HyperDocs, UDL, and the SAMR model as gateways to develop Greek teachers' digital competence through the lens of DigCompEdu: The case of "HyperMOOC"

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Abstract

Digital competence encompasses a set of knowledge, skills, and attitudes citizens need to actively participate in the digital world. There is a need to adequately develop teachers' digital competence as a part of their professional development to facilitate students' digital competence. Several competency frameworks have described the facets of digital competence for teachers, but it remains unclear how to support teachers in developing their digital competence. MOOCs have the potential to be a viable solution for developing teachers' digital competence. This study presents the educational design and development of the "HyperMOOC," a hybrid MOOC that utilizes the DigCompEdu framework to develop teachers' digital competence in certain areas identified as needing improvement. The proposed educational design is based on a collaborative approach that leverages existing frameworks and models, including UDL, HyperDocs, and the SAMR model, to provide valuable insights on how to design and develop MOOCs for effective teacher professional development on digital competences.

Keywords: Massive Open Online Courses, Digital Competence, DigCompEdu, UDL, HyperDocs, SAMR model.

Introduction

Digital competence is increasingly acknowledged as a key competency in the 21st century that is essential for lifelong learning. It is recognized as a set of knowledge, skills, and attitudes required for individuals to live, work, and actively participate in the so-called knowledge society (European Commission, 2018). It is clear that education and training systems could play a vital role in addressing the need for digitally competent citizens. The COVID-19 pandemic has heavily impacted education and training, accelerating the need for effective use of digital learning practices worldwide, further enhanced by the advancement of Artificial Intelligence (AI). The aforementioned factors have accelerated the digital transformation of education, emphasizing the need for educators to foster their digital competences and seamlessly incorporate new emerging technologies into their teaching practice (European Commission, 2020; Flogie & Krabonja, 2023). In this context, teachers' digital competence has been identified as a fundamental part of teacher professional development (TPD) as education has become more digitalized (Lucas et al., 2021). Moreover, teacher digital competence training is essential not only to meet the demands of transforming education for the digital age but also to facilitate students' digital competence (European Commission, 2020).

The advancement of digital technology has led to the development of Massive Open Online Courses (MOOCs), a rapidly evolving educational phenomenon that has attracted significant attention from researchers over the last decade (Zhu et al., 2020). MOOCs are forms of online courses designed for mass participation and open access to knowledge through the web (Kaplan & Haenlein, 2016). The increasing enrolment of teachers in conventional MOOCs underscores the possible impact of these courses as tools to provide effective teacher professional development (Ho et al., 2015). MOOCs represent a scalable and cost-effective option for teachers' professional development, equipping

them with the necessary competences, knowledge, and skills required to meet the demands of the rapidly changing teaching profession (Vivian & Falkner, 2014). To this extent, MOOCs have the potential to address teachers' educational needs for training and continuous professional development in digital competences, offering flexible forms of education to a large number of learners at low cost.

The demand for digitally competent teachers has emerged, and several studies have explored the interchangeable use of different terms ranging from digital or media literacy to digital competence in order to explore in more detail the concept of digital competences (Fernández-Batanero et al., 2020; Tiede, 2020). In light of these terms and meanings, many digital competence frameworks have been developed to best describe and characterize the different dimensions of teachers' digital competence and the complex set of knowledge, skills, and attitudes that the term digital competence encompasses. Some of the most common international digital competence frameworks are the following: the UNESCO ICT Competency Framework for Teachers, the European Framework of Digital Competence for Teachers (DigCompEdu), and the ISTE Standards for Teachers (Mattar et al., 2022). Nevertheless, there remains a lack of research on how to enhance teachers' digital competence. As research has shown, there is a need to design effective, personalized, contextually grounded digital competence development interventions that focus on the implementation and integration of digital technologies by highlighting the practice and pedagogy in profound and practical ways (Kivunja, 2013; McGarr & McDonagh, 2019).

Many researchers have mentioned the usefulness of MOOCs for teachers' professional development (Castaño-Muñoz et al., 2018; Koukis & Jimoyiannis, 2019; Stutchbury et al., 2023). However, existing evidence regarding the effectiveness of MOOCs for professional development in teachers' digital competence remains relatively scarce (Engeness & Nohr, 2020). This study aims to present the educational design of the "HyperMOOC," an innovative Massive Open Online Course developed to enhance Greek teachers' digital competence. Rooted in key educational frameworks, such as DigCompEdu, the SAMR model, Universal Design for Learning, and HyperDocs, this course helps educators integrate digital and AI technologies for more effective inclusive teaching and learning in both online and hybrid education formats.

Theoretical Frameworks Underpinning the HyperMOOC Educational Design

There is an ever-present research and practice divide in teacher education, and we need innovative ways to transform the research experience regarding teachers' digital competence into practical proposals to be applied in teacher education (Korthagen, 2010). Educational theoretical frameworks are research-informed models that encompass a broader range of theories, principles, standards, and practices to guide and inform the educational process. These frameworks can be used as a basis to inform the design and implementation of MOOCs as a possible solution to alleviate insufficient teacher training on digital competence and bridge the gap between theory and practice.

The HyperMOOC instructional design was developed in accordance with several theoretical and conceptual frameworks working together to provide an effective and comprehensive design framework. In this section, we briefly present the frameworks that underpin the proposed HyperMOOC instructional design model.

The Hybrid Pedagogical Model of MOOC Design

The underlying formative model in MOOCs has a substantial impact on the management and organization of course resources and activities. The most popular MOOC models, cMOOCs and xMOOCs, offer different approaches in terms of pedagogical approach, organization, and management of resources and activities. Connectivist MOOCs (cMOOCs) promote an autonomous and community-driven learning environment, emphasizing the creation of educational materials by

participants across various Web 2.0 Tools. This model is based on connectivism and constructivism theories of knowledge, promoting informal, participant-generated content as the foundation for learning. In contrast, extended MOOCs (xMOOCs) offer a more traditional, structured learning experience through a specific platform, where content and activities are pre-designed by instructors based on pre-set, specific course objectives. xMOOCs focus on a more structured content-oriented formal training approach, which leads to certification through assessments within a predetermined time period (García-Peñalvo et al., 2018).

The hybrid pedagogical model of MOOCs (hMOOCs), as proposed by Fidalgo-Blanco et al. (2016), combines the characteristics of xMOOCs and cMOOCs in the following way: It utilizes the specific e-learning platform of xMOOCs for formal training and the social media platforms of cMOOCs for informal learning, combining formal and non-formal learning activities to facilitate a continuous flow of knowledge between platforms. Course instructors prepare and organize resources in modules and sections on the e-learning platform. Participants are encouraged to interact with each other in collaborative discussions, produce their own resources, and share them on social media platforms. This approach fosters a continuous flow of knowledge and leverages the advantages of both xMOOCs and cMOOCs in order to enhance the participants' learning experience.

The European Framework for the Digital Competence of Educators (DigCompEdu)

The European Framework for the Digital Competence of Educators (DigCompEdu) combines national and regional initiatives to identify educator-specific digital competences. It provides a scientifically grounded description of what it means for educators to be digitally competent, with a specific emphasis on the pedagogical dimension of digital technologies. It is applicable to educators at all levels of education, from early childhood to higher and adult education, encompassing early childhood, higher education, adult education, general and vocational training, special needs education, and non-formal learning environments. The DigCompEdu framework synthesizes the concept of digital competence based on three dimensions: a) educators' professional competences, b) educators' pedagogic competences, and c) learners' competences. The DigCompEdu framework categorizes educators' digital competence with a total of 22 competences into six different areas. These areas are (Redecker & Punie, 2017):

1. Professional Engagement: This area relates to educators' ability to use digital technologies in their professional interactions, communication, and collaboration with colleagues, students, and broader educational communities. It includes lifelong learning strategies and digital well-being.

2. Digital Resources: This area focuses on selecting, creating, sharing and modifying, digital resources for classroom use and at the same time emphasizing the legal and ethical use and management of digital content.

3. Teaching and Learning: This area focuses on the enhancement and improvement of teaching and learning strategies with the use of digital technologies in the different phases of the learning process. It encourages the development of blended and student-centered learning environments and pedagogical approaches.

4. Assessment: This area emphasizes how digital technologies can enhance formative and summative assessment strategies, including feedback and data analysis to track and monitor student progress.

5. Empowering Learners: This area is about leveraging technology to foster students' engagement in the learning process and empower them to take control of their own learning. It involves the inclusive and personalized use of digital technology to ensure accessibility to learning resources and address students' diverse learning needs.

6. Facilitating Learners' Digital Competence: This area presents the ability to facilitate learners' digital competence as an integral part of educators' digital competence. Educators are not only expected to

use digital technologies effectively but also to support students in becoming digitally competent and critical users of digital technologies.

The DigCompEdu framework proposes a progression model to support teachers' continuous professional development, by emphasizing the "strengths" of educators and recognizing the areas that require additional progress. The proposed progression model includes six progression levels inspired by the Common European Framework of Reference for Languages (CEFR), ranging from Newcomer (A1) to Pioneer (C2) (Ghomi & Redecker, 2019; Redecker & Punie, 2017).

Based on the DigCompEdu Framework, the European Commission designed and developed the "DigCompEdu Check-In," a self-reflection tool that aims to support teachers in developing their digital competence. This tool helps educators assess their level of digital competence and reflect upon it by offering targeted feedback and proposing strategies to improve and further develop their digital competence according to their progression level (Ghomi & Redecker, 2019).

Different Teacher Digital Competency Frameworks have emerged to best describe the different dimensions that the term "digital competence" encompasses (Muñoz-Repiso, Martín & Gómez-Pablos, 2020). In their study, Cabero-Almenara et al. (2022) compared and evaluated two of the most commonly used teacher digital competence frameworks: the European Digital Competence Framework for Teachers (DigCompEdu) and the Common Framework for Teaching Digital Competence (INTEF). The results indicated that both frameworks were rated very positively, but "the European DigCompEdu Teaching Digital Competence Framework is the most endorsed by experts". To this extent, DigCompEdu stands out as a valid and adequate framework that can support the development of a MOOC tailored to enhance Teacher Digital Competence (TDC).

The SAMR Model

The SAMR model, developed by Puentedura (2009), aims to describe and enhance the integration of digital technology in learning environments. According to this hierarchical model, classroom technology integration is distinguished into four different levels: Substitution, Augmentation, Modification, and Redefinition.

This model serves as a guide for teachers to evaluate the extent to which digital technologies are incorporated into their teaching practices, moving from using technology as a tool to enhance learning experiences (Substitution, Augmentation) to transforming learning experiences in ways that would not be possible without technology (Modification, Redefinition). Using the SAMR model, teachers can make intentional decisions about technology integration, leading to more meaningful and effective student learning outcomes (Blundell, Mukherjee & Nykvist, 2022).

Despite the model's broad recognition, it has been repeatedly criticized for its weak theoretical foundation and lack of empirical evidence (Bicalho et al., 2023). This model was developed in a relatively unsystematic manner with limited grounding to theory and previous research, something that often leads to misunderstandings in how teachers relate their teaching practices to the model. Furthermore, some of the main challenges to the SAMR model arise from its rigid structure, the absence of context, and the emphasis placed on the product over the process. The SAMR model presents a hierarchical representation, moving from enhancement towards transformation, where higher levels are perceived as superior to lower ones. However, this rigid structure of the model does not acknowledge the influence of the educational context in which teaching occurs, such as the availability of resources, teacher proficiency, or student needs. This model positions teaching and learning as a product based on how technology is used to complete a specific task rather than as an ongoing process of making technology integration more effective to enhance student learning (Hamilton, Rosenberg & Akcaoglu, 2016).

To address these challenges and take advantage of the practical task-oriented guidance of the SAMR model, we used this model not as a standalone framework but in combination with a broader

framework, the European Framework for the Digital Competence of Educators (DigCompEdu). Linking the DigCompEdu framework to the SAMR model helps overcome SAMR's hierarchical rigidity by recognizing the importance of context and pedagogy, thus allowing for a more flexible integration of digital technologies based on the needs of students, teachers, and available resources. While DigCompEdu serves as a broader contextual-based framework for developing teachers' digital competence, the SAMR model adds a layer of direct classroom relevance, helping teachers focus on the practical use of technology in specific learning tasks.

The Universal Design for Learning (UDL) Framework

Universal Design for Learning (UDL) is an educational framework that supports the development of inclusive learning environments. It was inspired by the movement of universal design in architecture and focuses on the development of an accessible and flexible curriculum for all students with or without disabilities and various backgrounds, including those who are not identified yet (Kloo & Zigmond, 2008; Meyer et al., 2014). The fundamental concept of this framework lies in the fact that it is the curriculum that needs to change, rather than the learner (Meyer & Rose, 2005). UDL provides a structure to proactively design course curricular components such as goals, materials, methods, and assessments. UDL is based on cognitive neuroscience and specifically on the existence of three primary neural brain networks that participate in the learning process. These networks correspond directly to the three principles of UDL: multiple means of representation, engagement, and action and expression (Mangiatordi & Serenelli, 2013).

Universal Design for Learning can be used as a framework for inclusive instructional design in both traditional and online or hybrid learning environments in order to provide insights to educators on how to create flexible, engaging and inclusive learning environments to address learner variability (Rao, 2021). Research has shown that there is no typical average student, and the "one size fits all" approach does not effectively meet the needs of the diverse student population (Rose et al., 2018). According to Smith et al. (2019), "*UDL is not simply a listing of various flexible options and strategies, rather it is a process of designing intentionally to reduce cultural, cognitive, behavioral, and physical barriers*", emphasizes that the deeper purpose of UDL is to design learning environments that proactively address and reduce barriers across various dimensions rather than simply offering a set of different options.

HyperDocs

HyperDocs are interactive, visual, and engaging digital lesson plans created by teachers and given to students. They are described as digital documents or slides that package and organize all the learning content in one digital space. HyperDocs can be applied to all learning formats (digital, face-to-face or hybrid) and can reach all learners at all levels of education. They are aligned with curriculum standards and grounded in effective pedagogy models that shift the traditional instructional cycle of Learning by giving students content to explore before direct instruction in order to promote inquiry-based learning methods. A HyperDoc is different from a multimedia text set because it emphasizes the creation of knowledge rather than consumption and asks students to apply their learning in order to create authentic digital artifacts using the 4Cs of 21st-century skills: critical thinking, communication, collaboration, and creativity (Carpenter, Trust & Green, 2020; Trust et al., 2022).

These student-facing lesson plans "*replace the standard worksheet method of delivering instruction*" (Highfill et al., 2016, p.7) and propose a new way to design, package, and deliver lessons, shifting the way students access content and experience learning. In fact, HyperDocs have the ability to transform the way educators design and deliver instruction by shifting the worksheet method of delivering instruction into student-centered inquiry-based learning methods. HyperDocs are not limited to the school setting; they can also be used for teachers' professional development to provide a more engaging, personalized, and effective learning experience (Carpenter et al., 2020).

Insights of prior MOOC implementations

MOOCs have the potential to support and complement teacher education by equipping educators with the essential digital competencies required for effective teaching in contemporary classrooms (Svoboda & Mynaříková, 2021). The educational design of MOOCs is a key aspect of their effectiveness. To this extent, various frameworks and strategies are employed in the design of MOOCs to enhance their educational value (Sergis, Sampson & Pelliccione, 2017).

Martínez-Pérez et al. (2022) in their study explored the educational potential of Transfer Massive Open Online Courses (T-MOOCs) in improving the digital competences of trainee teachers. The research was guided by the European DigCompEdu framework, which outlines six core areas of competence for educators. The study employed a descriptive cross-sectional research design, targeting a sample of 313 students enrolled in the Primary Education Degree program at the University of Seville. Data collection was carried out using two online questionnaires: the DigCompEdu Check-In, which assesses educators' digital competence, and a content-specific questionnaire focusing on digital pedagogy and resource management. The results indicated that most participants demonstrated low-to-medium levels of digital competence, especially in digital pedagogy and resource management. To address these gaps, the T-MOOC was designed with structured learning modules, interactive e-activities, and resources aimed at enhancing both technical and pedagogical digital competences. This study highlights the importance of integrating pedagogical frameworks like DigCompEdu into MOOC design to ensure that the design of such MOOCs is not only technologically advanced but also pedagogically robust.

Henderson et al. (2019) in their study designed a Massive Open Online Course (MOOC) based on the Universal Design for Learning (UDL) framework to promote inclusive and flexible virtual learning environments. The research employed a descriptive approach, utilizing the ADDIE instructional design model (Analysis, Design, Development, Implementation, Evaluation) to structure the development of the MOOC, titled "Inclusive Educational Contexts: Design for All." The MOOC was launched at the University of Atlántico in Colombia and incorporated various accessibility tools, such as audio, video, and sign language, aligned with UDL principles to ensure content accessibility for all learners. Initial findings showed that participants found the course accessible and adaptable to their individual needs. This study emphasizes the importance of incorporating UDL in MOOC design to ensure inclusivity for all learners.

Titova (2017), in her study created a Massive Open Online Course (MOOC) as a tool to support blended learning in a Content and Language Integrated Learning (CLIL) course. The research aimed to create a collaborative learning environment by incorporating a MOOC titled "Understanding Language: Learning and Teaching" into a blended course at Moscow State University. The study was guided by the SAMR model (Substitution, Augmentation, Modification, and Redefinition), current MOOC theories, and connectivism to integrate new technologies and open educational resources effectively into teaching. The study employed an action research design, and 30 undergraduate students engaged in collaborative activities, such as participating in discussions on MOOC forums and the creation e-portfolios. The results showed that 87% of participants improved their digital literacy and collaboration skills. However, challenges such as time constraints and lack of familiarity with online collaboration were highlighted by the participants. This study emphasizes the importance of using the SAMR model in MOOC design to enhance collaboration and digital literacy, showing that MOOCs can successfully complement face-to-face learning in blended CLIL courses.

Carpenter et al. (2020) conducted a study that explored the potential value of HyperDocs, as a popular form of interactive teaching and learning materials created and remixed by educators. Prior to this study, HyperDocs have not been the subject of peer-reviewed research. To address this gap, the researchers conducted an exploratory, primarily qualitative study to examine how educators conceptualized HyperDocs and why they chose to implement them in their teaching. Data were collected from a sample of 261 educators on their uses and perceptions of HyperDocs. The analysis

demonstrated that educators used HyperDocs in various ways, such as enhancing student engagement, promoting collaboration, and supporting the development of learners' digital competences. The study highlighted that while HyperDocs have the potential to transform instruction, there was a misalignment between their intended use and their actual implementation. To this extent, professional development opportunities related to HyperDocs could benefit and help educators incorporate them in their teaching practice in ways that align with their original intent to support student, pedagogy, and educator change.

The Proposed HyperMOOC Educational Design Framework: A Collaborative Approach

HyperMOOC is a training course designed to foster teachers' digital competence within the innovative structure of a hybrid MOOC for teachers' professional development. In order to address the research/practice divide in teacher training, it was concluded that the European Framework for the Digital Competence of Educators (DigCompEdu), as proposed by Cabero-Almenara et al. (2020) in their research, is a valuable and appropriate framework to be used as a reference framework that guides the development of the HyperMOOC. The main advantage of DigCompEdu compared to other frameworks is that it prioritizes the pedagogical dimension of teachers' digital competence (Redecker & Punie, 2017).

To facilitate the design and development of the HyperMOOC, we conducted a study to investigate the training needs of Greek primary and secondary school teachers in digital competence, according to the European Framework for the Digital Competence of Educators (DigCompEdu). The objective was to reveal Greek teachers' overall level of digital competence and how this level varies across the six distinct areas outlined by the DigCompEdu framework. Teachers' training needs were considered explicit and conscious, and therefore, quantitative empirical research was adopted. The survey sample included 208 primary and secondary school teachers selected randomly. The research tool was the "DigCompEdu Check-In" reflective questionnaire, which was translated and adapted into Greek. The analysis of the data showed that the majority of Greek teachers (64%) were found to have a medium level of overall digital competence (B1-B2 level), and a significant proportion (23%) had a low overall level of digital competence (A1-A2 level). Only a small percentage (13%) demonstrated a high level of digital competence (G1-G2 level). The study revealed that teachers scored lower in the following areas of the DigCompEdu, indicating a need for further improvement (Chorozidis & Karagiannidis, 2023):

- Area 3 (Teaching and Learning): 65% of teachers fell into the lower levels (A1-A2), indicating a limited ability to integrate digital technologies to enhance their teaching practices effectively.
- Area 4 (Assessment): 69% of teachers scored low in digital assessment, showing a need to enhance existing assessment strategies for improving student evaluation and feedback processes.
- Area 6 (Facilitating Learners' Digital Competence): 62% of teachers demonstrate a limited ability to enable learners to develop their own digital competence and creatively use digital technologies for information, communication, content creation, well-being, and problem-solving.

To help educators develop their competencies in the aforementioned areas of the DigCompEdu framework that need further improvement, we designed and developed "HyperMOOC," an online course in MOOC format that focuses on utilizing digital and AI tools to facilitate effective teaching in hybrid and online inclusive education formats. One of the major concerns highlighted in the relevant literature about MOOCs for Teacher Professional Development (TPD) is related to pedagogical aspects, including the pedagogical design, content resources, and learning materials (Misra, 2018). In response to these challenges, we propose a new framework for the design and development of the HyperMOOC. This new framework is based on a collaborative synthesis of existing frameworks. Each focuses on a different dimension of the HyperMOOC, ensuring a comprehensive and practical educational experience.
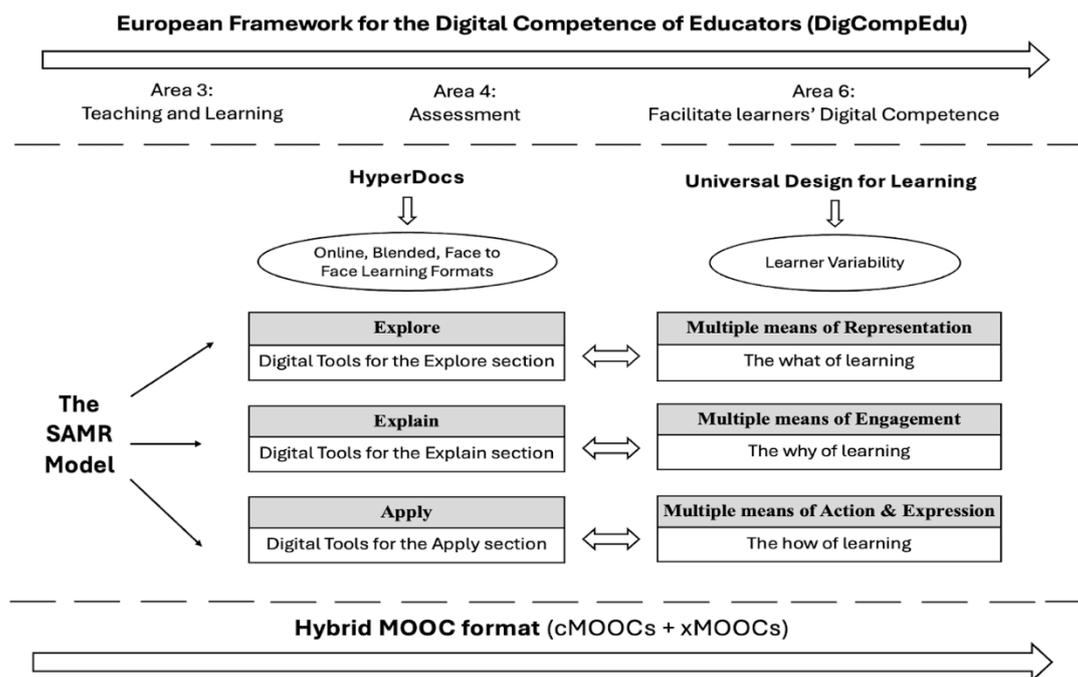
Figure 1. The "HyperMOOC" Educational Design Framework

The proposed framework for the design and development of the HyperMOOC, as shown in Figure 1, uses the hybrid pedagogical model of MOOC design, proposed by Fidalgo-Blanco et al. (2016), and the DigCompEdu framework, proposed by Redecker and Punie (2017), as the primary guiding frameworks for the formation of the course. In order to put these frameworks into practice, the combined use of additional frameworks, such as the HyperDocs, the Universal Design for Learning (UDL), and the SAMR model, can significantly address the identified training needs of Greek teachers in the areas as mentioned earlier, according to the DigCompEdu framework.

HyperDocs are interactive digital lesson plans that replace the worksheet method of instruction in online and blended learning formats. Teachers design them and give them to students to package all the learning content in one digital space (Highfil et al., 2016). HyperDocs can significantly aid in developing the DigCompEdu areas, where Greek teachers have demonstrated lower proficiency levels. They can help teachers combine content, technology, and pedagogy in a carefully crafted digital lesson plan, which packages all the learning content in one digital place and incorporates the "Explore, Explain, Apply" cycle of learning in its core (Karplus, 1970). These students facing lesson plans are shifting instruction by giving students content to explore before direct instruction and asking them to apply their learning using digital tools to put into practice the key competencies for the 21rst century learning, such as the "Four Cs" (Creativity, Critical Thinking, Communication, and Collaboration).

The Universal Design for Learning (UDL) framework can be used in conjunction with HyperDocs to ensure a proactive learning design that embraces learner variability and promotes accessibility and inclusion. The explore portion of the HyperDocs can be enhanced by the UDL principle of providing multiple means of representation, the explain portion by providing multiple means of engagement, and the apply portion by providing multiple means for action and expression. The SAMR model can be combined with HyperDocs and UDL to provide a practical guide for teachers and ensure that digital tools are integrated in a meaningful and transformative way in the learning process.

The integration of HyperDocs, UDL, and the SAMR model helps teachers implement the competencies outlined in the areas of "Teaching and Learning" (Area 3), "Assessment" (Area 4), and "Facilitating Learners' Digital Competence" (Area 6) of the DigCompEdu framework by enhancing instructional practices, assessment methods, and students' digital competence. With the combination of these frameworks, teachers can manage and orchestrate digital technologies, using the "Explore, Explain,

Apply" cycle of learning that redefines the traditional "Explain, Apply, Assess" approach. This shift in the learning cycle enables teachers to move from teacher-led lectures to student-driven inquiry-based learning using digital tools to support students' self-regulated learning, embed collaboration, and allow students to show what they know creatively. Students can show their learning in various ways, and this product can be used as a summative or formative assessment method, aligning with the "Assessment" area of the DigCompEdu framework. This structured learning format allows students to creatively and responsibly use digital technologies and develop their own digital competence, thus aligning with the DigCompEdu area of "Facilitating Learners' Digital Competence."

Implementation of the HyperMOOC

HyperMOOC is an online course designed for teachers' professional development, focusing on specific areas of the DigCompEdu framework, such as teaching and learning, assessment, and empowering learners' digital competences. This course has a total duration of 15 hours over 4 weeks, with predefined starting and ending dates. Its targeted audience includes pre-service and in-service general and special education teachers of Greek primary and secondary education, aiming to foster teachers' digital competence through collaborative professional development in an inclusive education format. During this four-week course, participants will explore in-depth strategies for creating an inclusive blended learning classroom format. They will learn how to design and deliver instruction through HyperDocs that incorporate the Universal Design for Learning (UDL) principles and how to choose specific web tools that impact student learning. Furthermore, they will be guided in writing effective prompts to leverage free AI tools for designing their HyperDoc lessons. The HyperMOOC units and workflow were structured into eight thematic units, organized on a weekly basis, as shown in Table 1.

HyperMOOC is rooted in the hybrid pedagogical model of MOOC design (hMOOC) proposed by Fidalgo-Blanco et al. (2016), combining features of both xMOOCs and cMOOCs. There is a main platform (website) that serves as the primary hub for delivering the course resources and activities in a sequential structure of modules and sections, where participants can access all the learning content, as shown in Figure 2. Besides that, there are two social network learning platforms where participants will have the opportunity to create, connect, and collaborate within the course's learning communities and receive a certificate of completion free of charge. The purpose is to create an online learning community for those passionate about teaching, enabling them to exchange good practices and explore new tools and frameworks, emphasizing pedagogy and practice.

Figure 2. The main page of the HyperMOOC platform

Table 1. HyperMOOC units and workflow

Week	Course units and structure
1	**About the course** • Course description • Let's get to know each other • Introduction: DigCompEdu Check-In Self-Assessment Questionnaire (Initial) **Unit 1: Teaching and Learning in the digital age** • Explore • Explain • Apply **Unit 2: The use of "HyperDocs" and "Universal Design for Learning" (UDL) in the learning process** • Explore • Explain • Apply
2	**Unit 1: The Educational Design of HyperDocs: The "Explore" Cycle of Learning** • The "Explore" cycle of learning • Digital tools for the "Explore" cycle of learning • The Universal Desing for Learning (UDL) Framework: Providing multiple means of representation o Multiple means of representation: Examples of classroom application • "Explore": Design your own HyperDoc with the help of Generative AI tools • Reflective Quiz **Unit 2: The Visual Design of HyperDocs: Aesthetic Elements and Packaging** • Designing a HyperDoc: The aesthetic design of HyperDoc (look-and-feel) • Packaging a HyperDoc with Google Docs and Google Slides • Designer checklist: what to look out for when designing a HyperDoc
3	**Unit 1: The Educational Design of HyperDocs: The "Explain" Cycle of Learning** • The "Explain" cycle of learning • Digital tools for the "Explain" cycle of learning • The UDL Framework: Providing multiple means of engagement o Multiple means of engagement: Examples of classroom application • "Explain": Design your own HyperDoc with the help of Generative AI tools • Reflective Quiz **Unit 2: Teaching and Learning with HyperDocs** • Strategies to share your HyperDoc with your students • Strategies to collect student work and provide feedback with HyperDocs • Tips and tricks for teaching with HyperDocs
4	**Unit 1: The Educational Design of HyperDocs: The "Apply" Cycle of Learning** • The "Apply" cycle of learning • Digital tools for the "Apply" cycle of learning • The UDL Framework: Providing multiple means of action and expression o Multiple means of action and expression: Examples of classroom application • "Apply": Design your own HyperDoc with the help of Generative AI tools • Reflective Quiz **Unit 2: Educational Neuroscience and HyperDocs** • Explore • Explain • Apply **Critical Reflection – Completion of the Course** • Closing: DigCompEdu Check-In Self-Assessment Questionnaire (Final) • Course evaluation questionnaire • Certificate of completion

The HyperMOOC educational design allows teachers to experience, as learners, the application of these frameworks in practice. The learning content and activities in the HyperMOOC leverage the HyperDocs' "Explore, Explain, Apply" cycle of learning and present specific web tools and their uses according to the SAMR model. Besides that, it focuses on the application of UDL principles in the following ways: For multiple means of representation, we present content utilizing multiple media and formats (e.g., videos, text, images, and infographics) in order to address the learning needs and preferences of all learners and develop a deeper understanding of concepts. For multiple means of engagement, we provide activities that allow for adjustable levels of challenge, allowing participants to learn consistently with their learning needs, preferences, or interests. Finally, for multiple means of action and expression, we allow participants to demonstrate mastery of their knowledge of the course content using a medium that best matches their learning needs and preferences.

Conclusions and future work

Fostering teachers' digital competence should be a priority in teacher professional development, including initial and continuous teacher training. The vast majority of the related studies reveal a lack of effective teacher training on digital competences. This study aims to contribute to this quite promising research area by introducing MOOCs as a possible solution to alleviate insufficient teacher training on digital competence. Through this study, we expect to shed light on the issues and concerns related to the educational design of MOOCS in order to provide effective competency-based education for teachers' professional development on digital competence.

HyperMOOC was designed and developed based on a well-structured educational design. The empirical data of its implementation will provide insights into the effectiveness of this approach in enhancing teachers' digital competence. This work, which is part of an ongoing research project, is expected to work positively and bridge the gap between research and practice by addressing the identified teachers' needs for training and continuous professional development in digital competence. Future research will focus on evaluating the impact of HyperMOOC on teachers' digital competence by analyzing whether the specific training needs initially identified among educators were effectively met. As part of the ongoing scalability of the project, we aim to conduct a follow-up study with the teachers who attended and successfully completed the HyperMOOC to identify if these competencies gained are practically valuable in real teaching scenarios. Using teacher feedback, we plan to enhance the HyperMOOC curriculum to better address these needs, thereby making the course content more targeted and beneficial.

Acknowledgement

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