Analysis of Pedagogical Applications and Awareness Issues of Using Chatbots in The Science Classroom

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Abstract. Over the several years, there has been a significantly increased in the use of educational technology through chatbot applications. This paper aims to present the use of chatbots to help students meet their achievement in the science classroom. Chatbots can enhance potential of students’ learning by providing quick feedback, satisfying response, stimulating involvement, and personalize learning which depending on the specific requirements of each student. The potential applications of chatbots in a wide variety of scientific subjects, spanning various kind of knowledge. Additionally, it evaluates the familiarity of teachers with chatbots in the classroom. The paper discuss how it is useful, possibility, and ethical concerns in science education by shedding light on the possibility and effectiveness of using chatbots as teaching aids in science classes.

1 Introduction

The development of artificial intelligence and the period of the modern technological era have had a significant impact on education [1,2]. These processes have occurred simultaneously to educational management, students’ nature of learning, adaptative learning, and accepting chatbots into classroom. Chatbots are being used in a wide range of educational environments, even though the integration of it into teaching and learning is becoming more common. It is possible that incorporating a chatbot into a scientific classroom might be an interesting and engaging way to improve the learning experience for both the students and the teachers [3].

Teachers have the ability to present students with a new manner of learning that goes beyond the techniques that are traditionally used. Students have the opportunity to ask questions, get answers, and dive deeper into scientific subjects. Not only does this make in-class activities more interesting, but it also encourages students to participate actively, which is something that is very necessary in the educational system. Chatbots technology has

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profoundly influenced many aspects of our life, including education [4]. It becomes a useful instrument in education, namely in the areas of classroom participation and assistance, among other technical advancements [5].

Chatbots are often used in different purposes, chatbot may serve as a multifunctional tool due to its adaptability, helping students with challenging concepts and offering real-time assistance for complex scientific challenges. Its ability to generate unique and rapid answers to certain questions. Chatbot may be used by teachers as an additional tool to help students understand scientific concepts more, clarify concepts, design lesson plans or experiments, and engage students with course materials [2,6]. It has the potential to revolutionize science education by enhancing the learning experiences and opening up new avenues for critical thinking, collaborative discovery, and creativity based on text generating.

Chatbots play a substantial role in enhancing accessibility and diversity in the field of education. It may function as a tools for students with diverse learning styles or those who need extra assistance. The chatbots' conversational interface may enhance the accessibility of learning, particularly for students who may feel reluctant to inquire in a conventional classroom environment. Furthermore, chatbots may be built to provide information in several languages, thereby overcoming any linguistic obstacles that may hinder the learning experience.

The utmost importance lies in addressing privacy problems, making ethical considerations, and implementing strong cybersecurity safeguards. Furthermore, it is essential to ensure that chatbots enhance human interactions rather than substitute them, in order to preserve the personal and sympathetic elements of education. The continuous advancement of technology, the role of chatbots in education is expected to grow, providing teachers and students with creative ways to improve the entire learning experiences. Adopting it into a new age of science learning.

2 Useful of Chatbots in Science Classroom

Chatbots have potential uses in science classes and might improve students’ learning in many appropriate ways. Students may get tailored learning. The advantages of incorporating chatbots into science teaching and learning can be highlighted that chatbots enrich students' learning and their achievement in several ways. According to cognitive load theory, chatbots provide personalized assistance, which improves the learning experience by adapting it to each student's cognitive abilities [7].

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Chatbots may be used to simplify difficult contents or subjects for students’ understanding. Students who are having some difficulty comprehending a certain content might ask chatbots to get answers in a different manner. However, they have to critique and ask teachers about its reliable and accuracy. Chatbots have the ability to provide various explanations in order to accommodate a variety of learning styles. Students have just prepare the effective questions and learn to deal with various kinds of information. Chatbots may be generate some information from a wide range of resources, but students have to had critical thinking and positive communication with others.

Chatbots can generate questions and answers in which students may ask questions about natural and physical worlds. The results of its response can make students be satisfied with answering. Teachers might want to have Q&A skills to learn with chatbots that are connected to the topics discussing in class. For students, this may be an engaging and participatory opportunity to further investigate the interesting contents which they are learning.
Simulations and scenarios

Students may engage in theoretical discussions, experimentation, and problem-solving with the help of chatbots. The simulated settings can enhance student engagement with chatbots through the positive feedback. The various scientific pursuits, such as theoretical debates, experimentation, and problem solving, might be covered in the exchanges. This method seeks the ways to improve science education by giving students a chance to put what they have learned into a virtual, hands-on setting, and by incorporating contemporary educational technology into traditional science classroom.

Peer teaching

Students are required to create learning models that mimic chatbot functionality and they are required to construct their own knowledge. This means the models will have the ability to explain things, respond to queries, and carry on discussions on scientific contents. Students should begin their learning through information literacy or AI literacy by reading up and understanding on the particular scientific ideas.
Research assistance

The use of chatbots is being suggested or even mandated to students. They may pose questions about certain scientific subjects, and the chatbot will respond with pertinent information. As part of the procedure, students may ask the chatbot questions about various scientific subjects. They may learn about the importance of technology in the classroom via the usage of chatbots for research. Students learn to effectively use technology to supplement their academic pursuits by interacting with a linguistic model for inquiry.

Writing assistance

Students use chatbots as a writing support tool to create idea and express feelings. They create written material based on questions or phrases that response to eager. The material takes the form of essays or explanations, it is indicating that the emphasis on conveying knowledge and demonstrating comprehension. The employment of chatbots is thought to help them improve communication abilities. Students may improve their ability to express ideas clearly and successfully communicate information by working with the chatbot to develop textual explanations. Chatbots are used not just to generate textual material but also to assess students' conceptual understanding.
Chatbots may be taught to give aid and instruction that is neither too easy nor too hard, creating an ideal learning environment. Based on the student's answers and degree of comprehension, they may dynamically change the difficulty, provide more explanations, or give more practice. Chatbots provide a kind of social learning that may not be possible with human interactions alone. A more interactive and cooperative classroom setting may result from the incorporation of this social component. In this essence, it enables the use of chatbots in science instructional achievement. The idea of personalized assistance is in line with educational philosophies that stress the significance of accommodating unique student needs and making the most of each student's educational experiences.

3 Ethical Considerations on Chatbots in Classroom

A thorough analysis of the many ethical issues raised by the use of chatbots in science classroom is necessary. Even though there are many advantages to using it as a digital tool, there are concerns about privacy, data security, equal access, and possible effects on human connections. Data security and privacy, chatbots often gather and handle user data. In the context of education, this might include gathering data on the performance, preferences, and learning styles of the students. Information about the data being gathered and its intended use must be made transparent.

It is possible that some students don't have the same access to technology outside of the classroom. There's a chance that using chatbots to help with homework or provide extra learning support would exacerbate already-existing socioeconomic gaps. That all students, regardless of their background, have equitable access to educational resources, ethical concerns should address the possible influence to learning gap. This issue, ethical decision-making and fair of access, teachers may have a more sophisticated grasp of ethical dilemmas than a chatbot [8]. Also, student-teacher relationship, teachers are able to give emotional support and understanding. Maintaining a positive teacher-student connection is crucial from an ethical standpoint [9]. Teachers should use chatbots as additional tools to enhance student learning, not as a replacement for technology. The ethical framework needs to highlight how technology and human teaching function together.

Ethical considerations should address the potential risks of data breaches and the preservation of educational system integrity [10]. It is critical that teachers, administrators, and legislators set clear guidelines, and communicate openly with stakeholders. It is also continuously evaluated the effects of these technologies on students' education and well-being in order to navigate the ethical landscape of integrating chatbots into science classrooms. Ensuring that the implementation of chatbots is in line with the values of fairness, privacy, and the general best interests of students requires ethical considerations to be a crucial component of the decision-making process.

Several moral questions arise from incorporating chatbots into the science classroom, chatbots provide an opportunity for students to cheat on tests, homework, and other academic tasks. This has the potential to create an uneven playing field for students and compromise the credibility of education as a whole. Students' capacity to develop critical thinking and problem-solving abilities may be hampered if they become too dependent on chatbots for assistance with their studies. Another concern is that students who rely only on chatbots for responses would not have the chance to learn from their own errors.

Problems in understanding how chatbots make judgments or come up with replies arise from their lack of openness about their internal workings. Accountability and justice may be called into question due to this opaqueness. Beyond these broad ethical considerations, there are more nuanced worries about the use of chatbots in various forms of formal and informal education. In primary classrooms, for instance, chatbots might assist pupils with fundamental arithmetic or give them basic factual information. Nevertheless, it should be avoided that
Chatbots are used to supplant human conversation or to instruct pupils in intricate ideas. One possible application of chatbots is to help students with homework by connecting them to relevant resources and answering their inquiries.

4 Conclusions

The increasing influence of technology on education has led to a growing interest in the use of chatbots to enhance students' learning experiences. Chatbots, driven by artificial intelligence, a basic informative aid to interactive instructional companions. An important trend in the future of chatbots in education is the focus on customization and adaptive learning. Chatbots has the capacity to examine individual learning styles, preferences, and performance data in order to customize educational material and interventions. It may enhance the learning experience by offering individualized feedback, adapting to students' requirements, and giving specific resources. This fosters a more efficient and captivating learning environment.

Due to the global nature of education, chatbots are expected to provide improved multilingual assistance, effectively overcoming language obstacles. Upcoming chatbots will be developed to provide information and support in several languages, guaranteeing equal access to educational materials for students throughout the globe. This phenomenon corresponds to the worldwide scope of online education and promotes a more comprehensive learning atmosphere. It has the potential to function as virtual facilitators for groups, promoting collaboration, dialogue, and the exchange of information among students.

Chatbots are positioned to have a vital function in the domain of ongoing evaluation and feedback. Possible future advancements may include the use of chatbots that conduct tests, assess tasks, and provide immediate feedback to students. The real-time evaluation not only facilitates continuous learning but also enables educators to adjust their teaching methods depending on students' performance data, promoting a dynamic and adaptable educational setting. The incorporation of chatbots into students' learning experiences is now experiencing a significant transformation, and the patterns addressed here provide a preview of the future of education [11, 12]. With increasing sophistication, personalization, and integration with advanced technology, chatbots have the potential to transform the educational environment by offering students dynamic, adaptable, and immersive learning experiences. While adopting these trends, it is essential to preserve equilibrium, guaranteeing that ethical, privacy, and fairness concerns are at the core of the creation and implementation of chatbots in education.

In the future, the combination of technology and teaching methods will create a new age when chatbots play a crucial role in improving students' learning experiences [13]. However, the real-life situations and human interaction needed to encourage our students to learn and live with others, learn to create our society with other technologies based on sustainable development [14]. The chatbots can be used in classroom with suitable design classroom and allow students to deal with artificial intelligences as well as constructive and inquiry-based learning. Science classroom cannot reject chatbots or other educational technologies, but students require to deal with virtual and reality in balance. The discussion about chatbots in science classroom should be elaborated and applied based on ethical considerations as well.

References

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