

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

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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, an American futurist and computer scientist who served as the president of the Institute for the Future from 1967 to 1992, is credited with the statement "We tend to overestimate the effects of new technologies in the short term and underestimate them in the long term", which is known as "Amara's Law". Following Amara's Law, both the internet and social media have been flooded with news and information about great things that can be done excellently by AI alone, without any outside knowledge. Among these euphoric outcries, we also found the idea of tools and even entire platforms where AI takes care of all the course creation.

As part of a European project, this study sheds light on the realistic situation of integrating AI into course creation using the example of a Flipped Learning 3.0-based course on digital competences in adult education. This paper is a product of the Erasmus+ Project "Digital Competences Recognition Framework for Adult Education", 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 increasingly digitalized world, adults need to be equipped with strong digital competencies to effectively navigate the digital landscape. Digital skills are essential for lifelong learning, personal development, and employability. The DigComp framework of 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 developing these competencies, adults can thrive 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, FL has gained global popularity and has been implemented at various educational levels worldwide. In the same year, Sams and Bergmann established the Flipped Learning Network™ to support educators in FL implementation. International support for FL grew, evidenced by the formation of the Flipped Learning Global Initiative (FLGI) in 2016, which included members from 49 countries. In 2018, prominent institutions like Harvard, Stanford, and MEF University in Turkey (The university, recognized as the first in the world to adopt a flipped learning approach [2], presented its standards in November 2018.) contributed to the FL movement by collaborating on the publication of Flipped Learning 3.0 Global Standards, which were derived from 187 best practices in FL worldwide.[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 field of course creation, a multi-faceted approach is adopted to cater to diverse learner needs and preferences. The process begins with the generation of course outlines that align with learning objectives, ensuring a logical progression for an engaging experience. Content creation is extensive, encompassing lesson plans, slide decks, and eLearning materials, with an emphasis on interactivity through quizzes, simulations, and case studies. A significant feature is the personalization of course paths and content, tailored to individual learning styles, coupled with the translation of materials into multiple languages 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.

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.

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 is currently very popular on social media. However, no applications are being dealt with at a scientific level. The promotions are either advertisements for the sale of various tools, some of dubious quality, or convey superficial knowledge without any practical benefit.

What is missing is a well-founded practical approach to the problem of AI-based content creation, complete concepts, as well as experience in practical implementation.

It is also noticeable that adult education plays no role either in the literature or in the published blog posts.

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 AI (gAI), also known as generative modeling, is a branch of artificial intelligence that focuses on developing algorithms that can automatically generate new content. These algorithms are trained on large datasets of existing data, such as text, images, or audio, and learn to identify patterns and relationships in the data.

In the process of Backward Design, gAI was used in the competence description as well as in the creating 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 available content definition was extended to text-based description of the multimedia and interactive content. This text description also included basic graphics and illustrations. In this work phase, gAI was used widely.

The creating of the slide-structured description of H5P presentations was executed with ChatGPT. Additionally, general depictions or illustrations for these slides were done, based on DALL-E. The attempts to use specific tools to create the slides directly failed due to the inferior quality of the results.

Storyboards have been created using BARD (or ChatGPT) resulting in clip-based descriptions. Proposals for visuals have been requested as well. These proposals lacked in feasibility in almost all cases. The request to create well-fitting questions to be included to make the video interactive failed and the questions were created by specific prompts and inserted into the storyboard. Since no AI tools could deliver satisfactory results, the videos were produced in a traditional manner and completed as interactive videos with 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.

In general, it must be noted that the results cannot be trusted, and each individual result must be checked. However, a certain reduction in the workload could certainly be registered. Seen in this light, the use of gAI tools in course development and the creation of learning content are comparable to the introduction of the pocket calculator in the 1970s. Some time-consuming processes can be delegated to AI. However, the final control lies with the user. It is also clear that the user must have in-depth knowledge, extensive expertise and some experience, which cannot be compensated for by AI.

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 review and close check of all AI-generated results is mandatory. Here is a simple example: multiple-choice questions are generated from key words and the correct answers are labelled as such. This labelling is incorrect in a small percentage of cases.
- 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 where 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 area should be left to the individual. Especially in the area of creating flipped learning courses, AI does not currently possess the ability that is inherent to humans. Artificial intelligence is neither intelligent nor creative but is geared towards working with "big data".

As long as special models for flipped learning are not created, learning design is a 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

Compared to a traditional approach, gAI offers advantages that can save time and effort. However, it is important to provide appropriate training for those who will be using gAI. While there are many ready-made prompts available online, working with gAI requires experience and a strong foundation in the underlying concepts. It is suggested that anyone who will be using gAI receives basic training to ensure that they are able to use it properly as much as effectively.

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

Following the empirical findings, the research question can be answered positively under certain restrictions and limitations. However, the AI used must be seen as a tool in specific areas and not as a

comprehensive solution. It should also be noted that the use of gAI requires in-depth knowledge of both traditional course development and the use of AI tools.

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REFERENCES

- [1] Flipped Learning Global Initiative (FLGI). (2023). Flipped Learning 3.0. Retrieved [date of access] from <https://www.flglobal.org/flipped-learning-3-0/>
- [2] Smith, E. S. C. (2018, May 8). Lessons from the Rector of the First Fully Flipped Learning University. *Flipped Learning Review*. Retrieved from <https://flr.flglobal.org/lessons-from-the-rector-of-the-first-fully-flipped-learning-university/>
- [3] Flipped Learning 3.0 Global Standards Summit. (2018). Flipped learning 3.0 global standards. Available from <https://aalasinternational.org/flipped-learning-global-standards-summit/>
- [4] UNESCO. (2023). Guidance for generative AI in education and research. UNESCO. ISBN 978-92-3-100612-8
- [5] Abunaseer, H. (2023). The Use of Generative AI in Education: Applications, and Impact. In *TechCurr2023*. Ontario Tech University. Retrieved from <https://pressbooks.pub/techcurr2023/chapter/the-use-of-generative-ai-in-education-applications-and-impact/>
- [6] Grassini, S. (2023). Shaping the Future of Education: Exploring the Potential and Consequences of AI and ChatGPT in Educational Settings. *Educational Sciences*, 13(7), 692. <https://doi.org/10.3390/educsci13070692>
- [7] Michel-Villarreal, R., Vilalta-Perdomo, E., Salinas-Navarro, D. E., Thierry-Aguilera, R., & Gerardou, F. S. (2023). Challenges and Opportunities of Generative AI for Higher Education as Explained by ChatGPT. *Educational Sciences*, 13, 856. <https://doi.org/10.3390/educsci13090856>
- [8] Gozalo-Brizuela, R., & Garrido-Merchán, E. (2023). A survey of Generative AI Applications. ResearchGate. Retrieved June 5, 2023, from https://www.researchgate.net/publication/371311926_A_survey_of_Generative_AI_Applications
- [9] Li, B., & Peng, M. (2022). Integration of an AI-Based Platform and Flipped Classroom Instructional Model. *Volume 2022*. Article ID 2536382. <https://doi.org/10.1155/2022/2536382>
- [10] Mazohl, P. (Ed.), Sanz, E., Yeratziotis, A., Mettouris, C., Venditti, P., & Smith, E. S. C. (2023). Digital Competences Recognition Framework for Adult Education [ERASMUS+ Project 2022-1-CY01-KA220-ADU-000085965]. Retrieved June 1, 2023, from <https://www.digicompass.eu/en/results/downloads/>