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Digi Com Pass

Editors

Constantinos Tsouris, Peter Mazohl

Contributions

Amorós, E. S., Arapi, F., Beier, F., Chaves, L. A. P., Filioglou, M., Jörgens, M. C., Kreibich, S., Makl, H., Mazohl, P., Mitsaina, E., Papadopoulos, G., Papadopoulos, G. A., Peters, N. C., Stamatopoulos, V., Tendillo, F. B., Theophilou, I., Todorova, D., Tsouris, C., Tzimopoulos, N., Vanezi, E., Vourkos, F., Werth, D., Yeratziotis, A.

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Contents

DigiComPass Project

* Alexandros Yeratziotis[1], Constantinos Tsouris[1], Peter Mazohl[2], G.A. Papadopoulos[1]

[1]University of Cyprus (CYPRUS)

[2]Europäische Bildungsinitiative (AUSTRIA)

Abstract

Digital Competences Recognition Framework for Adult Education (DigiComPass) is an innovative EU co-funded program that employs a Flipped Learning (FL) 3.0 instructional design to develop, implement and evaluate a 5-module training course on Digital Competencies for Adult Education. Meaningful, real- life tasks, autonomy, targeted support, and increased learner engagement are but a few of the many advantages of FL designs. In this paper we provide a brief overview of three of the significant outcomes from this project. The first significant outcome presented are the modules that comprise the DigiComPass course. The DigiComPass course will be administered via Moodle, a Learning Management System (LMS) that is also ideal for competency-based training and adaptable in its flexibility for FL 3.0, addressing the needs of both learners and instructors. The DigiComPass e-learning platform, represents the second significant outcome discussed in this paper. Accreditation is the third significant outcome presented in this paper. A Recognition Framework Model (RFM) was developed to support this, in alignment with good practices on validation in non-formal and informal learning.

Keywords: flipped learning, adult learners, e-learning platform, accreditation

1 Introduction

The EU funded project Digital Competences Recognition Framework for Adult Education (DigiComPass) prioritises improving the availability of high-quality learning opportunities for adults in the field of digital competencies, where competencies are sorely lacking. The developed training framework offers an innovative training concept based on Flipped Learning (FL) 3.0 while the modular DigiComPass course also aligns to the digital transformation initiative through development of digital readiness, resilience and capacity.

The inception of the project idea is dated prior to COVID-19, while the pandemic further necessitated its need. COVID-19 made evident that digital competences were now even more crucial than ever before. Social distancing was a best practice

example of the importance of digital competences, e.g. to deal with authorities (eGovernment) or to be able to use the digital signatures to access eGovernmental and other services or to even socialise in general. These types of issues and more are described in the Digital Competence Framework for Citizens (DigComp) and formed a central part in the new training developed for DigiComPass. A breakdown of the main objectives and results of DigiComPass follows:

- Development of a recognition and course model for Digital Competences implementing FL 3.0 as the pedagogical framework.
- Development of a quality enhanced framework guiding and monitoring the process of course creation, implementation and evaluation.
- Designing and development of an accessible and easy to use e-learning platform to host the DigiComPass course.
- Implementation of a European recognition model defining the curriculum, training environment, evaluation and grading, and consistent certification, which aligns to the Europass CV.
- Implementation of digital badges for the recognition model
- Conduct and evaluation of pilots on the developed course.
- Creation of a "floating guide" to define the way of adaptation for future developments.
- Production of a transferability guide for School Education.
- Provision of the course as Open Educational Resources and in several languages.

Next, two key concepts of this project, the Digital Competence Framework and FL 3.0 are presented. The paper then showcases the modules of the DigiComPass course and the e-learning platform, the heart of the individual learning space. The paper concludes with a brief overview of the accreditation implemented for the course.

1.1 Digital Competence Framework

Digital Competences (DigComp) are crucial for citizens today and in the future. Yet, digital competences motivation of European citizens differs strongly between countries. In Europe, the average level in DigComp of well-educated citizens is approximately 56%. From the countries participating in the DigiComPass project, Italy, Cyprus, Spain and Greece sit below this average, while Austria is at the average.

DigComp defines the core aspects of digital competence across five areas and 21 specific skills. It includes eight proficiency levels and provides examples of knowledge, skills, attitudes, and practical applications in education and employment (Carretero Gomez et al., 2017). This framework is central to the EU's efforts to enhance digital skills, supporting the Digital Education Action Plan 2021–2027, which contributes to the Commission's aim of building 'A Europe fit for the Digital Age' and the Next Generation EU initiative. It serves multiple purposes, including creating tools for competence assessment, designing training programs and materials, and identifying digital professional roles in the contexts of employment, education, training, and social inclusion.

In the frame of the project, a curriculum covering the items M1 Information and data literacy, M2 Communication and collaboration, M3 Digital content creation, M4 Safety and M5 Problem solving was developed.

1.2 Flipped Learning 3.0

The concept of the "Flipped Classroom" began as a pedagogical approach where traditional teaching methods are inverted or "flipped." In a traditional classroom, an instructor typically presents new content during class time, and learners then work on homework and problem-solving outside of class. The flipped classroom turns this model on its head, and in its original model, learners first gain exposure to new material outside of class, usually through video lectures or reading assignments. Then, classroom time is used to deepen understanding through discussion and problem-solving activities with the peer group and instructor. This approach leverages out-of-class time for initial content engagement and uses valuable in-class time for higher-order thinking activities.

The pedagogical approach has evolved since the original model, resulting in the current FL 3.0 framework. This has evolved into a more dynamic framework, incorporating the rapid advancements in technology, globalisation, and an understanding of pedagogy. Some of the advancements of FL 3.0 are presented in Table 1 (Mazohl & Tsimopoulos, 2021; Bergmann & Smith, 2017):

Table 1: FL 3.0 advancements

Advancement	**Description**
Global Standards	The establishment of global standards for FL practices helps ensure consistency and quality in implementation.
Advanced Technologies	The use of technology and ed-tech tools are integrated into the FL model.
Deeper Integration	FL 3.0 goes beyond the classroom and curriculum to influence the entire ecosystem of education, including how schools are designed and how teacher training is conducted.
Community and Collaboration	There is a greater emphasis on forming global communities of flipped educators for sharing resources, strategies, and experiences. Professional development and ongoing collaboration are key.
Research-based Strategies	FL 3.0 is driven by research and data. Educators are encouraged to use evidence-based practices to make informed decisions about their teaching.
Personalisation and Differentiation	With the help of technology, teachers can personalise learning paths and content for learners, which allows for a more differentiated approach to accommodate varied learning needs.
Comprehensive Strategies	The model includes strategies for complex areas such as assessment, observation, and reporting in the FL context.
Learning Spaces	In FL, the Individual Learning Space refers to the portion of learning where learners engage with instructional content independently at their own pace, often outside of the classroom, using resources like video lectures or reading materials. The Group Learning Space,

Advancement	Description
	conversely, is where learners apply, analyse, and synthesize the knowledge they've acquired individually, often within the classroom setting through collaborative activities, discussions, and hands-on projects facilitated by the instructor.
Bloom's Taxonomy	In FL, Bloom's Taxonomy guides the structuring of tasks so that lower-level cognitive skills are addressed during individual study, while higher-level analytical and creative skills are fostered through collaborative activities in the classroom.

The progression from the flipped classroom to FL 3.0 has been about refining the practice to be more holistic, adaptable, and integrated into the fabric of education. It recognises the complexities of the modern learning environment and seeks to equip educators with the tools, skills, and networks needed to facilitate learner-centered learning effectively.

2 DigiComPass course

The DigiComPass training Course is based on the DigComp Framework, developed by the European Commission (Vuorikari, et al. 2022). Table 2 presents the modules that are included in the course:

Table 2: Modules of the DigiComPass course

Module no.	Module name	Module description
1	Information and Data Literacy	Focuses on skills for searching, locating, and retrieving digital content, as well as judging its relevance and purpose. Also covers the ability to store, manage, and organize digital data.
2	Communication and Collaboration	Focuses on the importance of digital communication, emphasising aspects

Module no.	Module name	Module description
		such as online etiquette, sharing information and content, and using digital tools for collaborative processes and for netiquette.
3	Digital Content Creation	Focuses on skills required to create and edit new content. It involves different formats and expressions like writing, coding, or graphic design, and an understanding of copyright and licensing.
4	Digital Safety	Focuses on the skills necessary for safe and responsible use of the digital realm. It covers topics like data protection, digital identity protection, and understanding the potential harms and threats in the digital environment.
5	Problem-Solving	Focuses on the higher-order skills of identifying digital needs and resources, making informed decisions on the most suitable digital tools according to the purpose or need, and solving conceptual problems through digital means.

3 DigiComPass e-learning platform

The platform was designed using Moodle LMS as the basic platform. With the course targeting a wide range of adult learners, Moodle LMS carries multiple benefits for inclusion and accessibility, promoting two of FL's main building blocks, namely inclusion and diversity. Designing learning content in diverse multimedia formats, offering community support and multimedia-based microlearning, as well as a range of assessment tools for example, all contribute to inclusion.

The instructional design considers two different learning spaces, both central in FL environments. The Individual Learning Space (distance learning) is where learners can digest and reflect upon the information at their own pace, independently and often outside the classroom, ensuring the acquisition of foundational knowledge before learners enter the classroom. The Group Learning Space (collaborative On-site training) typically takes place in the classroom and is where active, collaborative learning occurs. This enables a dynamic process where learners can practice and enhance their understanding through group activities and interactions.

The individual learning space implements the DigiComPass course, consisting of the 5 modules along with their respective units. Each unit has multiple lessons and access to content stored in the platform's database, such as videos, text, presentations, self-evaluations, infographics and interactive maps.

The accreditation component is available for users to utilise after the completion of each module. The accreditation system, i.e. open badges, which are issued upon successful completion of each module, supports a gamification element to engage learners, while an online certificate will be awarded upon collection of all badges. Next, we present several screenshots depicting aspects of the front-end from the e-learning platform.

Figure 1: The home page where the 5 modules are presented to the user

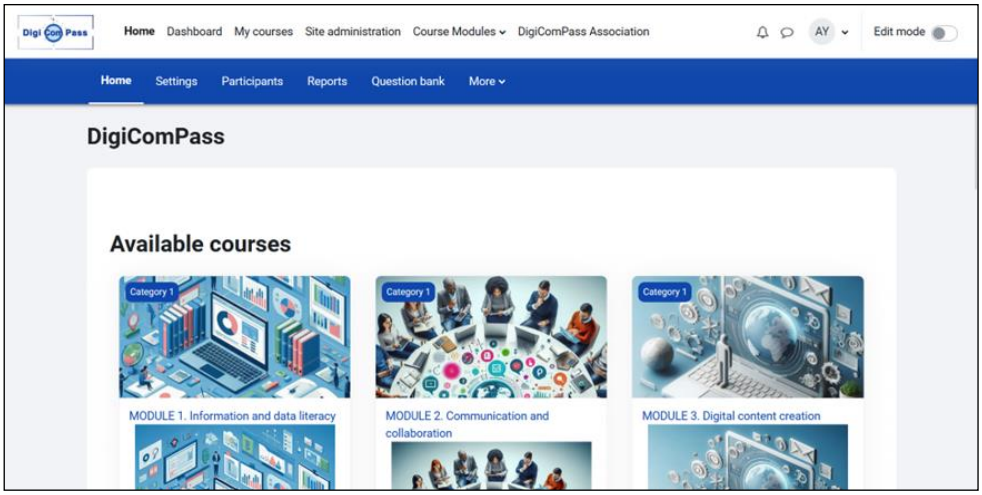


Figure 2: The collapsable menu applied to each module, consisting of the general and units' sections. Module 3 (Digital content creation) sections are presented.

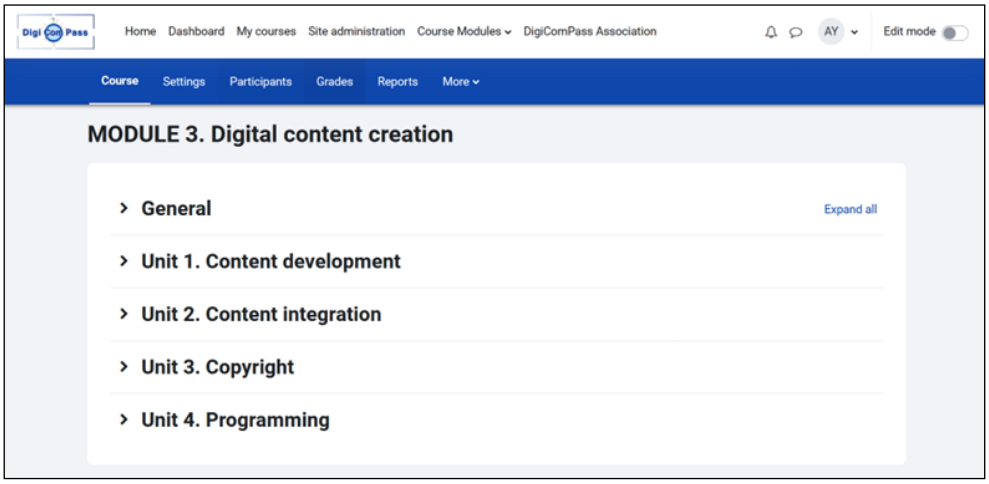


Figure 3: A lesson on job opportunities within a unit of Module 3 (Digital content creation).

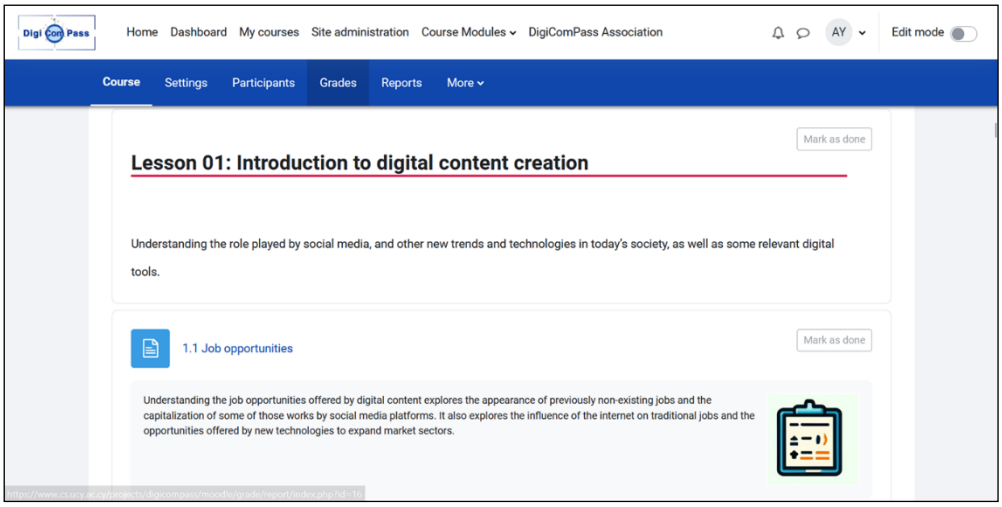
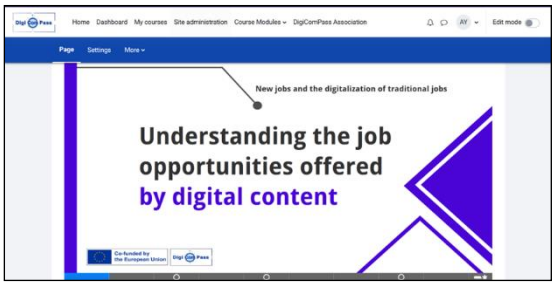
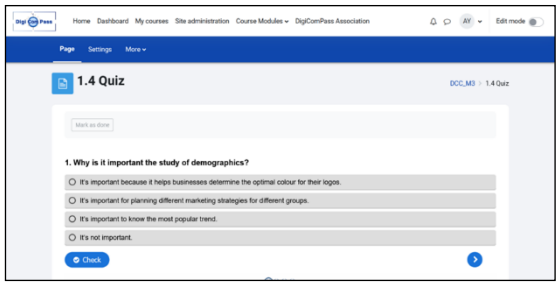


Figure 4: Example of two gamified and iteractive activities (interactive presentation and quiz) to enage learners and asess knowledge.





4 DigiComPass accreditation

Badges and certificates comprise the accreditation system of the DigiComPass course. Badges are seen as a feature that enables instructors to recognise and reward learners' achievements and serve as visual indicators of accomplishment or skills acquired by learners. It requires learners to achieve specific criteria or complete certain activities to earn them.

In the DigiComPass course, completion of a module leads to the issuing of the respective badge, as per the learner's overall score. When all 5 badges have been awarded (regardless of colour), learners also receive a Certificate. Should all badges earned be green (i.e., learner averaging scores of over 61% in each module), then the DigiComPass Passport is further awarded (Mazohl et al., 2024; Yeratziotis et al., 2024). Learner achievements are defined according to three success levels, with the badges issued in three colours as follows:

- Level 3 badge (Red) = Pass (course attended, no summative evaluation, overall score of 1-30%).
- Level 2 badge (Yellow) = Pass with success (overall score of 31-60%).
- Level 1 badge (Green) = Pass with excellence (overall score of 61-100%)

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Transforming Training with Flipped-Learning 3.0: Insights from the DigiComPass Training Course Experience

Peter Mazohl[1], **Harald Makl**[1]

[1]European Initiative for Education

Abstract

This case study describes the development of the module “Problem Saving” of the DigiComPass training course utilizing a Flipped Learning 3.0 approach. This process was supported by using Artificial Intelligence Tools. The development process covered both the "Individual Learning Space" within the MOODLE platform and the "Group Learning Space" through a trainer's guide outlining group activities. Our approach was based on Backwards Design – an essential element of Flipped Learning 3.0, which entails defining the intended training outcomes, identifying the necessary means to evaluate learning results, and detailing the learning and training activities required to achieve the assessed knowledge and skills.

In developing this course, human considerations were supported by AI, primarily using language models for brainstorming and accurate text formulation. AI was instrumental in creating differentiated learning content, proposing storyboards, and structuring presentations. The final training content, however, was developed by human effort and manpower using various tools, including the H5P framework, CANVA for presentations and videos, and AniMaker for creating cartoons. Although generative AI was considered for videos and presentations, the quality of the outputs was insufficient for high-quality training materials.

The Flipped Learning 3.0 Framework provided the development and implementation environment, organized around the 12 sectors of efficient Flipped Learning. To ensure a consistent development framework for all five learning modules, we employed the "Flipped Instructional Design" developed in a previous project phase. This structured approach facilitated a harmonized and efficient development process across all modules.

Keywords: Flipped Learning 3.0, Artificial Intelligence (AI), Backwards Design, DigiComPass, Flipped Instructional Design

1 Introduction

There's a saying attributed to Roy Amara, a futurist who studied technology's impact: "We tend to overestimate the effects of new technologies in the short term and underestimate them in the long term." This principle, known as Amara's Law, applies to Artificial Intelligence (AI) as well. There's a lot of hype about AI creating entire courses flawlessly, without human input.

This study, part of a European project, offers a more grounded perspective. We'll explore how AI can realistically be integrated into course creation, using a Flipped Learning 3.0 (FLFI, 2023) course on digital skills for adult learners as an example. This research stems from the Erasmus+ Project "Digital Competences Recognition Framework for Adult Education" (2022-1-CY01-KA220-ADU-000085965).

We will provide an introduction of the concept of the Flipped Learning Framework 3.0 and the Flipped Instructional Design developed as part of the project and its relevance to modern educational practices. It sets the stage for the case study by highlighting the importance of integrating technology, such as Artificial Intelligence, in creating effective and attractive multimedia-based and interactive learning environments.

1.1 Flipped Learning 3.0

This is a complete framework and offers an educational approach that builds upon the original Flipped Learning model. In a traditional classroom, lectures take up most of the class time. Flipped Learning 3.0 flips this idea. Students learn foundational knowledge by working through active training material or studying materials outside of class time, in most cases online. This learning phase is called "Individual Learning Space" ILS. This frees up classroom time for more engaging activities like problem-solving, discussions, and experiments. This phase is called the "Group Learning Space" GLS.

Flipped Learning 3.0 offers several advantages. Students can learn at their own pace outside of class, and teachers can personalize instruction during class time to address student needs. Additionally, the approach encourages active learning, which can lead to deeper understanding.

However, there are also some potential problems. Flipped Learning 3.0 requires students to be self-motivated and have access to technology outside of class. Additionally, developing flipped learning materials can be time-consuming for

teachers. While research is ongoing in higher education and K-12 schools, there is a lack of research specifically focused on using Flipped Learning 3.0 in adult education settings.

1.2 Objectives of the Paper

This paper describes a conceptual approach to the development and design of Flipped Learning 3.0 training courses. This approach is based on the empirical experiences of 5 adult education centres, scientifically supported by a university.

It also describes the development of the competence-orientated course modules based on Backwards Design, as well as the creation of the specific content. Reference is made to the use of AI tools in each case. In principle, freely available tools are used, as in general, smaller adult education organisations do not have the generous financial resources available.

2 Background

The DigiComPass Training Course is designed to enhance digital competencies among adults of all ages, using the DigComp Framework (Vuorikari, 2022). This is seen as crucial for engaging effectively in today's digital-centric economy and for participating in the EU's digital single market. This course leverages the Flipped Learning 3.0 methodology, which centralizes the learner in the educational process by allowing them to interact with the material at their own pace through Moodle, a flexible learning management system. Moodle is used to deliver the content for the ILS.

This approach not only facilitates deeper comprehension and retention of digital skills but also accommodates the diverse learning needs of adults, including the elderly. The course content is rich in multimedia and interactive elements like videos, quizzes, and practical exercises, promoting active learning and real-world application. Additionally, features such as multilingual support and self-evaluation tools enhance accessibility and enable learners to monitor their progress, ensuring a broad and effective reach of the program.

3 Methodology

This part details the Backwards Design methodology used in structuring the course, focusing on defining learning outcomes, assessment methods, and necessary training activities. It explains the dual focus on Individual Learning Space within the

MOODLE platform and Group Learning Space facilitated through a trainer's guide. All considerations are based on Bloom's taxonomy (Anderson, 2001).

3.1 The approach

The Backwards Design (Davila. 2005) method used in the project emphasizes starting with clear, defined learning outcomes and working backwards to design the assessments and learning experiences that best support achieving these outcomes. The implemented approach in this project consists of three stages:

Identifying Desired Results

This initial stage focuses on defining specific, measurable, achievable, relevant, and time-bound learning objectives that learners should meet by the end of the course. The learning outcome is described in terms of competencies, split into knowledge, skills, and attitudes.

Determining Acceptable Evidence of Learning

In this stage, the types of assessments that will verify whether learners have met the desired results are identified. These assessments are aligned with the learning objectives and structured to provide meaningful feedback.

Designing Learning Activities and Experiences

The final stage involves crafting engaging, challenging, and relevant learning activities that help learners achieve the set objectives. Topics addressing so-called "Lower Blooms" (Understanding, Remembering) are distributed to the ILS, while the higher Blooms activities (Applying, Analysing, Evaluating, and Creating) are dedicated to skills and implemented in the GLS.

The benefits of Backwards Design include ensuring that all course elements—content, activities, and assessments—are aligned with desired learning outcomes. This alignment helps improve teaching effectiveness, enhances student learning, and ensures that assessments provide useful feedback for both students and instructors. Furthermore, it fosters meaningful and engaging learning experiences, promotes equity by setting clear goals, and reduces curriculum development time by focusing on essential content and activities.

3.2 Training Content Framework

For the implementation of the training course, as a follow-up of the Backward design process, a training content framework is used consequently and stringently in all course modules. The framework consists of the description of the competence,

the keywords for the evaluation, the evaluation and assessment methods as well as the description of the content and the delivery method used, including the type of multimedia (Mazohl, 2023A).

4 Integration of Artificial Intelligence (AI)

The first thing to note is that AI is not used by the learners. This relatively new technology is used by the course developers when creating the training content.

Several studies explore generative AI in education. Abunaseer (2023) examines its applications, impact, and challenges. Grassini (2023) investigates its potential and consequences, while Michel-Villarreal et al. (2023) focus on its use in higher education, including challenges, opportunities, and responsible use guidelines. Gozalo-Brizuela & Garrido-Merchán (2023) provide an overview of current generative AI tools. This survey aims to be a valuable resource for researchers and practitioners, offering insights into the latest advancements and fostering further innovation. Finally, Li & Peng (2022) explore generative AI in a flipped classroom context.

Generative Artificial Intelligence (gAI), also known as generative modelling, is a subfield of Artificial Intelligence (AI) concerned with developing algorithms that can automatically produce new content. These algorithms are trained on vast collections of existing data, such as text, images, or audio. By analysing this data, they learn to identify patterns and relationships within it.

In the context of Backward Design, gAI was employed to support two key stages. The first addressed the Competence Description. gAI tools were used to analyse the learning objectives (competencies) for each lesson. This involved breaking down the competencies into key areas of knowledge, skills, and attitudes that students should acquire. The other one was used in the frame of the Assessment Creation. gAI assisted in developing assessments based on the identified learning points. This could involve generating keywords or suggesting appropriate assessment methods like quizzes or case studies.

It's important to note that gAI played a supporting role in these processes. Human expertise remained essential for reviewing and refining the gAI outputs, ensuring the final competencies and assessments were clear, comprehensive, and aligned with the learning objectives.

4.1 Defining Competencies with gAI

For each lesson, we defined the key skills, knowledge, and attitudes students should gain (competencies). We used both BARD/Gemini and ChatGPT 4 to analyse the provided competency statements. We carefully reviewed the results from both tools, improved them, and combined them into clear and comprehensive summaries. A list of keywords for assessments was created and reviewed by the course creators.

4.2 Creating Assessment Structure

Based on the keywords generated in the previous step (often extensive lists), we identified the essential learning points. We then defined the most appropriate assessment methods for these points, such as formative quizzes, case study solutions, or test questions. This stage is solely handled by the course developer.

We then integrated the existing question formats into the course framework and assigned them to individual or group learning spaces based on the content.

4.3 Defining Content

Course creators defined the content including the content types (based on the foreseen multimedia types), requiring significant knowledge and experience to determine the best way to present the material. This process also considered broader principles, such as using a variety of teaching methods.

4.4 Content Creation

We expanded the defined content into detailed descriptions for multimedia and interactive elements. These descriptions included basic graphics and illustrations. We used gAI tools extensively in this phase.

We used ChatGPT to create slide-structured descriptions for H5P presentations, along with basic visuals based on DALL-E. Attempts to use specific tools for direct slide creation failed due to poor results.

Storyboards were created using BARD/GEMINI (or ChatGPT), resulting in descriptions of video clips and proposed visuals. However, in most cases, the proposed visuals were impractical and were revised by human course developers. Requests for interactive video questions were also unsuccessful. As a result, videos were produced traditionally and made interactive with H5P tools.

Creating case studies was a success area for BARD and ChatGPT. gAI tools were particularly helpful in developing this content. These results provided many examples of real-life situations, a selection of which were integrated into the course as interactive case studies.

5 Development Process

The development process section describes how AI tools were employed to assist in brainstorming, text formulation, and content creation. It also discusses the use of various other tools like H5P (Magnusson, 2014), CANVA (Gehred, 2020), and AniMaker (Tamba, 2023) to enhance the training material's effectiveness and engagement.

gAI tools supported the creation of multimedia and interactive content:

- **CANVA:** We used CANVA to create interactive presentations and information sheets. Its built-in DALL-E feature and automated translation helped to generate visuals, illustrations, and graphics, especially for infographics. The in-built translating feature was used as well to translate the training content into the target languages of this European Project. In any case, a human control of the translation by native speakers was necessary.
- **Voice-over Tools:** These tools were used to create voice narration for videos.
- **Image Creation Tools:** We used text-to-image tools to create some illustrations or pictures within lesson descriptions and explanations.
- **Text Support Tools:** DEEPL and Grammarly were used for text writing, proofreading, correcting existing text, or writing new text elements.

In the development of the DigiComPass training course, the project team faced several challenges with the use of gAI for video and presentation creation, ultimately deciding against its use due to concerns over quality and consistency. Bandi (2023) analyses (based on the various models) the mentioned issues and influenced our decision. The team identified several key issues as mentioned now that emerged during the initial trials of AI-generated multimedia content.

Firstly, the problems with the quality of multimedia presentations were significant. While gAI tools are proficient at producing content at a rapid pace, they often fell short in delivering the high-quality, polished visuals needed for professional training materials (Kulkarni, 2023). The videos and presentations generated by AI were

found to lack the nuanced, detailed aesthetic that is typically achieved through human creativity and manual design processes. Manu (2024) mentions this shortfall as particularly evident in the finer elements of design, such as colour schemes, font choices, and the overall layout, which often did not meet the professional standards required for educational materials intended for a diverse and discerning adult audience.

Additionally, there was a notable issue with bias in the AI-generated content (Gichoya et. Alt, 2023). AI models are inherently limited by the data on which they are trained, and they can inadvertently perpetuate biases present in that data. In the context of educational content creation, this could lead to skewed or unbalanced presentations that might not accurately represent the diversity of perspectives or cater effectively to the broad target demographic of the course. Ensuring unbiased, equitable content is crucial in educational settings to foster an inclusive learning environment. Typical occurrence of misinformation or wrong statements were found in the development of the feedback given to learners created by gAI. Typical cased occurred in those cases where the question is answered in the negative. This is obviously confusing and has led to some amusing issues with the gAI.

Another major concern was the poor quality of pictures and images generated by the AI. These often lacked the resolution and clarity expected in professional training modules, appearing blurred or distorted, which could detract from the learning experience. People with three arms were created as well as having finger problems. Text in created images was mostly extremely error prone. Moreover, the generative AI tended to produce graphics with always similar-looking formats and outputs, making it easy to identify them as AI-created. This uniformity could lead to a monotonous and less engaging user experience, as the repeated visual styles could become less stimulating for learners over time. Finally, the assigning of specific colours, using the RGB Hex notation (#rrggbb) did not work in an appropriate way.

Given these issues, the team opted to utilize human designers to revise generated images, graphics and all text-generated content to ensure that the training content was not only of high quality but also free of biases and visually engaging. This approach allowed for the creation of tailored, high-quality educational materials that effectively addressed the specific learning goals of the DigiComPass course while maintaining a professional standard that AI tools could not yet achieve. This decision underscored the importance of human oversight and intervention in the

creation of educational content, particularly in aspects where current AI technologies still show significant limitations.

6 Implementation

This section outlines how the Flipped Learning 3.0 Framework and Flipped Instructional Design were applied to implement the module effectively. It covers the strategic organization of the learning modules into 12 sectors for efficient delivery and assessment.

6.1 Individual Learning Space

The "Individual Learning Space" is set up with a Moodle platform, provided by the SEIT Lab of the University of Cyprus. The multimedia and interactive learning content provided (based on the principle of microlearning) enables learners to acquire the knowledge and skills (Lower Bloom's) required for the group learning space with a higher success than in normal learning (Freeman, 2014). Numerous self-assessment units enable learners to continuously monitor the growth of their knowledge (Chappuis, 2020). These self-assessments follow the principle of "learning by assessment" by commenting on the results for immediate evaluation.

6.2 Group Learning Space

In the Group Learning Space, the acquired knowledge and skills are put into practice in practical and life-orientated tasks in groups. Presentations of the results, station model-based work in groups and similar activities ensure in-depth learning outcomes (Alacapınar, 2020).

7 Results

This section explores the implementation and evaluation and examines the effectiveness of generative AI tools in content creation and assessment, while identifying the challenges of multimedia quality, bias and interactivity.

7.1 Effectiveness of gAI Tools

Competence Description and Assessment Creation

gAI tools proved valuable in analysing learning objectives. BARD and ChatGPT 4 effectively summarised competencies into key knowledge, skills, and attitudinal areas. They also assisted in crafting assessments based on identified learning points, suggesting methods like quizzes or case studies. Additionally, these tools

generated comprehensive keyword lists for assessments, aiding in defining essential learning points and assessment methods.

Content Creation

gAI tools like ChatGPT and DALL-E were instrumental in creating descriptions for H5P presentations, including slide structures and basic visuals. They further assisted in developing detailed descriptions for multimedia and interactive elements. Notably, BARD and ChatGPT excelled at case study content generation, demonstrating gAI's potential for complex, context-specific educational materials. Tools like DEEPL and Grammarly proved effective for text writing, revising, and correcting existing content, ensuring high-quality written materials.

7.2 Observed Problems with gAI Tools

Quality of Multimedia Content

AI-generated presentations and videos often lacked professional-grade visuals. The finer design elements such as colour schemes, font choices, and layouts fell short of professional standards.

Bias and Misinformation

AI-generated content occasionally perpetuated biases present in the training data, leading to skewed or unbalanced presentations. Instances of misinformation were also identified, particularly in learner feedback, which could be confusing. An interesting observation was made during the creation of questions and explanations for the answers. It turned out that gAI has problems with negations. For questions such as 'Which of the behaviours do NOT belong to ...' or 'Which of the characteristics mentioned are NOT ...', incorrect answers were provided several times, or the explanations provided were incorrect. This shows the current limitations of gAI, which does not understand questions, but constructs the answer text according to probabilities.

Poor Quality of Generated Images

AI-generated images often lacked resolution and clarity, appearing blurred or distorted. Common issues included people with extra limbs and malformed hands. Additionally, text within images was prone to errors, and the graphics tended towards similar formats, making them easily identifiable as AI-created and potentially monotonous for learners. Assigning specific colours using RGB Hex notation also proved unreliable.

Interactivity Issues

Attempts to directly use specific tools for slide creation and interactive video questions were unsuccessful, necessitating a traditional video production approach with post-production interactivity added via H5P tools.

7.3 Validation of the Flipped Learning 3.0 (FL3) Approach

Individual Learning Space

Moodle platform usage and microlearning principles enabled learners to effectively acquire knowledge and skills. Numerous self-assessment units allowed for continuous monitoring of knowledge growth, supporting the "learning by assessment" principle.

Group Learning Space

Practical application of knowledge and skills through group tasks, presentations, and station model-based work ensured in-depth learning outcomes. This aligns with the FL3 emphasis on active, collaborative learning, and practical application of theoretical knowledge. Here it became apparent - especially in the small test groups - that mutual learning, as well as learning from each other, is extremely effective. The need to listen to others and to mentally analyse and reflect on what was said were essential elements for understanding and, subsequently, for developing critical thinking.

8 Discussion

This study explored the effectiveness of using large language models (gAI tools) within a Flipped Learning 3.0 (FL3) approach for a digital competence training course. The analysis reveals both promising applications and limitations of gAI in this context.

8.1 Findings

gAI tools like ChatGPT and DALL-E significantly improved efficiency in content creation. They excelled at:

- **Extracting Key Learning Points**
  BARD/Gemini and ChatGPT effectively analysed learning objectives, summarizing them into knowledge, skills, and attitudinal areas.
- **Crafting Assessments**
  These tools assisted in developing assessments based on identified learning points, suggesting methods and generating keyword lists.

- **Case Study Development**
  Notably, gAI tools demonstrated a strong potential for creating complex, context-specific educational materials like case studies.
- **Content Polishing**
  Tools like DEEPL and Grammarly ensured high-quality written materials by revising and correcting existing content.
- **FL3 Support**
  gAI complemented the FL3 approach mainly in facilitating the development of content for the Individual Learning Space**.** This covers the development of content based on microlearning principles, combined with self-assessment units implementing the "learning by assessment" approach.

However, there were undoubtedly some limitations and restrictions. In the use of gAI Tools.

- **Visual Design Shortcomings**
  AI-generated presentations and videos regularly lacked professional-grade aesthetics. This might be in context that we used free-available tools with the consideration that adult education organisations are often unable to afford expensive software due to their structure. Colour schemes, fonts, and layouts fell short of desired standards.
- **Bias and Misinformation**
  The study identified instances of bias and misinformation in the AI-generated content, particularly in learner feedback and explanations for questions with negations. This highlights the current limitations of gAI in terms of true comprehension and the importance of human oversight.
- **Image Quality Issues**
  gAI-generated images lacked resolution and clarity, with issues like distorted figures, text errors, and repetitive visual styles. Additionally, assigning specific colour codes proved unreliable.
- **Limited Interactivity**
  Attempts to directly utilise gAI tools for interactive elements within presentations and videos were unsuccessful. Traditional video production with post-production interactivity using H5P tools remained necessary.

8.2 Final Discussion

gAI tools offer promising support for creating high-quality educational content and streamlining content creation processes. However, limitations in visual design, potential for bias, and restricted interactivity necessitate human intervention and oversight. The most effective approach appears to be a collaborative one, where gAI handles the heavy lifting of content generation and human expertise refines and polishes the outputs, ensuring quality and addressing potential biases.

The study also highlights the strengths of FL3 in fostering individual learning through microlearning and self-assessment, while group activities promote application, collaboration, and critical thinking. Combining these elements with well-designed gAI-assisted content creation has the potential to create a highly effective learning experience for digital competence training.

9 Conclusion

This study explored the potential of large language models (gAI tools) within a Flipped Learning 3.0 (FL3) approach for a digital competence training course. The findings reveal that gAI plays a valuable role in content creation, but human oversight remains crucial.

gAI tools significantly improved the speed of content creation in several areas. BARD and ChatGPT effectively summarized learning objectives, while other tools assisted in developing assessments, generating keyword lists, and crafting complex case studies. Additionally, tools like DEEPL and Grammarly ensured high-quality written materials. Furthermore, gAI facilitated the development of content for the individual learning space within FL3, including microlearning modules and self-assessment units that promote "learning by assessment."

However, limitations of gAI were also identified. AI-generated presentations and videos lacked professional aesthetics, particularly in colour schemes, fonts, and layouts. This highlights the importance of considering budget constraints in adult education when selecting gAI tools. Additionally, instances of bias and misinformation were found in AI-generated content, especially in learner feedback and responses to negation-based questions. This underscores the need for human oversight to ensure unbiased and accurate content. Furthermore, the study identified issues with gAI-generated image quality, including resolution, clarity, distorted figures, text errors, and repetitive styles. Assigning specific colour codes

also proved unreliable. Attempts to directly utilize gAI for interactive elements were unsuccessful, and traditional video production with post-production interactivity using H5P tools remained necessary.

The study suggests that the most effective approach leverages the strengths of both gAI and human expertise. gAI can handle the heavy lifting of content generation, while human intervention ensures quality, addresses potential biases, and creates a professional aesthetic.

The study also reinforces the value of the FL3 framework in promoting individual learning through microlearning and self-assessment. Additionally, group activities within FL3 foster collaboration, application of knowledge, and critical thinking skills.

By combining well-designed gAI-assisted content creation with the strengths of FL3, this research suggests a promising path towards highly effective digital competence training experiences.

10 Future Work

A need for future work has been identified in improving the quality and reliability of AI-generated multimedia content, which will be a future challenge for the participating team members. The rapid development and quality enhancement steps of the various gAI tools allows a positive and hopeful view of the future development of learning content. Nevertheless, A well-considered and in-depth training of the course developers is necessary, with the imparting of the skills to use the tools efficiently and purposefully, without losing the special focus on quality.

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Used terms

Artificial Intelligence (AI): Artificial intelligence is a branch of computer science that deals with the creation of intelligent agents, which are systems that can reason, learn, and act autonomously. (Russell)

Backwards Design: Backwards design is an instructional design model that focuses on starting with the desired learning outcomes and then designing learning experiences and assessments that ensure students achieve those outcomes. (Wiggins, digicompass)

Language Model: A language model is a statistical method that predicts the next word in a sequence based on the words that have already been seen. Language models are used in a variety of applications, including machine translation, speech recognition, and text generation. (Jurafsky)

DigComp Framework of the European Commission: This Framework defines what digital competence means for European citizens. It outlines a combination of

knowledge, skills, and attitudes needed to confidently, critically, and responsibly engage with digital technologies in various aspects of life, including learning, work, and social participation. It provides this s**tructure** (five key areas of digital competence):

- Information and data literacy
- Communication and collaboration
- Digital content creation
- Problem-solving
- Safety

MOODLE: This is a free and open-source learning management system (LMS) written in PHP. It's used for various online learning projects, including **Blended learning, Distance education,** or the **Flipped classroom.**

Integration of Artificial Intelligence in Flipped Learning models: Redefining language pedagogy

*Constantinos Tsouris[1]
Language Centre, University of Cyprus

Abstract

This paper explores the transformative impact of integrating Artificial Intelligence (AI) with the Flipped Learning (FL) model in language pedagogy. FL, a learner-centered approach that inverts traditional classroom dynamics by introducing content outside of class and reserving in-class time for interactive activities, is proving effective in enhancing learner engagement and comprehension. The addition of AI tools offers new opportunities to further personalize and optimize language instruction. AI technologies, such as intelligent tutoring systems, natural language processing (NLP) tools, and speech recognition software, enable learners to practice language skills autonomously, receive instant feedback, and access customized learning resources. This paper examines how AI-driven tools can complement FL by facilitating self-paced learning, identifying individual learning gaps, and adapting content to meet diverse language proficiency levels. By exploring the practical applications of AI in Flipped classrooms, this research highlights the pedagogical benefits, such as increased learner motivation, improved retention, and enhanced linguistic skills. Furthermore, it addresses potential challenges, including ethical considerations and the need for instructor training in technology integration. Ultimately, this study argues that combining AI with FL offers a dynamic approach to language teaching, fostering a more engaging and personalized learning experience.

Keywords: flipped learning, AI, personalization, language learning

1 Introduction

AI integration into FL models is transforming the landscape of language pedagogy, offering new avenues to enrich learner learning experiences. Flipped classrooms shift content delivery to pre-class time, freeing up class time to focus on application-based, interactive learning and allowing learners to apply higher-order skills. In language classrooms, where practice and feedback are essential, AI's

adaptive capabilities significantly enhance flipped models. AI technologies, including intelligent tutoring systems, NLP applications, and speech recognition software, enable learners to engage with language content in a personalized, autonomous manner outside of class. Such tools provide instant feedback help learners refine their language skills before classroom activities, fostering a more targeted use of class time.

This paper explores the benefits of combining AI with FL in language teaching, emphasizing how AI-driven customization can address diverse language proficiency levels, facilitate self-paced learning, and improve learner motivation. Moreover, it addresses challenges, such as the ethical implications of data use in AI tools and the necessity of instructor training for technology integration. Overall, AI-enhanced FL is presented as an innovative, learner-centered approach, tailored to meet the evolving needs of diverse learners.

2 Flipped Learning

FL deviates from traditional pedagogy by moving direct instruction outside the classroom and using class time for interactive, learner-centered activities. Learners engage with foundational content beforehand through videos, readings, or multimedia materials (Bishop & Verleger, 2013). This allows them to come to class with a basic understanding of the topic, freeing up time for more in-depth learning through collaboration, discussions, projects, or problem-solving tasks. Consequently, learners actively apply their knowledge and deepen their understanding, while instructors provide support and feedback (Zainuddin & Halili, 2016).

It was educators like Jonathan Bergmann and Aaron Sams who popularized the FL approach in the early 2000s, aiming to create more flexible, responsive classroom environments, characterized by self-paced learning and the activation of higher-level cognitive skills, deeper understanding, critical thinking, and engagement. Studies have highlighted its benefits in various disciplines, from science and math to language and social studies, as it fosters a collaborative, active learning environment that encourages learners to take ownership of their learning (Chen, Wang, & Chen, 2014; Zainuddin & Perera, 2018). Technological advancements have since made it easier for educators to create and share engaging, accessible content, hence further enhancing FL (Bergmann & Sams, 2012).

A core principle of FL is its focus on differentiated instruction. In mixed classrooms, in all levels of formal and further education, flipped models can thus address diverse learner needs in ways that more traditional teaching approaches fail to do. Learners can study at their own pace, re-watch videos or revisit resources as necessary (Mason, Shuman, & Cook, 2013). In class, instructors can provide targeted guidance, helping learners address specific challenges. This approach fosters a more personalized learning experience, enhancing learner motivation and accountability (O'Flaherty & Phillips, 2015).

There are obvious ties linking flipped models to constructivist concepts, namely *zones of proximal development* and *scaffolding*. The former is the distance between learners' developmental level (what they can do independently) and potential developmental level (what they can do under assistance by, or in collaboration with experts or more knowledgeable peers) (Vygotsky, 1978). Such zones enable peer assessment and depend on joint interaction (Adams, 2006) and collaborative scaffolding (Vandergriff, 2006). The latter can be any supporting mechanism that peers or experts employ to assist peers in achieving their learning goals (Murphy, 2008). AI can assume such a role.

Like all pedagogical models, FL requires careful planning to be optimal. It demands high-quality, well-structured content in alignment with learning objectives to ensure that learners engage with material effectively. It also needs meticulously designed tasks that encourage active knowledge application, critical thinking and synthesis. In language contexts, such tasks should focus on developing all aspects and skills of language proficiency while at the same time taking into consideration learners' diverse competency levels. The tasks must therefore challenge learners to collaborate, problem-solve, and engage deeply with the content, ensuring that class time is productive and meaningful.

3 Integration of AI in flipped models in language pedagogy

Integrating AI into flipped models is becoming increasingly relevant. AI provides instructors with powerful tools that can enhance the efficacy and personalization of FL by making pre-class and class activities more dynamic, adaptive, and targeted to individual learning needs. In recent years, AI has emerged as a transformative force in education, enabling instructors to deviate from traditional

teaching methods and supplement flipped models with features like personalized learning and real-time feedback. This integration has the potential to revolutionize language pedagogy, building more efficient, flexible, learner-centered experiences.

3.1 AI in pre-class language learning content

AI has introduced new ways to enhance the quality and personalization of materials learners engage with in flipped, pre-class activities. Tools like adaptive learning platforms enable language learners to access content tailored to their proficiency levels and learning paces. For example, platforms like Duolingo and Babbel use machine learning algorithms to adjust content based on learners' previous performance, thus creating more personalized experiences that better prepare them for in-class tasks.

AI-driven content creation tools also enable instructors to design highly customized and diverse language materials. NLP can automatically generate vocabulary exercises, grammar drills, or pronunciation guides in alignment with individual learner profiles. NLP-based language models like GPT-4 can generate context-rich practice sentences or role-play scenarios that suit learners' specific needs. Such tools have the capacity to set up interactive, communicative activities, presenting learners with the foundational knowledge required for in-depth engagement.

3.2 AI-powered language assessment and feedback

AI's ability to provide instant feedback and continuous assessment is a significant advantage of its integration into flipped models. Feedback and assessment are crucial components for language learners who need regular input on their progress. AI-driven assessment tools provide pre-class, real-time feedback on pronunciation, grammar, fluency, and vocabulary use. Apps like ELSA Speak for example, use AI to analyze pronunciation accuracy, giving learners detailed feedback on areas needing improvement.

Such types of pre-class assessment enable instructors to gather individualized performance data. Hence, data-driven approaches to language assessment not only support learners' development but also allow instructors to tailor class activities based on learners' specific needs. Rather than spending class time on generic feedback, instructors can use AI-generated insights to develop targeted exercises that address specific language competencies. This personalized approach maximizes the efficiency of flipped models, as it informs learners and instructors of strengths and areas for improvement.

3.3 Enhancing class activities with AI

AI integration into FL further enhances class sessions by offering advanced tools that support language practice and interaction. Examples of this abound. AI-powered language practice applications can simulate real-world conversational scenarios, allowing learners to practice speaking skills in controlled environments. Virtual assistants or chatbots can role-play scenarios like asking for directions or placing an order, providing learners with invaluable interactive practice.

Instant in-class feedback is also enabled through AI-driven interactive tools, such as speech recognition and NLP. Such tools can correct pronunciation or syntax errors time, thus helping learners achieve better accuracy. Sentiment analysis can assess learners' emotional engagement, helping instructors adapt activities in real time, thus maintaining motivation and ensuring a supporting environment for learners. In this sense, AI can also enhance collaboration.

3.4 Personalized learning paths and AI

Integrating AI enables educators to design highly personalized learning paths, addressing individual learners' progress and proficiency level. To achieve that, AI algorithms track and analyze performance and suggest resources and activities that align with the learner's skills and learning pace. Such an approach is valuable in language pedagogy, as learners may be progressing at varying speeds in different skill areas.

These adaptive learning paths can be embedded in FL models to create a seamless experience where each learner can engage with content suited to their level before and during class. This ensures that in-class time is used efficiently, with learners arriving at relatively similar levels for discussions and activities. It also fosters self-paced learning and encourages learners to take ownership of their learning.

3.5 AI-driven insights for instructors

AI also enhances the FL model by providing instructors with deeper insights into learners' learning patterns and progress. Advanced analytics generated by AI-powered systems (LMS) offer valuable data on learner engagement, time spent on tasks, and areas of improvement. Instructors can henceforth identify common challenges or misconceptions and adjust pre-class content and in-class activities accordingly. This data-driven approach helps them make informed pedagogical decisions, ensuring that the flipped classroom experience aligns with learner needs.

3.6 Challenges and considerations in AI-integrated FL models

There are various challenges that come with AI integration into flipped models. A primary concern is the issue of digital literacy and technology access. Effective use of AI-powered tools requires a certain level of digital competence by instructors and learners. That may not always be the case. This digital divide can hinder the seamless integration of AI. Schools and institutions must hence ensure equitable access to devices, reliable internet, and technical support to prevent disparities among learners and maximize the possible benefits.

A second area that needs attention is instructor training in technology integration. Effective training equips educators with the skills to use AI tools and the pedagogical strategies to apply these tools meaningfully. Additionally, training addresses ethical considerations, such as data privacy and responsible implementation of AI. As with any pedagogy, well-prepared instructors are key to integrating AI into FL models.

Another challenge is over-reliance on AI, which can diminish the role of human interaction. Language acquisition depends on communication, which AI-driven systems cannot fully replicate. While AI tools can provide instant feedback in certain areas, they may lack the nuanced, cultural insights and empathy that human instructors bring to class. This raises the need for a balanced approach that incorporates AI as a supplement while maintaining instructor-led, interactive elements that foster authentic language practice.

Privacy and data security also present critical considerations, especially as AI tools often require access to personal data to offer personalized feedback and adaptive learning experiences. Collecting and processing such data raises ethical concerns regarding learner privacy and consent, particularly with underage learners. Institutions must ensure compliance with data protection regulations and implement strict security protocols to safeguard learner data.

Lastly, AI integration can strain institutional budgets, particularly in smaller educational settings. Such integration demands investment in both technology and training, and ongoing support is necessary to maintain system updates and address emerging technical issues. Institutions must evaluate whether these costs align with their objectives and ensure that any investment meaningfully enhances teaching and learning.

4 Conclusion

Integrating AI within FL models provides an innovative framework for enhancing language pedagogy, providing opportunities for personalization, instant feedback, and adaptive learning. AI enhances pre-class content preparation, optimizes in-class activities, and supports learners individually. Despite challenges such as access to technology and privacy considerations, the strategic use of AI in FL models can foster a more dynamic and engaging language learning experience. As AI technology continues to advance, it holds promise for creating more responsive, learner-centered approaches within flipped models, supporting the complex and diverse needs of language learners.

In a world where technology increasingly supports education, FL presents a promising model that fosters active, engaged learners. As educational landscapes continue to evolve, this model exemplifies how technology and innovative teaching strategies can be combined to create more dynamic, learner-centered learning experiences.

Ultimately, this study argues that combining AI with FL offers a dynamic, efficient approach to language teaching, fostering a more engaging and personalized learning experience.

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Flipped Classroom Approach in Teaching Research and AI Ethics: A Comprehensive Literature Review

[*]Evangelia Vanezi[1], Ioanna Theophilou[1], George A. Papadopoulos[1], Vassilis Stamatopoulos[2], Effrosyni Mitsaina[2]

[1]Computer Science Department, University of Cyprus, Cyprus; [2]Fraud Line/INNOFY, Greece

*Corresponding author

Abstract

This literature review examines the implementation, outcomes, challenges, and benefits of the flipped classroom (FC) approach in teaching research and AI ethics. Through a systematic analysis of peer-reviewed articles, we identify key strategies employed in flipped classrooms, including pre-class activities such as video lectures and guided readings, and in-class activities like case study discussions, collaborative group work, and interactive problem-solving. The review highlights significant benefits, including enhanced ethical reasoning, critical thinking, and student engagement, as well as improved knowledge retention. Challenges identified include technical barriers, variability in student preparation, and limitations in self-directed learning. While the findings suggest that the flipped classroom model is effective for fostering active learning and deeper comprehension in ethics education, the review also underscores the need for further research to address existing challenges and optimise its implementation. This study details the methodology employed, addresses the research questions posed, and presents a synthesis of results to offer actionable insights and directions for future research in ethics education.

Keywords: research ethics, scientific ethics, AI ethics, flipped classroom approach

1 Introduction

Teaching research ethics is essential for creating a strong foundation of integrity, fairness, and respect in scientific work. As research evolves and emerging fields like Artificial Intelligence (AI) grow rapidly, the challenges researchers face become more complex, making ethics education even more critical. Traditional teaching methods often struggle to keep pace with these changes, which is why innovative

approaches, such as the flipped classroom (FC) model, are gaining attention. This method encourages students to engage with materials like videos and text presentations before class, freeing up in-class time for active discussions, problem-solving, and collaboration.

Despite its success in many educational fields, using the flipped classroom to teach research and AI ethics is still relatively unexplored. This literature review carried out as part of the Erasmus+ BriGRETE project, aims to address that gap. BriGRETE focuses on making research ethics training more accessible and effective across Europe, with a special emphasis on the ethical challenges unique to AI research. By examining how the flipped classroom can foster deeper understanding and critical thinking in ethics education, this review highlights strategies, outcomes, and opportunities for improving how we prepare researchers to navigate ethical complexities.

As part of the Erasmus+ BRIGRETE Project, we examined various aspects of teaching and learning research and AI ethics. Our initial data collection involved focus group interviews with members of 12 Research Ethics Committees (RECs) and online surveys completed by 450 researchers. The study aimed to explore online, in-class, and blended teaching approaches. Results revealed that REC members identified significant barriers to advancing their knowledge in research ethics, including a lack of time and suitable training materials. They emphasized the need for accessible online resources as well as in-person workshops and seminars to support their development.

Over 90% of the surveyed researchers rated research ethics training as "Important" or "Very Important." However, they highlighted challenges such as limited time, inadequate training resources, insufficient institutional support, and high training costs.

Notably, the flipped classroom (FC) approach was not explored in this initial phase of data collection. This gap highlighted the need for further investigation, prompting this comprehensive literature review on the use of the FC model for teaching research and AI ethics, as detailed in this study.

Background. Research ethics involves the application of moral principles and guidelines to ensure the integrity of scientific research, protect participants, and maintain public trust in scientific conduct. AI ethics, a subset of research ethics, addresses the ethical challenges arising from the development and deployment of

artificial intelligence technologies. These challenges include bias in AI systems, accountability for decisions made by AI, and societal impacts such as job displacement and surveillance.

The integration of AI ethics into education is critical given the rapid adoption of AI across industries. It emphasizes preparing researchers and developers to consider ethical implications proactively and responsibly.

Although research ethics education is a well-established domain, limited studies have investigated the use of the flipped classroom model in this context. Traditional methods often rely on lectures and passive content delivery, which may not effectively foster critical engagement with ethical dilemmas. The FC approach has the potential to bridge this gap by encouraging active discussions, case study analysis, and collaborative problem-solving. These methods help students develop practical ethical reasoning skills applicable to real-world scenarios.

To the best of our knowledge, there is no other literature review on teaching research ethics with the flipped classroom approach.

Structure. The rest of the paper unfolds as follows: Section 2 presents our literature review methodology; Section 3 presents our results; and Section 4 discusses the findings and conclusions.

2 Literature Review Methodology

In this literature review, we explore studies in the field of teaching research and AI ethics using the FC approach, following a pre-set systematic literature review methodology. Initially, we defined our research questions and extracted the relevant search phrases to find literature to address them. Using the phrases we searched in pre-selected literature databases. Through this search, we received numerous articles as presented in Table 1. We then filtered the articles initially through screening of their titles and abstracts to determine if they follow our inclusion criteria, and in some cases through checking parts of the full text. We concluded with a set of 6 articles to study and analyze in our review. For these articles, we read the full text, extracted useful data and synthesized them, to address our research questions. In this section, we present our research protocol in detail. We then report our findings in Section 4.

Figure 1: Literature Review Methodology

3 Research Questions

To explore the area of interest, we have defined and aimed to address the following research questions:

RQ1: How are research and AI ethics being taught in FC?

> *This question aims to collect information on the methods used to teach research ethics in a FC approach, including media, technical tools, educational methodologies and their strategy for implementing the FC approach.*

RQ2: What are the outcomes of using the FC approach to teach research and AI ethics, as identified in the literature?

> *This question aims to provide information on the results of the data collection evaluating the FC methodologies applied, including challenges and benefits.*

4 Search Strategy

We conducted our search in pre-selected databases as presented in 2.2.1, using extracted search phrases from the research questions, shown in 2.2.2. Table 1 presents the number of articles returned from each search.

Libraries. We conducted our search in the following databases: ACM Digital Library, IEEE Xplore, Science Direct, and Google Scholar.

Search Phrases. We developed some well-specified search terms following the guidelines provided by Kitchenham and Charters (Keele, S. (2007)):

1. Extracting the key concepts from each RQ and identifying keywords.
2. Including synonyms identified from relevant literature.

3. Using Boolean operators (AND, OR) to link the keywords and synonyms into search phrases.

Based on the above, we extracted the following search phrases (SPs):

- SP1: Flipped classroom AND research ethics
- SP2: Flipped classroom AND AI ethics
- SP3: Flipped classroom AND scientific ethics
- SP4: Flipped classroom AND research integrity

Table 1: Number of articles returned per source

	SP1	SP2	SP3	SP4
Science Direct	829	121	318	339
ACM	1360	809	721	5893
IEEE Explore	8	2	2	6
Google Scholar	17,300	17,300	17,500	17,200

4.1 Selection Process

The search process returned an initial set of articles, as presented in Table 1. We then filtered all articles by screening their titles, abstracts and where needed parts of the full text, checking if our inclusion criteria are satisfied. Our inclusion criteria are presented next:

- The publication year is between 2017 and 2024, covering the literature in the past 7 years.
- Studies published in the English language.
- The publication went through a peer-reviewing process.
- Scientific publications (journal articles, conference papers, academic thesis/dissertations).
- The articles must be relevant to our research questions including studies that:
    - describe the implementation of a flipped classroom approach in teaching research or AI ethics;
    - evaluate the implementation of a flipped classroom approach in teaching research or AI ethics;
    - and discuss the advantages and disadvantages of a flipped classroom approach in teaching research or AI ethics.

All articles were screened and reviewed by at least two researchers independently. In the end, we concluded with 6 articles to be included in our literature review.Data Extraction and Synthesis

To evaluate the articles, we considered and extracted the following information:

- P1: The research and evaluation strategy of each paper, including the data collection and research aims.
- P2: The participants' profiles and numbers.
- P3: The flipped classroom implementation Strategies. *Used to address RQ1.*
- P4: The outcomes assessed, results, challenges, limitations and benefits.
  Used to address RQ2.

5 Results

In this section, we present our results from the survey in the existing literature. Table 2, presents the findings from the data extracted for parameters P1-P2 essential to understand each study's aims and methodologies.

Table 2: Findings from the data extracted for parameters P1-P2. The papers are presented as follows:

	P1	P2
[1]	**Theoretical Framework**: Diffusion of Innovations Theory (Rogers (2003). **Research model**: Mixed-methods design with thematic analysis and descriptive statistics. **Data collection tools:** Structured observation forms, interviews, and focus group discussions. **Collected data:** Students' views on the flipped classroom model, their satisfaction, challenges experienced in the process, and their attitudes regarding dissemination potential. **Investigating**: Advantages, disadvantages, and effectiveness of the flipped classroom model in ethics education.	24 Senior Students from the Department of Computer Education and Instructional Technologies at a state university in Turkey, within the scope of the Scientific Ethics Course for 11 weeks in 2016.

[2]	**Theoretical Framework**: Situational Judgment Test. **Research model**: Pre-experimental design with quantitative data analyzed using descriptive statistics. **Data Collection Tools**: Achievement tests, project summary and research proposals. **Collected data:** Learners' performance in understanding concepts and acquiring high-level cognitive skills. **Investigating**: Impact of the FC model on pre-service teachers' learning and skill development, and differences in learning by gender and education program.	93 undergraduate students (pre-service teachers) at a state university in Turkey, from different teaching programmes, in the science and research ethics course. 72% female, 28% male participants / 22.5% pre-service guidance and counselling teachers, and 21.5% pre-service Turkish language teaching teachers.
[3]	**Data Collection Tools**: Ethics-related exam questions, online discussion forum assignments, in-class group discussions, and self-satisfaction end-of-course survey. **Collected data:** Students' performance data and self-reflection data. **Investigating**: Acquisition of three learning outcomes: competency in ethical principles, collaboration in ethical discussions, and awareness of AI/ML ethical issues.	24 students of AI ethics in a Business Analytics course.
[4]	**Data Collection Tools**: Survey questionnaire, behaviour observation, and academic performance data (activities and exams). **Collected data:** Learners' opinions, preparation behaviours, group work performance, and exam results. **Investigating**: Whether collaborative learning techniques in the flipped classroom enhance willingness to learn and critical thinking skills.	28 students enrolled in the computer ethics course of the current academic year 2016, at Chulalongkorn University.

[5]	**Collected Data:** Literature review, desk research, and a Horizon Europe survey among academic teachers. **Investigating:** Dialogical strategies for teaching ethical research, including the flipped classroom approach; no application or evaluation conducted.	No participants.
[6]	**Research Model:** Quasi-experimental pre/post-test group design (experimental and control group). **Data Collection Tools:** Online questionnaires (before and after the teaching process), analysed with descriptive and inferential statistics. **Collected Data:** Students' ethical awareness, ethical ability, and course satisfaction. **Investigating:** Effectiveness of integrating academic ethics into a flipped chromatographic analysis course for improving academic integrity.	203 undergraduate pharmaceutical students in a flipped chromatographic analysis course at a large public university in China in the second semester of the 2021-2022 academic year.

Sources: [1] Urfa, M., & Durak, G. (2017); [2] Tosun, C. (2023); [3] Taylor, G., & Deb, D. (2021); [4] Pugsee, P. (2017); [5] Koterwas, A., Dwojak-Matras, A., & Kalinowska, K. (2021); [6] Du, B., & Guo, J. (2024).

In the rest of the section, the two research questions are addressed, by synthesizing the data extracted from parameters P3 and P4.

5.1 RQ1 Results: How are research and AI ethics being taught in flipped classrooms?

Several methodologies have been employed to teach research ethics and AI ethics using the flipped classroom approach, encompassing both the pre-class and in-class stages of learning. These methodologies vary across studies but share common themes of collaborative learning, online engagement, and integration of ethics into diverse academic contexts.

5.1.1 Pre-class Stage.

In the pre-class phase, students were introduced to foundational materials to prepare them for active engagement during in-class activities. Various tools and resources were utilized for this purpose:

- **Online Learning Platforms:** Tools like Edmodo (Urfa & Durak, 2017), EasyClass (Tosun, 2023), Superstar-Xuexitong (Du & Guo, 2024), and CourseVille (Pugsee, 2017) provided access to instructional videos, articles, slides, press clippings, and other learning materials.
- **Task Assignments:** Students were often required to watch videos, complete readings, or engage in exercises before class. For example, in Du and Guo's (2024) study, students received a task list five days in advance to guide their preparation.
- **Discussion Boards:** In Taylor and Deb's (2021) study, students participated in online discussion boards, posting threads and responses to analyse case studies before class sessions.

5.1.2 In-class Stage.

The in-class stage emphasized active, collaborative, and problem-solving learning activities:

- **Collaborative** Learning: Group-based activities featured prominently in many studies. For instance:
    - Urfa and Durak (2017) organized students into groups to complete assignments collaboratively and participate in discussions guided by a faculty member.
    - Pugsee (2017) incorporated collaborative techniques such as group exercises, discussions on case studies, and presentations of group findings.
    - Du and Guo (2024) utilized cooperative problem-solving activities as part of their flipped classroom model.
- **Scenario-based Learning**: Tosun (2023) employed fictionalized problem scenarios related to ethical issues, which were discussed during synchronous online sessions.
- **Case Study Analysis**: Taylor and Deb (2021) used the Montreal Declaration of Responsible AI Development as a framework for students to analyze ethical dilemmas in case studies during in-class group sessions.

- **Assessment and Feedback**: Students were frequently assessed through in-class presentations (Taylor & Deb, 2021), formative assessments (Du & Guo, 2024, Taylor, G., & Deb, D. (2021), Pugsee, P. (2017), and Tosun, C. (2023)), or collaborative group assignments (Urfa & Durak, 2017). Instructors facilitated discussions and provided feedback to deepen critical thinking and ethical reasoning.

5.1.3 Integration.

While most studies focused on standalone ethics courses, some integrated ethics into broader academic contexts. For instance, Du and Guo (2024) embedded academic ethics into a flipped chromatographic analysis course, exposing students to ethical topics alongside technical content.

5.1.4 Challenges and Variations

The methodologies varied across contexts, influenced by factors such as delivery mode (face-to-face, online, or hybrid), available platforms, and course objectives. For example, Tosun (2023) adapted to online teaching due to the COVID-19 pandemic, leveraging synchronous discussions and asynchronous material sharing.

5.2 RQ2 Results: What are the outcomes of using a flipped classroom approach to teach research and AI ethics?

The outcomes of employing a flipped classroom (FC) approach to teach research ethics and AI ethics demonstrate several benefits, challenges, and variations across different implementations.

5.3 Positive outcomes.

5.3.1 Improved Learning Outcomes and Understanding:

- Studies highlighted significant improvements in ethical awareness and comprehension:
    - Ethical Awareness and Academic Integrity: Du and Guo (2024) found that integrating academic ethics into a flipped classroom significantly enhanced students' awareness and ability to practice academic integrity.
    - Ethics Concepts: Tosun (2023) reported the FC model was more effective for teaching concepts related to ethics and morality,

although less so for topics related to science, research and method.

- Case Application: Taylor and Deb (2021) demonstrated that 68% of students could correctly apply ethical guidelines to AI-based case studies, showing increased conceptual understanding.

- Collaborative activities were instrumental in promoting deeper understanding:
  - Pugsee (2017) reported over 90% of students felt collaborative learning activities such as group discussions and brainstorming can help to support flipped classroom learning, improving critical thinking skills and comprehension of ethics content.
  - Urfa and Durak (2017) observed that the FC model encouraged active learning and fostered a better understanding of ethics compared to traditional methods.

5.3.2 Enhanced Critical Thinking and Engagement:

- Collaborative learning techniques within the flipped classroom helped students practice critical thinking more effectively (Pugsee, 2017). Active group work and in-class discussions acted as catalysts for deeper enhancing student engagement and performance (Taylor & Deb, 2021).
- Online platforms and multimedia content supported interactive and engaging environments (Urfa & Durak, 2017), which motivated students and prevented boredom.

5.4 Self-Paced and Flexible Learning:

The FC model enabled students to learn at their own pace through pre-class activities, including video lectures and online resources, which were highlighted as motivating factors (Urfa & Durak, 2017).

5.5 Adaptability Across Disciplines:

The flipped classroom approach proved adaptable for teaching ethics across various disciplines, including AI ethics (Taylor & Deb, 2021) and academic ethics in a chromatographic analysis course (Du & Guo, 2024).

5.6 Challenges and Limitations.

5.6.1 Limited Pre-class Preparation:

- While collaborative learning activities in class were effective, pre-class preparation was a recurring challenge:
- Pugsee (2017) found that students often did not engage fully with pre-class materials, with only 14% watching videos seriously and about 30% studying slides thoroughly.
- This lack of preparation reduced the potential benefits of the flipped classroom model.

5.7 Variability in Learning Outcomes:

- Tosun (2023) noted inconsistencies in the learning of ethics concepts, with certain topics such as social responsibility and open-access publications not well-understood by half of the students.
- Differences in cognitive skill acquisition were observed, with the FC model being moderately effective for fostering high-level skills in ethics (Tosun, 2023).

5.8 Technical and Pedagogical Challenges:

- Technical malfunctions and the need for advanced digital literacy posed difficulties for both instructors and students (Urfa & Durak, 2017).
- Students' readiness for self-directed learning was also a concern. Pugsee (2017) attributed low preparation to the inexperience of second-year students in self-study techniques.

5.9 Mixed Confidence Levels:

Despite increased ethical awareness, only half of the students felt confident discussing AI ethical issues professionally (Taylor & Deb, 2021).

5.10 No Significant Change in Satisfaction:

Du and Guo (2024) observed that while ethical awareness improved, students' overall course satisfaction remained unchanged.

6 Discussion & Conclusion

Very few studies were found addressing the teaching of research and AI ethics using the flipped classroom (FC) approach. Most studies were applied and evaluated based on varying methodologies and theoretical concepts, reflecting the

adaptability of the flipped model to different teaching contexts. Across these studies, the core structure of the flipped classroom remained consistent: students studied diverse materials—videos, articles, and interactive content—at home before class, and subsequently engaged in active, often collaborative, in-class activities to apply their learnings. These in-class activities ranged from case study analyses and group discussions to problem-solving exercises, designed to help students demonstrate their understanding of the topics.

Evaluation methods in the studies primarily involved student surveys or analyses of their grades and performance. In most cases, the results were positive, reflecting significant improvements in ethical awareness, critical thinking, and engagement. For example, students reported better retention of concepts, higher motivation, and increased confidence in applying ethical principles in real-world scenarios. However, challenges such as limited pre-class preparation, variability in learning outcomes, and technical barriers were also evident.

Interestingly, one study (Koterwas, A., Dwojak-Matras, A., & Kalinowska, K., 2021) discussed flipped learning as an approach to teaching research ethics based on survey and desk research in the context of a Horizon Europe project but did not involve practical application or evaluation. This finding highlights the growing recognition of the flipped learning model among academic educators, even in cases where its implementation is still theoretical.

The FC model demonstrated versatility across disciplines, from standalone research ethics courses to integration into broader contexts, such as chromatographic analysis and AI ethics. Despite differences in execution, the underlying pedagogical philosophy—active and student-centered learning—was consistently emphasized. The collaborative nature of in-class activities further supported critical thinking and deeper engagement, with some studies reporting over 90% of students agreeing that group discussions, brainstorming, and presentations significantly enhanced their learning experience (Pugsee, 2017).

However, the success of the FC model depends on addressing key challenges. Limited pre-class preparation emerged as a significant barrier, with some students not engaging with pre-class materials seriously or thoroughly (Pugsee, 2017). Technical difficulties and the need for advanced digital literacy also posed obstacles (Urfa & Durak, 2017). Furthermore, although ethical awareness improved,

confidence in professional application remained moderate in some cases (Taylor & Deb, 2021).

The BRiGRETE project, funded by the European Union's Erasmus+ Program, is well-positioned to address these challenges and advance the integration of the FC model in research ethics education. As part of its mission to bridge gaps in ethics training, BRiGRETE emphasizes the importance of innovative teaching methodologies that cater to diverse learners across disciplines and institutions. Future efforts within the project can focus on piloting and evaluating FC-based ethics courses, leveraging digital platforms and collaborative tools to overcome technical and pedagogical hurdles.

In conclusion, the flipped classroom approach shows promise as an effective model for teaching research and AI ethics, enhancing critical thinking, ethical awareness, and engagement. Nonetheless, its success hinges on carefully addressing implementation challenges, ensuring adequate student preparation, and providing support for technical and self-directed learning skills. The findings suggest that, while the FC model is a versatile and impactful tool for ethics education, more applied studies and evaluations are needed to refine its methods and extend its adoption across educational contexts.

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Implementation of the training course on remote places

***Filioglou Michail[1], Tzimopoulos Nikolaos[2],**

[1]Natural Science Laboratory Center of Egaleo, Greece, [2]South Aegean Regional Directorate of Education, Greece

Abstract

In this paper the evolution of distance learning course organized in Greece will be presented, initially in the area of the South Aegean and then throughout the country, during the years 2010-2024. The main objective of these courses was the training of teachers in ICT and its implementation in the school. Information is given on both the content and the structure of these seminars, the particularities they presented and the response they had to primary and secondary education teachers.

1 Introduction

The entire activity, namely the training of teachers in ICT and their implementation in the classroom, was started in 2010 by the Prefecture of the Cyclades islands, and more specifically by the Informatics and New Technologies Center of the prefecture. From 2010 to 2013, the seminars were addressed to teachers of the prefecture of Cyclades. In the period 2013-2017, these seminars were extended throughout the South Aegean.

In this Archipelagos, there are 62 inhabited islands, having 195 schools of primary education, 89 of lower secondary education, 30 of General higher secondary education and 26 vocational schools.

The next stage was their adoption by the Hellenic National Support Organization (NSO), that is operates with collaboration of Ministry of Education and Religious Affairs (MERA[1]) and Computer Technology Institute and Press "Diofantus" (CTI[2]).

[1] https://minedu.gov.gr
[2] https://www.cti.gr/en/

2 Methodology

A summary of the distance learning courses provided from the Centre of Informatics and New technologies (KEPLINET) Cyclades (2010 – 2017) and from eTwinning (2017 – 2020), are presented in the table 1 (eTwinning press release 2020).

Table 1: Summary of the distance learning courses provided from the Centre of Informatics and New technologies (KEPLINET) Cyclades (2010 – 2017) and from eTwinning (2017 – 2020)

Course Title
1. E-learning platforms - Educational material production tools - Communication tools
2. Multimedia editing tools - Educational material production tools
3. Website Builder Tools - Collaborative and Supportive Tools
4. Online educational communities and utilization of learning objects
5. Creative and safe internet - Assessing and developing critical thinking about digital content
6. Utilization of mobile devices (Tablets and mobile phones) in teaching lessons
7. Scratch Programming and Educational Robotics
8. Educational robotics with Thymio
9. Educational robotics with Raspberry
10. Educational robotics with Arduino
11. Distance trainer training
12. "Use of ICT and Web 2.0 tools in the teaching of Informatics I courses"
13. "Use of ICT and Web 2.0 tools in the teaching of Informatics II courses"
14. "Use of ICT and Web 2.0 tools in the teaching of Informatics III courses in Primary Schools"
15. "Use of ICT tools for science teachers"
16. School Violence & Bullying
17. "Technical support of IT Laboratories using Virtual Machines
18. Use of Web 2.0 tools in teaching practice (Blended Learning with the use of a virtual world, OpenSim)

19. Use of UBUNTU Operating System, Libre Office & EL/LAK Applications in teaching
20. Training course for the Heads of School Laboratory of Informatics and Computer Applications, using Virtual Machines
21. Distance training of students in small islands in the safe use of the internet - information evaluation, using a virtual world, OpenSim
22. Intersex relationships and the HPV virus
23. Training of ICT teachers in the Python programming language
24. Development of activities with the LAMS educational platform
25. Training of primary education teachers on Internet Safety using a virtual world, OpenSim
26. Using the interactive whiteboard in teaching, Openboard
27. Natural Sciences didactics
28. Network of schools for school mediation
29. Training of parents in the use of ICT (Naxos). Mixed F2F and distance learning

These are online courses are offered free to teachers of primary & secondary education, attract high interest (for the new school year more than 15,000 teachers have registered) and receive excellent evaluation from participants. The course content includes LMSs, educational material production tools, collaborative and teaching supportive tools, developing critical thinking about digital content, teaching using mobile devices, Scratch programming, educational robotics at all levels of schools, etc. All the trainers involved are voluntary and the online courses are completely free for the trainees. Each online course's support team writes, posts, proofreads and updates the training materials, creates and coordinates the online classes, and resolves learner issues. At the same time, the team of trainers & graders (consisting of ~500 volunteer trainers), who motivate the trainees and grade the activities they prepare. Every week the material of a new teaching unit is posted, and the participants are asked to submit activities related to the respective unit. The content of the online courses is co-shaped by the whole community through the completion of questionnaires. The oldest trainees participate as trainers. Upon successful completion of each online course, which consists of the

successful submission of at least 70% of assignments, each learner can retrieve their attendance certificate from the e-learning platform. The training material remains permanently available for all trainees. Online courses are conducted exclusively using distance learning techniques and methods. For the asynchronous part, the internationally established Moodle platform is used, while for the synchronous part, we use the Webex Suite. It assists All-in-one AI-powered collaboration. So, we had a fully integrated collaboration suite that includes calling, meetings, messaging, webinars, events, polling, whiteboarding, and video messaging.

This suite is provided to the teachers for free by the Greek Ministry of Education.

Table 2: number of e-classes and the number of the trainees registered

Training period	Registered teachers	No of e-classes
2019 - 2020	6653	377
2018 - 2019	6475	340
2017 - 2018	4000	200
2016 - 2017	1113	54
2105 - 2016	970	48
2014 - 2015	859	43
2013 - 2014	860	40
2012 - 2013	579	35
2011 - 2012	200	25
2010 - 2011	40	8
Total	21749	1170

3 Results

From the period 2010 till 2020, we had a total of 21,749 teacher registrations from all specialties. In table 2, the number of e-classes and the number of the trainees registered each year are presented (eTwinning press release 2020).

4 Analysis

In table 3, there is data from the period 2022-2023, concerning the degree of successful course completing and the registration number during 2023-2024 (eTwinning press release 2023)

Table 3: Data from the period 2022-2023, concerning the degree of successful course completion and the registered trainees' number

Course name	Completion percentage 2022-2023	Registration 2023-2024
Arduino Basic: Introduction to Educational Robotics Using Arduino	64%	632
i. E-learning platforms - educational material production tools - Communication tools	63%	2188
ii. Media Editing Tools - Educational Material Production Tools	82%	2940
iii. Website Builder Tools - Collaborative and Supportive Tools	68%	2392
iv. Online learning communities and the use of learning objects	65%	1249
v. Thymio	67%	153
vi. Creative and safe internet - Assessing and developing critical thinking about digital content	66%	1009
Educational Robotics in Kindergarten - Beebot	84%	1044
Educational Robotics at School - Edison	67%	105
Mobile devices 1: Application in everyday life	78%	1078
Mobile devices 2: Application in education	69%	2461
Scratch Programming and Educational Robotics	74%	1211
Educational Robotics with Micro:bit (Pilot)	69%	340
Arduino Intermediate: Dive into educational robotics using Arduino	80%	253
Mean	72%	19740

5 Discussion

Students who do poorly on the first quiz of the semester or who do not complete the first quiz of the semester are at high risk for not completing the course. Of the students who completed the first quiz of the semester, 75.8% successfully completed the course while only 35.3% of students who did not complete the first quiz successfully completed the course (3).

Many researchers have investigated the satisfaction degree of on-line courses found out that the degree of completion of these courses is very low (4). Various research has the percentage rate for completion of online courses between 5 and 15 percent (5), with research putting Massive Open Online Courses at 3 to 6 percent (4). Because people are not completing their self-paced online courses, they are not getting the full impact of the learning.

There are several reasons why the completion rate of self-paced online courses might be so low including (5):

- Lack of structure: Without a set schedule or timeline, it can be easy for individuals to become distracted or lose motivation, which can make it more difficult for them to stay on track and make progress.
- Limited interaction and support: Without the opportunity for regular in-person or online interactions with instructors or other students, individuals may feel isolated and may not have access to the same level of support and guidance as they would in a one-on-one or group coaching program.
- Limited accountability: Self-paced online courses offer limited accountability. Without the structured support of a coach (or an accountability group), it can be easy for individuals to fall behind or lose motivation. This lack of accountability can make it more challenging for learners to stay on track and achieve their goals.

6 Conclusion

The training model followed all these years (2020-2024) as it is described at the "methodology section, is considered to be successful because:

- The exceptional high degree of the course completion (63-84%, mean value 72% for the period 2022-2023)
- The enthusiastic comments provided by the trainees during the evaluation, at the end of the course (see appendix I).

All these actions confirm the fact that Communities of practice, as they are present in our courses, are the new frontier. They may seem unfamiliar now, but in five to ten years they may be as common to discussions about organization as business units and teams are today—if managers learn how to make them a central part of their companies' success (Wenger et al. 2000).

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Structure and Scope of Digital Skills training programs in vocational an educational training for employment in Europe

Emilio Sanz Amorós[1], Fernando Benavente Tendillo[2]

[1]Fundación Pascual Tomás, Valencia (Spain), [2]Iniciativas de Futuro para una Europa Social COOP, Valencia (Spain)

Abstract

This paper examines the critical role of continuous training in driving the digital transformation of the workforce within the European Union (EU). The discussion begins by outlining the strategic context, focusing on the EU's common regulatory frameworks such as the European Qualifications Framework (EQF) and the European Skills Agenda. These frameworks are pivotal in ensuring that member states develop and implement continuous training programs that are aligned with the evolving demands of the digital economy. Additionally, the paper highlights the financial support provided by the European Social Fund (ESF) and NextGenerationEU, which are essential in sustaining these initiatives.

The structure of continuous training programs is explored, detailing how they are designed to be flexible, modular, and responsive to the specific needs of different sectors and demographics. The participant profiles are analyzed, categorizing them by age groups, types of companies (SMEs, large enterprises, and entrepreneurs), and industry sectors (technology, manufacturing, services, and green economy). This analysis illustrates how continuous training programs are tailored to enhance employability across various age groups and professional backgrounds, while also addressing the specific skills needed in key industries.

The paper further investigates the dual objectives of digitalization through continuous training: enhancing individual employability and increasing corporate competitiveness. On a personal level, these programs aim to equip workers with the digital skills necessary to stay relevant in a rapidly

changing job market. For companies, particularly SMEs and large enterprises, continuous training is a strategic tool to boost productivity, foster innovation, and maintain competitiveness in a globalized economy.

The expected outcomes of these programs are critically examined, with a focus on improving employability, facilitating adaptation to digital advancements, and strengthening economic competitiveness. Additionally, the paper highlights the role of continuous training in promoting social inclusion by reducing the digital divide and ensuring equal access to educational resources.

The progress of different EU member states in implementing continuous training programs is compared, showcasing leaders such as Germany and Sweden, which have successfully integrated digital skills into their workforce development strategies. Conversely, the challenges faced by countries like Spain and Poland are also discussed, particularly in terms of regional disparities and the integration of traditional sectors into the digital economy.

In conclusion, the paper emphasizes the importance of ongoing evaluation and continuous improvement of these training programs to ensure their relevance and effectiveness.

Keywords: Continuous Training, Digital Transformation, European Union, Workforce Development, European Qualifications Framework, European Skills Agenda, Employability, Corporate Competitiveness, Social Inclusion, European Social Fund, NextGenerationEU.

1 Introduction and European Context

Digitalization has transformed the way we live and work, and its impact on the labour market is profound. In a global environment marked by rapid technological evolution, it is crucial that workers keep their skills up to date and aligned with the demands of the labour market. The European Union (EU) has recognised the importance of this challenge and has put in place a robust regulatory framework to support continuous training and the digitalisation of the workforce.

The European Qualifications Framework (EQF) is one of the EU's main tools to facilitate the comparability and recognition of qualifications across Europe. The EQF establishes a common reference system that allows Member States to align their national qualifications frameworks, ensuring that competences acquired through lifelong learning are recognised in other European countries. This is essential to promote labour mobility and ensure that European workers can compete in a single market.

In addition to the EQF, the European Skills Agenda and the Skills Pact are key policies that guide the EU's efforts to upskill. These initiatives focus on ensuring that all citizens have access to the continuous training needed to stay competitive, with a particular focus on digitalisation and green skills. These policy frameworks are financially supported by the European Social Fund (ESF) and NextGenerationEU, which play a crucial role in the implementation of lifelong learning programmes across the EU.

2 Structure of Continuing Education Programmes in the EU

The structure of continuing education programmes in the EU is robust and designed to be flexible, accessible, and aligned with labour market needs. These programmes are the result of close collaboration between governments, companies, and training providers, which ensures that the skills taught are relevant and respond to current demands.

Design and Development of Programs: Continuing education programs are developed based on an exhaustive analysis of the needs of the labour market. This includes identifying the most in-demand skills in strategic sectors such as technology, sustainability, and advanced manufacturing. The programs are designed to be modular, allowing participants to choose courses that suit their professional and personal needs. This flexibility is key to facilitating the participation of workers of different ages and sectors.

Implementation and Certification: Programs are implemented through a network of vocational training centers, universities, and private providers. The certification obtained through these programmes is aligned with the EQF, which facilitates the recognition of competences in all Member States. This is especially important in a labour market where mobility is becoming more common. In addition, many

programmes allow for the recognition of prior learning, making it easier to accumulate skills and obtain official qualifications, even for those who have acquired skills informally.

Funding and Support: Funding for these programmes comes largely from the ESF and NextGenerationEU. The ESF is the EU's main financial instrument to support lifelong learning and employability, funding programmes that align with European priorities, such as social inclusion and digitalisation. NextGenerationEU, meanwhile, is a temporary recovery plan designed to help repair the economic and social damage caused by the COVID-19 pandemic. This fund finances specific lifelong learning programmes with a focus on digitalisation and the green transition.

Evaluation and Continuous Improvement: Continuous evaluation of programs is crucial to ensure their effectiveness. The results of these evaluations inform the continuous improvement of programs, ensuring that they remain relevant and effective. In addition, pilot programmes and innovative projects are promoted that explore new ways of providing continuous training, often with the support of European funds.

3 Profile of Participants

Participants in continuing education programmes in the EU are diverse, reflecting the inclusive nature of these initiatives. The profile of the students is detailed below according to age, the type of company, and the sectors in which they are involved.

Grouping by Age:

- **Young Adults (18-29 years old)**: This group generally includes recent graduates or people with little work experience who are looking to improve their skills to enter the labour market or adapt to a first job. They actively participate in digitalization programs and new technologies. The sectors of greatest interest to this group include ICT (Information and Communication Technologies), digital marketing, and financial and e-commerce services.
- **Young Adults (30-45 years old)**: Professionals with several years of work experience who are looking to update their skills, adapt to new technologies, or prepare for a career change. This group often participates in continuing education programs offered by their employers, with a focus

on sectors such as advanced manufacturing, renewable energy, and project management and leadership.

- **Older Adults (46-65 years old)**: Workers with extensive work experience who seek to maintain their employability in a changing work environment or who need to update their digital skills. This group participates in training programmes related to professional retraining and the transition to less physical or more strategic roles, in sectors such as public administration, health and social care, and education and training.

Grouping by Type of Company:

- **Small and Medium-sized Enterprises (SMEs)**: Employees of SMEs participate in continuous training due to the need to maintain competitiveness against larger companies. These workers often seek training in areas such as process digitization and small business management. Sectors such as retail, tourism and hospitality, and light manufacturing are common among this group.
- **Large Companies**: Professionals in large companies participate in training programs organized or financed by their employers, with a focus on leadership development, advanced technical skills, and digitalization. These programs are often part of the company's talent development strategy. Sectors such as the automotive industry, financial services, and ICT are the most representative.
- **Self-employed and Entrepreneurs**: This group includes individuals who are looking to acquire new skills to strengthen their business or adapt to new markets. They participate in continuing education programs that help them develop entrepreneurial and technological skills, in sectors such as e-commerce, professional services, and innovation and start-ups.

Grouping by Sectors:

- **Technology and Innovation Sectors**: Young and adult professionals who seek to stay at the forefront of new technologies, with high participation in digitalization, cybersecurity, and software development programs. This group has a prominent presence in sectors such as ICT and technological innovation.
- **Traditional Sectors in Transformation**: Middle-aged workers who need to update their skills to adapt to the digitalization and modernization of their

sectors. Sectors such as manufacturing, construction, and transportation and logistics are representative of this group.

- **Services and Administrative Sectors**: Adults of all ages, with a high participation of women, who are looking to improve their administrative, digital and customer service skills. Sectors such as public administration, health and social assistance, and education are common among this group.
- **Green and Sustainable Sectors**: Professionals and technicians seeking to acquire skills in sustainability, renewable energy, and circular economy. Sectors such as renewable energy, waste management, and sustainable agriculture are key in this group.

4 Objectives of Digitalization

The digitalization of the workforce through continuous training has differentiated objectives according to the personal interest of the workers and the interest of the companies.

Personal Interest: For workers, the main objective of digitalization through continuous training is to improve their employability and professional development. Continuous training allows workers to update their digital skills, helping them adapt to rapid technological changes and improve their performance in their current roles. In addition, it prepares them for new job opportunities in emerging sectors. It is also crucial to bridging the digital divide, ensuring that all workers, regardless of age or sector, can fully participate in the digital economy.

Interest of Companies: For companies, the digitalization of the workforce through continuous training is essential to increase productivity, efficiency and competitiveness. Equipping employees with advanced digital skills allows companies to implement new technologies, optimize processes, and foster innovation. This is particularly important in a global market where adaptability is a determining factor for business success. In addition, continuous training in digital skills allows companies to align with market demands and stay competitive in sectors that are undergoing rapid transformations.

5 Expected Results

Continuing education programs are designed to achieve several key outcomes that benefit both individuals and businesses.

Improved Employability: One of the main expected outcomes is a significant improvement in employability. Continuous training allows workers to acquire and update skills that are in high demand in the labour market, which contributes to reducing structural unemployment and improving labour mobility.

Adaptation to Digitalization: Another expected outcome is the adaptation of the workforce to digitalization. As technology advances, it is essential that workers are equipped with the digital skills needed to take advantage of the opportunities offered by the digital economy. This includes everything from basic digital literacy to advanced skills in areas such as cybersecurity and artificial intelligence.

Social inclusion: Continuing education programmes also aim to promote social inclusion, especially by bridging the digital divide. Ensuring that all citizens, regardless of age, gender or geographical location, have access to lifelong learning is crucial to ensure full participation in the economy and avoid social exclusion.

Strengthening Economic Competitiveness: Strengthening the competitiveness of national and regional economies is another expected outcome. Upskilling the workforce not only increases productivity, but also facilitates the adoption of new technologies and innovative practices, which is essential to staying competitive in a global marketplace.

Support for the Green and Sustainable Transition: Finally, continuous training programs support the transition to a greener and more sustainable economy. Equipping workers with skills related to sustainability and renewable energy is critical to addressing environmental challenges and seizing the opportunities arising from the green economy.

6 Progress by Country

Progress in the implementation of continuing education programmes varies significantly between EU Member States, depending on factors such as investment in education, collaboration across sectors, and the ability to adapt to economic and technological changes.

Germany and **Austria** stand out as leaders in the integration of dual training and digitalisation, with high participation rates in lifelong learning and a strong focus on innovation. These countries have achieved a high level of employment and economic competitiveness, with a workforce that adapts well to technological changes.

Sweden and **Finland** also show remarkable progress, especially in integrating digital and sustainable skills into lifelong learning. Both countries have a strong focus on innovation and sustainability, which has allowed them to maintain high economic competitiveness and a workforce well adapted to the demands of the future.

Spain and **Italy** have made significant progress in digitalisation and social inclusion, with the support of European funds such as the ESF and NextGenerationEU. However, these countries still face challenges in terms of regional cohesion and reduced inequalities. In particular, Spain has made progress in reducing unemployment and improving digital skills, but still faces challenges in rural areas and among vulnerable groups.

Greece and **Poland** are in development phases with a focus on modernization and reducing inequalities. Although both countries show positive progress in improving digital skills, challenges remain in regional cohesion and the integration of traditional sectors into the digital economy.

7 Conclusion and Final Thoughts

In conclusion, the digitalisation of the workforce through continuous training is a strategic priority for the European Union. Lifelong learning programmes are designed to be inclusive, adaptive, and aligned with labour market needs, ensuring that the European workforce is well equipped to meet future challenges. However, the success of these programs depends on continued collaboration between governments, businesses, and workers, as well as the ability to adapt quickly to technological and economic changes.

As we move forward, it is crucial to continue to evaluate and improve these programs, ensuring they remain relevant and effective. By doing so, we will not only improve employability and competitiveness, but also contribute to a more sustainable, digital and inclusive European economy. Continuous training is not only a tool for adaptation; It is an investment in the future of the European workforce and in the long-term competitiveness of our economies.

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Assessment of Digital Competences: Necessity and Role in the Modern Workplace

Nina Christine Peters[1], Michelle Celine Jörgens[1], Florian Beier[1], Sebastian Kreibich[1], Dirk Werth[1]

[1]August-Wilhelm Scheer Institute for digital products and processes gGmbH, Saarbrücken, Germany

Abstract

Digital transformation is rapidly changing the modern workplace, which results in a need for digital competences to actively participate in this new landscape. Assessing and evaluating employees' competences is crucial for enabling personalized, lifelong learning and ensuring that individuals can adapt to the changing demands of their roles. Furthermore, the measurement of digital competences is a necessity to improve employees' workflow, efficacy, and work experience. Competence assessment takes a significant role in the development of effective competence management strategies, which allows organizations to identify skill gaps and tailor training programs.

This paper highlights the need and goal of competence assessment. Furthermore, it presents an insight into an assessment instrument created to measure digital competences. The instrument aims at identifying hidden champions in companies to find the best match between employees and job profiles. Finally, the paper addresses potential use cases of the instrument and benefits companies can draw from it.

The overall aim of this paper is to emphasize the importance of lifelong learning by addressing the necessity of competence assessment and targeted development to strengthen companies from the inside.

Keywords: Digital Skills, Digital Competences, Competence Assessment, Lifelong Learning

1 Introduction

The rapid advancements in digital technology are transforming today's ways of working, which makes digital competences essential for success in the digitalized workspaces (Dondi et al., 2021; Murawski & Bick, 2017). Possessing at least a basic

level of digital competence is crucial for both individual and organizational success (McCallum et al., 2018; European Commission, 2008). Therefore, companies need to foster digital competences to ensure that they meet the new demands by making the best use of the human capital and thus, enhance the competitiveness (Ellström & Kock, 2008; Mikhridinova et al., 2021). Competence assessment plays a crucial role in competence management, enabling organizations to identify competence gaps and tailor training programs accordingly. To successfully foster digital competences, first a company-related competence model needs to be determined. Based on that, an assessment of the current state of digital competence that makes effective use of scientific methods needs to be employed (Bohlouli et al., 2017). Following this process, the August-Wilhelm Scheer Institute developed a holistic digital competence assessment in collaboration with an industry partner to address the importance of employee competences and to identify potential competence gaps (Bender et al., 2023).

This paper introduces the needs and goals of digital competence assessment, including different use cases to demonstrate its application. Furthermore, the developed instrument is described conceptually. With these insights, the paper aims to contribute to the broader discourse on the significance of digital competence assessment to strengthen companies and employee's growth.

2 Needs and goals of competence assessment

Digital transformation progresses rapidly and leads to a change in society and the required competences (Dondi et al., 2021). New technologies are developed constantly and have a significant impact on the way employees work (Kolade & Owoseni, 2022). A large study with a representative German workforce sample highlighted that already in 2016, most employees were faced with information and communication technologies at work. Nearly 80 percent of the employees indicated a need for a constant further development of their competences (Arnold et al., 2016). This was further reinforced by the COVID-19 pandemic which pushed digitalization, (Krzywdzinski et al., 2022) resulting in an increased level of digitalization in companies across various sectors (Krzywdzinski et al., 2022). For example, the higher level of digitalization was observed in communication and interaction, where communication technology gained importance for both internal and external communication (Gerber et al., 2024). These insights point out that digital competences at least on a basic level become increasingly important

(European Commission, 2018; McCallum et al., 2018) and so does lifelong learning. To face the challenges arising from the digital transformation, many competence frameworks have been developed during the past years (Oberländer et al., 2020), such as the DigComp 2.2, a digital competence framework for citizens of the European Union (Vuorikari et al., 2022).

A competence-enhancing culture is of great importance for companies because competence is seen as a key aspect of the human capital, therefore, determines possibilities for action (Erpenbeck & Rosenstiel, 2006). Moreover, it has a positive impact on productivity and innovative capabilities, and thus, on the competitiveness of companies (Ellström & Kock, 2008). Competence frameworks are the key element of competence management as they build the sound base and provide a mutual understanding (Grote et al., 2006). Combining standardized competence models with company-specific requirements arising from employees' responsibilities, work processes, and activities, current trends and changing corporate structures, as well as business processes and corporate goals(Blumberg & Kauffeld, 2021) is crucial to develop relevant competence assessments. By assessing employees' competences, the current competence level can be identified and compared with the desired one to determine the gap between these two states. These findings then can be used to derive further actions to close the identified gap (Grote et al., 2006), such as identifying or developing targeted further education offers to foster lifelong learning.

Overall, competence assessment can support decision making in various fields such as recruiting, performance management, and further education. By identifying current competence levels and matching them with future requirements, organizations can find the best suited candidates for a job and can tailor development plans to bridge competence gaps effectively. Following this competence-oriented approach supports the organization's long-term goals by ensuring that employees are perfectly suited for a specific role, thereby paving the way to drive innovation.

3 Description of the digital competence assessment instrument

Competence is defined as "the proven ability to use knowledge, skills and personal, social and/or methodological abilities" (European Commission, 2008, p. 11). This

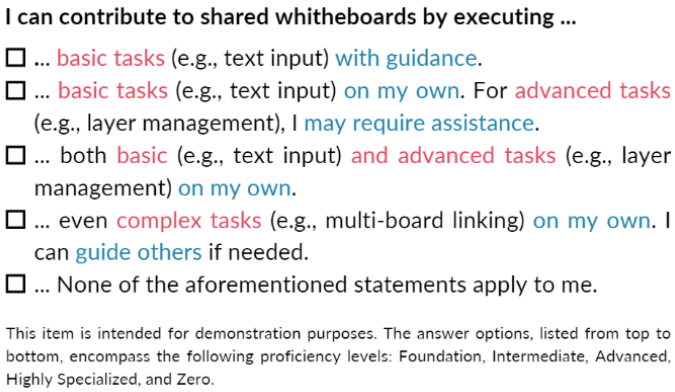
means that competences are understood not only by knowledge and skills someone possesses, but also by how these are applied in real-life scenarios.

The development of the digital competence assessment instrument is based on three commonly used competence frameworks: the DigComp 2.2 (Vuorikari et al., 2022), the EntreComp (McCallum et al., 2018) and the DELTA framework (Dondi et al., 2021). The instrument includes five different competence categories: *Digital and Modelling*, *Implementation*, *Project Management*, *Communication*, and *Strategic Thinking.* These categories were determined in close coordination with a company in the ceramics sector, which has served as a practice partner for this project. Competences of the mentioned competence frameworks perceived as relevant for the company's job profiles, were allocated to the determined categories. In that context, a job profile is understood as a description of a job, its underlying tasks as well as responsibilities, and consequently, the required competences to master the job.

The competence levels of the instrument were established based on the standards of the DigComp 2.2 and EntreComp, which in contrast to the DELTA framework consider detailed competence levels. Within these frameworks, eight specific competence levels are determined, organized into four main groups: *Foundation*, *Intermediate*, *Advanced*, and *Highly Specialized*. To reduce the number of response alternatives per item, we used the four main levels and adapted the response alternatives according to the levels. Since the lowest competence level within the frameworks requires at least a foundational competence, a fifth level was added representing no competence at all. As specified by the DigComp and EntreComp, the instrument measures competences both at the level of complexity of the tasks and at the level of autonomy (Vuorikari et al., 2022). At the *Foundation* level, a person can solve simple tasks partly by one's own, when needed with guidance. The *Intermediate* level is characterized by the fact that a person can solve well-defined and routine tasks as well as problems on one's own. This happens mostly independently and according to one's needs. If a person can solve different tasks and problems as well as choose the most appropriate solution independently, and one can guide others, this is referred to as an *Advanced* level. At the *Highly specialized* level, a person can solve complex problems with limited solutions and many interacting factors independently, can guide others, and can contribute to professional practice as well as propose innovative ideas and processes. Lastly, the *Zero* level indicates that a person meets no requirements of any other level (Bender

et al., 2023). An example of how the levels are applied to an item is illustrated in *Figure 1* with task complexity highlighted in red and autonomy highlighted in blue.

Figure 1: Example item



Two formats are used to measure digital competences. First, for each competence, two example-based questions were created with five response alternatives, each representing one competence level. These questions target competences on a general level but are enriched with company-specific examples to promote understanding and relatedness. Second, to increase the reliability of the results and the relevance to real life, each category is measured by a scenario-based question that describes a company-specific scenario requiring each competence in the category. The response alternatives describe real-life actions to make the competences and their levels more tangible, thereby differentiating the assessment from traditional self-assessments.

The outcome of the competence assessment is a competence profile, providing information about the level in each category and in each competence. Thus, the assessment is suitable for job starters, employees at any professional level, and career changers. It is usable in HR workflows, such as in the recruiting process as a jobseekers' self-assessment to identify the best match to an open job position. During employment, iterative assessment can be used to track the employees' competence development and identify further development needs. The assessment can be carried out either analog using pen and paper or in a digital format linked to HR software or as a stand-alone online survey. Based on the further development needs, targeted further education offers can be identified so that each employee can be offered individualized learning paths. Moreover, company-intern hidden talents can be identified, i.e., employees that are currently working in a company but have competences that are even better suited to another job profile. These applications aim at ensuring that employees are matched with job profiles based on their competences and competence levels, contributing to

employee satisfaction as well as work efficiency, and as a result, to improved competitiveness.

4 Conclusion

Due to the impact of digitalization, digital competences are emerging as essentials in the modern workplace. For companies to remain competitive, the assessment of competences plays a crucial role in identifying employees' current digital competences and comparing them to the target competences to match each person to the most fitting job profile. In this context, the development of a digital competence assessment instrument conducted by the August-Wilhelm Scheer Institute represents a structured and scientifically sound concept for digital competence assessment. The overall aim of the instrument is to enable companies to contemporary competence orientation so that they can support their employees by fostering lifelong learning and thereby, appropriately prepare them for the digitalized workplace. Further research is needed to determine the quality of this instrument.

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Non-Formal Learning In Formal Education

Filaretos Vourkos[1], Fotini Arapi[2]

[1]Director and Trainer, K.A.NE. Social Youth Development, Greece, [2]Trainer and Researcher, K.A.NE. Social Youth Development, Greece

Corresponding author: Fotini Arapi

Abstract

In this presentation we aim to explore the importance of non-formal learning (NFL) and its role in enriching lifelong learning and acting as a complementary tool in formal education systems. After defining the different kinds of learning, we will move on to presenting different non-formal learning tools and methods, highlighting the flexibility and learner-centred approach of NFL. Additionally, we will examine the significance of NFL in developing skills at personal, social and professional levels, whilst exploring the ways that it can be used in formal education contexts in order to create a holistic educational landscape and act as a catalyst for inclusive and adaptive learning.

Keywords: non-formal learning, lifelong learning, inclusive education, skills development

1 Introduction

The 21st century has brought forth an increasing need for the re-imagining of educational practices so that they can adhere to different learning needs as well as foster the development of the so-called 21st century skills and life-long learning, which include soft skills such as communication and collaboration, creativity, social skills, media and digital literacy, flexibility, adaptability, etc. Traditionally, formal education has the primary role in the structured development of knowledge, however, it focuses more on groups/categories of learners and does not necessarily address the dynamic and different ways in which individuals learn nor the different learning needs of the learners.

Here is where NFL can play an important role, complementing formal education and offering a more adaptable, flexible and learner-centred approach. This was clearly

highlighted in a recommendation of the EU parliamentary Assembly states that "The Assembly acknowledges that formal educational systems alone cannot respond to rapid and constant technological, social and economic change in society, and that they should be reinforced by nonformal educational practices.' (Council of Europe Parliamentary Assembly, 2000).

Flexibility, learner-centered approach, and adaptability are the main characteristics of NFL. It embraces a diverse range of educational tools and methods as well as activities that can take place outside of the traditional classroom setting. That includes training activities, community workshops, online courses, peer learning and experiential education. These methods can be a valuable alternative way for learners to acquire knowledge and develop skills, often emphasizing on practical application, creativity, and personal growth (Rogers, 2004).

2 Types of Learning

Before moving forward, it is important to understand the different types of education/learning. Learning is generally categorized into three distinct types: formal education, non-formal education/learning, and informal learning. Each type plays an important role in the lifelong learning process and adheres to different dimensions of personal and professional development.

There are many definitions of the 3 types of learning. For the purposes of this paper, we will use the definitions adopted by the Council of Europe and included in the COMPASS Manual for Human Rights Education (Council of Europe, 2023).

Formal Education

> *Formal education refers to the structured education system that runs from primary (and in some countries from nursery) school to university, and includes specialised programmes for vocational, technical and professional training. Formal education often comprises an assessment of the learners' acquired learning or competences and is based on a programme or curriculum which can be more or less closed to adaptation to individual needs and preferences. Formal education usually leads to recognition and certification. (Council of Europe, 2023, pg 31).*

Non-Formal Education/Learning

Non-formal education refers to planned, structured programmes and processes of personal and social education for young people designed to improve a range of skills and competences, outside the formal educational curriculum. Non-formal education is what happens in places such as youth organisations, sports clubs and drama and community groups where young people meet, for example, to undertake projects together, play games, discuss, go camping, or make music and drama. Non-formal education achievements are usually difficult to certify, even if their social recognition is increasing.

Non-formal education should also be:

- voluntary
- accessible to everyone (ideally)
- an organised process with educational objectives
- participatory
- learner-centred
- about learning life skills and preparing for active citizenship
- based on involving both individual and group learning with a collective approach
- holistic and process-oriented
- based on experience and action
- organised on the basis of the needs of the participants. (Council of Europe, 2023, p 31).

Informal Learning

The lifelong process whereby every individual acquires attitudes, values, skills and knowledge from daily experience and the educational influences and resources in his or her own environment (family, peer-group, neighbours, marketplace, library, mass media, work, play etc). (Council of Europe, 2023, pg 489).

While all three types of learning have different characteristics, they can, and they should complement each other in order to achieve the best

possible learning outcomes for each learner and contribute to the life-long learning process.

3 Non-formal learning Tools and Methods

There is a diverse range methods and tools that are used in NFL in order to promote the development of competences (divided usually in knowledge, skills and attitudes). NFL tools and methods are designed and developed in a way so that they can be flexible and adapt to the specific needs of learners and groups of learners. Unlike formal education, which typically has to follow a standard curriculum, the priority of NFL is to adapt to the different learners, making it a valuable tool in the support of diverse groups, including marginalized groups and people with fewer opportunities, facing different kinds of difficulties (educational, social, cultural, economic, health, etc).

Let us review some of the main elements of NFL:

3.1 Interactive workshops and trainings

Interactive workshops and trainings are very valuable, as they provide a space for learners to interact and learn by working together. NFL workshops are based on facilitation and working in groups, rather than the mere presentation of facts. According to the Manual for Facilitators by the Council of Europe (2022), the basis of each session during a workshop/training is active participation through collaboration, dialogue, learning from each other and the application of knowledge to real-world scenarios, through working in groups, simulation exercises, analysis of case studies, role-playing, etc. The objective is not only to gain knowledge, but also to develop soft skills, such as critical thinking, problem-solving skills, and social competencies (Council of Europe, 2022). Non-formal learning tools used in these activities can include working in groups, debates, interactive presentations, simulation exercises, warm-up and ice breaking activities, storytelling, case study analysis, brainstorming, game-based learning activities, etc.

Another key method often used in NFL is participatory training, which -in contrast to traditional training- is designed so as to involve learners in the decision-making process, allowing them to influence the content and direction of their learning experience. This method, as highlighted in the Facilitators' Guidebook by the Danielle Mitterrand Foundation (2022), fosters the empowerment and feelings of accomplishment of the learners, as it recognizes their competences and ideas as

factors to the development of the educational process. This also allows for the development of a sense of ownership and an increased motivation among participants.

3.2 Peer Learning and Collaborative Activities

Peer learning as a method in NFL deserves a special mention, as it stands at the centre of it, using the collective knowledge and experiences of the participants in order to facilitate the learning process and allow them to learn from one another. This process happens through working in small groups, study circles, and common projects where the learners share ideas, opinions and insights, challenge each other and create together. This approach aligns with the principles outlined in the NFE Handbook by ICYE (2017), which emphasizes the importance of collaboration in developing both cognitive and social skills.

The COMPASS Manual for Human Rights Education by the Council of Europe (2023) explains that peer learning is a particularly effective way to foster and promote values such as empathy, respect, and mutual understanding (Council of Europe, 2023).

3.3 Experiential Learning

Experiential learning is another great method of NFL that involves engaging learners in activities that simulate real-life challenges and encourage reflection on their experiences. The OECD's Learning Framework 2030 highlights experiential learning as a critical component in developing the so-called 21st century competencies, such as adaptability, creativity, and problem-solving (OECD, 2018).

Experiential learning in non-formal contexts often includes outdoor education, community service, and internships, where learners apply theoretical knowledge to practical situations. According to UNESCO (2015), this method not only enhances understanding but also builds essential life skills that are difficult to get through the traditional education in the classroom. Experiential learning also emphases on reflection, supporting learners to internalize their experiences and apply their insights to future challenges.

3.4 Digital transformation in NFL

The digital transformation of education, and especially of NFL, has broaden the horizons of learning, widening the access to learning opportunities and bringing education closer to the young people. More and more, especially in the post COVID-

19 era, NFL providers use online platforms, webinars, virtual meeting/conference spaces to deliver educational programmes. The United Nations' Policy Brief on Education during COVID-19 and beyond (2020) emphasizes the importance of bridging the digital divide, developing digital literacy and creating digital learning tools in maintaining educational continuity and reaching learners in remote and underserved areas (United Nations, 2020).

In NFL, digital tools allow for the development of more self-directed learning activities, where learners can learn on their pace and convenience. They are also a means of making NFL activities more accessible, provided that it coincides with efforts to enhance accessibility for all and digital literacy.

The OECD Digital Education Outlook 2021 suggests that such tools are particularly effective in supporting lifelong learning and professional development, as they offer flexible, on-demand access to a wide range of educational resources (OECD, 2021).

3.5 Feedback and Evaluation

Feedback and evaluation are important elements of NFL and they differ to the typical forms that are included in formal education. They are there to ensure that the learning process is following the learning needs of the learners and successfully achieves the learning outcomes. Unlike formal education, evaluation in NFL is not based on standardized tests, but it uses a variety of methods. Evaluation in non-formal education often involves self-assessment, peer assessment, and assessments by the facilitators, which collectively provide a comprehensive view of the learner's development. According to the COMPASS Manual (2023), this evaluation approach is particularly effective as it assesses not only the development of knowledge, but also development of competences at social and personal levels (empathy, problem solving, communication, active citizenship, etc). What is of particular importance is that by using this variety of evaluation methods, one can have a clearer understanding of the full range of learner achievements, including those that might be overlooked in more traditional assessment frameworks (Council of Europe, 2023).

What is more, another key element of NFL is continuous feedback. In NFL, learners are usually provided with regular opportunities to reflect on their progress and make adjustments to their learning expectations and strategies. The Manual for Facilitators (2022) by the Council of Europe highlights the importance of creating a feedback loop where learners can express their thoughts on the learning process

and receive constructive feedback from facilitators and peers. (Council of Europe, 2022).

4 Introducing Non-Formal Learning into Formal Education

Although they are different types of learning, introducing NFL methods and tools in Formal Education can be very valuable and a good opportunity for formal education to become more flexible and inclusive, focusing on the needs of the students and fostering the development of the 21st century skills in the classroom.

Introducing NFL into formal education makes sense because, as previously mentioned, each one has its own advantages that can act complementary to each other.

Formal education, being heavily structured and providing standardized assessment to the students, can be a solid foundation for knowledge. However, it is not as flexible when it comes to identifying and addressing individual learning needs or including more practical, hands-on experiences that are crucial for personal and professional growth. On the other hand, NFL is much more flexible and focused on the needs of the learners. According to UNESCO (2020), introducing NFL in formal education settings can bridge the gap between theoretical knowledge and practical skills, making education more relevant and engaging for students—especially in our today's world, where it is important to be able to adapt and apply knowledge in different contexts (UNESCO, 2020).

In order to successfully introduce NFL into formal education there needs to be careful planning and the implementation of specific strategies. Here are some successful approaches:

4.1 Blended Learning Approaches

Blended learning is an approach that combines teaching in a classroom with NFL activities. This can be the inclusion of activities that encourage the students to collaborate, such as experiential learning activities, project-based activities, etc. These can have already started to be included in the formal curriculum in several countries.

4.2 Partnerships with Civil Society Organizations

Another good way to bring NFL to the formal education setting is to building partnerships between schools and civil society organizations. Schools can work together with these organizations to provide the students to participate in different activities in and outside school hours. For example, our organization, K.A.NE. Social Youth Development developed and implemented in secondary education schools, the educational programme “Don't be in a hurry to throw away the garbage….”. The programme was approved by the Greek Ministry of Education and run in the school year 2018-2019.

The aim of this educational programme was to make students understand that plastic waste plays a significant role in the degradation of the urban and natural environment, with multiple impacts on the environment, society, economy, culture and health. In addition, the students were made aware that the reduction of plastic waste, its management and, in particular, its reuse, is an integral part of sustainable development, in which we can and should all participate in a fun and creative way.

The project was linked to the curriculum of Mathematics, Physics, Chemistry, Biology, Modern Greek Language, Expression, Art, Technology, Social and Civic Education, Physical Education and the course "Principles of Economic Theory" for high schools. At the same time it aimed at motivating the students to become more active and participate in Civil Society Activities and Civic Dialogue.

Schools can also arrange to visit civil society organizations and participate in NFL workshops there, together with volunteers and staff of the organizations, as well as other interested members of the community. This can take place during school hours and be incorporated into the curriculum, providing the opportunity to the students to engage in real-life activities and develop a stronger sense of social responsibility and active citizenship.

4.3 The importance of teacher training

In order to successfully integrate NFL into formal education it is important to provide teachers the opportunity to learn how to implement these methods effectively. The ERASMUS+ programme provides teachers and educators to participate in training courses and workshops that allow teachers to come into direct contact with NFL and learn how they can adapt and use Non-formal education activities within their classrooms.

The OECD's Teaching and Learning International Survey (2019) highlights the importance of ongoing professional development to help teachers adapt to new teaching methods and create inclusive, responsive learning environments (OECD, 2019).

5 Why is it important to integrate Non-formal learning methods in formal education?

Integrating NFL in formal education can be very beneficial, as it can motivate students to be more engaged in the school activities. By incorporating interactive learning tools used in NFL, students can become more motivated to participate actively and take charge of their own learning, enhancing their learning outcomes.

NFL tools and methods also support the development of the so-called 21st Century skills. According to the concept note of the Learning Framework 2030:

> *"Core knowledge, skills, attitudes and values for 2030 will cover not only literacy and numeracy, but also data and digital literacy, physical and mental health, and social and emotional skills. All of these are increasingly recognised as essential for thriving in the 21st century, and as important facets of human intelligence" (OECD, 2018).*

Integrating these skills into formal education prepares students for the challenges and opportunities of the 21st century.

Finally, integrating NFL into formal education gives students a wider perspective and motivates them to continue to develop their knowledge, skills and attitudes, throughout their lives, thus encouraging life-long learning. This is particularly important in a rapidly changing world where continuous learning is necessary for personal and professional success (UNESCO, 2020).

6 Conclusion

To conclude, in today's world, where everything is everchanging, it is important for the formal education system to change as well. NFL can improve the learning outcomes, as well as the school experience of the students and encourage them to be more engaged and active in and outside the classroom. NFL in the classroom can make learning more inclusive and adaptable to the specific needs and difficulties of the individual student. It can also support the students in developing

the 21st century skills, that will allow them to develop in personal, social and professional levels and help them face the real world in the future.

The process of integrating NFL into formal education requires thoughtful planning, collaboration, and ongoing support for teachers and educators. Moreover, blending NFL with traditional methods encourages students to take an active role in their education, fostering a lifelong love of learning. This approach not only prepares them for future challenges but also equips them to be adaptable, resilient, and active participants in society.

Ultimately, integrating NFL into formal education is not just about improving academic outcomes; it's about creating a more holistic, well-rounded educational experience that empowers every student to reach their full potential.

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Design Thinking Method can be effectively integrated into flipped learning to enhance the learning experience and outcomes for learners

Diyana Todorova[1]

[1]Project Manage Brainlogr, Denmark

Abstract

This paper explores the integration of design thinking methodology into flipped learning environments, aiming to enhance student engagement, innovation, and learning outcomes. Design thinking, with its iterative and human-centered approach, offers a promising framework for educators to rethink traditional teaching practices and cultivate creativity and problem-solving skills among students. Flipped learning, characterized by the inversion of traditional classroom activities, provides an ideal setting for the application of design thinking principles, fostering active learning and personalized instruction. Through a comprehensive literature review, this paper examines the theoretical foundations of both design thinking and flipped learning and investigates previous research on their integration in educational contexts. Drawing on examples and case studies, it demonstrates how each stage of the design thinking process—empathize, define, ideate, prototype, and test—can be applied to flipped learning, resulting in more effective and student-centered teaching practices. Moreover, the paper discusses potential challenges and considerations in implementing this integration and proposes strategies to address them. By exploring the implications of combining design thinking with flipped learning for educators, students, and educational institutions, this paper contributes to the ongoing discourse on innovative teaching methodologies and provides recommendations for future research and practice in this area.

Keywords: Design Thinking Method, Flipped Learning, learning experience, learners

1 Introduction

Design thinking, renowned for its human-centered and iterative approach to problem-solving, has gained significant traction in various fields, including education. Simultaneously, flipped learning, characterized by the reversal of traditional classroom activities, has emerged as a promising pedagogical model to enhance student engagement and learning outcomes. This paper explores the convergence of these two methodologies—design thinking and flipped learning—and investigates how their integration can revolutionize teaching practices and student experiences. By applying the principles of design thinking to flipped learning environments, educators can create more dynamic, personalized, and interactive learning experiences that empower students to become active participants in their own education. This introduction sets the stage for a deeper exploration of the theoretical foundations, practical applications, and potential implications of this integration, ultimately contributing to the ongoing discourse on innovative educational practices.)

Background: Design Thinking and flipped learning are two innovative educational approaches that, when integrated, have the potential to significantly enhance the learning experience and outcomes for students. Both methodologies emphasize active, student-centered learning, which makes their combination particularly powerful in fostering deeper engagement and understanding.

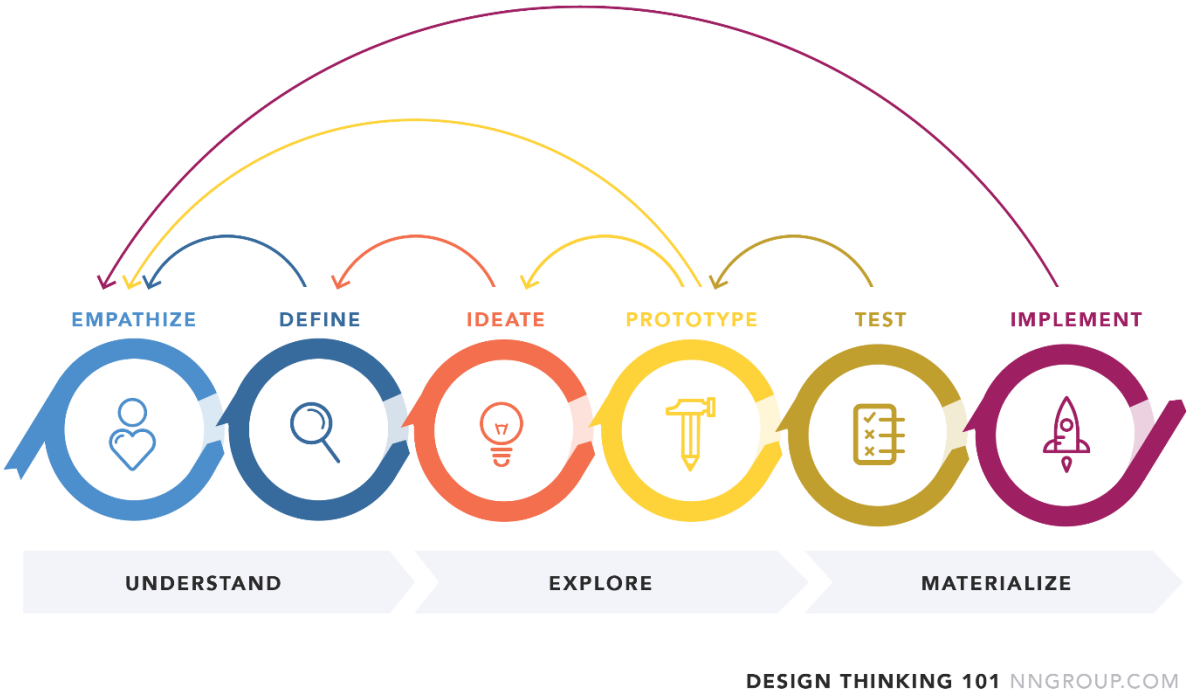
2 Design Thinking Method

Design Thinking is a problem-solving approach that is user-centric and iterative. It involves five key stages: Empathize, Define, Ideate, Prototype, and Test. Originally developed for product and service design, it has been successfully applied in education to promote creative thinking, collaboration, and real-world problem-solving skills.

- **Empathize**: Understanding the needs and experiences of the users (students in this context).
- **Define**: Clearly articulating the problem based on insights from the empathize stage.
- **Ideate**: Generating a broad range of ideas and potential solutions.
- **Prototype**: Creating tangible representations of ideas.
- **Test**: Iterating based on feedback and refining solutions.

This method encourages students to be proactive, think critically, and collaborate with others, leading to a deeper understanding of subject matter and its practical applications.

Figure 1: Design Thinking process (Source: Design Thinking 101, nngroup.com))



3 Flipped Learning

Flipped learning is a pedagogical model where traditional lecture and homework elements are reversed. Students are introduced to new content outside of class, typically through video lectures or reading materials, allowing class time to be used for interactive activities such as discussions, problem-solving, and hands-on projects. This approach shifts the focus from passive reception of information to active engagement and application.

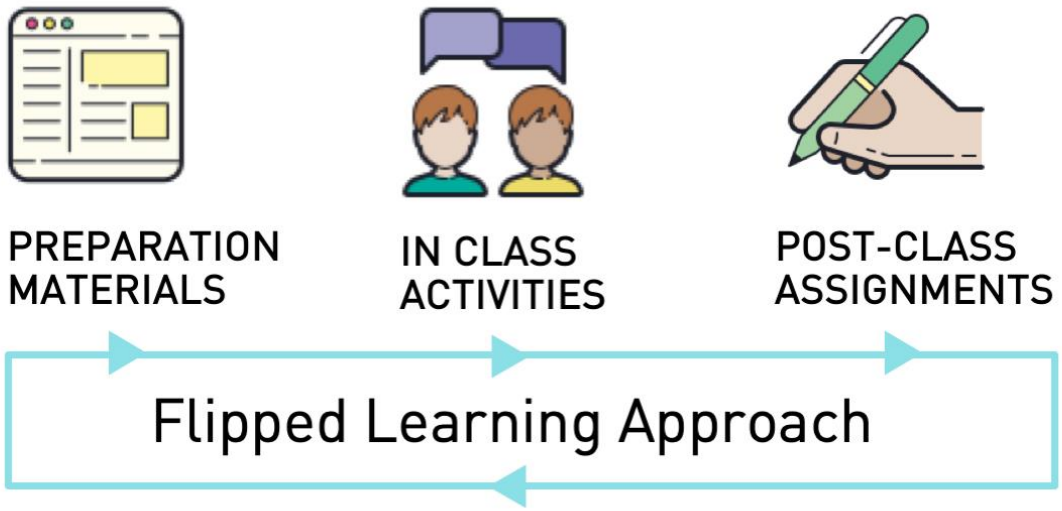


Figure 2: Flipped learning process
Source: Flipped Learning | Academic Technologies (miami.edu)

4 Integration of Design Thinking into Flipped Learning

Integrating Design Thinking into flipped learning can enhance the learning experience by aligning both methodologies' strengths. Here's how:

- Active Engagement: Design Thinking encourages active participation and critical thinking, which complements the interactive, hands-on nature of flipped learning. When students come to class prepared with foundational knowledge, they can engage in Design Thinking activities more effectively, using class time for collaboration and creative problem-solving.
- Real-World Problem Solving: Both approaches emphasize real-world applications. Flipped learning provides the theoretical foundation, while Design Thinking allows students to apply this knowledge in practical scenarios, enhancing relevance and retention.
- Collaboration and Communication: Design Thinking fosters a collaborative environment where students work in teams to ideate and prototype solutions. Flipped learning's classroom model provides the ideal setting for these activities, enabling students to discuss and refine their ideas with peers and instructors.
- Iterative Learning: The iterative nature of Design Thinking, with its focus on testing and refining ideas, aligns well with the formative assessment opportunities in flipped learning. Students can continuously improve their understanding and skills through feedback and iteration.

- Empathy and User-Centricity: Design Thinking's emphasis on empathy encourages students to consider different perspectives and develop solutions that truly meet user needs. In a flipped classroom, this can translate to projects that address real community or societal challenges, making learning more meaningful and motivating for students.

5 Enhanced Learning Outcomes

By integrating Design Thinking into flipped learning, students can achieve several enhanced learning outcomes:

- **Deeper Understanding**: Active engagement with content and real-world applications fosters a deeper understanding of material.
- **Critical Thinking**: The iterative process of Design Thinking develops critical thinking and problem-solving skills.
- **Collaboration** Skills: Working in teams enhances communication and collaboration abilities.
- **Creativity and Innovation**: Generating and testing new ideas cultivates creativity and innovation.
- **Practical Application**: Applying knowledge in practical scenarios increases its relevance and retention.

6 Acknowledgment

I would like to extend my gratitude to the educational experiences and opportunities that have shaped my journey in mastering the Design Thinking method. My time at university and involvement in student projects provided the foundational skills necessary to practice and refine this approach. These early experiences, combined with my current role as a project manager, allowed me to implement Design Thinking in real-life projects, ultimately developing my expertise in this field.

I am also deeply thankful to the educational professionals and institutions that have provided valuable case studies and shared their experiences, which have enriched the content of this paper.

I would like to extend my heartfelt thanks to the leadership and my colleagues for their continued support throughout the development of this paper.

I am also grateful to the DigiCompass project partners for their valuable contributions and teamwork, which have enriched this research and its practical application.

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Workshop Description: Creating Effective Learning Content with Generative AI Using Backward Design

Peter Mazohl

Europäische Bildungsinitiative (AUSTRIA)

In this hands-on workshop, participants will learn how to develop impactful, AI-enhanced learning content using the Backward Design methodology. Through practical exercises and the use of generative AI tools, attendees will gain the skills to systematically design content that aligns with well-defined learning outcomes, measurable assessment methods, and practical application.

1 Workshop Steps

1. **Identifying Learning Outcomes**
   Begin by defining clear learning outcomes focused on **competencies** in terms of **knowledge**, **skills**, and **attitude**. Participants will craft comprehensive competence descriptions that serve as the foundation of the learning content, ensuring clarity in the intended outcomes.

2. **Assessment Planning**
   Develop a strategy for assessing the competencies identified. In this step, participants will outline assessment criteria, using **keywords** and **hands-on tasks** as markers for evaluating learner achievement. This step ensures the learning content will have measurable, meaningful assessment parameters.

3. **Content Development**
   Design content that directly supports learners in mastering the assessments. Participants will engage in creating presentations using **Canva** and designing assessments with **H5P** by integrating **AI-generated images and text**. This content development phase leverages GenAI tools to streamline the creation of visually appealing and educationally effective materials.

All developed material can be used web-based (Learning Platform Moodle, WordPress, stand-alone upload).

2 Practical Activities

- **Competence Description Creation**: Define knowledge, skills, and attitudes that form the foundation of the learning module.

- **Assessment Keyword Generation**: Identify keywords and phrases that align with the intended competencies.
- **Presentation Design with Canva**: Use Canva to create visually engaging presentations.
- **Assessment Development with H5P**: Craft an assessment using H5P that incorporates AI-generated images and texts for an interactive learner experience.

3 Target group

This workshop is ideal for educators, instructional designers, and content creators seeking to elevate their learning content through structured design and the power of generative AI.

You need a digital device, best works a Windows-based Laptop with the technical background to connect to WiFi (WLan). Additionally, care for a USB Pen drive (virus checked and clean).

Materials Required for Workshop Participants

Please ensure you have access to the following tools before the workshop:

1. **LUMI Software**
   Download LUMI for creating H5P-based interactive content: LUMI Download
2. **CANVA User Account**
   Create a free user account on Canva for presentation and design creation: Canva
3. **Microsoft Designer**
   Access Microsoft Designer for AI-powered image creation: Microsoft Designer

Having these tools ready will allow you to fully participate in the workshop's hands-on activities.

4 Miscellaneous

In this workshop, we will exclusively use **freeware tools** to ensure accessibility for all participants. Please prepare by downloading and setting up the digital tools as outlined:

- **LUMI** for H5P content creation

- **Canva** for presentation design
- **Microsoft Designer** for AI image generation

By attending, participants agree that any photographs taken during the event may be used for dissemination purposes within the **DigiComPass Project**.

Thank you for ensuring your digital tools are prepared, allowing for a smooth and productive experience during the workshop.

Innovate Backwards: Shaping the digital skills of tomorrow

[*] Florian Beier[1], Laura Alejandra Paz Chaves[1], Sebastian Kreibich[1], Dirk Werth[1]

[1]August-Wilhelm Scheer Institute for digital products and processes gGmbH, Saarbrücken, Germany

*Corresponding author

Abstract

"Innovate Backwards: Shaping the Digital Skills of Tomorrow" is a workshop designed to address the pressing digital skills gap that exists between current industry demands and the competencies developed by higher education institutions. Drawing inspiration from the comprehensive DigComp Framework, the presentation of our competence taxonomy and the Backward Design methodology, this workshop stands at the intersection of education, innovation, and practical industry needs.

Structured as an engaging 60-minute session, the workshop facilitates generative discussions that pave the way for innovative scenarios, empowering educators, industry professionals, and students alike with creative strategies to narrow the digital skills gap. Participants will work on real industry use cases. Starting with the desired skill outcomes, participants will be working backwards to develop creative strategies to solve the industry training needs, ensuring that every part of the educational process is aligned with the final objectives, making learning more targeted and effective. Through interactive group work, participants will address critical competence areas based on the DigComp framework and our competence taxonomy and will develop solutions for training digital skills within an industry context. This will be followed by a strategic analysis, and the space for groups to present their outcomes using digital resources. The session concludes with a discussion and reflection designed to provide a practical takeaway on implementing digital skill development programs.

“Innovate Backwards: Shaping the digital skills of tomorrow”, promises a concise, interactive, and productive session for participants looking to deepen their understanding of digital education needs and innovative training solutions.

Keywords: Digital skills, DigComp, Backward design, Skill gap

Non-Formal Learning Tools and Formal Education

Fotini Arapi[1]

[1]Trainer and Researcher, K.A.NE. Social Youth Development, Greece, Corresponding author: Fotini Arapi

Abstract

This workshop explores the dynamic tools and methods of non-formal learning (NFL) and their application within formal education settings. Participants will engage in hands-on activities and discussions aimed at understanding how NFL fosters creativity, critical thinking, and personalized learning experiences. By the end of the session, attendees will leave with practical strategies to integrate non-formal learning into traditional teaching environments, enhancing both teaching effectiveness and student engagement.

Keywords: Non-formal learning, creativity, critical thinking, learner engagement, personalized learning

1 Introduction and icebreaker

Objective: Set the tone for the session and introduce the key concepts.

1.1 Ice-breaker activity

Participants introduce themselves and share one non-formal learning experience that stood out to them. This helps frame the discussion around the versatility of learning outside the classroom.

1.2 Interactive Quiz and Presentation of key-concepts

Participants participate in an interactive quiz followed by a brief introduction to non-formal learning, outlining the differences between formal, non-formal, and informal learning, and why integrating these tools into formal education is critical today.

2 Interactive Presentation of Non-Formal Learning Tools

Objective: The purpose of this activity is to introduce participants to a range of non-formal learning tools and provide opportunities for them to reflect on how these tools could be adapted and integrated into formal education settings.

Description: This activity combines a structured presentation of non-formal learning tools with moments of participant engagement and reflection. Participants will be introduced to a variety of key non-formal learning tools and methods, such as peer learning, experiential learning, project-based learning, gamification, and challenge-based learning. For each tool, a brief overview will be presented, highlighting its definition, key characteristics, and potential applications within formal education.

2.1 Presentation

In this session, the facilitator will introduce several non-formal learning tools, including peer learning, experiential learning, simulation exercises, challenge-based learning, gamification, working in groups, collaborative learning, etc.

2.2 Participant reflection and application

Participants will work in smaller groups in order to brainstorm on possible applications of these non-formal learning tools into formal education settings.

2.3 Group discussion and Q&A

At the end of the session, the groups will present their findings and the facilitator will lead a brief discussion in which participants can share their reflections and insights on how non-formal learning tools could transform their classroom dynamics. Participants will also be encouraged to ask questions, fostering a deeper understanding of the tools presented.

3 Reflection and feedback

Objective: Conclude the workshop with reflections on what was learned and actionable steps.

3.1 Reflection activity

In this session, participants will be asked to write down one key takeaway from the workshop and share how they plan to implement it in their educational settings.

3.2 Q&A

After the reflection, the facilitator will lead a brief questions and answers session.

3.3 Wrap-Up

The facilitator will wrap up the workshop by summarizing the key-takeaways from the workshop.

4 References and further reading

Council of Europe. (2022). *Manual for Facilitators in Non-Formal Education.* Retrieved August 25, 2024, from https://rm.coe.int/manual-for-facilitators-2022/1680a5ebc2

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ICYE. (2017). *NFE Handbook: A Handbook on Non-Formal Education for Young People.* Retrieved August 25, 2024, from https://www.icye.org/wp-content/uploads/2017/06/NFE-Handbook-May-2017.pdf

Rogers, A. (2004). *Non-formal education: flexible schooling or participatory education?*. Hong Kong: Comparative Education Research Centre, the University of Hong Kong.

About this booklet

This anthology showcases the papers and workshops presented during the inaugural DiciComPass conference, held at the University of Cyprus in November 2024 under the Erasmus+ *Digital Competences Recognition Framework for Adult Education* Project (2022-1-CY01-KA220-ADU-000085965). Main themes centred on Flipped Learning 3.0, Digital Competences and Artificial Intelligence.

A few words on the DigiComPass Association

The "Association for the Promotion and Development of the 'Digital Competencies Passport'," is commonly abbreviated as "DigiComPass." It is a non-profit organization. Its activities are focused on:

- Managing and further developing the "DigiComPass" training course, which was created by the Transnational Project Group as part of the aforementioned Erasmus+ Project and is offered as an Open Educational Resource (OER).
- Promoting the DigiComPass training course throughout Europe.
- Facilitating networking among members who provide the training course.
- Providing ongoing education to members and others interested in this course.

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