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INVESTIGATING THE IMPACT OF CHATBOTS IN DIFFERENT LEARNING CONTEXTS ON STUDENT ENGAGEMENT AND CRITICAL THINKING

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Abstract

Technology integration in education has been a topic of interest for many years. Among those technologies, chatbots have been used in many educational settings. However, the impact of chatbots on students' engagement and critical thinking in different learning contexts has not been fully explored. This study investigated the impact of chatbots in different learning contexts on student engagement and critical thinking. A literature review examined previous studies on using chatbots in different learning contexts and relevant theoretical frameworks on student engagement and critical thinking in online and blended learning contexts. This study's results revealed that chatbots could improve students' engagement in different learning contexts and support the development of critical thinking skills. However, the design and features of chatbots should be aligned with the learning context to achieve optimal results. This study fills a gap in the literature by providing insight into how chatbot-mediated instruction may vary in different learning contexts and its possible impact on student engagement and critical thinking. The findings of this study have implications for chatbot design and instruction in different learning contexts, and it could be considered a valuable reference for educators, instructional designers, and researchers.

Keywords: *chatbots, learning contexts, student engagement, critical thinking*

Introduction

Technology integration in education has been a topic of interest for many years (Nelson et al., 2019; Tondeur et al., 2019). Among those technologies, chatbots have been used as a teaching and learning aid in many educational settings (Smutny & Schreiberova, 2020; Yang & Evans, 2019). However, the impact of chatbots on students' engagement and critical thinking in different learning contexts (such as online and blended learning) has not been fully explored. This study investigated the impact of chatbots in different learning contexts on student engagement and critical thinking.

Chatbots, or conversational agents, are computer programs that simulate human conversation (Hussain et al., 2019). They can provide information, answer questions, and perform various tasks (Meyer von Wolff et al., 2019). In education, chatbots have been used to support various learning activities, such as answering students' questions, providing feedback, and facilitating discussions (Huang et al., 2022). Despite the increasing use of chatbots in education, the impact of chatbots on student engagement and critical thinking in different learning contexts (such as online and blended learning) has not been fully explored.

The present study endeavours to answer the following questions: Firstly, how does the usage of chatbots influence the level of student engagement across a variety of learning contexts, such as blended and online? Secondly, how do chatbots facilitate the development of critical thinking skills in diverse learning settings, such as online and blended environments? By examining these questions, the research aims to provide insights into the role of chatbots in enhancing learning outcomes and strategies for their effective implementation in varied educational contexts. The investigation utilises a mixed-methods data collection and analysis approach to draw robust conclusions from the gathered data.

This study is essential for several reasons. First, it provides insight into how chatbot-mediated instruction may vary in different learning contexts and its possible impact on student engagement and critical thinking. Second, it can be considered a valuable reference for

educators, instructional designers, and researchers interested in using chatbots in education. Third, it can inform the design of chatbots aligned with the learning context to achieve optimal results.

A literature review examined previous studies on using chatbots in different learning contexts and relevant theoretical frameworks on student engagement and critical thinking in online and blended learning contexts. Additionally, existing chatbot systems were analysed, and data were collected from studies investigating using chatbots in different learning contexts.

Many studies have investigated using chatbots in education (Palasundram et al., 2019; Sreelakshmi et al., 2019; Zahour et al., 2020). These studies have shown that chatbots have the potential to support various learning activities, such as answering students' questions, providing feedback, and facilitating discussions. Additionally, some studies have reported that chatbots can improve students' engagement and motivation (Ebadi & Amini, 2022; Kim et al., 2019; Kuhail et al., 2022). However, most of these studies have focused on the use of chatbots in traditional face-to-face classrooms, and less is known about the use of chatbots in different learning contexts, such as online and blended learning.

Student engagement is a critical factor that affects student learning outcomes (Bowden et al., 2021; Dwivedi et al., 2019). In online and blended learning contexts, student engagement can be impacted by various factors, such as the learning environment's design, interaction type, and technology use (Chen & Liang, 2018).

One way to increase student engagement in online and blended learning contexts is to create a learning environment that encourages interaction between students and instructors and to provide access to technology that supports collaborative learning activities (He & Zhao, 2020). Providing access to digital tools and resources, along with educational guidance, can help further to enhance student engagement in online and blended learning contexts (Sahni, 2019). Game-based learning activities can also effectively increase student engagement in online and blended learning contexts (Holbrey, 2020).

This paradigm of active engagement and collaboration is beneficial for boosting student interaction and creates an ideal framework for fostering an essential skill in education - critical thinking. Critical thinkers are more than just engaged students; they analyse, evaluate, and synthesise the presented information, using it to construct an informed perspective. Critical thinking is a cognitive process that involves analysing, evaluating, and synthesising information (Dwyer et al., 2014; Garrison et al., 2001; Snyder & Snyder, 2008). In online and blended learning contexts, technology can support the development of critical thinking skills by providing opportunities for collaboration and simulation (Castro, 2019).

For example, online discussion forums, simulations, and collaborative projects can all be used to foster and develop critical thinking skills in online and blended learning contexts (Geng et al., 2019). These activities enable students to apply the concepts they are learning to real-world situations, strengthening their ability to reason and think critically. Additionally, using technology in online and blended learning contexts can support the development of critical thinking skills by allowing students to explore subject material in depth and making them more aware of the implications of their decisions (Geng et al., 2019).

Theoretical frameworks such as the Community of Inquiry (CoI) framework (Castellanos-Reyes, 2020; Garrison et al., 1999) and the Technology Acceptance Model (TAM) (Davis, 1989) can be used to explain the impact of different learning contexts on student engagement and critical thinking. The CoI framework suggests that student engagement and critical thinking are impacted by the quality of the social, cognitive, and teaching presence in the learning environment (Law et al., 2019). The TAM suggests that the technology's perceived usefulness and ease of use impact student engagement and critical thinking (Fearnley & Amora, 2020).

Therefore, it is essential to consider the impact of the learning environment and technology when designing online learning experiences to ensure that students are engaged and

have the opportunity to practice critical thinking. Furthermore, educators should also consider other factors, such as the learner's prior knowledge and experience, the level of instructor support, and the design of learning activities to ensure that students are engaged and can practice critical thinking. Additionally, learner motivation should also be considered, as this plays an essential role in fostering engagement and critical thinking.

The literature review revealed that while many studies have investigated the use of chatbots in education, there is a lack of research on how the use of chatbots in different learning contexts (such as online and blended) impacts student learning engagement and critical thinking. Further research is needed to assess the impact of chatbot-based learning on student learning outcomes and to identify best practices for their successful implementation in education. Additionally, research should be conducted to understand how chatbot technology can facilitate more equitable and inclusive learning experiences. In order to explore the potential of chatbot technology for educational purposes, research should also be conducted to examine how it can be used to support a variety of learning styles and needs.

Given the gaps in the literature, this study aimed to investigate the impact of chatbots in different learning contexts on student engagement and critical thinking. The findings of this study will provide insight into how chatbot-mediated instruction may vary in different learning contexts and its possible impact on student engagement and critical thinking. The findings will also inform the design of chatbots that are aligned with the learning context to achieve optimal results. The results of this study are expected to provide practitioners with a better understanding of the potential of chatbot-mediated instruction for student engagement and critical thinking, as well as guidelines for chatbot design and implementation. This will enable educators to make the most effective use of chatbot technology in the classroom. This could lead to improved student outcomes and more effective use of instructional time. Further research is necessary to explore the implications of the findings of this study and determine the long-term impact of chatbot-mediated instruction on student engagement and critical thinking.

Method

The research design, data collection, and analysis methods used in this study were a literature review, chatbot systems analysis, and data analysis. A literature review examined previous studies on using chatbots in different learning contexts and relevant theoretical frameworks on student engagement and critical thinking in online and blended learning contexts. Relevant studies were identified by searching online databases such as JSTOR, ProQuest, and Google Scholar. The search terms used included "chatbots," "conversational agents," "online learning," "blended learning," "student engagement," and "critical thinking." Existing chatbot systems used in different learning contexts (online and blended) were analysed. The chatbot systems were selected based on their popularity and the availability of information about their design and features. The analysis included examining the chatbot's design.

This study has some limitations. First, the scope of the study is limited to chatbots used in different learning contexts and does not include other forms of conversational agents, such as voice assistants. Second, the sample size for the data analysis may be limited and not generalisable to a larger population. Third, the data collected from the studies used in the analysis may not be directly comparable due to the different methodologies used in each study. Validity and reliability are essential aspects of any research study. Multiple sources of information were used to ensure the study's validity, including a literature review, chatbot systems analysis, and data analysis. To ensure the reliability of the study, a thorough analysis of the data was conducted, and the results were cross-checked with previous studies and the theoretical frameworks used in this study.

In this way, the methodology used in this study aimed to provide a comprehensive understanding of using chatbots in different learning contexts and its possible impact on student

engagement and critical thinking. Through the literature review, chatbot systems analysis, and data analysis, this study aimed to provide evidence to answer the research questions and achieve the study's objectives.

Results

The results of this study reveal the impact of chatbots in different learning contexts on student engagement and critical thinking.

Chatbot systems analysis

The chatbot systems analysis revealed that chatbots used in different learning contexts have different designs and features (Huang et al., 2022; Neto & Fernandes, 2019; Tran & Luong, 2020). Some chatbots were designed to answer students' questions, provide feedback, and facilitate discussions, while others provided personalised support, adaptive learning, and gamification.

Data analysis- student engagement

The data analysis revealed that chatbots could improve students' engagement in different learning contexts (Huang et al., 2022; Kohnke, 2022; Plantak Vukovac et al., 2021). Chatbots effectively provided immediate feedback, answered students' questions, and facilitated discussions, all contributing to student engagement.

Data analysis- critical thinking

The data analysis also revealed that chatbots have the potential to support the development of critical thinking skills in different learning contexts. Chatbots effectively provided collaboration, simulation, and problem-solving opportunities, all of which support critical thinking (Chang, Hwang, et al., 2022; Chang, Kuo, et al., 2022; Subramaniam, 2019).

Data analysis- online learning and blended learning

The data analysis revealed that chatbots positively impact student engagement and critical thinking in online and blended learning contexts. Chatbots effectively provided immediate feedback, answered students' questions, and facilitated discussions (Abbas et al., 2022; Chen et al., 2022; Lee et al., 2020). Additionally, chatbots effectively provided opportunities for collaboration, simulation, and problem-solving.

Theoretical frameworks

The theoretical frameworks suggest that student engagement and critical thinking are impacted by the quality of the learning environment's social, cognitive, and teaching presence (Carrillo & Flores, 2020; Lim & Richardson, 2021; Martin & Borup, 2022). The chatbot systems analysis revealed that chatbots can potentially improve social and cognitive presence in the learning environment.

The Chatbot design and features

The design and functionality of chatbots are vital contributors to their efficacy in enhancing student engagement and critical thinking. Specifically, chatbots are constructed to address student inquiries, offer constructive feedback, and promote practical discussions, thereby improving student engagement (Studente & Ellis, 2020). Furthermore, chatbots with features like personalised assistance, adaptive learning modules, and gamified elements have shown noteworthy success in fostering the growth of critical thinking skills (González-González et al., 2023).

Comparison of online and blended learning

The data analysis revealed that chatbots similarly impact student engagement and critical thinking in online and blended learning contexts (Fidan & Gencel, 2022; Huang et al., 2019; Mai, 2022; Studente & Ellis, 2020). The chatbots effectively provided immediate feedback, answered students' questions, facilitated discussions, and provided collaboration, simulation, and problem-solving opportunities.

In conclusion, this study's results reveal that chatbots can improve student engagement and critical thinking in different learning contexts, such as online and blended learning.

However, the design and features of chatbots should be aligned with the learning context to achieve optimal results.

Findings and Discussions

The study aimed to investigate the impact of chatbots in different learning contexts on student engagement and critical thinking. The study revealed that chatbots could improve student engagement and critical thinking in different learning contexts, such as online and blended learning. However, the design and features of chatbots should be aligned with the learning context to achieve optimal results.

Chatbots and student engagement

The study revealed that chatbots could improve student engagement in different learning contexts. Chatbots effectively provide immediate feedback, answer student's questions, and facilitated discussions, all of which contribute to student engagement (Abbas et al., 2022). This aligns with previous studies that have reported that chatbots can improve students' engagement and motivation.

Therefore, it is essential to consider utilising chatbots to enhance student engagement in the classroom and online learning environments. To maximise the potential benefits of chatbots, it is essential to design and implement them to fit the specific learning context. In order to do this, educators should focus on incorporating chatbot features tailored to their students' needs (Wollny et al., 2021). Furthermore, it is critical to provide ongoing support and training for educators to ensure they can use chatbot technologies in their classrooms effectively.

Chatbots and critical thinking

The results of the study also revealed that chatbots have the potential to support the development of critical thinking skills in different learning contexts. Chatbots effectively provided collaboration, simulation, and problem-solving opportunities, which all support critical thinking (Chang, Kuo, et al., 2022). This aligns with previous studies that have reported that technology can support the development of critical thinking skills.

Furthermore, chatbots can provide personalised feedback and guidance to students, which is essential for developing critical thinking skills (Chen et al., 2022). Additionally, chatbots can provide students with instant feedback, allowing them to make more informed decisions and gain insight into their learning process. This suggests that chatbots can be a powerful tool for developing students' critical thinking skills and that further research should be conducted to explore this potential. In order to maximise the potential of chatbots to support the development of critical thinking skills, there should be an emphasis on utilising them in meaningful learning activities that emphasise collaboration, problem-solving, and reflection.

Chatbot design and features

The outcomes of this study underscored the pivotal role of chatbot design and features in influencing student engagement and critical thinking. It was observed that chatbots, engineered to respond to students' queries, offer feedback, and stimulate discussions, yielded significant improvements in student engagement (Hew et al., 2022). Moreover, chatbots fitted with personalised support mechanisms, adaptive learning elements, and gamified features demonstrated their efficacy in bolstering the developing of critical thinking skills. These findings emphasise the need to consider specific learning goals and contexts carefully when designing and integrating chatbots into educational frameworks.

It is essential to ensure that the design and features of chatbots are tailored to the needs of learners in order to maximise their effectiveness. Chatbots' design and features should be carefully considered when designing and implementing them in education. Chatbots can provide students with a practical and engaging learning experience by leveraging the right design and features. Therefore, it is essential to ensure that chatbots are designed with the right features to meet the needs of learners.

Online and blended learning

The study found that chatbots similarly impact student engagement and critical thinking in online and blended learning contexts. This suggests that chatbots can be valuable for supporting student engagement and critical thinking regardless of the specific learning context. To further explore this potential, future research should focus on how best to implement chatbots in various learning contexts. This should include looking at how chatbots can support learners in synchronous and asynchronous online learning environments. Additionally, research should focus on the effectiveness of chatbots in facilitating collaboration between learners in different learning contexts.

Theoretical frameworks

The study found that theoretical frameworks such as the Community of Inquiry (CoI) framework and the Technology Acceptance Model (TAM) can be used to explain the impact of different learning contexts on student engagement and critical thinking. The CoI framework suggests that student engagement and critical thinking are impacted by the quality of the social, cognitive, and teaching presence in the learning environment (Shea & Bidjerano, 2009). The TAM suggests that the technology's perceived usefulness and ease of use impact student engagement and critical thinking (Legris et al., 2003). This highlights the importance of considering these frameworks when designing and implementing chatbots in education.

This suggests that educators must be mindful of how the chatbot's design supports the desired learning outcomes and whether the technology is user-friendly to maximise student engagement and critical thinking. Therefore, educators need to be aware of the potential for chatbots to influence student engagement and critical thinking and to create an effective learning environment. To ensure the successful implementation of chatbots in education, educators should thoroughly understand the theoretical frameworks and how they can be applied to the chatbot's design. This involves carefully considering the pedagogical implications of the chatbot and the potential impact it can have on student engagement and critical thinking.

Gaps in the literature

The study aimed to fill a gap in the literature by investigating the use of chatbots in different learning contexts, specifically online and blended learning. The study's results provide insight into how chatbot-mediated instruction may vary in different learning contexts and its possible impact on student engagement and critical thinking.

The findings of this study suggest that chatbot-mediated instruction can be beneficial in different learning contexts, as it can potentially increase student engagement and critical thinking. Future research should further investigate the impact of chatbot-mediated instruction on student engagement and critical thinking in different learning contexts. It is also essential to consider how chatbot-mediated instruction can best be used to improve learning outcomes and foster student success in each learning context. This research is a starting point to explore the potential of chatbot-mediated instruction in different learning contexts and its implications for student engagement and critical thinking.

Implications for practice

The results of the study have implications for the practice of using chatbots in education. The study highlights the importance of considering specific learning objectives and contexts when designing and implementing chatbots. Furthermore, the study suggests that chatbots with personalised and adaptive features and gamification elements can enhance student engagement and critical thinking skills (Tsvilodub et al., 2023).

To ensure effective implementation, teachers should clearly understand the student's needs and learning objectives and be involved in the design process of chatbots. Additionally, teachers should be well-versed in the features and capabilities of chatbots and understand how to use them to promote learning in their classrooms (Nadi et al., 2022). Teacher training and support should be incorporated into any implementation plan for using chatbots in education to

maximise the effectiveness of their use. Furthermore, it is essential to evaluate the effectiveness of chatbots regularly to ensure they are meeting the desired learning outcomes.

Implications for future research

The study's results also have implications for future research on using chatbots in education. Future research could investigate the use of chatbots in other learning contexts, such as K-12 education or vocational training. Additionally, future research could further investigate the impact of different chatbot designs and features on student engagement and critical thinking. Future research could also explore how different learning styles interact with different types of chatbot designs to optimise student learning. Furthermore, the research could also examine how to design practical chatbot-based learning experiences to enhance student motivation and engagement. Future research could also look into how chatbot technology can be used to support personalised learning, as well as how to evaluate the efficacy of chatbot-based learning experiences. Finally, the research could explore the potential of combining chatbot technology with other educational technologies to create immersive and interactive learning experiences.

As a result, further research is necessary to determine the effectiveness of chatbots in various contexts and with larger sample sizes. Furthermore, examining the differences between chatbots and voice assistants would be essential to determine which technology is better suited for particular learning contexts. Comparing the results of the studies to each other would provide a more comprehensive understanding of the effectiveness of chatbots. Further research should also explore the differences between chatbots and voice assistants to determine which technology is better suited for particular learning contexts.

Conclusion

In conclusion, this study aimed to investigate the impact of chatbots in different learning contexts on student engagement and critical thinking. The study revealed that chatbots could improve student engagement and critical thinking in different learning contexts, such as online and blended learning. However, the design and features of chatbots should be aligned with the learning context to achieve optimal results.

The study's main findings were that chatbots effectively provide immediate feedback, answer students' questions, and facilitate discussions, improving student engagement in different learning contexts. Additionally, chatbots effectively provide collaboration, simulation, and problem-solving opportunities, which support the development of critical thinking skills. The study has implications for the practice of using chatbots in education. The study highlights the importance of considering specific learning objectives and contexts when designing and implementing chatbots. Furthermore, the study suggests that chatbots with personalised and adaptive features and gamification elements can enhance student engagement and critical thinking skills. This can guide educators and instructional designers in effectively using chatbots in their instruction.

The study also has implications for future research on using chatbots in education. Future research could investigate the use of chatbots in other learning contexts, such as K-12 education or vocational training. Additionally, future research could further investigate the impact of different chatbot designs and features on student engagement and critical thinking to enhance the understanding of how chatbots can support student learning.

In this way, the results of this study provide valuable insights into the use of chatbots in different learning contexts and their possible impact on student engagement and critical thinking. This can help educators, instructional designers, and researchers make informed decisions when using chatbots in education and provide direction for future research.

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