THE DIGICOMPASS TRAINING COURSE: A FLIPPED AND AI-BASED APPROACH TO CONTENT CREATION

P. Mazohl[1], A. Yeratziotis[2], C. Tsouris[2], C. Mettouris[2], G. Papadopoulos[2]

[1]European Initiative for Education (AUSTRIA)
[2]Computer Science Department of the University of Cyprus (CYPRUS)

Abstract

This paper presents the results of an empirical study on the use of Generative Artificial Intelligence (AI) for content creation in the context of a Flipped Learning 3.0 training course on digital competences for adults. The study was conducted as part of the Erasmus+ KA2 project "Digital Competences Recognition Framework for Adult Education", 2022-1-CY01-KA220-ADU-000085965.

The study found that AI can be a valuable tool for content creation in the Flipped Learning 3.0 setting. AI can be used to assist but not to automate tasks such as creating multimedia content, generating the concept of interactive training content, and creating assessment material for self-evaluation or formally testing learner progress. This can free up trainers to focus on more strategic tasks, such as designing learning experiences and creating concepts like storyboards for videos. The identified problem is the missing formats of AI output to fit to multimedia content-creating tools like H5P or Canva.

However, the study also found that there are some challenges associated with using AI for content creation. For example, currently available AI tools like ChatGPT, CANVA, DALL-E or AI-supported correction tools are only suitable to a limited extent and regrettably imperfect in the context of content creation. Additionally, AI tools can be expensive, time-consuming to learn how to use and the content supplied must be checked for hallucination, correctness and accuracy.

Overall, the study suggests that AI has the potential to be a valuable tool for content creation in the flipped classroom setting. However, it is important to be aware of the associated challenges before making a decision about whether to use it. It should also be stressed that the work of the content developer cannot be taken over by AI. Finally, based on the insights of involved trainers and content developers, the study provides recommendations for people working on similar training courses.

Keywords: AI in Education, Flipped Learning 3.0, Digital Competences, Content Creation Challenges, Multimedia Tools Integration

1 INTRODUCTION

Roy Amara, a distinguished American futurist and computer scientist who presided over the Institute for the Future from 1967 to 1992, is attributed with articulating "Amara's Law", which posits, "We tend to overestimate the effects of new technologies in the short term and underestimate them in the long term". In accordance with Amara's Law, both the internet and social media have been awash with reports and insights regarding the formidable capabilities that can be achieved by Artificial Intelligence (AI) autonomously, devoid of external input. Amidst these enthusiastic proclamations, there emerged discussions concerning tools and even entire platforms where AI is solely responsible for course creation.

Within the framework of a European initiative, this study illuminates the pragmatic scenario of embedding AI in the process of course development, exemplified by a course based on Flipped Learning 3.0 focusing on digital competencies in adult education. This document is an output of the Erasmus+ Project titled “Digital Competences Recognition Framework for Adult Education”, reference number 2022-1-CY01-KA220-ADU-000085965..

1.1 Context and Background of the Paper

This paper refers to the development of a training course for adults to acquire digital competences. It is based on the DigComp Framework of the EU. The course creation method is based on the Flipped Learning 3.0 Framework [1].

1.2 Importance of Digital Competence in Adult Education

In an ever-more digitalised world, it is imperative that adults are equipped with a robust set of digital competencies to navigate the digital landscape effectively. These digital skills are fundamental for lifelong learning, personal development, and employability. The DigComp framework, established by the European Union, outlines five key areas of digital competence: Information and Communication Technology (ICT) literacy, digital content creation, communication and collaboration, problem-solving and decision-making, and digital citizenship. By fostering these competencies, adults can flourish in the digital age.

1.3 Introduction to Flipped Learning 3.0

John Bergmann and Aaron Sams, two Chemistry teachers, pioneered the Flipped Learning (FL) model by prerecording their lectures for students to watch as homework. This approach allowed students to engage more actively in problem-solving and experiments during classroom time. Reflecting on questions about student struggles and optimizing online and in-person learning, Bergmann and Sams formulated and shared their strategy through various publications.

Since its inception in 2012, Flipped Learning (FL) has achieved global popularity and has been implemented across various educational levels internationally. In the same year, Sams and Bergmann established the Flipped Learning Network™ to provide support for educators implementing FL. International backing for FL grew with the formation of the Flipped Learning Global Initiative (FLGI) in 2016, bringing together members from 49 countries. In 2018, prestigious institutions like Harvard, Stanford, and MEF University in Turkey (notably recognised as the world's first institution to adopt a flipped learning approach [2], it presented its standards in November 2018) further bolstered the FL movement by collaborating on the publication of the Flipped Learning 3.0 Global Standards. These standards were derived from a global collection of 187 best practices in FL. [3].

At the moment, research and further development is taking place primarily in the field of higher education and school education. Adult education is rather neglected. There is hardly any literature or in-depth research in this area.

1.4 Overview of Generative AI in Educational Content Creation

Generative AI (gAI), epitomized by tools like ChatGPT since late 2022, has transformed daily life and specialized domains with its ability to mimic human output across various mediums. Its profound impact on education challenges traditional concepts of learning and creation, prompting a reevaluation of the educational process in the digital age [4].

In the realm of course development, a multifaceted approach is adopted to address the varied needs and preferences of learners. The process commences with the formulation of course outlines that are aligned with learning objectives. This ensures a logical progression for an engaging learning experience. Content creation is comprehensive, encompassing the development of lesson plans, slide decks, and eLearning materials. An emphasis is placed on interactivity through the incorporation of quizzes, simulations, and case studies. A significant feature is the personalisation of course pathways and content, tailored to individual learning styles. Furthermore, the translation of materials into multiple languages is undertaken to broaden accessibility.

1.5 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.

This document also details the development of competence-oriented course modules utilising a Backwards Design approach. It outlines the creation of the specific content for these modules. Notably, the text references the incorporation of AI tools in both processes. Where possible, freely available tools were employed, acknowledging the budgetary constraints typically faced by smaller adult education providers.

The research question is: Can generative AI be used satisfactorily to create course content in a Flipped Learning Training course for adults in the creation of learning content?

Considering the financial capacity of small adult education centres, we have turned our attention to freely available tools.

2 LITERATURE REVIEW

The literature review focused on “Flipped Learning using generative AI” and the creation of learning content based on this approach. Although there are some publications in this direction, material in this area is still scarce.

2.1 Overview of Generative AI Technologies

Abunaseer [5] describes the use of generative AI in education, with a focus on its applications, impact, and challenges. Simone Grassini [6] explores the potential and consequences of using AI and ChatGPT in educational settings. Michel-Villarreal et. al. [7] care about use of generative AI in context with teaching in Higher Education. Furthermore, they explore the challenges and opportunities associated with these technologies and propose guidelines for their responsible use in education. Gozalo-Brizuela and Garrido-Merchán [8] give an overview of possible generative AI tools. This survey aims to serve as a valuable resource for re-searchers and practitioners to navigate the rapidly expanding landscape of generative AI, facilitating a better understanding of the current state-of-the-art and fostering further innovation in the field. Finally, Li and Peng [9] address the topic in an article dealing with a flipped classroom-based learning platform.

2.2 Gap in Research Addressed by This Study

The topic of AI-based content creation has garnered significant traction on social media platforms. However, a concerning lack of scientific rigour characterises current applications. Promotions tend to fall into two categories: either blatant advertisements for tools of questionable quality, or superficial content offering little practical value.

What remains conspicuously absent from the discourse is a well-structured, practical approach to utilising AI for content creation. We see a dearth of comprehensive frameworks and a conspicuous absence of documented real-world implementation experiences.

Furthermore, a noticeable gap exists in both published literature and online blog posts – a complete disregard for the potential role of adult education in this burgeoning field.

3 METHODOLOGY

The methodology used consisted of the development of a Flipped Instructional Design [10], the development of the course structure and the creation of the course content. Peer review cared for the necessary feedback, combined with the feedback of the content developers.

3.1 Description of the Empirical Approach

The Flipped Instructional Design was developed as a peer-reviewed joint document and is based on the Flipped Learning 3.0 Framework. The appropriate elements from the 12 sectors were integrated and processed into an overall concept.

The course consists of 5 modules (Information and data literacy, Communication and collaboration, Digital content creation, Safety, and Problem solving). The use of competences, which were structured into lessons through backward design, was specified as fundamental. In the implementation of the Flipped Learning 3.0 approach, the teaching content was assigned to the individual and group learning space. This process followed the description in the Instructional Design and was based on Bloom’s Taxonomy.

These text descriptions were ultimately developed as multimedia and interactive content and made available on a MOODLE learning platform.

In line with the principles of Flipped Learning 3.0, the content for the individual learning space was fully integrated into the learning platform. For the group learning room, instructions, examples and learning content were developed as trainer material in PDF form for download.

3.2 Description of generative AI Tools Used in the Study

Generative Artificial Intelligence (gAI), also referred to as generative modelling, is a subfield of artificial intelligence concerned with the development of algorithms capable of autonomously generating novel content. These algorithms are trained upon vast datasets of pre-existing data, encompassing text, images, or audio. Through this process, they learn to identify and understand patterns and relationships within the data.

Within the framework of Backward Design, gAI has been utilised in the formulation of competence descriptions as well as the creation of assessments.

3.2.1 gAI used for the competence definitions

For each lesson, a competence definition has been developed. Both BARD and ChatGPT 4 were used to split the given competence in Knowledge, Skills, and Attitudes. The findings from both sets of outcomes were carefully evaluated, enhanced and integrated into a comprehensive and fitting summary. Additionally, keywords for the assessments have been created.

3.2.2 Creating of assessment structure

Assessments have been developed out of the list of keywords created in the previous step. These lists contained a large number of keywords that were reduced to essential elements. The appropriate test methods (formative assessments, solutions for case studies, test questions, etc.) were then defined for those. This process is the sole responsibility of the course developer.

The existing question methods were entered into the content framework and assigned to the individual or group learning room according to the content.

3.2.3 Content definition

The course creators were responsible for defining the content, a task necessitating extensive knowledge and experience to determine the most effective implementation of the material. Additionally, this process involves consideration of deeper principles, such as the use of varied instructional methods.

3.2.4 Content creation

The scope of the content definition was expanded to encompass a text-based description of the multimedia and interactive content. This textual description also incorporated basic graphical elements and illustrations. During this phase, extensive use was made of gAI.

The creation of slide-structured descriptions for H5P presentations was undertaken using ChatGPT. Additionally, general visual representations or illustrations for these slides were generated using DALL-E. Attempts to employ specialised tools for direct slide creation were unsuccessful due to the substandard quality of the outputs.

Storyboards were developed using BARD (or alternatively, ChatGPT), resulting in descriptions structured around clips. Proposals for visuals were also solicited, however, these proposals were found to be largely infeasible. The request for the generation of well-suited questions for interactive video integration yielded unsatisfactory results. Consequently, the questions were formulated through specific prompts and incorporated into the storyboard. As no AI tools were able to deliver results of sufficient quality, the videos were produced using traditional methods and then finalised as interactive videos using H5P.

Case studies have been created using BARD as well as ChatGPT with notable successes. The gAI proved to be a real help in this content area in particular.

3.2.5 Creation of multimedia-based content

The creating process of the multimedia-based and interactive content was supported by gAI tools as well.

CANVA was used to create interactive presentations and info sheets. The inbuilt DALL-E was used to create depiction, illustrations, and graphics especially for the developed info graphics. The voice-over AI tools also were used to create voice-over in videos.

Image creating tools (text to image) were partly used to create illustrations or image pictures in the description or explanations of various lessons.

Additionally, support tools like DEEPL and Grammarly were used for text corrections or as a writing tool of text-based content elements.

4 RESULTS

The results were quite mixed: While purely text-based tools were quite convincing, all graphics-based tools showed weaknesses in a way that makes a high-quality use only conditionally recommendable.

4.1 Effectiveness of AI in Content Creation for Flipped Learning 3.0

While various publications rave about what would be possible with gAI tools, the reality shows a different picture. The freely available tools have weaknesses in many aspects.

It is important to note that, in general, the results produced by gAI tools cannot be implicitly trusted. Each individual outcome must be meticulously scrutinised. However, it is undeniable that their utilisation could lead to a demonstrable reduction in workload. In this respect, the incorporation of gAI tools in course development and learning content creation bears a resemblance to the introduction of the pocket calculator in the 1970s. While gAI can alleviate the burden of time-consuming processes, it is crucial to recognise that ultimate control resides with the user. Furthermore, it is abundantly clear that the user must possess in-depth knowledge, extensive expertise, and some experience, qualities that gAI is currently incapable of replicating.

4.2 Reviewers' Feedback and Observations

The reviewers were satisfied with the results delivered. At first glance, the text results provided by the gAI are not recognisable as such. This is not the case with the graphic material: the materials produced can be clearly assigned to the gAI.

Some of the most important observations:

- Working with AI tools saves a small amount of time.
- The qualifications of the course creator or trainer are still high, if not sometimes even higher than without AI.
- A thorough review and verification of all AI-generated outputs is essential. For illustration, consider the generation of multiple-choice questions from keywords. While the correct answers are designated, a small proportion may be inaccurately labelled.
- The new generations of gAIs also tend to hallucinate and occasionally provide answers that are "plucked out of thin air".
- Text analyses, generating keywords from a text, improving text quality, translations and similar text-based tasks work well, deliver good results and help to save time.
- Imaging tools often create artefacts and are essentially unusable in the photorealistic field for good quality. Artefacts or distortions (as with the hands) are particularly noticeable here. In the area of image processing, the tools prove themselves well.
- Voice-over creating works well. Nevertheless, it is not a human voice that is created by the freeware tools. Hence, we preferred human reading of text in all cases were emotions should be expressed.

5 DISCUSSION

In this section, we would like to address some of the questions that have arisen in the context of the project work.

5.1 Learning design

This domain is best left to the individual's expertise. Particularly in the field of flipped classroom design, AI currently lacks the inherent capabilities possessed by humans. Artificial intelligence is not demonstrably intelligent or creative in its current form; rather, its strengths lie in working with vast datasets. Until specialised models for flipped learning are developed, the design of learning experiences remains a fundamentally human endeavour.

5.2 Analysis of AI's Role in Content Creation

Despite its shortcomings, AI can actually relieve the burden on people, especially in the area of "big data". All areas that are covered by the existing "background knowledge" of AI can be covered satisfactorily by gAI. This applies to all aspects of text analysis, keyword extraction, and voice-over generation.

5.3 Challenges Faced: Tool Limitations, Learning Curve, and Accuracy Concerns

Free tools have limitations, which may include a reduction in the number of created images, limitations in text, or a decrease in image creation speed. The team tested several tools and found that, in most cases, the quality of the image-giving tools was too low to justify the cost.

Especially, with image creating tools we did not identify a learning curve.

In context with the used language models, a learning curve was visible.

5.4 Comparison with Traditional Content Creation Methods

In comparison to traditional methods, gAI presents advantages that can lead to significant time and effort savings. However, it is crucial to ensure that those who will be utilising gAI receive appropriate training. Whilst a wealth of pre-prepared prompts can be found online, effective work with gAI necessitates experience and a firm grasp of the underlying concepts. It is therefore recommended that all gAI users undergo basic training to guarantee both proficient and efficacious utilisation of the tool.

6 POTENTIAL AND RECOMMENDATIONS

The experience gained during this study and the specific findings can be summarised as follows.

Prioritize Human Involvement in Learning Design

Leave the design of learning, particularly in creating flipped learning courses, to individuals. AI lacks the comprehensive view inherent in humans as well as the intention behind the course concept and is therefore not in a position to replace human creativity and intelligence in this area.

Utilize AI for Big Data Tasks

Employ AI to manage tasks involving "big data". AI is effective in areas like text analysis, keyword extraction, and voice-over generation, where it can work within its existing background knowledge and save humans valuable time. The same applies for creating multiple choice questions or similar tasks.

Be Aware of Free Tool Limitations

Recognize that free tools come with limitations such as reduced image creation capabilities, text restrictions, or slower processing speeds. Assess the quality and cost-effectiveness of these tools carefully before integrating them into your workflow.

Understand the Learning Curve and Accuracy Concerns

Acknowledge that while language models show a learning curve, image creation tools may not exhibit the same. This can impact the accuracy and effectiveness of the content created by AI.

Compare AI with Traditional Content Creation Methods

Understand that while AI (gAI) can save time and effort compared to traditional content creation methods, it requires proper training and understanding. Ensure that users of gAI receive basic training to maximize its effectiveness and understand its underlying concepts.

Provide Training for gAI Users

Offer comprehensive training for individuals using gAI to ensure they have a strong foundation in the necessary concepts and can use the tool effectively. This is crucial to leverage the advantages of gAI while mitigating its limitations.

Human final control is essential.

Do not show blind trust to results delivered by AI. Starting into the years 2024, AI is still hallucinating and repeatedly delivers questionable or even false results. This requires constant checking of the results, such as the answers labelled as correct in multiple choice questions. Despite these limitations, a certain amount of time can be saved, and the workload reduced.

7 CONCLUSIONS

Considering the empirical evidence, the research question can be answered affirmatively, albeit with certain caveats and limitations. However, it is crucial to recognise that artificial intelligence (AI) should be viewed as a targeted tool, not a panacea. Furthermore, it is worth noting that the effective utilisation of general artificial intelligence (gAI) necessitates a thorough understanding of both conventional course development methods and the application of AI tools.

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