ChatGPT in higher education: the good, the bad, and the University

Marius Schönberger

University of Applied Sciences Kaiserslautern, Campus Zweibrücken, Department of Computer Science and Microsystems Technology, Germany.

Abstract

This research examines the opportunities and risks of artificial intelligence (AI) in the context of higher education, using ChatGPT as an example. The hype around AI tools in education has led to a skeptical attitude among many educators towards this technology. Based on a comprehensive literature analysis, the opportunities and risks of ChatGPT in higher education are identified and analyzed. The research concludes with a recommendation for a sensible use of ChatGPT in higher education. The results of this study can support educators in their decision-making process on whether and how to use ChatGPT as a tool in their teaching contexts.

Keywords: Artificial intelligence; higher education; ChatGPT.

1. Introduction

The potential that artificial intelligence (AI) offers for the teaching and learning process is diverse, providing new opportunities for personalized and effective education (Zawacki-Richter et al., 2019). AI technologies are gaining increasing importance in universities, as confirmed by a survey of university leaders in Germany in 2019: AI technologies offer a range of opportunities for personalized and effective education, with 26.4% of universities already using AI, machine learning, text mining, and data mining in their research and teaching activities (Gilch et al., 2019). In addition, universities are increasingly offering courses in AI, integrating AI modules into the curricula of courses, and developing interdisciplinary study content to provide basic digital and AI-specific 'literacy' (Laupichler et al., 2022; Mah and Büching, 2019). Thus, AI plays a key role, especially in the context of digital transformation of higher education, and AI applications, such as intelligent tutoring systems, teaching robots, learning analytics dashboards, adaptive learning systems, personalized learning systems, assessment and feedback systems, human-computer interaction, or intelligent virtual reality, have become established over the years (e.g., Bearman et al., 2022; Ouyang et al., 2022; Hinojo-Lucena et al., 2019; Zawacki-Richter et al., 2019; Ma and Siua, 2018).

However, there are also concerns about AI's potential risks in higher education, including reinforcing existing inequalities, increasing plagiarism, and replacing teachers (e.g., Cotton et al., 2023). In this context, ChatGPT (Generative Pre-trained Transformer), a language model for providing conversational responses, is attracting a lot of attention in higher education, with potential applications for text analysis and automation of writing tasks (Zhai, 2022). ChatGPT is developed by OpenAI and has been trained on a massive amount of human-generated text data using the "Transformer Network" machine learning technique for natural language processing (OpenAI, 2022). As a result, ChatGPT has a comprehensive understanding of human language and is able to have human-like conversations. ChatGPT can therefore be used for a variety of applications in higher education, such as text analysis or the automation of writing tasks, making it a tool with far-reaching implications for teaching. Therefore, ChatGPT has the potential to revolutionize applications and services related to universities. This, in turn, calls for critics as well as advocates.

This research seeks to address this disconnect by exploring the opportunities and challenges associated with the use of ChatGPT in higher education. Specifically, this paper addresses the following research questions (RQ):

- RQ1: What are the opportunities and risks of using ChatGPT-based chatbots in higher education?
- RQ2: How can ChatGPT-based chatbots effectively shape teaching, learning and administrative processes in higher education?

To answer the RQs, this paper identifies and analyses the advantages and disadvantages of ChatGPT based on a literature review and provides recommendations for the effective use of ChatGPT in higher education. The aims of the paper are (1) to contribute to the understanding of the role of ChatGPT in higher education, (2) to provide insights into the opportunities and challenges associated with its use, and (3) to help educators make informed decisions about the use of AI in higher education.

2. Literature review

To provide an overview of the current use of AI technologies, specifically ChatGPT, in higher education, a systematic literature review was conducted. However, the heterogeneity of European universities (Lepori, 2022) makes it difficult to collect a complete and up-to-date literature review. Therefore, the aim of this thesis is to identify key literature on the implementation of AI technologies in higher education. As a result, the review results presented in Chapter 3 do not claim to be exhaustive. Rather, it is intended to provide a general orientation of the literature. The following section describes the literature review procedure, which follows the methodology of Mikelsone and Liela (2015).

Prior to conducting a literature review, the following criteria were used to narrow the search area: (1) *Content limitation*: The literature reviewed is intended to be as comprehensive as possible in highlighting different approaches to implementing AI in higher education contexts. For better comparability of approaches, the term "university" is used generically, without specific reference to individual disciplinary orientations within higher education. (2) *Linguistic limitation*: The focus of the literature review is on European higher education institutions. Therefore, for better comparability, only English language literature is used for this study. (3) *Type of publication limitation*: To achieve the best possible and appropriate results through the literature review, research papers, conference papers, proceedings, monographs, books, and dissertations are examined and evaluated. (4) *Time limitation*: Since the focus on AI in higher education, especially on the recently published ChatGPT, implies the identification of only a few sources, there is no limitation on the time of publication. Nevertheless, an attempt is made to consider current literature.

The literature review is based on an extensive keyword search of the following literature databases: *Google Scholar*, *Scopus*, *Ebsco Academic Search*, *ScienceDirect*, *Emerald Insight*, and *Sage Journals*. The search was conducted in several steps: First, a complete overall search was performed. The keywords were combined into a search string: Each main keyword was AND-linked with the corresponding thesaurus terms, while the latter were OR-linked, e.g., "ChatGPT" AND "higher education" OR "university". The search was then restricted to article titles, abstracts, and keywords. In a second step, the first results were limited to fully accessible publications only, and in a third step, duplicates within the results

were eliminated. Finally, the results were analyzed by reading the abstracts and references of the remaining research papers. Again, publications that did not address the research problem were excluded.

3. Research findings

As predicted before, only a few scientific papers were identified in an initial search. One reason for this is that ChatGPT was first published in November 2022 (OpenAI, 2022). Therefore, the keywords "artificial intelligence" and "AI" were added to the initial keywords and the search was performed again. Finally, a total of 120 literature sources were identified, of which 88 sources were considered for this study after the elimination of duplicates. The content of the collected publications can be summarized in the following topics:

- The implementation of ChatGPT in the context of higher education (e.g., Döbeli Honegger, 2023; Cotton et al., 2023; Zhai, 2022).
- The use of AI technologies in teaching, research, and development (e.g., Ouyang et al., 2022; Mah and Büching, 2019; Zawacki-Richter et al., 2019).
- The teaching of AI-specific digital literacy and curriculum development (e.g., Laupichler et al., 2022; Wannemacher and Bodmann, 2021; de Witt et al., 2020).
- The development and use of AI-based learning systems, including chatbots or feedback tools (e.g., de Witt et al., 2020; Seufert et al., 2019).
- Ethical aspects of the use of AI applications in higher education (e.g., Bearman et al., 2022; Zhai, 2022; de Witt et al., 2020).
- Future scenarios and potentials of AI technologies in higher education (e.g., Wannemacher and Bodmann, 2021; de Witt et al., 2020).

The following sections discuss possible trends, opportunities and challenges, and recommendations for implementing ChatGPT and AI in higher education.

3.1 Opportunities and risks

First, the opportunities for ChatGPT in higher education are summarized before the identified risks are listed. This provides an answer to the first research question.

Developing digital literacy: ChatGPT can be used in general to learn how AI works, what the consequences of its use are, and how AI specifically changes working with and on texts. In addition, students can learn to critically question the origin, composition, and quality of AI-generated data (e.g., Laupichler et al., 2022; de Witt et al., 2020).

Supporting scholarly practices: ChatGPT can support researchers in carrying out scientific work, such as conducting literature searches, analyzing and evaluating data, recording experiments, or producing scientific texts (e.g., Cotton et al., 2023; Zhai, 2022)

Automated student support: ChatGPT can be used to quickly and efficiently assist students with questions about their courses, assignments, exams, or other academic matters (e.g., Cotton et al., 2023; Zawacki-Richter et al., 2019).

Personalized learning support: ChatGPT can be used as a tutor to help students with concepts and skills they are struggling with. For example, ChatGPT can optimize texts based on given criteria and adapt them to different needs (e.g., Bearman et al., 2022; Ma and Siua, 2018).

Encourage creativity: ChatGPT can function as a creativity technique, using unexpected or incorrect answers constructively, e.g., to deviate from well-trodden paths of thought or to stimulate one's own thought processes (e.g., Cotton et al., 2023; Zhai, 2022).

Generation of text passages, summaries, and formats: ChatGPT can quickly generate suggestions for text passages, analyze and summarize longer texts, and generate suggestions for special formats (e.g., press releases, blog posts) from existing texts (e.g., Döbeli Honegger, 2023; Zhai, 2022).

Encourage interaction and collaboration: ChatGPT can be used to motivate and help students interact and collaborate with each other by serving as a moderated platform for discussions and questions (e.g., Cotton et al., 2023; Ouyang et al., 2022).

However, ChatGPT is not perfect and may sometimes generate inaccurate or inappropriate responses. The following additional risks exist when using ChatGPT:

Biases and training through inputs: Using ChatGPT can introduce various types of bias because the data used to train the model may contain certain distortions and imperfections that become embedded in the model and may be reflected in the responses it generates. Examples of possible biases include (1) gender bias, (2) race and ethnicity bias, (3) political bias, or (4) incomplete data bias (e.g., Brennan, 2023; Zhai, 2022).

Misinformation: ChatGPT not only generates text, but also offers explanations for scientific contexts. In addition to incorrect, randomly generated citations or sources, misinformation is also possible (e.g., Döbeli Honegger, 2023; Cotton et al., 2023).

Difficulty in evaluating the results: It is difficult to distinguish texts generated by ChatGPT from those written by humans, as the source of the result remains opaque. This also makes it difficult to detect misinformation (e.g., Döbeli Honegger, 2023; Cotton et al., 2023).

Lack of consideration of current and scientific sources: Because ChatGPT's database is not currently up to date, relevant information may be missing. Also, results from scientific studies that are not freely available are not considered (e.g., Döbeli Honegger, 2023; Cotton et al., 2023).

Unclear authorship: It is currently unclear how text generated by ChatGPT should be cited in publications. It is also unclear to what extent ChatGPT's use of existing documents may violate copyright, even if the content is not copied literally (e.g., Döbeli Honegger, 2023).

3.2 Recommendations for implementation in higher education

Based on the results of the literature review, the following section provides recommendations for the implementation of ChatGPT in higher education. This will answer the second research question.

ChatGPT as a tool for teachers: ChatGPT is particularly suitable as a working tool for teachers. The focus here is less on automated text generation. Instead, experimenting with ChatGPT should sensitize teachers and give them ideas for their lessons, such as ideas for quiz questions, arguments for pro-contra discussions, or impulses for role plays. ChatGPT can also help create individualized materials, such as assignments for students. It can also transfer existing content into new formats, such as scripts for podcasts or instructional videos. It can also help streamline instructions, overviews, and the like, and create standardized text types such as event descriptions.

ChatGPT as a didactic element of courses: Teachers should use the chatbot as part of their teaching approach, which limits the privacy issue to the teacher's data. In addition, the use of ChatGPT should be transparent to address the potential and risks of AI systems and to promote the development of digital literacy among students. Didactic scenarios could include identifying fake news, managing discussions, comparing summaries, comparing text formats and writing styles, and developing criteria for a successful scientific text.

Use of ChatGPT in exams: The use of ChatGPT in the context of examinations (e.g., written exams, term papers, presentations) naturally poses an increased risk of cheating, especially since current plagiarism detection software does not yet recognize ChatGPT-generated texts as plagiarism. Even though tools are being developed to detect ChatGPT texts, concerned and uncertain lecturers should refrain from traditional term papers or take-home exams, or only use them in combination with an oral defense. If ChatGPT is to be used as a tool to assist students in the future, there will inevitably be new rules requiring students to indicate which tools they have used. ChatGPT could also be a reason to change the culture of examinations at universities to one where students refrain from cheating and recognize the value of academic integrity.

4. Conclusions and outlook

In conclusion, the use of AI, particularly ChatGPT, in higher education is attracting attention due to its opportunities and implications for teaching and learning. However, there are also concerns about its potential risks. This paper aims to address this disconnect by exploring the

opportunities and challenges associated with ChatGPT in higher education and providing recommendations for its effective use. A literature review of European universities and their use of AI technologies in higher education was conducted to provide a general orientation of the field. Based on the results of the literature review, this research also aims to contribute to the understanding of the role of ChatGPT in higher education and to help educators make informed decisions about using AI in higher education.

Currently, any specific recommendations for the implementation of ChatGPT should be understood as impulses for reflective experimentation and as an invitation for discourse on the design of AI-based teaching in higher education. It should be emphasized that an uncritical and automated use of the results of ChatGPT is not recommended. Furthermore, the opportunities and risks summarized in this paper should always be understood in relative terms, as they are based solely on the results of the literature review. An exact representation of the real opportunities and risks is hardly presentable, since a feasible evaluation always depends on the concrete context and the objective.

Like other new digital tools, ChatGPT presents both opportunities and risks. However, by making AI accessible at a low threshold, ChatGPT can be expected to make qualitative leaps compared to previous digital developments, the consequences of which cannot yet be assessed with certainty. Regarding the implementation of AI-based technologies in higher education, Hinojo-Lucena et al. (2019: 1) state that "this technology is already being introduced in the field of higher education, although many teachers are unaware of its scope and, above all, what it consists of." In this context, this paper contributes to filling this gap, and the authors accordingly recommend further research, both qualitative and quantitative, on the implementation of AI in the different activities of higher education, not only in the context of teaching and research, but also for administrative, recruitment or accreditation tasks.

References

Bearman, M., Ryan, J., & Ajjawi, R. (2022). Discourses of artificial intelligence in higher education: a critical literature review. *Higher Education*, 1-17.

Brennan, K. (2023). ChatGPT and the Hidden Bias of Language Models. https://thestoryexchange.org/chatgpt-and-the-hidden-bias-of-language-models/, accessed 06 February 2023.

Cotton, D. R., Cotton, P. A., & Shipway, J. R. (2023). Chatting and Cheating: Ensuring academic integrity in the era of ChatGPT. *Preprint. https://doi.org/10.35542/osf. io/mrz8h*, accessed 06 February 2023.

de Witt, C., Rampelt, F., & Pinkwart, N. (2020): Künstliche Intelligenz in der Hochschulbildung. *Whitepaper*, October 2020. Berlin: KI-Campus.

Döbeli Honegger, B. (2023). *ChatGPT & Schule. Einschätzungen der Professur „Digitalisierung und Bildung" der Pädagogischen Hochschule Schwyz.* https://mia.phsz.ch/pub/MIA/ChatGPT/2023-chat-gpt-und-schule-v128.pdf, accessed 06 Februar 2023.

Gilch, H., Beise, A. S., Krempkow, R., Müller, M., Stratmann, F., & Wannemacher, K. (2019). *Digitalisierung der Hochschulen: Ergebnisse einer Schwerpunktstudie für die Expertenkommission Forschung und Innovation* (No. 14-2019). Studien zum deutschen Innovationssystem. Berlin: Expertenkommission Forschung und Innovation (EFI).

Hinojo-Lucena, F. J., Aznar-Díaz, I., Cáceres-Reche, M. P., & Romero-Rodríguez, J. M. (2019). Artificial intelligence in higher education: A bibliometric study on its impact in the scientific literature. *Education Sciences*, 9(1), 51.

Laupichler, M. C., Aster, A., Schirch, J., & Raupach, T. (2022). Artificial intelligence literacy in higher and adult education: A scoping literature review. *Computers and Education: Artificial Intelligence*, 3(2022), 100101.

Lepori, B. (2022). The heterogeneity of European Higher Education Institutions: a configurational approach. *Studies in Higher Education*, *47*(9), 1827-1843.

Ma, Y., & Siau, K. L. (2018). Artificial intelligence impacts on higher education. *Proceedings of the 13th Midwest Association for Information Systems Conference* (MWAIS), 42(5), 1–5.

Mah, D., & Büching, C. (2019). *Künstliche Intelligenz in Studium und Lehre. Überblickstudie zu Professuren und Studiengängen der Künstlichen Intelligenz in Deutschland*. Berlin: VDI/VDE Innovation+Technik GmbH.

Mikelsone, E., & Liela, E. (2015). Literature review of idea management: Focuses and gabs. *Journal of Business Management*, 2015, No. 9, 107-121.

OpenAI (2022). *ChatGPT: Optimizing Language Models for Dialogue*. 30. November 2022. https://openai.com/blog/chatgpt/, accessed 06 February 2023.

Ouyang, F., Zheng, L., & Jiao, P. (2022). Artificial intelligence in online higher education: A systematic review of empirical research from 2011 to 2020. *Education and Information Technologies*, 27(6), 7893-7925.

Seufert, S., Guggemos, J. & Moser, L. (2019). Digitale Transformation in Hochschulen: auf dem Weg zu offenen Ökosystemen. *Zeitschrift für Hochschulentwicklung*, 14(2), 85-107.

Wannemacher, K., & Bodmann, L. (2021). Künstliche Intelligenz an den Hochschulen. *Potenziale und Herausforderungen in Forschung, Studium und Lehre sowie Curriculumentwicklung*; Hochschulforum Digitalisierung: Berlin, Germany.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education–where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1), 1-27.

Zhai, X. (2022). ChatGPT user experience: Implications for education. *Available at SSRN 4312418*.