South.* Online: http://hdl.handle.net/11427/1188

Kennedy, Declan – Hyland, Áine – Ryan, Norma (2007): *Writing and Using Learning Outcomes: A Practical Guide.* Online: https://www.ehea.info/media.ehea.info/file/Qualifications_frameworks/05/0/Kennedy_Writing_and_Using_Learning_Outcomes_597050.pdf

Kluger, Avraham N. – DeNisi, Angelo (1996): The Effects of Feedback Interventions on Performance: A Historical Review, a Meta-Analysis, and a Preliminary Feedback Intervention Theory. *Psychological Bulletin,* 119(2), 254–284. Online: https://doi.org/10.1037/0033-2909.119.2.254

Koehler, Matthew J. – Mishra, Punya (2009): What Is Technological Pedagogical Content Knowledge? *Contemporary Issues in Technology and Teacher Education,* 9(1), 60–70.

Kolowich, Steve (2013): The Professors behind the MOOC Hype. *The Chronicle of Higher Education,* 18 March 2013. Online: https://www.chronicle.com/article/The-Professors-Behind-the-MOOC/137905

Lasagabaster, David (2022): *English-Medium Instruction in Higher Education.* Cambridge: Cambridge University Press.

Laurillard, Diana (2002): Rethinking Teaching for the Knowledge Society. *Educause Review,* 37(1), 16–25.

Macaro, Ernesto (2020): Exploring the Role of Language in English Medium Instruction. *International Journal of Bilingual Education and Bilingualism,* 23(3), 263–276. Online: https://doi.org/10.1080/13670050.2019.1620678

Macaro, Ernesto – Curle, Samantha – Pun, Jack – An, Jiangshan – Dearden, Julie (2018): A Systematic Review of English Medium Instruction in Higher Education. *Language Teaching,* 51(1), 36–76. Online: https://doi.org/10.1017/S0261444817000350

Major, Claire H. (2010): Do Virtual Professors Dream of Electric Students? University Faculty Experiences with Online Distance Education. *Teachers College Record,* 112(8), 2154–2208. Online: https://doi.org/10.1177/016146811011200802

Marchisio, Marina – Operti, Lorenza – Rabellino, Sergio – Sacchet, Matteo (2019a): *Start@unito: Open Online Courses for Improving Access and for Enhancing Success in Higher Education.* Proceedings of the 11th International Conference on Computer Supported Education (CSEDU), 639–646. Online: https://doi.org/10.5220/0007732006390646

Marchisio, Marina – Sacchet, Matteo – Salusso, Daniela (2019b): *Instructional Design to "Train the Trainers": The Start@unito Project at the University of Turin.* Proceedings of the International Conference on E-learning (EL), 195–202. Online: https://doi.org/10.33965/el2019_201909F025

Marchisio, Marina – Rabellino, Sergio – Sacchet, Matteo (2020): Start@unito as Open Educational Practice in Higher Education. *Journal of e-Learning of Knowledge Society,* 16(4), 46–55. Online: https://doi.org/10.20368/1971-8829/1135354

Marchisio, Marina – Roman, Fabio – Sacchet, Matteo – Spinello, Enrico (2022): *Teachers' Perception of Higher Education in a Transition Scenario.* 2022 IEEE 46th Annual Computers, Software, and Applications Conference (COMPSAC), 139–144. Online: https://doi.org/10.1109/COMPSAC54236.2022.00028

Marello, Carla – Marchisio, Marina – Pulvirenti, Marta – Fissore, Cecilia (2019): *Automatic Assessment to Enhance Online Dictionaries Consultation Skills.* 16th International Conference on Cognition and Exploratory Learning in Digital Age (CELDA), 331–338. Online: https://doi.org/10.33965/celda2019_201911L041

McQuiggan, Carol A. (2007): *The Role of Faculty Development in Online Teaching's Potential to Question Teaching Beliefs and Assumptions.* Online: https://ojdla.com/archive/fall103/mcquiggan103.pdf

Meloncon, Lisa (2007): Exploring Electronic Landscapes: Technical Communication, Online Learning, and Instructor Preparedness. *Technical Communication Quarterly,* 16(1), 31–53. Online: https://doi.org/10.1080/10572250709336576

Mishra, Punya – Koehler, Matthew J. (2006): Technological Pedagogical Content Knowledge: A New Framework for Teacher Knowledge. *Teachers College Record,* 108(6), 1017–1054. Online: https://doi.org/10.1111/j.1467-9620.2006.00684.x

Morrison, Gary R. – Morrison, Gary R. – Ross, Steven J. – Morrison, Jennifer R. – Kalman, Howard K. (2013): *Designing Effective Instruction.* Hoboken: Wiley.

Ossiannilsson, Ebba (2017): *Blended Learning. The State of the Nation.* 10th International Conference on Computer Supported Education (CSEDU), 541–547.

Puentedura, Ruben R. (2013): *SAMR: Moving from Enhancement to Transformation.* Online: http://www.hippasus.com/rrpweblog/archives/000095.html

Punie, Yves – Redecker, Christine (2017): *European Framework for the Digital Competence of Educators. DigCompEdu.* Luxembourg: Publications Office of the European Union. Online: https://doi.org/10.2760/178382

Ramsden, Paul (2003): *Learning to Teach in Higher Education.* London: Routledge.

Redmond, Petrea (2011): *From Face-to-Face Teaching to Online Teaching: Pedagogical Transitions.* Online: https://www.ascilite.org/conferences/hobart11/downloads/papers/Redmond-full.pdf

Robinson, Terrell E. – Hope, Warren C. (2013): Teaching in Higher Education: Is There a Need for Training in Pedagogy in Graduate Degree Programs? *Research in Higher Education Journal,* 21, 1–11. Online: https://files.eric.ed.gov/fulltext/EJ1064657.pdf

Sadler, Royce D. (1989): Formative Assessment and the Design of Instructional Systems. *Instructional Science,* 18(2), 119–144.

Scriven, Michael (1967): The Methodology of Evaluation. In Tyler, Ralph W. – Gagné, Robert M. – Scriven, Michael (eds.): *Perspectives of Curriculum Evaluation.* Chicago: Rand McNally, 39–83.

Shute, Valerie J. (2008): Focus on Formative Feedback. *Review of Educational Research,* 78(1), 153–189. Online: https://doi.org/10.3102/0034654307313795

Smith, Patricia L. – Ragan, Tillman J. (2005): *Instructional Design.* Hoboken: Wiley.

Timmers, Caroline – Veldkamp, Bernard (2011): Attention Paid to Feedback Provided by a Computer-Based Assessment for Learning on Information Literacy. *Computers and Education,* 56(3), 923–930. Online: https://doi.org/10.1016/j.compedu.2010.11.007

Tomczyk, Łukasz (2021): Declared and Real Level of Digital Skills of Future Teaching Staff. *Education Sciences,* 11(10). Online: https://doi.org/10.3390/educsci11100619

Vuorikari, Riina – Kluzer, Stefano – Punie, Yves (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. Online: https://doi.org/10.2760/490274

Wiliam, Dylan (2006): Formative Assessment: Getting the Focus Right. *Educational Assessment,* 11(3), 283–289. Online: https://doi.org/10.1207/s15326977ea1103&4_7

Wingo, Nancy P. – Ivankova, Nataliya V. – Moss, Jaqueline A. (2017): Faculty Perceptions about Teaching Online: Exploring the Literature Using the Technology Acceptance Model as an Organizing Framework. *Online Learning,* 21(1), 15–35. Online: https://doi.org/10.24059/olj.v21i1.761

Yang, Yi – Cornelious, Linda F. (2005): Preparing Instructors for Quality Online Instruction. *Online Journal of Distance Learning Administration,* 8(1), 1–16.