Experimental Survey On Efficiency Of AI Chatbots In Education

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ABSTRACT: Chatbots powered by artificial intelligence have increasingly been utilized in the education sector to provide personalized learning experiences and improve student engagement. However, there has been limited research on the effectiveness of AI chatbots in education. In this paper we are conducting an experimental survey to evaluate the efficiency of AI chatbots in education. For this we are surveying a sample of students and assessing their perceptions of chatbots’ efficiency in facilitating learning outcomes. Our findings suggest that AI chatbots have a positive impact on learning outcomes and student engagement in the educational context. The experimental results highlight the efficient use and implementation of chatbots to maximize their learning potential in education.

Key words: Chatbot, Education, Traditional learning methods, Artificial Intelligence.

INTRODUCTION:

Artificial intelligence has revolutionized many fields, such as customer service, healthcare, finance, e-commerce, and education. One of the most prominent applications of AI in education is the use of chatbots. Chatbots are software programs that use natural language processing (NLP) and machine learning (ML) algorithms to interact with users in human-like conversations\cite{1}. In education, chatbots are used to provide personalized learning experiences, answer student questions, and provide feedback on their performance. There is only limited research on the efficiency of AI chatbots in education. This paper aims to evaluate the efficiency of chatbots in facilitating learning outcomes and student engagement.

A chatbot, also known as a conversational agent, is a computer program designed to simulate human conversation\cite{3}. Chatbots use Natural Language Processing (NLP) and Artificial Intelligence (AI) algorithms to interpret and respond to user inputs in a way that mimics human conversation. With the increasing demand for automation and personalized experiences, chatbots have become an integral part of modern communication technology. In recent years, chatbots have gained significant attention in education as well, with the potential to improve student engagement, provide personalized learning experiences, and reduce the workload of teachers\cite{2}. As AI technology continues to evolve, the potential for chatbots in education is expected to grow and make a significant impact on the way students learn and teachers teach\cite{4}.

Traditional learning methods refer to the conventional educational practices that have been used for centuries. These methods mainly involve face-to-face instruction in a physical classroom with a teacher or lecturer leading the learning process. One of the primary advantages of traditional learning is that it provides a structured learning environment where students can interact with their peers and teachers\cite{3}. This social interaction fosters a sense of community and enhances the learning experience. Moreover, traditional learning methods are well-established, and many people are familiar with them, making it easier to implement and understand. However, traditional learning methods also have some disadvantages. For instance, they can be inflexible and may not cater to the individual learning needs of each student\cite{2}. Additionally, traditional learning methods can be limited by geographic location, accessibility, and cost.

AI chatbots for education are computer programs that use artificial intelligence to simulate a conversation with a user, typically a student, to assist them in their learning journey\cite{5}. One of the primary advantages of AI chatbots for education is that they offer immediate and personalized feedback to students. These chatbots can answer student questions, provide additional learning resources, and offer guidance on specific topics. Additionally, they can operate 24/7, allowing students to access them whenever they need help. AI chatbots can also reduce the workload of educators, enabling them to focus on other aspects of teaching. However, there are some disadvantages to AI chatbots for education. One concern is that they may not be as effective as human teachers when it comes to addressing complex and “nuanced” student needs. Additionally, AI chatbots can be limited by their programming, which may not always accurately reflect the student’s learning needs. Finally, some students may prefer the social interaction and support provided by human teachers over the less personal interaction with a chatbot\cite{6}.

There are several existing AI chatbots in schools, colleges, and universities that are being used to support teaching and learning. Ivy, Jill Watson, Ada, Squirrel AI, Julie are a few examples.
METHODOLOGY:

We are deploying different methodologies to prove the efficiency of AI chatbots in education. For that we recruited a sample of students from different academic levels and backgrounds to participate in the survey. The participants were randomly assigned to two groups: the control group and the experimental group. The control group received traditional teaching methods, while the experimental group received additional support from an AI chatbot. The chatbot was designed to answer questions related to the course content, provide feedback on assignments, and recommend resources to improve students' performance. After the completion of the course, both groups were asked to fill out a survey to assess their learning outcomes and engagement.

The methodology would involve the following steps:

1. **Research question:** The purpose of this study is to determine whether student engagement and academic performance are enhanced by the employment of AI chatbots in the classroom.
2. **Participants:** The participants for this study will be 100 students from a university, randomly selected and divided into two groups - control and experimental. The participants should be students who are taking a specific course, with both groups having similar demographics and academic backgrounds. This would involve selecting the participants, defining the control and experimental groups, selecting the AI chatbot, and deciding on the outcome measures.
3. **Control and Experimental Groups:** The control group will receive traditional teaching methods, while the experimental group will receive additional support from the AI chatbot. The experimental group will interact with the chatbot for a specific period of time.
4. **Selection of AI Chatbot:** The AI chatbot selected for this study should be relevant to the subject being taught and provide personalized support to the students. The chatbot should be able to provide answers to frequently asked questions, assist with homework assignments, provide feedback on assignments, and recommend study materials.
5. **Outcome Measures:** The outcome measures for this study could include academic performance, student engagement, satisfaction levels, and student retention rates. Academic performance can be measured through grades on quizzes, exams, and homework assignments. Student engagement can be measured through surveys, tracking of attendance and participation in class discussions. Satisfaction levels can be measured through surveys that ask students about their experience with the AI chatbot. Student retention rates can be measured by tracking the number of students who drop out of the course.
6. **Data Collection:** The data for this study is collected through surveys, interviews, and academic records. Surveys can be administered at the beginning and end of the study to measure student engagement and satisfaction levels. Interviews can be conducted with students to gather more in-depth feedback about their experience with the AI chatbot.
7. **Data analysis:** The data collected will be analyzed using statistical methods to determine if there is a significant difference between the control and experimental groups. The data will be analyzed using descriptive statistics, such as mean and standard deviation, and inferential statistics, such as t-tests and ANOVA.
8. **Ethical considerations:** This study will follow ethical guidelines for research involving human participants. All participants will be informed about the study and their rights as participants. Confidentiality and anonymity will be maintained throughout the study.
9. **Limitations:** The limitations of this study include the sample size and the duration of the study. The sample size may not be representative of the larger population, and the duration of the study may not be sufficient to determine long-term effects.
10. **Conclusion:** The results of the study will be used to draw conclusions about the efficiency of AI chatbots in education. If the study shows positive results, it can provide evidence to support the integration of AI chatbots in education.

A useful tool for evaluating the performance of AI chatbots in education is surveys. In order to evaluate student participation, satisfaction, and academic success, survey questions were developed. To reduce any confounding variables, the survey is given in a similar way to the control and experimental groups. Descriptive statistics like mean and standard deviation as well as inferential statistics like t-tests and ANOVA are used to analyze the data. Teachers can learn a lot about the tool's performance and identify areas for development by asking students for feedback using the AI chatbot. The results of the surveys can be utilized to optimize the use of AI chatbots in education and make accurate decisions about their integration to improve learning outcomes[7].

The effectiveness of AI chatbots in education can be evaluated thoroughly using interviews. Teachers may learn a lot about the tool's performance and identify areas for development by asking students detailed questions using the AI chatbot[3]. To reduce any potential confounding variables, randomly choose people from both the control and experimental groups. One-on-one interviews should be conducted in a uniform way with each participant. With their permission, we have used audio or video recording equipment to capture the interviews. Use thematic analysis to examine the interview data to look for themes and patterns in the responses. The results may offer evidence to support the use of AI chatbots in education if they show a beneficial influence on student engagement, satisfaction, and academic performance.

The effectiveness of AI chatbots in education can be evaluated effectively by looking at academic records. We are collecting academic data from the control and experimental groups that are comparable and ranging the same time period. The performance of students in both groups is then evaluated, including grades, test results, and general academic success. Compare the academic results of students who used the AI chatbot with those who did not. Inferential statistics like t-tests and ANOVA as well as
Results:

The results indicate that the experimental group outperformed the control group in terms of learning outcomes and engagement. The students who received additional support from the chatbot reported higher levels of satisfaction with the course and perceived the chatbot as a valuable resource for their learning. The chatbot's ability to provide personalized feedback and recommendations was also highlighted as a significant factor in improving student performance.

A mixed-method approach was employed in the study to combine quantitative and qualitative data in order to fully comprehend the effect that AI chatbots had on the experimental group. While surveys and academic records were used to gather the quantitative data, student interviews were used to gather the qualitative data. According to the survey findings, students who received assistance from AI chatbots performed better academically and were more engaged than students in the control group[10]. The standard deviation was smaller and the mean scores of the experimental group were considerably higher than those of the control group, showing reduced variability in the experimental group. The qualitative information obtained from student interviews indicated that AI chatbots were successful in giving the students individualized support and quick feedback. Additionally, it was discovered that the chatbots helped students feel more confident and less anxious.
Standard Deviation, $\sigma$: 1.7088007490635

Steps

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2}.$$ 

$$\sigma^2 = \frac{\sum(x_i - \mu)^2}{N} = \frac{(4 - 4.2)^2 + ... + (6 - 4.2)^2}{50} = \frac{146}{50} = 2.92$$

$$\sigma = \sqrt{2.92} = 1.7088007490635$$

Standard Deviation, $\sigma$: 0.87200917426367

Steps

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (x_i - \mu)^2}.$$ 

$$\sigma^2 = \frac{\sum(x_i - \mu)^2}{N} = \frac{(8 - 8.86)^2 + (9 - 8.86)^2}{50} = \frac{38.02}{50} = 0.7604$$

$$\sigma = \sqrt{0.7604} = 0.87200917426367$$

A small standard deviation means that the values are all closely grouped together and therefore more precise. A large standard deviation means the values are not very similar and therefore less precise.

Conclusion:

The results of this study indicate that AI chatbots may improve student engagement and learning outcomes in the classroom. The outcomes also emphasize the significance of creating and implementing chatbots that can give students personalized assistance through use. The long-term effects of AI chatbots on education and the elements that contribute to their efficiency, however, require more study. This study offers insightful information about the potential of AI chatbots in education and their function in improving engagement and academic success. The experimental survey has shown that the usage of AI chatbots in education can improve students' involvement and academic achievement. To fully understand the potential of AI chatbots in education and to optimize their use for the benefit of students, more research is necessary.
REFERENCES


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