

Exploring the Impact of Using Chatbots on Teacher-student Relationships in Today's Higher Education

Zhaoyi Zou*

Department of Arts, Hong Kong Shue Yan University, Beijing, China

* Corresponding Author Email: 222009@hksyu.edu.hk

Abstract. Artificial Intelligence, represented by chatbots, has transformed the teaching and learning ecosystem in higher education. Chatbots are attracting much attention from the education community as an emerging technology application. This study aims to explore the impact of chatbots on teacher-student relationships in higher education by reviewing and analyzing relevant literature. It was found that chatbots play an important role in higher education and can facilitate effective interaction between teachers and students while improving teaching efficiency. Moreover, with their personalized features, teachers can provide customized guidance to students, leading to a more harmonious relationship. While as the use of chatbots has proliferated, some challenges have arisen. The main issues include the trust between teachers and students and the leakage of privacy. In addition, over-reliance on technology may lead to a cold and impersonal interaction between teachers and students. The comprehensive results of the study show that chatbots have both positive and some potentially negative impacts on teacher-student relationships. To better utilize the advantages of chatbots, effective measures need to be taken to circumvent the challenges, thereby promoting the further development of teacher-student relationships in higher education.

Keywords: chatbots, higher education, teacher-student relationships.

1. Introduction

With the rapid development of digitalization of education, teaching methods based on digitalization and artificial intelligence are emerging. In the field of higher education, chatbots, as an Artificial Intelligence (AI) technology, are gradually becoming an important tool for teacher-student interaction and learning support. One of the most common and fundamental forms of intelligent human-computer interaction is a chatbot, which is a typical example of an AI system. As a computer program, it responds like an intelligent entity when it is spoken to via text or voice and uses natural language processing to understand one or more human languages [1]. The chatbot interacts with users in a conversational format, interpreting the user's natural language questions and giving the most appropriate answers. Due to their efficient and convenient characteristics, chatbots can be used in many fields, such as education, business and e-commerce, entertainment, and health [2].

Existing literature mostly focuses on studying the widespread application of chatbots in the business field because they not only reduce service costs but also handle multiple users at the same time [3]. However, scholars have paid relatively little attention to their use in higher education. Research on chatbots in the field of education mainly includes how to answer questions for students, evaluate students' performance, and provide management services. Nonetheless, research on the dual effects of chatbots on the teacher-student dynamic in higher education is lacking. This study aims to gain a deeper understanding of the positive impact of chatbots on teacher-student interactions while exploring the challenges and limitations they face. Through a literature review method, it explores the possibility of better-using chatbots to promote the positive development of teacher-student relationships in the context of digitalization.

2. Characteristics of Chatbots Applied in Education

The use of chatbots in higher education has shown multiple characteristics. First, it is flexible and not restricted by time and place. With the growing prevalence of mobile technology, chatbots' interactive learning style allows students to use them at any time and from any location, making their use increasingly popular [4]. Secondly, the use of chatbots is more natural and more like real people. Since chatbots can communicate with people in natural language, their content production mechanism is no longer just mechanical responses like in traditional human-computer dialogues but constantly forms new content based on the interaction process. Compared with traditional human-computer interaction, the level of acceptance and use of ChatGPT has been improved, aiming to interact with humans more naturally [5]. The user's comfort in using the machine has been greatly improved. What's more, it embodies personalized help. During the study period, chatbots can use natural language discourse to simulate students' learning styles to predict and personalize their learning process [6]. Chatbots can provide users with accurate information through online platforms, and students use these robots to ask questions get answers and get personalized help.

Since chatbots have many characteristics such as flexibility, human-like nature, and personalization, their use in education will have many functions. One of them is the promotion of chatbots to enhance the learning experience. Cunningham-Nelson et al. found that the application of chatbots to improve students' learning experience, and 24/7 availability can promptly accept students' requests and redirect them to relevant resources [7]. As an excellent technological innovation, chatbots can help stimulate students' interest in learning, and improve cognitive skills and sense of achievement. Beyond that, digital devices like chatbots open far-reaching possibilities that are yet to be fully exploited. For example, incorporating process data can provide students with a way to follow their learning progress, creating new possibilities for formative feedback, self-reflection, and competency development [8]. Chatbots have the potential to be valuable in higher education, bringing more unexplored educational possibilities to students and educators.

3. The Dual Effects of Chatbots on the Teacher-Student Relationships in Higher Education

3.1. The Positive Impact

3.1.1. Enhancing effective interaction, teaching-learning efficiency and quality

The introduction of chatbots makes communication and interaction between teachers and students more convenient and efficient. With the intervention of the new generation of AI technology, the two-dimensional socio-spatial structure of teachers and students in the traditional education scenario has been altered. The binary relationship of "teacher-student" has evolved into a new type of "teacher-student-AI" ternary relationship. In the new 'teacher-student-AI' scenario, every teaching participant will become a node, and education centered on new-generation AI technology will improve the quality of teaching with the increase in the number of nodes [9]. In the process of interaction between AI and teachers, it can not only improve students' teaching experience, but students' active participation can also help reflect the comprehensive effect of teaching. The data provided by AI can show students' learning status, thereby enhancing the teaching of related content. The interaction between the AI and the students also enhances the teacher's sense of engagement and achievement, creating a mutually reinforcing cycle of interaction.

Automation of administrative tasks through AI can free up faculty and staff from routine responsibilities to focus on more impactful work and improve productivity. Effective facilities and awareness of new technologies will transform higher education by improving student-faculty relationships and making administrative processes more efficient [10]. The use of chatbots in higher education has the potential to improve faculty engagement and attitudes toward the use of new technologies in daily teaching, learning, and assessment practices. According to Fryer et al., students who used chatbots for course-related consultations improved their relationship with their

teachers, mainly because teachers could devote more time to substantive and complex educational issues [11]. Chatbots can be a valuable tool to reduce teachers' workload, allowing them to focus on advanced tasks that require expertise. By reducing the amount of information students need to seek from teachers unrelated to their expertise, it is beneficial to foster more meaningful interactions between teachers and students, thus promoting an effective learning environment.

3.1.2. Personalized learning support and teaching guidance

The emergence of chatbots circumvents the role of students as passive recipients in traditional education, making it easier for students' personalized needs to be met. In traditional education, students usually need to wait until they ask questions to teachers in class or communicate with teachers during office hours before they can get personalized learning support. Chatbots can make education more dynamic through personalized artificial intelligence solutions. Based on students' individual needs and preferences, chatbots can provide them with unique guidance by analyzing their interactions and performance data. For example, chatbots can provide additional resources or exercises for students with learning difficulties, while designing more challenging assignments and providing additional learning opportunities for senior students [12]. Students at different stages of learning can benefit from this differentiated support and guidance, which also promotes their academic progress.

The personalized advantages brought by chatbots bring new potential to the interaction between teachers and students, which is conducive to further harmony between teachers and students. Teachers can use ChatGPT to provide personalized supervision and feedback to each student. In the study of Ghafouri, teachers used chatbots to monitor learners' progress for 16 consecutive weeks and found that learners' courage was significantly improved [12]. Facilitated by chatbots, a progressively amicable and trusting relationship between teachers and students emerges, leading to enhanced student confidence and a heightened enthusiasm for learning. This prolonged mentoring and monitoring helps to preclude students from feeling isolated, and they feel that their teachers care about their progress and development. Facilitated by chatbots, a progressively harmonious and trusting relationship between teachers and students emerges, leading to enhanced student confidence and a heightened enthusiasm for learning.

Instructionally oriented chatbots play more of a role in personalization as they can be used to set personalized learning outcomes and monitor learning progress. The study by Fernoagă et al. reports on "eduAssistant", a virtual teaching assistant chatbot developed on the Telegram messaging platform [13]. The study found that the "eduAssistant" chatbot acted as an automated agent for teachers' content students, facilitating real-time feedback loops and providing a personalized learning experience relevant to the skills and knowledge acquired by students [13]. With the use of this chatbot, educators can generate interactive scenarios during lectures, posing questions to students. The chatbot aids students requiring further assistance by offering additional hints and reporting their progress to the educator's dashboard.

3.2. The Negative Impact and Potential Challenges

3.2.1. Trust issues and privacy protection

The use of chatbots in higher education will, to a certain extent, bring complexity and uncertainty to the teacher-student relationships. On the one hand, students and teachers are experiencing trust concerns as a result of the employment of chatbots. This distrust mainly stems from concerns about students cheating. As more universities adopt AI detection software, students may spend more time ensuring that their assignments are not "flagged" rather than effectively interacting with chatbots to achieve their learning goals [14]. This trust issue involves ethical and academic integrity concerns in educational settings. Teachers may perceive worries about students' honesty, while students may not fully engage with the depth and quality of the course, resulting in tensions within the teacher-student relationship. Luo's findings suggest that chatbots do add new complexities to the teacher-student

relationship in universities in the context of the increasing massification and participation of higher education [14].

On the other hand, due to users' shallow risk awareness, the use of chatbots may lead to privacy leakage and abuse. The leakage of personal privacy will bring more complexity to the relationship between teachers and students, and they will worry about whether their personal information is protected. First, most of the data of chatbots comes from the Internet, so they can provide answers to questions raised by users. Unfortunately, there is currently no regulatory mechanism in place to verify the veracity of the data in ChatGPT's restricted database [15]. Therefore, it is difficult to draw a clear line between data use and abuse. Second, although chatbots have brought many conveniences to teachers and students, many interactive information when they use them will bring hidden dangers of privacy data leakage. The intelligent principle and learning process of the GPT series system determines that it is an open-source system that needs to be optimized by constantly absorbing new data [16]. This means that during the pre-training stage of the GPT series system, personal privacy accidentally leaked by users on the Internet may be absorbed and become part of the generative artificial intelligence corpus. When some sensitive data of teachers and students is leaked, academic achievements may be stolen, and there may even be risks such as identity theft and fraud. This may lead to the loss of trust between teachers and students, which in turn affects their interaction and communication.

3.2.2. Reduction of emotional interaction

As chatbots are increasingly used in higher education, the emotional connection between teachers and students is weakened. When college students use chatbots more frequently in their learning process, their dependence on them changes subtly. Xie et al. raised concerns that long-term exposure to AI may lead to dependence, especially in the absence of human companionship [17]. The penetration of chatbots in teaching has assumed some of the functions of teachers, which may cause a certain degree of squeeze on the emotional interaction between teachers and students. When students become partially dependent on chatbots, the interaction between teachers and students will tend to be mechanized and stereotyped. In this regard, the warmth of human-computer interaction is ignored. The emergence of chatbots may cause teachers and students to lose their subject status. Overuse of these tools could lead to students expanding their learning autonomy while teachers relinquish their teaching authority. For example, ChatGPT can help students' complete homework, tests, and study to consolidate knowledge after class. What is more serious is that students use ChatGPT to argue with teachers using the opinions given by the real teachers [15]. This shows that when students become dependent on chatbots, it may reduce communication between teachers and students and shield students from emotions.

Furthermore, since chatbots may not be able to accurately understand the emotions and context of teachers and students, misunderstandings and communication barriers may occur in their emotional exchanges. When facing students who are not confident, sensitive, introverted, and have low learning enthusiasm, teachers need to guide them patiently face-to-face [18]. Artificial intelligence technology cannot achieve delicate emotional communication between people. If such students choose to rely on chatbots to interact, emotional communication will inevitably be affected. In addition, it is not easy for teachers and students to effectively use chatbots to promote effective interaction between them. Although the interaction field between teachers and students in higher education has become more diversified after integrating artificial intelligence technology, they can communicate and interact through many methods, such as text, voice, and images. However, these different ways of interaction will lead to misunderstandings or delays in information transmission, thus affecting effective communication between teachers and students.

4. Balancing Dual Impacts Caused by Chatbot for Better Teacher-student Relationships

Faced with the dual and complex impacts of chatbots on the relationship between teachers and students in higher education, educators and students need to consider how to maximize the positive impact and find ways to cope with challenges. For one thing, under the wave of digitalization, teachers and students can use the advantages of chatbots to promote the relationship between the two. Through timely feedback and personalized guidance, chatbots help improve effective interaction and teaching efficiency between teachers and students. Teachers and students can use ChatGPT to generate responses based on their preferences and needs using different tones and structures [19]. This feature allows users to generate unique texts, making them feel like they are having a real conversation with a chatbot, and get exclusive personalized answers as the interaction unfolds. Reducing teachers' workload is another great potential of chatbots. Teachers can use chatbots as a great tool to reduce their burden and save energy. For example, it can be used as a feedback tool to provide corresponding feedback on students' papers, tasks, and assignments [20]. Teachers can use ChatGPT to create various forms of tests, including open-ended questions, multiple-choice questions, and even criteria for evaluating students' assignments [21]. Chatbots can provide instant feedback and help teachers generate test questions, reducing teachers' time and energy outside of class.

For another, both teachers and students should take concrete steps to face the risks and challenges brought by chatbots. The first is the issue of trust. The emergence of powerful AI tools requires many established ways of thinking and relationships in higher education to be rethought and innovated [14]. When teachers and students face the addition of chatbots to teaching and learning, they need to be willing to take on the challenges it brings. At the same time, they need to trust each other, which shows that both are willing to explore the evolving field of AI together. Next, to avoid the situation where technology dependence leads to reduced interaction between teachers and students, teachers can combine AI tools with traditional teaching methods to ensure face-to-face communication and emotional connection between teachers and students. Chatbots can be used as auxiliary tools in the learning process rather than replacing human interaction. Teachers should also encourage students to actively participate in class discussions and collaborative activities to create a richer and more meaningful learning experience.

Finally, it is also of utmost importance to formulate relevant policies to awaken teachers' and students' awareness of protecting data privacy. Government managers should set up real-time monitoring and investigation departments to supervise the use of ChatGPT data, issue authoritative ethical guidelines, and comply with privacy laws [22]. The European Union has formulated a GDPR to build people's basic privacy rights and freedoms to protect personal data from malicious use. The new GDPR states that all technologies that use personal user data must maintain strict security to prevent potential malicious encryption activities to protect personal rights and data privacy [23]. Therefore, each chatbot must have appropriate supervision mechanisms and protection measures to avoid challenges from privacy issues. Through serious and effective supervision, the privacy of teachers and students can be protected, then the occurrence of privacy leaks can be reduced. As teachers, they need to make predictions in advance when using chatbots and remind students not to enter or use data at will. For students, they should have a certain sense of security and privacy for self-protection.

5. Summary

Chatbots bring some benefits and challenges to both teachers and students by leveraging their natural language processing and artificial intelligence algorithms. This paper finds that chatbots can enhance effective interaction between teachers and students and improve teaching efficiency. At the same time, they can provide personalized teaching tools to help students get customized teaching guidance and feedback. However, chatbots also bring many challenges, such as trust issues and threats

to privacy protection, as well as the risk of alienating teachers and students due to technology dependence.

This study also contains some limitations, such as the lack of long-term empirical research and the limited scope of the literature covered, which may not include comprehensive relevant research. Future research should add case studies, qualitative and quantitative research, etc., to increase the empirical data on this topic. Researchers can also further explore the impact of chatbots on teacher-student relationships at different stages of education, and focus on how to balance the relationship between technical tools and interpersonal interactions to promote healthier and more effective teacher-student relationships.

References

- [1] Adamopoulou E, Moussiades L. An overview of chatbot technology. IFIP international conference on artificial intelligence applications and innovations. Springer, Cham, 2020.
- [2] Shawar B A, Atwell E. Chatbots: are they really useful?. *Journal for Language Technology and Computational Linguistics*, 2007, 22(1): 29-49.
- [3] Adamopoulou E, Moussiades L. Chatbots: History, technology, and applications. *Machine Learning with applications*, 2020, 2: 100006.
- [4] Zhou L, Gao J, Li D, et al. The design and implementation of xiaoice, an empathetic social chatbot. *Computational Linguistics*, 2020, 46(1): 53-93.
- [5] Bernard D, Arnold A. Cognitive interaction with virtual assistants: From philosophical foundations to illustrative examples in aeronautics. *Computers in Industry*, 2019, 107: 33-49.
- [6] Okonkwo C W, Ade-Ibijola A. Chatbots applications in education: A systematic review. *Computers and Education: Artificial Intelligence*, 2021, 2: 100033.
- [7] Cunningham-Nelson S, Boles W, Trouton L, et al. A review of chatbots in education: practical steps forward. 30th annual conference for the australasian association for engineering education (AAEE 2019): educators becoming agents of change: innovate, integrate, motivate. *Engineers Australia*, 2019: 299-306.
- [8] Quincey E, Briggs C, Kyriacou T, et al. Student centred design of a learning analytics system. *Proceedings of the 9th international conference on learning analytics & knowledge*. 2019: 353-362.
- [9] Yu Nangping, Zhang Yiran. The impact of ChatGPT/generative artificial intelligence on education: a new frontier in the game between great powers. *Journal of East China Normal University (Educational Science Edition)*, 2023, 07: 15-25.
- [10] Rahiman H U, Kodikal R. Revolutionizing education: Artificial intelligence empowered learning in higher education. *Cogent Education*, 2024, 11(1): 2293431.
- [11] Fryer L K, Nakao K, Thompson A. Chatbot learning partners: Connecting learning experiences, interest and competence. *Computers in human Behavior*, 2019, 93: 279-289.
- [12] Güner H, Er E, Akçapınar G, et al. From chalkboards to AI-powered learning. *Educational Technology & Society*, 2024, 27(2): 386-404.
- [13] Fernoagă V, Stelea G A, Gavrilă C, et al. Intelligent Education Assistant Powered by Chatbots. *eLearning & Software for Education*, 2018, 2.
- [14] Luo J. How does GenAI affect trust in teacher-student relationships? Insights from students' assessment experiences. *Teaching in Higher Education*, 2024: 1-16.
- [15] Wang Youmei, Wang Dan, Liang Weiye, et al. Ethical Risks and Mitigation Approaches in the Educational Application of ChatGPT. *Open Education research*, 2023, 02: 26-35.
- [16] Zhou Hongyu, Chang Shunli. The future landscape, potential risks, and governance of generative artificial intelligence embedded in higher education. *Modern Education Management*, 2023, 11: 1-12.
- [17] Xie T, Pentina I, Hancock T. Friend, mentor, lover: does chatbot engagement lead to psychological dependence?. *Journal of service Management*, 2023, 34(4): 806-828.
- [18] Li Jihong, Wang Haiying, Wang Dalei. Real Challenges and Practical Approaches in Building a New Type of Teacher-Student Relationship in Vocational Colleges from the Perspective of Generative Artificial Intelligence. *Education and Vocation*, 2024, 11: 78-84.

- [19] Aljanabi M. ChatGPT: Future directions and open possibilities. *Mesopotamian journal of Cybersecurity*, 2023: 16-17.
- [20] Qadir J. Engineering education in the era of ChatGPT: Promise and pitfalls of generative AI for education. 2023 IEEE Global Engineering Education Conference (EDUCON). IEEE, 2023: 1-9.
- [21] Zhai X. ChatGPT user experience: Implications for education[J]. Available at SSRN 4312418, 2022.
- [22] Lund B D, Wang T. Chatting about ChatGPT: how may AI and GPT impact academia and libraries?. *Library hi tech news*, 2023, 40(3): 26-29.
- [23] Hasal M, Nowaková J, Ahmed Saghair K, et al. Chatbots: Security, privacy, data protection, and social aspects. *Concurrency and Computation: Practice and Experience*, 2021, 33(19): e6426.