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IMPROVE TEACHERS' INNOVATIVE DIGITAL SKILLS ACROSS EUROPE: THE ROLE OF IDEAS PROJECT

Mejorar las competencias digitales innovadoras de los docentes en Europa: el papel del proyecto IDEAS

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Resumen

El proyecto ERASMUS+ de Educación y Habilidades Digitales Innovadoras (IDEAS) tenía como objetivo mejorar las habilidades y competencias digitales de los profesores respondiendo directamente a la Prioridad Estratégica 1 del Plan de Acción de Educación Digital de la UE (2021-27). Consistió en el diseño de un curso de formación del profesorado de 30 horas con micro-credenciales, consistente en un conjunto de herramientas digitales con 14 micromódulos, utilizando modelos de aprendizaje adaptativo con el apoyo de los Mentores IDEAS e implementando un programa piloto que fue probado y evaluado. Para llevar a cabo el diseño instruccional del curso, se realizó un análisis de necesidades basado en una revisión de la literatura y una encuesta de referencia para evaluar las fortalezas, debilidades y necesidades de los profesores en la implementación de la pedagogía digital. Tras identificar las necesidades de los profesores, se concibieron, diseñaron y pusieron a disposición contenidos específicos en una plataforma que permite el acceso a la sociedad del conocimiento. El estudio mostró cuatro áreas de competencias digitales que necesitaban formación, y se elaboró un perfil del alumno tras un análisis de carencias de las 99 respuestas. Estos datos sirvieron de base a un programa piloto con 80 profesores de Formación Profesional y Educación Superior para probar la funcionalidad del conjunto de herramientas digitales, la plataforma de aprendizaje electrónico, el diseño, la calidad y el impacto de los contenidos. El análisis de los datos indica que los profesores participantes mejoraron sus competencias digitales y facilitaron experiencias de aprendizaje innovadoras en sus prácticas.

Abstract

The Innovative Digital Education and Skills (IDEAS) ERASMUS+ project aimed to improve teachers' digital skills and competencies by directly responding to the EU's Digital Education Action-Plan (2021-27) Strategic-Priority 1. It involved the design of a 30-hour micro-credentialed teacher training course consisting of

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a digital toolkit with 14 bite-sized modules using adaptive learning models with the support of the IDEAS Mentors and implementing a pilot program that was tested and evaluated. To carry out the course's instructional design, a needs analysis was conducted based on a literature review and a baseline survey to assess teachers' strengths, weaknesses, and needs in implementing digital pedagogy. After identifying teachers' needs, specific content was conceived, designed, and made available on a platform that allows access to the knowledge society. The study showed four areas of digital competencies needing training, and a learner persona was profiled following a gap analysis of the 99 responses. This data informed a pilot program with 80 Vocational Education and Training and Higher Education teachers to test the functionality of the digital Toolkit, the e-learning platform, design, quality, and impact of the content. Data analysis indicates that participating teachers improved their digital competencies and facilitated innovative learning experiences in their practices.

Palabras Clave: Pedagogía digital; competencias digitales; formación del profesorado online.

Keywords: Digital pedagogy; digital competencies; online teacher training.

Introduction

The COVID-19 pandemic revealed a general recognition of teachers' lack of preparation across all education cycles. The difficulties experienced highlighted the need for digital education programs to promote and develop digital competence among teachers worldwide. Recent studies (Afonso et al., 2020; Spilker et al., 2021) revealed the existence, among the teaching class, of knowledge gaps regarding digital skills and almost a full absence of digital skills in general regarding Distance Learning. Digital pedagogy and teacher training are crucial to improving the quality of education in the digital age.

According to Bećirović (2023, p.1), "digital pedagogy encompasses teaching and learning in online, hybrid, and face-to-face environments and digital

technologies are positioned to serve as vital drivers in the transformation and reform of education." In a broader sense, it implies not only the instrumental use of technology in teaching-learning but also the reflection on how its use will impact and transform the teaching-learning process, that is, the enculturation of technology use in educational practices to enhance or to change the learning experience.

The notion of digital pedagogy conveyed in the project is implementing a digital pedagogy framework to address the gap in digital competencies among Vocational Education and Training (VET) and Higher Education (HE) teachers. The gap analysis emphasised the need for teacher training programs that are tailored and personalised to fit the needs of teachers in terms of time availability and difficulty level.

The IDEAS pedagogical framework combines online and in-person instruction, adopts a hybrid modality, and focuses on creating personalised and compelling learning experiences using online resources, educational apps, and digital tools. Thus, it incorporates constructivist, socio-constructivist, and connectivism principles, implemented through microlearning and "assessment as learning" strategies. Furthermore, it highlights the importance of personalised learning paths, self-assessment, and mentoring in improving teachers' professional practices and digital competencies.

Digital technologies are increasingly present in educational contexts, and teachers need to be able to use these tools to improve learning and student engagement and prepare them to succeed in a technology-driven society. However, there are still many challenges, including developing teacher training programs that fit their needs in a tailored and personalised way regarding time availability and difficulty level.

This article presents the digital pedagogy framework implemented in IDEAS, an ERASMUS+ project, to address the gap in digital competencies identified in a population of VET and HE teachers. The article includes a Literature Review (theoretical framework), the IDEAS Methodology (procedures and tools used to develop, implement and evaluate the IDEAS course), feedback on the project's pilot, an overall discussion, and some final remarks.

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Defining the IDEAS Project

The IDEAS Project is an ERASMUS+ project (a partnership involving four European countries - United Kingdom, Malta, Denmark, and Portugal) to develop a direct response to the Digital Education Action Plan (2021-2027)[1] call and address its Strategic Priority 1: "Helping develop a high-performing digital education system" - "digitally competent and confident teachers and education and training staff".

IDEAS's partners are based in Europe and consist of two VET Colleges from the UK - Southeastern Regional College and Forth Valley College; a Danish e-learning/Adult Learning organisation with adaptive learning expertise - Copenhagen Business Academy; a Higher Education Institution from Portugal - Universidade Aberta, with expertise in distance and on-learning education, and B&P Emerging Technologies Consultancy Lab Ltd. - a technology company with expertise in Artificial Intelligence. The IDEAS project was based on the partners' digital and pedagogical expertise. It was developed specifically to meet the rapid shift to distance/blended learning due to COVID-19. It aims to supply VET teachers with the digital knowledge and skills they need to be flexible in their teaching and assessment approaches and prepared for education in the 21st Century.

Using an adaptive learning platform enabled teachers to access personalised training based on their individual needs, thereby taking responsibility for their Continuous Professional Development (CPP) and reinforcing their commitment to lifelong learning.

The project's innovative aspects lie in developing a micro-credentialed teacher training course offering bite-sized modules that are flexible and adapted to individual professional development needs. IDEAS aimed to improve teachers' digital skills and competencies through a 30-hour micro-learning teacher

[1] https://education.ec.europa.eu/sites/default/files/document-library-docs/deap-communication-sept2020_en.pdf

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training course, and its innovative aspects consisted of developing 14 bite-sized modules that are flexible and adapted to individual professional development needs. It uses adaptive learning models to enable teachers from any curricular area to increase their digital competence and skills using a personalised micro-credentialed training package with support from IDEAS Mentors, thereby encouraging a commitment to lifelong learning.

2. Methodology and Empirical Study

The research methodology adopted was guided by a pragmatic perspective and a mixed approach (qualitative and quantitative). Design-Based Research (DBR) was used as a research methodology as it is suitable for environments that integrate educational technologies (Costa, 2007) and combine theory and practice. It also justifies the use of different data collection techniques. As well as being an interactive approach with cycles of intervention and improvement in new cycles, it involves establishing partnerships between the researcher and participants (Anderson & Shatuck, 2012). The purpose of the DBR was to analyse a real problem in real contexts and use a cyclical nature approach (Parker, 2011; Hoadley & Campos, 2022) with four phases: analysis, design, development and implementation. The various cycles are described below.

2.1. Phase 1 – Analysis of a Practical Problem: Literature review about teachers' digital skills

The first phase consisted of analysing a practical problem (diagnosis) based on a literature review, namely the lack of digital skills in the use of technology by teachers.

The pandemic context highlighted and sped up the process of change in teaching practices and culture. Thus, sharing teachers' digital educational experiences worldwide promoted the emergence of virtual learning or/and practice communities where teachers got involved. Through this involvement, we enculturate into new practices (Afonso, 2016).

The growing importance of digital skills in the international agenda is evidenced in DigComp Europa (Punie et al., 2013), which provides a digital competence

framework to ensure the implementation and integration of digital competence in society in general and education in particular. Furthermore, it encourages teachers to acquire and develop digital skills to enable the cultural appropriation of digital technologies in education (Cassundé et al., 2017; Uerz et al., 2018).

Published research on digital literacy shows significant growth. This growth accelerated between 2014 and 2016 (Roda & Morgado, 2019). By 2016, DigComp updates to include "new vocabulary and streamlined descriptors for better-scoped competencies" (Brande et al., 2017, pp. 13-14), such as: 1) Information and Data Literacy; 2) Communication and Collaboration; 3) Digital Content Creation; 4) Safety, and 5) Problem Solving.

Educational digital competence concerns the knowledge teachers need to make appropriate judgements for effectively integrating technology in the teaching-learning process. From this perspective, teachers need to identify the limitations and potential of technology and the best communication techniques, reformulating pedagogical practices to enable the creation of new experiences. Furthermore, Coutinho (2011, p.7) considers that digital competence requires a "teacher's understanding of the pedagogical techniques that allow technologies to be used in favour of the construction of knowledge by the student and not as a support for the teacher to teach". Increasing focus on digital competence demands high teacher preparedness levels (Scherer et al., 2019), thus promoting the development of a framework of required knowledge domains to deploy digital technologies into teaching practices effectively.

The European Commission (Redecker, & Punie, 2017) launched the European Framework for the Digital Competence of Educators (DigCompEdu). This scientifically based framework describes what it means to be a digitally competent educator by systematising the crucial digital skills for all educators, defining a common European framework to help the development of digital competencies specific to educators in Europe, for all levels of education, including formal and non-formal learning environments. The proposed matrix establishes the digital skills and competencies educators need in contemporary teaching environments with different target audiences but a common goal: effectively generalising a dynamic matrix of digital competence towards an increasingly digital society (Kampylis et al., 2017). The framework is constituted

by a total of 22 educator-specific competencies for teaching, around six areas: 1) Professional Environment; 2) Sourcing, Creating and Sharing Digital Resources; 3) Managing and Orchestrating the Use of Digital Tools in Teaching and Learning; 4) Digital Tools and Strategies to Enhance Assessment; 5) The Use of Digital Tools to Empower Learners and 6) Facilitating Learners' Digital Competence.

Basilotta-Gómez-Pablos et al. (2022) emphasise the need for personalised training programmes that address the diverse levels of digital competence and needs of teachers, which should enable and validate the recognition, accreditation and certification of the digital competencies teachers acquire.

2.2. Phase 2 – DESIGN. Data Collection: Survey, Gap Analysis, Learner Persona

2.2.1. The Survey

The survey was developed as a data collection tool, using the SELFIE[2] model and circulated to vocational and higher education teachers to determine their current digital literacy and skills needs. The survey analysis facilitated an understanding of the current state in terms of digital competence and skill; identified the gaps between the required new digital skills and demands of education considering the move to virtual/blended learning; defined course outline modules needed to improve teacher digital competence; and identify the digital toolkit to support online teacher training. The survey analysis informed the course's instructional design process based on the baseline survey results and feedback from relevant stakeholders.

Teachers from IDEAS partners representing educational institutions (United Kingdom, Denmark, and Portugal) undertook an initial baseline survey using the EU's SELFIE self-assessment tool to determine their current level of digital competence and skills. 99 teachers answered the survey (Appendix 1 - Digital Competences Survey), aged 40 to 59 years old (Graph 1), and the majority are female (Graph 2). Almost half the respondents teach in Denmark (48.5%; Graph 3). Nearly 40% of the respondents teach for 20 or more years (Graph 4). Most

[2] https://education.ec.europa.eu/selfie

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of the sample (Graph 5) is teaching in the financial area, either Business and Finance (33%) or Economics (18%); curiously, only 4% teach in the field of Education. Most of the respondents teach adults (Graph 6) and are enrolled part-time (37%) or full-time (33%). 25.3% of respondents affirm that 11-25% of the courses they teach are online/at a distance, and 24.2% teach online or at a distance 26-50% of their courses (Graph 7). When questioned about the presence of digital technologies in their teaching practices (Graph 8), most of the respondents affirmed they have been using it for 6-9 years (19.2%) or 10-14 years (19.2%), and the majority (45.4%) has been using it for the past three months (Graph 9). In addition, presentations, videos, digital quizzes/polls, and online learning environments are the most used digital technologies (Graph 10). Finally, 47.5% of the respondents rate their digital competence in teaching level as moderately high, while 34.3% rate it as average (Graph 11), which points to the need to increase digital literacy.

2.2.2. GAP analysis

The GAP analysis was carried out to inform the instructional design process of the course based on teachers' strengths and weaknesses in implementing digital pedagogy. The baseline survey developed identified operational characteristics that allowed the instructional design to create and develop the pedagogical model and course design, learning content, strategies and interfaces, and some different situated circumstances and practices, allowing connections to specific student profiles (Brouns et al., 2017; Lilley et al., 2012).

The survey addressed the respondents' self-assessment of their strengths and weaknesses in using digital technologies in education through a 22 items questionnaire representative of the 22 competencies in the DigiCompEdu (Redecker & Punie, 2017) (Appendix II – GAP Analysis).

Regarding communication competence through combined digital media, 42.4% of the respondents regularly select, adjust, and combine digital solutions to communicate in the educational context. In terms of the competence of collaboration through digital technologies, 47.5% use digital solutions to collaborate in and out of the educational context. Concerning the development of digital skills/collaboration for the development of digital skills, 36.4% are

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interested in using digital technologies to improve their educational practices, while 28.3% are involved in helping others develop their digital teaching strategies. However, only 36.4% understand which areas of their digital competence need to be improved/updated and look for development opportunities (Identification of digital competence gaps). When asked about their competence to search and filter information about digital resources, 36.4% articulate information needs, search for data, information and content in digital environments, access and navigate them and select resources suitable to the learners' group. Concerning the competence to create and reuse digital resources, 59.6% can create and adapt different types of digital resources according to the needs of their educational practice. However, only 21.2% systematically protect sensitive data by combining different security methods, highlighting the need to develop personal/sensitive data protection competencies. Though 64% of the respondents refer to using digital tools and strategies in their educational practices, and only 23.2% use it to implement innovative pedagogic strategies, evidencing the need to develop competencies in using digital devices, tools, and technologies to create innovative educational practices and engage, individually and collectively, in digitally enriched learning environments (Innovation and using technology creatively).

Regarding competencies of supporting a safe, inclusive online environment, 39.4% regularly monitor and analyse their students' online activities, but only 18.2% regularly intervene with motivating/corrective feedback, highlighting the need to develop the competence to use proper regulation and feedback practices to support more engaging, safe, and inclusive digitally enriched learning environments. 94% of the participants evidence competencies to promote digitally enhanced collaborative work among their students, and 90% evidence competencies to empower digitally mediated students' self-regulation through digital tools/artefacts. While 70% use some digital tools to assess students, they do not do so systematically regarding competencies for adopting a digital assessment culture. Concerning the competence of using learning analytics for student success/comprehensive data analysis to promote students' success, 70% use the data to assess students needing support. However, only 11.1% affirm to intervene based on that information, and 19.2% consider that only performance and grades are relevant data. Hence, it evidences the need to develop competencies of understanding and using learning analytics to profile

students' needs and inform solutions for students' success. Only 13.1% of the respondents systematically use digital approaches when providing feedback, highlighting the need to develop competencies using digital forms of effective feedback aligned with a digital assessment culture in educational practices. 55% of the respondents globally understand the need to consider accessibility issues regarding digital teaching and learning practices, but only 14% seem to fully address the need to adapt the task/completion form to address students' access needs. Therefore, there is a need to develop competencies for understanding accessibility issues and implementing digital accessibility patterns in educational practices. Though 70% of the respondents try to address students' specificities when designing learning activities, only 10% systematically adapt their teaching practices to address students' learning needs, hence the need to develop competencies in Designing personalised learning experiences.

By using some digital tool/technology to engage students in learning activities, 86% reveal competencies in promoting learning engagement through digital technology, and 75% evidence information literacy competencies by using some strategy to elucidate students about the validity of information sources. Only 38.4% of the respondents are concerned with promoting communication outside the learners' community, revealing the need to develop competencies in promoting networking skills within their teaching practices. 49.5% affirm intentionally integrating digital content development assignments as part of the learning process, envisioning future skills development, which implies the development of competencies in authoring digital content. 67% of the respondents are concerned with addressing and implementing codes of digital conduct in their educational practices, evidencing competencies in setting conduct in digital environments. 54.5% of the respondents only occasionally encourage students to use digital technology in problem-solving situations, revealing a gap in the competence to adopt and implement creative digital problem-solving in educational practices.

In sum, the survey analysis revealed 9 competence gaps that need to be addressed in teachers' training to endorse innovative digital education and skills (Fig. 1).

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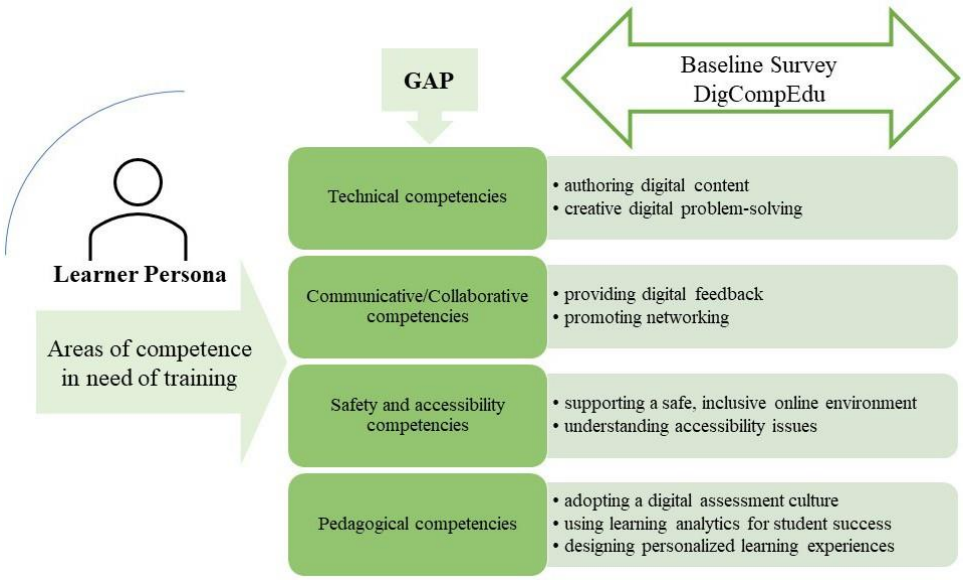
Fig. 1 – Competencies endorsing teachers' innovative digital education and skills (source: the authors)

COMPETENCE	DESCRIPTION
Supporting a safe, inclusive online environment	Uses proper regulation and feedback practices to support more engaging, safe, and inclusive digitally enriched learning environments.
Adopting a digital assessment culture	Adopts and implements practices promoting an alternative digital assessment culture in educational practices.
Using learning analytics for student success Comprehensive analysis of data to promote students' success	Understands and uses learning analytics as a tool to profile students' needs and inform decisions and solutions for students' success.
Using digital forms of providing effective feedback	Develops and uses digital tools to provide effective feedback aligned with a digital assessment culture.
Understanding accessibility issues	Understands and implements digital accessibility patterns in educational practices.
Designing personalized learning experiences	Includes students' needs and specificity in the design of digital learning experiences.
Promoting networking skills	Promotes collaboration and communication outside the learners' community to develop networking skills.
Authoring digital content	Implements activities of digital content authoring.
Creative Digital Problem-Solving	Adopts and implements activities that foster creative digital problem-solving.

The previous analysis identified the learner personas' 4 main areas of digital competencies in need of training, thus, the focus of the IDEAS course (Fig. 2).

Fig. 2 – Main areas of competence in need of training (source: the authors)



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2.2.3. Defining the IDEAS Learner Persona

Learner personas are fictional profiles representing the target audience we are designing a learning program for. They must reflect the findings of the baseline survey and have operational features allowing instructional designers to create and develop the pedagogical model and course design, learning contents, strategies, and interfaces, and some different situated circumstances and practices, enabling connections to specific learner profiles (Brouns et al., 2017; Lilley et al., 2012).

A learner persona representing the target audience was profiled and inspired the design of learning activities and experiences in an innovative micro-learning training program.

Data analysis reveals that IDEAS's Learner Persona, ages 40-59, teaches an adult population for 20 or more years in areas other than education, mainly at a distance. Has been using digital technology in teaching for the last 6-14 years and quite often in the last three months (at the time of the survey). The digital technologies used are presentations, videos, digital quizzes/polls, and (non-specified) online learning environments. The learner persona considers having a moderately high level of digital competence. However, it needs the training to develop the previously identified four areas of competencies: technical, communicative/collaborative, safety and accessibility and pedagogical.

2.2.4. The IDEAS Pedagogical Framework

A Pedagogical Framework (PF) is a set of principles, theories, and practices that guide the design and implementation of educational programs, providing a structure for designing teaching and learning activities that support students' learning and a roadmap for effective teaching and learning (Laurillard, 2012). It comprises five core elements: the teacher's role, the student's role, the learning environment, the teaching-learning activities, and the assessment and feedback mechanisms. It is essential for effective learning design, ensuring the teaching-learning process is coherent, structured, and purposeful.

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Fully online or hybrid learning programs often embrace social constructivism and connectivism as learning theories. Social constructivism (Vygotsky & Cole, 1978) emphasises the importance of providing students with opportunities for social interaction and collaboration in physical and virtual learning environments (VLE). This approach helps to foster a sense of community and support, which enhances students' engagement, motivation, and learning outcomes. Similarly, connectivism is a theory of learning where learners are part of a larger learning ecosystem, where they can connect with others, access information, and engage with different perspectives (Siemens, 2005). Additionally, it highlights the role of technology in facilitating learning, mainly through online networks, social media, and other digital tools. By incorporating connectivism principles in the PF, we can create learning experiences that are more collaborative, networked, and responsive to the needs of today's learners.

The right combination of both theories learning principles provides opportunities for social interaction, collaboration, and networked learning, thus creating a more engaging and supportive learning environment. Moreover, digital tools and networks can help prepare students for the challenges of the 21st Century, where connectivity, collaboration, and lifelong learning are increasingly important, creating more effective and relevant learning experiences in today's fast-paced, interconnected world.

Social-constructivism and connectivism learning principles, together with those implemented by a higher education (HE) institution in its pedagogical model[3] (Pereira et al., 2007), provide the IDEAS pedagogical architecture, conveying a model of self-paced learning with peer support and guidance that is framed by the concept of a CPD[4] Academy and supported by an online Virtual Community of Practice (VCoP) and a Mentorship program, under the paradigm of lifelong learning. Additionally, it provides resources and suggestions for ongoing

[3] Pedagogical Model principles of Universidade Aberta (Pereira et al., 2007): i) student-centred learning; ii) time-place flexibility; iii) diversified interaction (teacher-student, student-student, student-content); iv) promotion of digital inclusion.

[4] CPD stands for 'Continuous Professional Development' and broadly refers to the process of continuing your professional growth (Padwad & Dixit, 2011). The IDEAS project embraces CPD in education, as a holistic longer-term process, through which teachers continuously develop as professionals, as individuals, and as a community.

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professional development to help teachers stay current on best practices and improve their teaching skills.

The IDEAS PF is oriented to help increase digital teaching skills and, therefore, addresses the needs of teachers. It relies on combining online and in-person instruction, adopting a hybrid modality, creating more personalised and compelling learning experiences, and providing tips for using online resources, educational apps, and digital tools to enhance teaching and learning.

Based on the responses to the survey, modules and digital resources were created, tested, and reformulated to meet teachers' expectations. Following gap analyses, defining the Learner Persona and the Pedagogical Framework, a 30-hour course on digital teacher training using adaptive learning models supported by these conceptual tools was defined.

2.3. Phase 3 – DEVELOPMENT. IDEAS Digital Toolkit

The IDEAS PF is implemented by the Digital Toolkit (DT) to support online teacher training and a wide array of digital resources to help teachers along and beyond the learning experience. This DT (Fig. 3) encompasses all IDEAS courses/modules, the SmartLearning platform hosting them, the IDEAS-BOT, the digital pedagogical strategies suggested through the VCoP, the IDEAS Mentor program and all the available resources.

Fig. 3 – IDEAS Digital Toolkit (source: the authors)

Teaching & Learning	Resources	Technology	Peer support & social networking
14 IDEAS courses/modules Guidance on creating modules form Self-Assessment quiz Grading Quiz Badges	Ideas Mentor Handbook Ideas Reflective Practice Guidance Grow Model Guidance Feedback Top Tips Feedback Phrase Bank Ideas Mentor Meetings Structure Ideas Mentee Learning Log Ideas Mentee Feedback Form Mentor Reflective Practice Learning Log Ideas Module Feedback Form Ideas Mentoring Handbook	LMS – Smartlearning Platform Chatbot – IDEAS-BOT	VCOP - IDEAS VCOP Mentorship – IDEAS Mentor Program

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The instructional design process of the 30-hour micro-credentialed digital-skills teacher training course using adaptive learning models, was informed by the GAP analysis and addressed the four areas of digital competencies identified on the results of the baseline survey. The curricular design of the course consisted of 14 autonomous learning modules (cf. Table 1); participants could take all (the total number of modules) or only the ones they considered relevant to their journey.

Table 3 – IDEAS Modules/Courses and the addressed digital competence area (source: the authors)

Digital Competences Identified	IDEAS Microlearning Courses
Pedagogical (adopting a digital assessment culture, using learning analytics for student success, designing personalised learning experiences).	IDEAS Blended learning approaches IDEAS Planning for learning IDEAS E-assessment IDEAS Innovation in teaching and learning IDEAS Distance learning and online learning innovation IDEAS 21st Century skills in learning and teaching
Communicative/collaborative (providing digital feedback, promoting networking);	IDEAS The art of presentation IDEAS Moodle advanced IDEAS Microsoft Teams IDEAS Digital tools for academic writing
Safety and accessibility (supporting a safe, inclusive online environment, understanding accessibility issues)	IDEAS Accessibility IDEAS Netiquette and E-safety
Technical (authoring digital content, creative digital problem-solving)	IDEAS Digital Storytelling IDEAS Survey tools and polls

Microlearning is a "learning strategy designed using a series of short learning content and short activities that make a mini course. It is also called bite-sized learning because it utilises small, well-planned, bite-sized chunks of units or activities." (Alqurashi, 2017). In this sense, IDEAS courses/modules constitute digital-based microlearning environments that observe the following principles in their design: small content nuggets, short length, and single learning outcomes per nugget.

Considering that a well-designed microlearning environment enhances learners' confidence in their capabilities to learn the content in a digital environment, all modules developed have the same design and structure: maximum of 2 hours of workload for each module completion; the first section is an introduction providing an overview of the topics; the second section is a self-assessment

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quiz (so the learner can decide if it is necessary to complete the module or just parts of the module, or, instead, move on to another one); tailored content to their specific needs in that area of study; learning activity within the module provides an opportunity for "assessment as learning"[5], empowering participants to measure themselves via continual reflection, questioning and ongoing personal assessment as they journey through; a series of topics follows, within 3 to 7 content sections with varied learning resources (videos, texts) and formative learning activities for each section; extension activities and resources are available at the end of the modules for those who want to go deeper into the subjects and, a final assessment quiz (graded) where the user can answer questions related to the learning. The digital learning resources format used varies within the modules but has the same design template for coherence. The videos produced for the 14 modules are available on the e-learning platform and the IDEAS YouTube channel[6].

To assist the participants in navigating the modules and topics, a chatbot named IDEAS-BOT[7] was developed by the IDEAS project's partner B&P Emerging Technologies Consultancy Lab Ltd.. The Chatbot IDEAS-BOT uses artificial intelligence to guide teacher training, stimulating innovative, personalised, and impactful digital education for students learning. It is embedded in the IDEAS modules and provides help in 3 areas: technical support, content-related assistance, and content-related questions. The IDEAS-BOT was developed exclusively for the project.

2.4. Phase 4 – IMPLEMENTATION. Teacher Training and Piloting

A crucial part of the IDEAS project was the implementation of a pilot to test and refine the functionality, design, content and quality of the IDEAS teacher training e-learning platform, DT and pedagogical approaches, VCoP (Wenger et al., 2011) and network with other teachers from partner organisations as well as more experienced digital education experts.

[5] "Assessment as learning" provides a transformational element, allowing personal and natural decision-making around assessment practice that suits participants best, and encourages participants to own their learning journey and remain active (Mezirow, 2000).
[6] https://www.youtube.com/@ideaserasmusproject2542/videos
[7] https://www.ideas-bot.com/

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The pilots' core activity was the training of 80 (16 + 64) teachers from the partner countries with a double goal: i) developing teachers' digital competence and ii) providing feedback on improvements to both technical and content aspects and accompanying DT. Furthermore, the pilot provided valuable resources and guidance for teachers on implementing digital technology in their teaching practices and prepared the IDEAS-Mentors to assume the role of digital mentors within their organisations. The contents were amended where needed, and additional resources were created due to the continuous evaluation cycle and teacher progress feedback through the pilot. IDEAS Digital Tool provided a framework for the development and practical implementation of the effective use of digital pedagogy and benefited from the experiences across partner countries and feedback collected from the pilot evaluation process.

2.4.1. Teacher Training Event: IDEAS Mentors

Each partner undertook different strategies to recruit and select suitable IDEAS-Mentors and subsequent mentees. For the pilot, 16 teachers became IDEAS-Mentors and mentored 64 teachers within their organisations. Additionally, partner mentors met the IDEAS-Mentors monthly to report on progress and disseminate the training to more teachers within each institution. All teachers provided continuous feedback throughout the pilot phase and highlighted areas for improvement through the digital forms provided. These teachers were also crucial in actively participating in the VCoP by encouraging other teachers to join and share their knowledge and digital practices.

Before assuming the responsibility to train and mentor a further four teachers regarding the practical application of the e-learning course in teaching practices, the IDEAS-Mentors received in-depth training (as previously described). Each participant undertook a Needs Analysis survey to determine their current level of digital competence and skill and identify learning needs. The adaptive learning models applied combined with the micro-credentialed structure of the course conveyed a personalised learning experience designed to meet the specific needs of the individuals. Thus, the proposed approach ensured that teachers were directed to relevant material to meet their needs with a clear pathway for CPD. Teachers were provided with the tools and strategies to roll

out the IDEAS pedagogical approaches within their organisations. Teachers could put their new knowledge into practice to reinforce their understanding and further prepare them to conduct the pilot phase. The programme will become a permanent and evolving tool for upskilling VET and HE teachers in the UK, Portugal, and Denmark, with the potential for further impact across Europe.

After the development of the IDEAS e-learning platform, the training of IDEAS Mentors on the functionality and application of the content was one of the core activities of the project's implementation phase. This training event was conceived to train teacher participants on the platform's functionality, administration and content quality in preparation for the pilot stage. Developed and facilitated by the IDEAS partners [deleted for review], it was an in-person intensive three-day Learning and Teacher Training programme with 16 Mentors from across four partner organisations. The Training covered mentoring models and approaches to use with project mentees, a comprehensive overview of the project and associated performance measures, the VCoP and the chatbot. At the end of the training, the new IDEAS-Mentors were able to:

- demonstrate understanding of key objectives and measures of the project;
- understand the functionality of the e-learning platform;
- effectively navigate the e-learning platform;
- have a working knowledge of the tools and associated pedagogical strategies;
- apply the learning from each module (tools and associated pedagogical strategy);
- select and apply peer mentoring strategies to deliver training and coaching;
- use methods of classroom/lesson observation and provide effective feedback;
- review the evaluation feedback, making recommendations to improve the content;
- drive engagement with the platform through the community of practice.

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Additionally, the training allowed IDEAS-Mentors to network, communicate, and share best practices, providing in-depth feedback on the format, content, and structure of all modules for data capture and review by the IDEAS project team.

2.4.2. Pilot programme: The Mentees

The institutions recruited 64 participating teachers through an open, transparent and fair process. The selection was based on the applicant's commitment to the project and ability to use, disseminate and exploit their training beyond the project's duration. Participants evaluated the platform and content and highlighted improvements before the commencement of the pilot phase. Continuous evaluation by participating teachers throughout the pilot phase ensured the delivery of a robust, quality-assured e-learning platform and innovative learning experience.

2.4.3. Pilot Results Discussion: Modules Learning, Mentors and Mentees

Regarding the pilot results, the analysis of learning logs created to gain critical feedback from all mentors and mentees as they progressed through modules were analysed. Mentees completed evaluation forms at the end of each module, allowing them to rate the learning experience, suggest improvements to enhance content and highlight technical challenges. Additionally, mentors and mentees met monthly over three months, and discussions during these sessions used the mentor and mentee reflective practice logs, allowing both to reflect on how their professional practice changed because of IDEAS and the effect it had on students, colleagues and stakeholders. Finally, mentees completed a mentee experience feedback form, allowing them to report back on the pilot project.

During the testing, some modules received minor changes but kept the original setup and design of the courses. The analysis of the feedback collected is on the following lines.

By the end of the pilot, 114 participants (mentors, mentees and others) registered for the courses and completed the proposed activities. To evaluate the pilot program feedback on the learning, the structure and format of content,

the format of training resources and e-assessment from participants (mentees and mentors) was collected through a series of digital logs and forms made available: Learning Logs (57 responses); Reflective Practice Log (10 mentees and 11 mentors' responses); Module Evaluation Form (266 responses) and Mentee Experience Feedback Form (30 responses). This analysis aimed to gain insights into the pilots' overall satisfaction with the program, their perceptions of its effectiveness, and their suggestions for improvement.

Pilot program feedback provided valuable insights into the effectiveness and areas for improvement in training resources, content structure and e-assessment methods. We observed a significant level of participation and completion, indicating a high level of interest and engagement on the part of the participants. The Microsoft Teams and Accessibility modules stood out in the positive responses to the learning experience, demonstrating their relevance to participants' needs in these areas. The self-assessment feature at the beginning of each module was highlighted as a valuable tool for participants to identify areas for development, allowing for a more relevant learning experience. The structure and format of the training content and resources were well received, and the variety of formats used, including video presentations and interactive tasks, was highlighted.

The monthly meetings between mentors and mentees facilitated reflective practice, making it possible to identify and target the changes needed for continuous professional development and positive change in educational practices.

For the Pilot programme to test the functionality of the e-learning platform, design, quality and impact of the content (phase 1), 64 mentees tested the programme. Each of these mentees was asked to complete the modules that seemed most interesting, either for professional development or just for personal enrichment. Furthermore, the design of the course, based on microlearning courses, did not require - for certification and completion of the course - the completion of all 14 modules, but rather the completion of those that were important to each participant (mentee). However, the results show that 55.6 per cent of mentees completed all 14 modules (herein designated M) of the course (Table 3) with gains for their teaching practice. "I learned about a

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number of different tools that can be used within the classroom and students can be introduced to additional support tools prior to courses/ classrooms starting" (M1); "I learned what a digital story was, and the accessibility unit was really helpful." (M2); "I learned new skills and knowledge that I didn't know, and also refresher skills and knowledge that I don't think about on a daily basis. It is good to be reminded of these." (M3).

In addition, the remaining mentees chose the modules that seemed most relevant to them on an individual level, which resulted in a preference for some, highlighting the module Accessibility (46 Mentees): "Accessibility training showed me some new functions that I was unaware of. I can now use these within the classroom as and when required." (M4); "Look at a range of ways I can include formative E-assessment in my daily practice (online and face to face)" (M5); "I will review my materials for Accessibility moving forward" (M6).

The mentees also pointed out the Teams module "Will archive my Teams, however, I had to go to the MS Teams help site to do this, although probably just an oversight in module creation" (M6; "I love using TEAMS so I will make sure and check and facilitate the APPS more often" (M7).

When asked what they will do differently in their professional practice as a result of their learning experience, the mentees mentioned different aspects "The use of Flipgrid, Nearpod and other tools to enhance the classroom environment for the learners"; I will look to embed the digital skills tools for research, this will be beneficial for graded unit and research classes; consider how my students read from Whiteboards and screens … give them short sharp breaks; I will try to make time and work on the skills I have learned and bring these to my teaching practice. Gradual steps. For example, I know a lot already (and learned new skills during Covid - working from home), but I could improve again.

Mentees commented on what they learned from the completed modules. In general, mentees repeatedly commented on the learning they had achieved on module completion. The most popular modules included Microsoft Teams and Accessibility. Concerning the domain of knowledge of the perceived learning, for some of the mentees, the learning related to specific digital skills, while for others, it related to the learning and teaching strategies associated with the

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digital tool, and, finally, some referred to the development of the transversal skills. The modules helped teachers reflect on their learning, which will impact both them and their students.

Finally, although some participants were initially apprehensive regarding their digital skills, they found the content accessible.

2.4.4. Feedback on the structure and format of content and training resources

Mentees mainly commented positively on the range of formats used in module content, for example, the effective use of video presentations. The self-assessment at the start of each module was positively rated since it allowed mentees to identify what skills they had and which they could develop. Mentees commented positively on the effectiveness of the interactive tasks in helping to revise the information, though some had limited access to Moodle sites where they could practice for the modules needing Moodle content. Mentees commented favourably on the modules on Accessibility and Microsoft Teams. Notably, the terminology and language used were considered precise, and the positive comments on the benefits of the pedagogical approaches used. Finally, extension activities were perceived to be beneficial.

2.4.5. Feedback on e-assessment

Although they recognised the benefits and positive impact of the course on their learning, Mentees admitted the lack of time was a restriction to more impactful learning. However, mentees were pleased with the content, format and structure, even if some noted the relevance of specific content to vocational areas. The mentees found the course a useful programme, with the self-assessment pointed out as an effective tool to identify their training needs, being able to build on their current skills, allowing them to tailor the courses based on their current needs. Concerning final assessments, mentees commented that these were straightforward and playful. The programme's benefits extend beyond developing new skills to the opportunity to refresh and strengthen existing skills. In addition, mentees highlight the transferability of learning to different contexts and languages. Finally, it is noteworthy that

mentees have begun implementing the learning within their professional practice.

2.4.6. Mentors feedback

Mentors commented positively on the experience they had supporting their mentees. The positive aspects noted included: witnessing the development of mentees' skills; the opportunities to reflect on learning and teaching with the mentees; having a group approach to mentoring was identified as motivating and, the perception of the mentoring experience as improving the mentors' skills while supporting the mentees learning process. Also, the mentors noted the positive impact the learning was having on the mentees' professional practice.

Mentors used various strategies and media to scaffold the mentees' learning (in-presence meetings, zoom videoconferencing, WhatsApp groups, Waklet or chatrooms), allowing tailored peer support and feedback. This effort positively impacted the perception of the strength of the mentor-mentee relationship, including the supportive encouragement provided. However, some constraints were noted: the busy schedules of mentees and mentors and the fact that some mentees did not use social media or engage the VCoP. Also noted was the time taken to solve some errors flagged in the content, which was sometimes frustrating for the mentees.

In summary, the mentoring process was beneficial to both mentees and mentors irrespective of how experienced they were, and most mentors wish to incorporate more reflective practice into their everyday roles as teachers. The sense of community experienced between mentors was also a strength of the pilot.

3. Final Remarks

The IDEAS pedagogical model was implemented through microlearning and "assessment as learning" strategies that allowed the creating personalised learning experiences and, thus, enhance the development of digital competencies. The self-assessment component of the modules proved to be an

effective tool to identify and address the needs of each teacher according to the specificities required to effectively support and prepare their students to succeed in a technology-oriented society. This demonstrated the importance of personalised learning paths in professional development. The evidence, comments and feedback from participants indicated positive results in improving their professional practices, specific digital competencies, and transversal competencies. Along with this pedagogical component, a DT was developed to support and promote learning.

The project integrated a mentoring program from a scaffolding perspective, which supported participants in their learning process and digital transformation of teaching practices. The use of personalised, micro-accredited training modules, coupled with the guidance of IDEAS Mentors, has resulted in greater teacher involvement and a commitment to lifelong learning. The uniqueness of IDEAS digital pedagogy lies in its ability to balance digital training and personalised mentoring support, making it an innovative approach to professional development.

Another factor considered was the busy schedules and lack of time, which were limiting factors for some participants and most teachers' daily lives. The micro-credentialed teacher training modules are designed to be delivered online in a relatively short and compact period and are formally accredited.

Although it was not the project's focus, an IDEAS Virtual Community of Practice (VCoP) was created to support teachers in sharing educational experiences and practices. We noticed that after the end of the project, the VCoP is still active and sharing experiences.

According to the evaluation and feedback received from participating teachers, this project has significantly impacted their digital literacy and pedagogical practices, showing the programme's effectiveness. To summarise, the main benefits highlighted by participants in the IDEAS project are:

- Flexibility: Teachers can learn independently and tailor the course content to their professional needs, choosing the necessary modules.

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- Relevance: Micro-credential courses are designed based on identified gaps in teachers' digital competencies, ensuring they address areas most needing improvement.
- Accessibility: Being delivered online, these courses are accessible from anywhere, reducing barriers to participation.
- Personalisation: The modules used adaptive learning models to support teachers' specific needs, creating a personalised teaching-learning experience.
- Assessment as learning: Self-assessment components of the modules help teachers to identify and address their specific needs to support their students in a technology-oriented society.
- Mentorship Support: The project incorporated tools to share educational experiences and practices among peers, promoting collaborative learning.
- Formal accreditation: Micro-credential courses carry formal accreditation, providing teachers with tangible recognition of their newly acquired digital skills.

While this study provides valuable insights, we are aware of some limitations that should be recognised and addressed in future research. The study is confined to the scope of the consortium's work and within its partnership sample; it will be important to extend the experience to other contexts and countries.

Continuous technological change and development require systematic training and updating the digital competencies needed to respond to these transformations. As this is a pilot program test, it will be important to analyse its effectiveness and impact in the long term.

Further developments of the IDEAS project are to apply for formal certification of the course through the lifelong learning micro-credentialed program of Universidade Aberta (Portugal) and the replication of the pilot, thus increasing the IDEAS Mentors network.

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The data within this article are available from the corresponding author upon reasonable request

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