Using ChatGPT as a Tutor to learn Mathematics Application Program

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zARTICLE INFO	ABSTRACT
	The ability of ChatGPT to understand conversational context and provide relevant responses makes it very useful in human-computer interactions. ChatGPT can be a very useful tool for mathematics teachers in their role as tutors to learn and teach various applications related to mathematics. In this digital era, mathematical applications and software like GeoGebra, Matlab, Augmented Reality, and SPSS are becoming increasingly important in teaching and learning mathematics. ChatGPT can help teachers understand how to use these tools by providing detailed explanations, tutorials, and examples of their application in teaching. This research aims to determine the effectiveness and efficiency of ChatGPT in helping teachers understand and apply technologies such as GeoGebra, Matlab, Augmented Reality, and SPSS. Participants in this case study research consisted of 5 teachers. They ask chatGPT according to their individual needs to help them learn the application program. This collection of questions is grouped into several categories. The categories of participant questions asked to ChatGPT included (1) General explanation of the application, (2) How to download the application, (3) Equipment specifications required, (4) General use of the application, and (5) Requesting sample commands in the application. The results of this study indicate that participants will successfully use ChatGPT as a tutor for learning Mathematics Application Programs if they have the necessary equipment specifications required by the applications and are able to download the applications.

Introduction

The era of Society 5.0 represents modern societal life where advanced technology, especially artificial intelligence (AI), is maximally utilized to improve human quality of life. AI acts as the main driver that connects and processes data from various sources to create alternative solutions to meet human needs efficiently and personally (Manik, 2022). In this society, technology is applied not only in industry and the economy but also comprehensively in daily life, including in health, education, transportation, and even social life. In the field of education, mathematics teachers use technology such as mathematics application programs to assist learning.

ChatGPT is an innovative example of the use of artificial intelligence (AI) in the field of natural language processing (NLP) (Fitria, 2023). Developed by OpenAI, ChatGPT uses the GPT (Generative Pre-trained Transformer) model trained with a vast amount of text data to understand and generate natural human language. With its ability to process and respond to text, ChatGPT has been adopted in various applications such as virtual assistants, customer service, learning, and many more (Manik et al., 2023).

The ability of ChatGPT to understand conversational context and provide relevant responses makes it very useful in human-computer interactions. For example, in customer service, ChatGPT can answer general questions, help solve problems, and provide information quickly and accurately, thus increasing efficiency and customer satisfaction. In the education sector, ChatGPT can be used as a virtual tutor that provides lesson explanations, helps students with homework, and gives constructive feedback (Javaid et al., 2023).

In the field of education, ChatGPT functions as a virtual tutor that can help students understand difficult concepts, answer questions about lesson materials, and provide practice and assessment (Rahman & Watanobe, 2023). This AI can provide personalized learning assistance tailored to each student's needs, as well as offer additional or alternative explanations that might be easier to understand. This is particularly beneficial in situations where access to human teachers or tutors is limited, such as in remote learning or in rural areas.

Using ChatGPT in mathematics learning offers significant advantages for both students and teachers (Manik, 2024). As a virtual tutor, ChatGPT can help students understand complex mathematical concepts by providing step-by-step explanations. For instance, when students struggle with topics like algebra, calculus, or geometry, ChatGPT can provide detailed explanations and relevant examples to clarify these concepts. This enables students to learn independently and gain a better understanding of the subject matter.

In addition to explaining concepts, ChatGPT can also assist students in solving math problems. Students can input the problems they face, and ChatGPT will provide detailed solutions, including the calculation steps. For example, in solving quadratic equations, ChatGPT can explain the use of the quadratic formula and how to simplify and factor the equations. With this assistance, students can see the entire problem-solving process, helping them understand the methods and logic behind the solutions.

ChatGPT can be a very useful tool for mathematics teachers (Wardat et al., 2023) in their role as tutors to learn and teach various applications related to mathematics. In this digital era, mathematical applications and software like GeoGebra, Matlab, Augmented Reality, and SPSS are becoming increasingly important in teaching and learning mathematics. ChatGPT can help teachers understand how to use these tools by providing detailed explanations, tutorials, and examples of their application in teaching.

Mathematics teachers can use ChatGPT to learn the main features of various Mathematics Application Programs. For instance, when wanting to use GeoGebra to create interactive graphs or simulations, teachers can ask ChatGPT for guidance on how to create graphs, add interactive elements, and use special tools in the application. ChatGPT can provide clear and structured steps, making it easier for teachers to master and apply this technology in their classes.

This research aims to determine the effectiveness and efficiency of ChatGPT in helping teachers understand and apply technologies such as GeoGebra, Matlab, Augmented Reality, and SPSS. The problem statement addressed in this research is how mathematics teachers use ChatGPT as a tutor to learn applications related to mathematics.

Research Methods

The case study research method developed by Robert K. Yin is an approach used to understand complex phenomena in real contexts, especially when the research involves factors that are difficult to separate (Yin, 2018). This method is highly suitable for use in social sciences, political science, management, education, and various other disciplines. This research method is suitable for understanding the phenomenon of using ChatGPT in various fields.

The general steps in using Yin's case study research method are (1) Determining Research Objectives, (2) Case Selection, (3) Data Collection, (4) Conceptual Framework Development, (5) Data Analysis, and (6) Results Interpretation (Yin, 2018). Determining research objectives involves identifying the phenomenon or problem of using chatGPT in learning and clearly defining the research objectives and questions. Case selection is carried out to select cases or units of analysis that are relevant to the research, where these cases can be individuals, groups, organizations, geographic locations, or certain events. At this stage, participants are asked to choose one program that they know about from several application programs offered. Data collection involves collecting primary data (observation, interviews, surveys) and/or secondary data (documents, literature) according to the research questions, ensuring that the collected data is relevant to the studied case. The activity of conceptual framework development is identifying relevant conceptual frameworks or theories to support the analysis and creating initial hypotheses or assumptions that can be tested in the analysis. Data analysis involves analyzing the data using various techniques such as content analysis, thematic analysis, or comparative analysis, as well as looking for patterns, trends, or relationships that can explain the studied phenomena. The purpose of results interpretation is to interpret the findings within the context of relevant theories and explain the implications of the research results for theory and practice.

The data analysis step in case study research is a critical process for understanding and extracting insights from the collected data. This is the stage for identifying patterns, relationships, and meanings in the collected information. Qualitative data such as interview texts or observation notes will be analyzed using various analysis methods such as content analysis, thematic analysis, or narrative analysis to identify themes, patterns, or meanings in the data.

Findings

The participants in this case study research were five mathematics teachers. They were asked to learn about the use of Mathematics Application Programs they had never studied before using ChatGPT as their tutor. They were asked to choose one of four applications, namely GeoGebra, Matlab, Augmented Reality, and SPSS. They were asked to write down the list of questions they asked ChatGPT and the instructions given by ChatGPT. They were also asked to write down any difficulties they encountered in following ChatGPT's instructions if

any. Subsequently, the research activities were carried out according to Yin's case study research steps (Yin, 2018).

Determining Research Objectives

This research aims to explore how ChatGPT, as an advanced representation of artificial intelligence, can synergize with existing information technology applications in mathematics learning. The information technology applications referred to include popular software such as GeoGebra, Matlab, Augmented Reality, and SPSS. With this integration, it is expected to create more interactive, effective, and easily understood learning methods for students.

The primary objectives of this research are twofold: First, to determine how ChatGPT can be integrated with these applications in the context of mathematics learning. This research will examine various possibilities for synergy and how the interaction between ChatGPT and each application can support the learning process. For example, how ChatGPT can assist in using Matlab to solve complex mathematical calculations, or how ChatGPT can display real-like objects using Augmented Reality (Buchori & Pramasdyahsari, 2020).

Second, this research also aims to identify the challenges that might arise in the integration process and seek effective solutions. These challenges can be both technical and non-technical, such as software compatibility, the need for algorithm adjustments, feature limitations, or even obstacles in terms of understanding and usage by teachers and students. This research will strive to document these challenges in detail and offer practical solutions that can be implemented.

By understanding how ChatGPT can work together with existing information technology applications, as well as recognizing the challenges and solutions in its integration, it is hoped that this research can make a significant contribution to innovation in mathematics teaching methods. So this research objective is to formulate a guide for educators in using chatGPT as a tutor for studying educational application programs.

Case Selection

To achieve the objectives of this research, case selection was conducted by involving five mathematics teachers who would use ChatGPT to learn and master information technology applications they had never used before. The selection of participants and applications was based on the goal of exploring how ChatGPT can support the learning process and adaptation to new technology in the context of mathematics education.

The participants in this research consisted of mathematics teachers with diverse backgrounds, each of whom was asked to learn to use a new application with the help of ChatGPT. The five participants and the selected applications are described in Table 1.

Table 1 Applications Learned by Participants

No.	Participant	Application Studied
1	Ayu	GeoGebra
2	Anggie	Matlab
3	Lidwina	Matlab
4	Menna	Augmented Reality (AR)
5	Yulina	SPSS

The selection of applications was made based on their relevance and potential in supporting mathematics learning. Each participant was asked to write down the questions asked to ChatGPT and the responses provided by ChatGPT during the learning process.

Data Collection

Data collection in this research involved several stages, including the documentation of questions and answers between participants and ChatGPT, observation of participant experiences during the learning process, and interviews with participants to gather feedback on their experiences. This stage aimed to obtain comprehensive information about how ChatGPT can help teachers understand and use new Mathematics Application Programs.

Data collection was carried out as follows:

1. Documentation of Questions and Answers: Participants were asked to document the questions they asked ChatGPT and the responses provided. This documentation serves as a primary data source that can be analyzed to understand the type and quality of responses given by ChatGPT.

2. Observation of Learning Process: Observations were made to see how participants interact with ChatGPT and follow the instructions provided. This stage aimed to identify any difficulties or obstacles encountered by participants during the learning process.

3. Participant Interviews: Interviews were conducted with participants after they completed the learning process to gather feedback on their experiences. This feedback includes participants' opinions on the effectiveness and efficiency of using ChatGPT, as well as any suggestions for improvement.

Conceptual Framework Development

The conceptual framework developed in this research is based on the synergy between artificial intelligence represented by ChatGPT and existing information technology applications in the context of mathematics learning. This framework outlines the relationship between the learning objectives, the role of ChatGPT, and the specific applications being studied.

1. Learning Objectives: Understanding the new application and its features, using the application in the context of mathematics education, solving problems or creating projects with the application.

2. Role of ChatGPT: Providing detailed explanations about the application, guiding participants through the installation and setup process, assisting with practical use, and offering solutions to specific problems or tasks.

3. Specific Applications: GeoGebra, Matlab, Augmented Reality (AR), and SPSS.

By examining these elements within the conceptual framework, this research aims to provide a comprehensive understanding of how ChatGPT can support mathematics teachers in learning and using new technology.

Data Analysis

The data analysis process in this study involves two main methods: content analysis and comparative analysis. These methods aim to describe and compare the interactions between

participants and ChatGPT and evaluate the participants' success in understanding and applying the recommendations provided by ChatGPT.

(a) *Content Analysis*

Content analysis was conducted by examining the specific requests made by participants to ChatGPT during the learning process. The main focus of this analysis is to categorize and evaluate the types of requests made by participants. The five main types of requests identified are:

1. *General explanation of the application*: These requests include a basic description of what the application is, its main functions, and how the application is relevant in the context of mathematics learning.

2. *How to download the application*: These requests relate to step-by-step guides for downloading and installing the application on their devices.

3. *Equipment specifications required*: These requests focus on information about the hardware and software requirements needed to run the application.

4. *General use of the application*: These requests include general guides on how to operate the application, including basic navigation and main functions.

5. *Requesting example commands in the application*: These requests relate to concrete examples of commands or instructions that can be used in the application to perform certain tasks.

This content analysis helps identify how ChatGPT responds to each request and assess the clarity and completeness of the responses provided.

(b) *Comparative Analysis*

Comparative analysis was conducted to evaluate the success of each participant in understanding and applying the explanations provided by ChatGPT regarding the five general requests made. Participant success is measured based on their ability to perform the tasks described by ChatGPT independently and without significant obstacles. The results of this analysis are summarized in Table 2.

Table 2 Applications Learned by Participants

No.	Participants' Requests to ChatGPT	Participant	
		SUCCESS	FAILURE
1	General explanation of the application	√	√
2	How to download the application	√	×
3	Equipment specifications required	√	×
4	General use of the application	√	√
5	Requesting example commands in the application	√	√

From the table above, it is seen that participants will successfully use ChatGPT as a tutor for learning Mathematics Application Programs if they can perform the five instructions according to the categories of participants' requests to ChatGPT. However, participants will fail to use ChatGPT as a tutor for learning Mathematics Application Programs if they fail to download the application they are learning or if they do not have the equipment that meets the specifications required by the application to be studied.

By conducting this content analysis and comparative analysis, this study can identify areas where ChatGPT successfully helps participants and areas that need improvement. These findings are important for developing more effective strategies for using ChatGPT as a learning aid and for providing practical recommendations for mathematics teachers in integrating information technology into their teaching processes.

Discussion

The results of this research show that ChatGPT has great potential in guiding mathematics teachers to learn and master technology applications that are relevant for mathematics learning. These findings are consistent with the premise that ChatGPT, through systematic and appropriate interactions, can enable users to successfully learn technological applications, provided certain conditions are met. This is relevant to previous research findings which say chatGPT can be used as a tutor in mathematics courses that do not require other devices in the learning process (Manik, 2024).

One of the main conditions to consider is the specifications of the equipment used by the teacher. The analysis results show that participants who have devices with specifications that meet the requirements of the applications tend to be more successful in utilizing ChatGPT to learn the applications. When the devices used match the requirements, teachers can follow the installation and application usage steps without encountering significant technical obstacles. This underscores the importance of ensuring that the hardware and software used are compatible with the applications to be learned.

Additionally, participants' ability to install applications also plays an important role in the success of the learning process. Participants who can correctly download and install applications according to the guidelines provided by ChatGPT show a higher success rate in understanding and using the applications. The difficulties some participants experienced in the installation process indicate that more detailed and clear guidance from ChatGPT is needed, especially for those who are less familiar with technology.

In everyday use, ChatGPT proves effective in providing general explanations about the application, general usage instructions, and example commands in the application. Participants who followed the recommendations and guidance from ChatGPT successfully operated the applications with more confidence and understood the basic functionalities offered. However, some participants experienced difficulties in certain technical aspects, such as installation and understanding equipment specifications, indicating that ChatGPT still needs improvement in providing more comprehensive support in these aspects.

Overall, the results of this study indicate that with proper support from ChatGPT, mathematics teachers can learn and master technological applications for mathematics learning successfully. The main conditions to be met include having devices that meet the required specifications and the ability to correctly install applications. By considering these conditions, the integration of ChatGPT as a learning aid can be optimized, providing significant benefits for the mathematics education process.

These findings provide valuable insights for educational technology developers and educators in designing effective learning strategies using ChatGPT. By continuously improving ChatGPT's ability to provide more detailed technical guidance and ensuring the support of suitable devices, ChatGPT can become a very valuable tool in supporting digital transformation in mathematics education.

Conclusion

This study aims to explore how ChatGPT can synergize with existing information technology applications, such as GeoGebra, Matlab, Augmented Reality, and SPSS, in mathematics learning. The results show that ChatGPT has great potential as an aid in learning and mastering these applications, provided certain main conditions are met.

Mathematics teachers who have devices that meet the specifications required by the applications and who can correctly install the applications show success in utilizing ChatGPT to learn and operate these applications. ChatGPT proves effective in providing general explanations about the applications, usage guides, and example commands needed in the applications. However, some participants experienced technical difficulties, especially in the installation process and understanding the required equipment specifications. Overall, this study indicates that with proper support, ChatGPT can become a very useful tool in mathematics learning, helping teachers integrate information technology more effectively and efficiently.

Acknowledgment

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