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MEDT 8461: Diffusion Dr. Huett
6/15/2024

Research Article Innovation Analysis
An Individual Assignment Related to the Group Project

1. Article Reference

Write the article reference below in APA format (the latest version):

Jančařík, A., Michal, J., & Novotná, J. (2023). Using Ai Chatbot for Math Tutoring. *Journal of Education, Culture & Society*, 14(2), 285–296.
<https://doi.org/10.15503/jecs2023.2.285.296>

2. Database

In what **database** did you find the article?
ERIC (at EBSCOhost)

3. Introduction and (Literature Review) Background

Question	Your Response
a. In your own words, write the statement of the problem (the problem the study is helping to address).	The study addresses the effectiveness and utilization of an AI chatbot designed for math tutoring. Specifically, it examines how students interact with the chatbot while solving math problems. It focuses on their problem solving strategies and engagement with tutorial resources.
b. What was the purpose of the study ?	To pilot and validate an AI chatbot system as a tutoring tool in mathematics education. It aimed to assess whether the chatbot could effectively assist students in learning math independently beyond the traditional classroom setting. Additionally, the study sought to identify behaviors and patterns in student interactions with the chatbot to refine the system for optimal educational support.
c. What were the research questions, hypotheses, evaluation questions, or evaluation objectives ?	How do students engage with the AI chatbot while solving math problems? What are the patterns in student's solution times and their relationship to problem solving strategies?

Question	Your Response
	How effective is the chatbot in differentiating between students actively solving problems and those who do not engage deeply with the content?
d. What conceptual framework or theoretical framework did the study use? (more information) If not applicable, write "n/a".	Personalized learning and AI integration in education. It explores how AI technologies can enhance educational experiences by providing personalized support and adaptive feedback tailored to individual learning needs.

4. Methods & Research Design

Question	Your Response
<p>a. What type of study (research methodology) was this?</p> <p>(Some types that might be used include quantitative, qualitative, mixed method, ethnographic, historical, survey, correlational, causal-comparative, action research, evaluation research, literature review, or other. The abstract and method/methodology section should tell you).</p>	Quantitative
<p>b. Were the research methods quantitative, qualitative, or mixed methods? Explain why.</p> <p>(Depending on the study and how the researchers frame and define things, the answer to this question may be a repeat of the previous question a. If using a literature review, including the "search terms" or "search methods" could be helpful here.)</p>	Quantitative. It involved data from the application database to examine student interactions with the AI chatbot during math tutoring sessions. The study focused on quantitative measures such as solution times, frequency of problem solving, attempts, and utilization of tutorial resources such as hints and instructional videos.
<p>c. Who were the participants?</p> <p>(Describe in terms of number and any provided demographics)?</p>	121 students who enrolled in the math tutoring course. (no specific demographic details)
<p>d. What was the study setting?</p> <p>(If appropriate.)</p>	The online environment where the AI chatbot tutoring system was implemented.

5. Data Collection.

Use the following table to address the questions: What sources of data were collected? How were sources of data measured (instrument used, such as interview protocol, survey instrument, etc.)? How were the data analyzed? (Add rows as needed).

Data Source	How Measured/Instrument	How Analyzed
Student interactions w/ AI chatbot	Data recorded in the application database	Quantitative analysis- solution times measured in seconds for each problem, solving attempts, usage of hints and videos
Student progression	Progression records in the application database	Descriptive statistics- percentage of students completing each problem level (easy, basic, difficult), number and proportion of students skipping or repeating lessons.
Student declarations of problem solving	Data recorded in the application database	Quantitative analysis- accuracy rates of problem solutions, time elapsed between the problem display and student answer.
Student use of help/resources	Logs of interactions with hints and tutorial videos	Frequency analysis- number of times hints were accessed, number of tutorial views.
Student behavior patterns	Recorded behaviors during interaction sessions	Pattern recognition- identification of behavior clusters (repeated attempts, quick confirmation of answers).
Overall engagement	Aggregate data on course completion rate and engagement levels.	Comparative analysis- comparison of engagement metrics across different lessons and difficulty levels.

6. Implications & Limitations

Question	Your Response
<p>a. What limitations did the study author(s) note?</p> <p>(If not applicable, write “n/a”.)</p>	<p>The reliance on data from a single AI chatbot platform may limit the applicability of the findings to other AI tutoring systems with a different design. The study focused on short term outcomes such as completion rates and problem solving behavior. And did not explore long term effects on student learning or academic performance. It was inferred that the study may have limited generalizability due to the specific context of elementary mathematics education and the particular demographics of the participants.</p>
<p>b. What were the major findings or results of the study?</p>	<p>The findings indicated that students actively engaged with the AI chatbot for math tutoring by tackling multiple problem levels (easy, basic, and difficult). The AI chatbot facilitated learning through the widespread use of hints and tutorial videos. However, it was noted that some students tended to swiftly verify correct answers without fully engaging in the problem solving process. This suggests opportunities for enhancing AI tutoring systems to encourage deeper interaction and learning.</p>
<p>c. Thinking now about how you can apply the knowledge from this study to your current diffusion project, list the 2-3 of the most important takeaways from this study that apply to your current diffusion project.</p>	<p>Implementing interactive elements such as hints and tutorial videos within the AI system can enhance user engagement and support effective learning. Incorporating mechanisms to monitor and analyze user behavior such as solution times and usage patterns to provide valuable insights into how students interact with the AI system.</p>