

# Using Artificial Intelligence in Higher Education

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**Keywords:** Higher Education, Artificial Intelligence, Virtual Assistants, Chatbots, Opportunities, Challenges.

**Abstract:** Higher education always had its challenges that professors and other educators had to deal with. Along with challenges there are also different opportunities that various technologies provide in the form of usable educational aiding means. Sometimes the same technology can represent both opportunity and a challenge. This is true for an emerging technology based on artificial intelligence that comes in the form of various intelligent assistants and chatbots. One of the latest revolutions in this domain is artificial intelligence-based tool ChatGPT. In this paper, opportunities and challenges of using ChatGPT and other virtual assistants and chatbots are presented and discussed. Research results about using ChatGPT in higher education by students is also given and elaborated.

## 1 INTRODUCTION

Rapid development of different technology has resulted in various opportunities but also in different challenges in higher education. On one side new technology enables better visualization, more effective performance, higher level of automatization, quicker information retrieval, etc. On the other side there are many challenges for educators since the same technology can be used by students to solve their tasks quicker and easier with the aid of artificial intelligence, rather than using one's own knowledge and skills. This can consequently result in students not understanding particular concepts and processes. Based on this, it can be said that a special set of challenges for educators has emerged with the more applicable artificial intelligence tools, such as are various virtual assistants and chatbots.

Mentioned artificial intelligence-based tools can be of great value when used by professionals, and can also benefit students when used properly. However, if students opt for this it is possible to replace a significant amount of effort by work results provided by artificial intelligence (Cotton et al., 2023). In this way students can skip some important steps in their education which consequently leads to lower levels of professional capabilities.

Virtual assistants and chatbots are rather new addition to higher education in more widely used capacity. Students tend to adopt new technologies

rather quickly, and their educators have to do the same. This poses a challenge for educators since they must incorporate this into their in most cases already busy schedule.

Artificial intelligence in higher education opens many questions for educators, such as:

- How should artificial intelligence-based tools be used?
- What artificial intelligence-based tools should be used for?
- How can artificial intelligence-based tools be used to support education?
- How can unwanted uses of artificial intelligence-based tools be prevented?
- What teaching models should be used when considering artificial intelligence in education?
- How should tasks and assignments be modified in order to utilize artificial intelligence and possibilities of newly developed tools in this domain?
- How should student work be checked to detect authentic or artificial intelligence-based work results?

As artificial intelligence enters higher education educators will have to put a lot of effort into adapting to this new paradigm and providing students with adapted teaching models that will utilize new possibilities while preserving genuine education efforts.

## 2 ARTIFICIAL INTELLIGENCE IN EDUCATION

The rapid development of technologies affects the transformation of education in increasing capacity. In this process many new aspects have emerged, such as more rapid introduction of distance learning with and without digital support, e-learning in different development stages (1.0, 2.0 and semantic one), etc. Along with new aspects, a specific set of challenges has also been identified. Some of these challenges are already known, but many challenges are new and present something that is yet to be researched and resolved. One such set of challenges results from recent introduction of artificial intelligence in higher education that includes assistive tools in the form of various virtual assistants and chatbots, such as ChatGPT (Kung et al., 2022).

Web technology has allowed learners to communicate and access information and has enabled meaningful interactivity through Web 2.0 technologies that empowered e-learning students transforming them from recipients into active and social contributors.

The next generation of online education is in high capacity dictated by the academic need to personalise learning together with the efficient automation offered by artificial intelligence (Montebello, 2018) and learning analytics. According to Montebello (2018) the use and integration of artificial intelligence in every aspect of e-learning model is crucial due to its ability to capture the learners' individual characteristics and use them to personalise the e-learning delivery while addressing typical e-learning issues of isolation, motivation, and impersonal environment.

Personalized learning for students can be supported by 24/7 online feedback system which can be quite demanding and expensive whether analytic systems is used, or more teaching staff are hired. Graesser and McDaniel (2017) suggest cost-effective, and efficient virtual assistants/avatars and chatbots as the interactive systems used to serve heterogeneous roles to facilitate student learning, for example intelligent tutoring system or mentor (Huff et al., 2019).

Supported by LMS Moodle, Atif et al. (2021) have developed and hosted a Pedagogical Conversational Agent known as VIRTU (VIRTUal Agent) that simulates the teacher in providing support in order to promote better understanding of a learning unit and its requirements. Authors' idea was to build a character that students at universities would find engaging, hence, they have created virtual

pedagogical agent as female character designed to be employed in educational settings for instructional purposes, to interact with learners using text-based and audio-based communication (developed by using Unity 3D game-building development environment).

The results implicate the benefits of presented model as students continued to use VIRTU for months after VIRTU was initially made which indicates that students seek information when they need it, and a small percentage of them found it worthwhile to return to use it (Atife et al., 2021).

Tamayo et al. (2019) have implemented a virtual assistant in the form of chatbot, a model called EconBot that provides students with support in their online learning of economics.

Diwan et al. (2023) have developed AI-based, automatically generated learning content evaluated from the aspects of grammar, semantic accuracy and relevance, but even though the model had shown promising results it has not been tested in the classroom yet.

One of the novelties in the educational sector of video games design is Codex developed by OpenAI. Codex is a system that can autocomplete and generate programming code by translating natural language to a programming code. The system is proficient in more than dozen programming languages (Python, JavaScript, Go, Perl, PHP, Ruby, Swift, TypeScript, and even Shell) and is able to interpret commands in natural language and execute them on behalf of the user (Chen, 2021). This opens the door for students and developers to rely in a large extent on the software instead their own knowledge and skills. The same challenge comes to a design and art education programmes due to a large extent of using OpenAI Dall·E 2 for design of photos that never existed (OpenAI Dall·E-2, 2022).

Journalism and Marketing students can also benefit from using photos design by Artificial intelligence since it can create impressive design, and reduce costs, and skip the issues regarding publishing rights that comes with publishing of real people. This is possible because artificial intelligence can create imaginary people without identity and in any city and environment one can think of.

Educators face new challenges that come from the usage of artificial intelligence in education almost daily, and therefore it is challenging to analyse, structure or suggest effective approaches and models that can be used in education. The biggest challenge lies in everyday machine and deep learning that adapts artificial intelligence by enormous speed while at the same time educators are slowly learning about it and its effects.

### 3 ARTIFICIAL INTELLIGENCE AND AI CONTENT DETECTORS

Company OpenAI has become a worldwide market leader in the context of artificial intelligence models development. Their GPT-3 models can understand and generate natural language suitable for different purposes. But there are also many other tools based on artificial intelligence.

Davinci is highly capable model intended for applications requiring a lot of understanding of the content, like summarization for a specific audience and creative content generation explaining the motives of characters, and Ada is the fastest. Curie is capable for many nuanced tasks like sentiment classification and summarization, and Babbage can perform straightforward tasks and is efficient at semantic search documents ranking and matching up with search queries (OpenAI, 2023). Microsoft has implemented OpenAI's ChatGPT into its services, such as Bing search engine, MS Office 365 and Azure services (Microsoft, 2023). Google has recently released Chatbot Bard AI (Google, 2023). The announcement of the implementation of artificial intelligence in the increasing number of applications and tools suggests that the presence of artificial intelligence is daily increasing in almost all segments of usage. Many individuals and smaller companies have also been developing artificial intelligence solutions for years and they can be found in education efforts for some time. Some authors even present GPT as a co-author of their research paper (Thomas et al., 2022; GPT et al., 2022).

Even though this topic requires more attention and should be discussed more widely, what is equally relevant and concerning is not being able to detect student authorship in comparison to artificial intelligence-based authorship. This represents quite a challenge in education due to the need for very sophisticated verification of the authenticity and originality of the content.

In order to detect work that has resulted from using artificial intelligence-based tools, such as ChatGPT, several different approaches can be taken, including manual analysis. Some of these approaches are (Cotton et al., 2023):

- Look for patterns or irregularities in the language: chatbots often have limited language abilities and may produce text that is not quite human-like, with repetitive phrases or words, or with odd or inconsistent use of language. Examining the language used in the work can

help to identify whether it was likely written by a chatbot.

- Check for sources and citations: chatbots are not capable of conducting original research or producing new ideas, so work that has been written by a chatbot is unlikely to include proper citations or references to sources. Examining the sources and citations in the work can help to identify whether it was likely written by a chatbot.
- Check for originality: chatbots are not capable of producing original work, so work that has been written by a chatbot is likely to be very similar to existing sources. Checking the work for originality, either through manual review or using plagiarism detection tools, can help to identify whether it was likely written by a chatbot.
- Check for factual errors: while AI language models can produce coherent text, they may not always produce text that is factually accurate. Checking the essay for factual errors or inconsistencies could be an indication that the text was generated by a machine.
- Check the grammar and spelling: human writing may contain errors and mistakes, such as typos or grammatical errors, while writing generated by AI may be more error-free. However, this can vary depending on the quality of the AI language model and the input data it was trained on.
- Use language analysis tools: some tools (e.g. GPT-2 Output Detector Demo) are designed to analyse the language used in written work and to identify patterns or irregularities that might indicate that the work was produced by a chatbot.
- Finally, human writing tends to be more contextually aware and responsive to the needs of the audience, while writing generated by AI may be more generic and less tailored to a specific context. This can impact the effectiveness and clarity of the writing.

There are several artificial intelligence content detectors that can be used in higher education.

One of the most popular software for checking similarities is Turnitin Originality. It has been recently published that their software in development can detect artificial intelligence-assisted writing and artificial intelligence writing generated by tools such as ChatGPT (Caren, 2022).

Another potential solution for detection of artificial intelligence-based content has been presented by Princeton student Edward Tian as

GPTZero with built-ins for educators with one possibility among others, to get a holistic score for how much of the document is written by artificial intelligence (GPTZero, 2023).

Some other tools for detection of artificial intelligence-based content include (Originality.ai, 2023; OpenAI’s AI text classifier, 2023; Unicheck, 2023; Copyleaks AI Content Detector, 2023; Writer AI Content Detector, 2023; Crossplag AI Content Detector, 2023; Sapling AI Content Detector, 2023):

- Originality.ai
- OpenAI’s AI text classifier
- Unicheck’s Emma
- Copyleaks AI Content Detector
- Writer AI Content Detector
- Crossplag AI Content Detector
- Sapling AI Content Detector
- Etc.

For the purpose of this paper, and particularly to benefit academic work with students, some of the possibilities of artificial intelligence that students regularly use have been analysed. One of the frequently used ChatGPT usage options is creating a written essay. In order to test how well different artificial intelligence content detectors work a query for the ChatGPT to create a short student essay on a specific subject has been used. Created essay has been checked by using artificial intelligence content detector software to determine how efficient detection of artificial intelligence as the author of the text is.

There was no indication of such detection in the first report made by current version of Turnitin Originality (Figure 1). It should be mentioned that current version will likely soon be updated with new detection algorithms designed especially for artificial intelligence-based content, according to announcements (Turnitin, 2023).

Afterwards, the same essay was tested by GPTZero, which successfully determined an artificial intelligence authorship (Figure 2). OpenAI’s AI text classifier has also successfully detected that text is likely written by artificial intelligence (Figure 3). Crossplag AI Content Detector has not detected artificial intelligence writing (Figure 4), and Writer AI Content Detector found artificial intelligence content (Figure 5).

Obtained results have been tested in several iterations with different artificial intelligence created content, and consequent results have confirmed the first-round data.

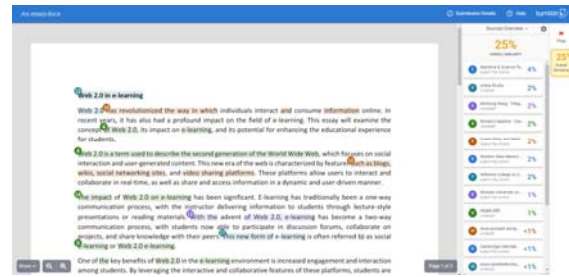


Figure 1: Turnitin Originality software.

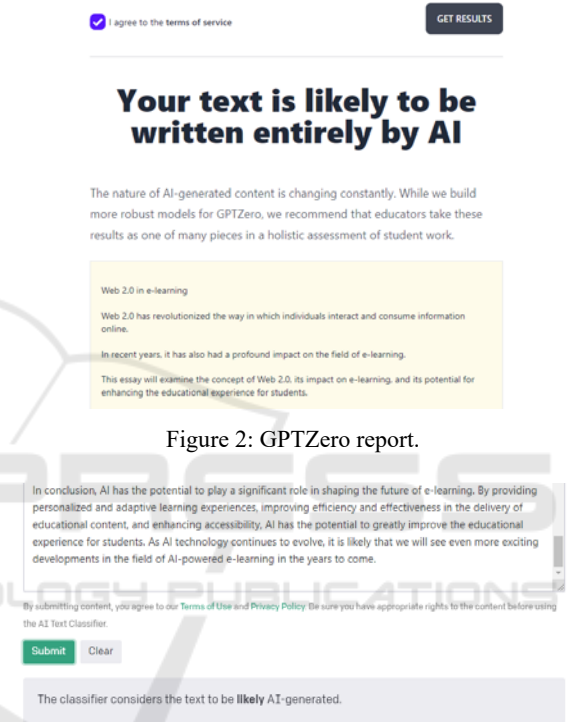


Figure 2: GPTZero report.

About the AI Text Classifier

Figure 3: OpenAI’s AI text classifier report.

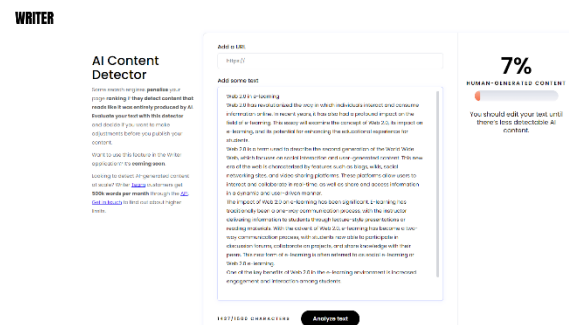


Figure 4: Crossplag AI Content Detector.



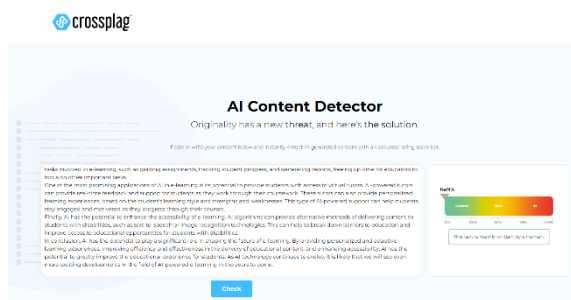


Figure 5: Writer AI Content Detector.

It can be concluded that detecting of artificial intelligence-based content will remain an ongoing development and research effort and it is safe to presume that all mentioned tools will get even better and more accurate in time. However, even now there are some good and usable options that can help educators to detect artificial intelligence footprint in created content.

An important step in future efforts of educators will be finding the right way of supporting development of students' knowledge and skills. Some authors suggest that the focus should be put on improving students' creativity and critical thinking rather than general skills (Zhai, 2022). Artificial intelligence has just begun to impact the world of higher education in a more concrete and wider scale. The challenges that will become more and more prominent will affect both teachers and students. More research efforts are needed in order to find the best possible approach and best education methods to benefit both teachers and students via new and applicable education tools.

#### 4 STUDENTS' EXPERIENCE WITH CHATGPT

In order to conclude about students' experience with ChatGPT, research was conducted by using designed questionnaire. The goal of the research was to determine how familiar are students with artificial intelligence and ChatGPT, for which purpose they use ChatGPT and whether they think artificial intelligence-based tools should be a standard part of their higher education.

All questionnaire answers were based on the Likert scale ranging from "Strongly disagree" (1) to "Strongly agree" (5). 67 information technology students have participated in the research. Research results are shown in Table 1.

Table 1: Research results.

Statement	$\bar{x}$	SD
I am familiar with the concepts of artificial intelligence	3,67	1,35
I am familiar with the ChatGPT software tool	3,69	1,37
I use ChatGPT in my higher education	2,25	1,29
I use ChatGPT to help me understand the learning content	2,24	1,43
I use ChatGPT to help me solve assigned tasks	2,07	1,39
I think that ChatGPT should be a standard tool in higher education	3,21	1,47

Research results have shown that students are fairly well informed about artificial intelligence and ChatGPT. It has also been shown that artificial intelligence-based tools have started to appear in higher student population as an aiding mean of choice. Since ChatGPT has fairly recently been positioned as an artificial intelligence tool suitable for wider use, it is understandable and expected that majority of students still do not use this tool in great capacity, but it is notable that this trend has started and that students are starting to adopt this artificial intelligence tools in their higher education activities. It will be interesting to track the popularity of this kind of aiding software in student population as a part of future research efforts.

#### 5 CONCLUSION

Higher education is an important driving force of development since it produces new professionals who are necessary for all types of further development. Higher education has had its challenges for years, along with opportunities that came with new technology.

One of the most recent advancements in technology is once again opportunity and challenge at the same time. Artificial intelligence and various tools that are based on it can benefit both professionals and students. It can save time, raise efficiency, make learning more engaging, etc. However, at the same time it offers students the possibility to skip important lessons and rely on the results of artificial intelligence too much.

One of the important challenges of educators will be to get to know the possibilities of artificial intelligence in education, to find the right approaches

and models that will utilize the possibilities and benefits of artificial intelligence and at the same time promote development of one's own knowledge and skills.

In this paper, opportunities and challenges of using ChatGPT and other virtual assistants and chatbots have been presented and discussed, along with brief analysis of current artificial intelligence content detectors and possibilities of detecting artificial intelligence authorship.

Further and more extensive analysis of artificial intelligence content detectors, trends and popularity of artificial intelligence-based tools among students and teachers, as well as analysing different approaches and education models will be part of future research efforts.

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