



# Integrating Artificial Intelligence into Physics Learning: A Case of ChatGPT in Madrasah

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**Abstract:** Artificial intelligence, one of which is ChatGPT, has become a new technology that is already well-known and utilized by the public in daily activities. This condition can certainly have positive and negative impacts on its users. Referring to this, the purpose of this study is to determine the process of integrating artificial intelligence, especially ChatGPT, in the physics learning process. This study used a mixed method with quantitative and qualitative methods. The sample used was 59 students of MA Plus Nurul Islam Sekarbela using a saturated sampling technique. Data were collected in this study through observation, questionnaires, and students' physics understanding test questions. All qualitative data were analyzed descriptively, while quantitative data were analyzed statistically using the IBM SPSS application. Based on the analysis, it was found that there was an effect of using ChatGPT in improving the understanding of physics concepts of 10th-grade students at MA Plus Nurul Islam Sekarbela. The results of the paired sample t-test showed that both classes had a t-test value with a significance of  $0.000 < 0.05$ .

**Keywords:** Artificial intelligence; ChatGPT; Understanding physics concepts

## Introduction

The development of digital-based technology is currently a key factor that continues to experience significant change (Rizaldi et al., 2022). These changes are occurring in nearly every aspect and are altering the very fabric of human activity. These changes are also driving a paradigm shift in education, necessitating the integration of technology into the learning process (Susilawati et al., 2025). One technology currently a hot topic of global discussion is the emergence of artificial intelligence (AI) (Burlakov et al., 2020; Zaenudin & Riyan, 2024). This technology enables humans to explore digital applications for editing and browsing various information. One form of artificial intelligence currently developing in society is ChatGPT. This technology can provide fast and efficient responses to any questions

posed using natural language, thus generating solutions to current problems (Goar et al., 2023).

When connected to the science learning process, including physics, technology is a key factor contributing to success (Fatimah et al., 2020). This is certainly related to the abstract nature of learning. The use of technology can facilitate interpretation and provide students with broader learning resources. This is what ChatGPT can foster or provide to improve students' conceptual understanding. It's undeniable that students find physics challenging because it demands critical and creative thinking skills to solve problems that arise, particularly during learning (Rizaldi & Fatimah, 2024). In this context, ChatGPT acts as a virtual tutor to support teachers in streamlining classroom learning while still retaining the primary learning resources, such as textbooks and student worksheets (Herdiana et al., 2025). With ChatGPT, students can

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explore various concepts, practice problems, and other material contexts used in physics classrooms.

In its implementation, madrasas, as institutions under the auspices of the Ministry of Religious Affairs, strive to integrate Islamic values and science with the development of digital technology. As Islamic-based institutions, madrasas must maintain the character and spiritual values of their students by not neglecting or neglecting digital literacy and scientific thinking skills. One example of this adaptation is the emergence of informatics, coding, and AI subjects to support students' acceptance of technological changes in the learning environment (Iddian, 2025; Nabila et al., 2022). Given these conditions, utilizing ChatGPT to integrate physics learning with technology offers the potential to improve the quality of the learning process while maintaining Islamic values and, of course, ethical use of technology in the learning process.

Various studies have demonstrated that ChatGPT has a positive impact on the learning process. However, negative impacts from the use of this application are certain to arise if not properly supervised, especially by teachers in madrasas. Based on these challenges, it is deemed essential to conduct research on how to integrate artificial intelligence technology, specifically ChatGPT, into physics learning in Islamic schools. The results of this study are expected to provide insights to readers, particularly physics teachers at the Islamic school level.

## Method

This study employed a mix of qualitative and quantitative methods to maximize the research outcomes. The qualitative approach was used to capture students' experiences with the use of ChatGPT in the learning process, while the quantitative approach was used to obtain data on the impact of ChatGPT on improving students' conceptual understanding of motion in physics.

This research was conducted at MA Plus Nurul Islam Sekarbela using a saturated sampling technique, with all 10th-grade students serving as the sample. Class 10-1, with 30 students, served as the experimental class, using AI in the form of ChatGPT in physics learning. Class 10-2, with 29 students, served as the control class, using a conventional learning approach, specifically textbooks from the madrasah. Because this study used a mixed approach, the research data consisted of qualitative data obtained through questionnaires distributed to students and classroom observation sheets. Quantitative data were obtained using conceptual understanding tests administered at the beginning and end of the lesson.

Before the conceptual understanding test is administered, the test instrument will undergo validity and reliability analysis in grade 11 to ensure the instrument used can measure the indicators that the researcher has set in this study. Qualitative data obtained in this study will be analyzed descriptively, while quantitative data will be analyzed statistically using the IBM SPSS application to measure the influence and increase in students' conceptual understanding scores after going through the physics learning process using ChatGPT. Statistical tests used include the dependent t-test, independent t-test, and N-gain. The research design used can be seen in the following table.

**Table 1.** Research Design

Class	Pretest	Treat	Posttest
Experiment	Y <sub>1</sub>	X	Y <sub>3</sub>
Control	Y <sub>2</sub>		Y <sub>4</sub>

Information:

Y<sub>1</sub> = Experimental Class Before being given treatment

Y<sub>2</sub> = Control Class Before being given treatment

Y<sub>3</sub> = Experimental Class After being given treatment

Y<sub>4</sub> = Control Class After being given treatment

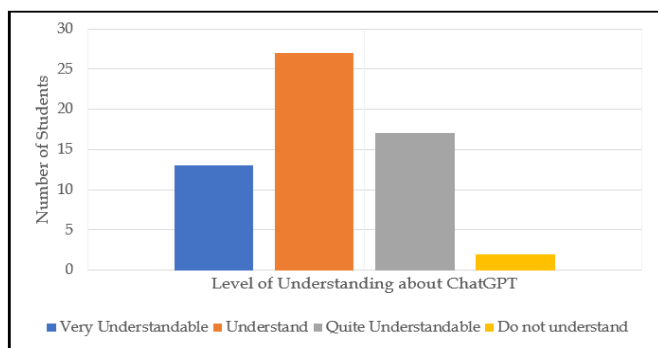
X = Treatment Using ChatGPT in Physics Learning

## Result and Discussion

### *Student Understanding of ChatGPT*

The initial stage of this research was to analyze students' understanding of Artificial Intelligence (AI) technology, specifically ChatGPT. As Generation Z, almost all students in grade 10 of MA Plus Nurul Islam Sekarbela already own gadgets or smartphones for daily activities. This is supported by the researcher's initial interviews with all students, which revealed that nearly 92% of students actively use smartphones, while the remainder do not use them due to their active participation in Islamic boarding schools (pesantren) that do not require smartphone use. All students at the pondok are in grades 10-2, so they did not impact the variables used in this study.

An initial needs analysis related to student understanding was carried out before the learning process began, producing data as in Figure 1. Based on the results of this initial analysis, it appears that students' understanding of ChatGPT is quite high. This is undoubtedly due to the fact that students currently live in a digital age, where gadgets are an inseparable component of their daily activities. Various studies have shown that Gen Z is a generation where technology is a primary supporter of activities, both in the context of social media and related to education (Irwanda et al., 2017; Nurhalifah et al., 2024; Rizaldi & Fatimah, 2022; Susilawati et al., 2023; Yakob & Yesaya, 2024).



**Figure 1.** Results of initial analysis of students' understanding of ChatGPT

*Integration of ChatGPT in Physics Learning*

Physics learning at MA Plus Nurul Islam Sekarbela generally utilizes learning media to support the achievement of previously expected objectives. These media include online learning applications, PowerPoint presentations, and educational games. However, currently, the learning process is complemented by the use of artificial intelligence through ChatGPT. The considerations for using this application, in addition to guiding students in its proper use, are known to provide a wider range of learning resources for students to utilize. This situation is certainly a primary solution to address the limited learning resources that arise from solely relying on textbooks provided by the madrasah. However, teachers ensure that the use of ChatGPT should not be focused on finding answers to every question or discussion material during the learning process. If students use ChatGPT solely to find answers to problems, it will certainly foster dependency without engaging in critical thinking (Supriyono et al., 2024).

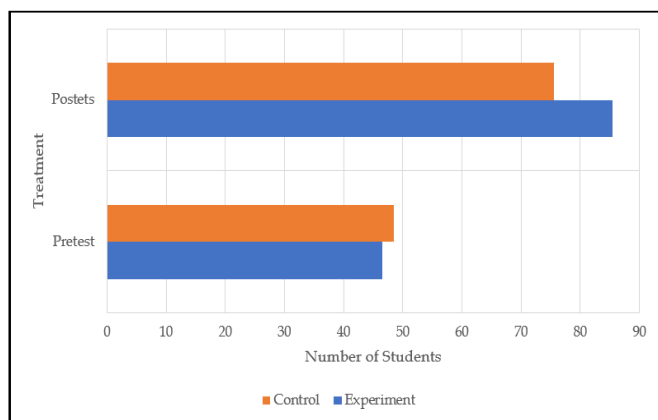
In physics lessons, teachers will provide students with the opportunity to utilize ChatGPT to search for as many theoretical studies as possible that support the topic being studied. After students, along with their friends or group members, have obtained the necessary information, they will be instructed to close their smartphones or laptops so they can analyze the given problem through a discussion sheet with their group members and answer based on the theoretical studies obtained. Therefore, integrating ChatGPT into the learning process can enrich students' references or literature reviews related to a phenomenon or problem. ChatGPT, which is open access, must be utilized optimally in the learning process. Increasingly sophisticated developments certainly have both positive and negative impacts, so in its implementation, a teacher must have a better understanding of ChatGPT's operational procedures to be able to provide optimal results when applied to the learning process. During the application in learning, one important component that researchers focused on was the use of prompts in searches (Pontjowulan, 2023). This is important to note because even though the topic being searched for is the same, it can produce different results if using different prompts. Therefore, students must be introduced to the editorial selection process so that the results displayed by ChatGPT can represent the author's intentions.

*The Effect of ChatGPT on Improving Understanding of Physics Concepts*

After conducting a needs analysis and implementing learning treatments using ChatGPT, a general overview was obtained after the final test, as shown in the following table.

**Table 2.** Statistical Description

Class	Sample	Pretest Average	Pretest Standard Deviation	Posttest Average	Posttest Standard Deviation
Experiment	30	46.50	9.21	84.50	8.20
Control	29	48.50	9.05	75.50	7.90



**Figure 2.** Results of initial analysis of students' understanding of ChatGPT

Based on the table 2, it can be seen that both classes experienced an increase in the results of the physics concept understanding test, with an average score of 84.50 for the experimental class and 75.50 for the control class. The higher increase in the experimental class certainly illustrates that the use of ChatGPT as a learning medium has a better impact compared to learning in the control class. ChatGPT is a visible differentiator because in the control class the main learning resources used are limited to textbooks and PowerPoint materials presented by the teacher in class. This limitation certainly limits students' vocabulary in answering questions, so that if they encounter problems that do not match their understanding, they tend to create new problems. This is in contrast to the experimental class,

which can search for various theoretical references by utilizing ChatGPT during the literacy process.

To measure the impact of ChatGPT on improving students' understanding of physics concepts at MA Plus Nurul Islam Sekarbela, a statistical test was conducted. The statistical test used must be based on the prerequisite tests, namely normality and homogeneity. The data for both tests can be seen in the tables 3 and 4.

**Table 3.** Normality Test Using Shapiro-Wilk

Class	Statistics	df	Sig.
Experiment Pretest	0.964	30	0.121
Experiment Posttest	0.958	30	0.087
Pretest Control	0.969	29	0.143
Posttest Control	0.959	20	0.066

**Table 4.** Homogeneity Test with Levene's Test

Levene Statistic	df <sub>1</sub>	df <sub>2</sub>	Sig.
0.98	1	57	0.328

Based on the normality test table using Shapiro-Wilk, the significance value for the pretest and posttest scores of both treatment classes was greater than 5% (0.05), indicating that all data scores were normally distributed. Meanwhile, based on the results of the homogeneity test, the posttest scores obtained a significance of 0.328, or greater than 5% (0.05), indicating that the distribution of scores was classified as homogeneous. After the data was known to be normally and homogeneously distributed, the statistical test used was the paired sample t-test. The results of the analysis test can be seen in the following table.

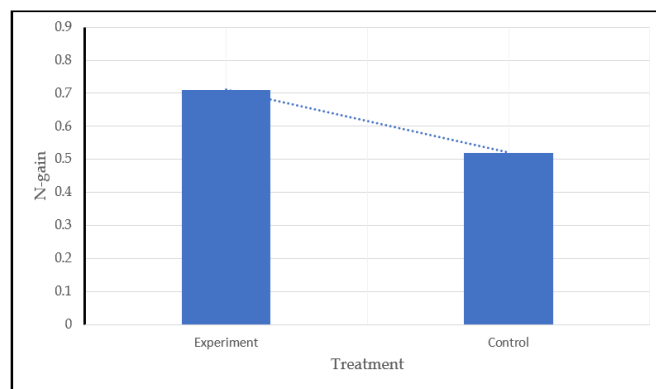
**Table 5.** Paired Sample T-Test

Class	t	df	Sig.
Experiment (Pre-Post)	-14.82	29	0.000
Control (Pre-Post)	-11.34	28	0.000

The results of the paired sample t-test showed that both classes had a t-test value with a significance of 0.000. Since the t-test value is below 0.05, it can be concluded that there is a significant difference between the pretest and posttest scores in both treatment classes. Both classes experienced an increase in understanding of physics concepts, with a stronger increase occurring in the experimental class that used ChatGPT as an additional learning medium in class. To see the improvements that occurred in both classes, an N-gain test was conducted by comparing the results obtained in the pretest and posttest. The test results can be seen in the following graph.

Referring to the statistical analysis results in the previous section, it is evident that the use of ChatGPT can improve students' understanding of physics at MA

Plus Nurul Islam Sekarbela. This improvement in understanding was significantly higher compared to the control class, with an N-gain value of 0.7 in the experimental class (high category) and 0.5 in the control class (moderate category). These results are supported by research conducted by Ahmad et al. (2025), who concluded that the integration of ChatGPT and Baamboozle significantly improved students' understanding of physics concepts and learning motivation. The use of this technology not only improves student engagement in learning but also encourages substantial improvements in learning outcomes and active engagement in the learning process. Furthermore, Amir et al. (2024) also confirmed that the use of artificial intelligence applications, including ChatGPT, has been shown to improve students' understanding of physics concepts at the University of West Sulawesi.



**Figure 3.** Comparison of n-gain values

Al Farizi et al. (2024) revealed that the integration of artificial intelligence technology, such as ChatGPT, into learning activities can significantly improve HOTS achievement compared to classes that do not use this technology. Thus, referring to several previous studies, it has been proven that the use of ChatGPT will have a positive impact if utilized optimally during the physics learning process. Most students today are already familiar with using gadgets, so it would be unethical for teachers to ignore these modern developments and continue to focus on conventional teaching methods.

### Conclusion

Based on the research results and data analysis, it was found that ChatGPT can be integrated into the physics learning process and has been proven to improve students' conceptual understanding of physics material. Using ChatGPT in the learning process provides an open space for students to obtain more optimal material or theoretical studies because this application provides far more material compared to the

use of conventional learning resources found in madrasahs. However, it is important to note that the use of ChatGPT must be properly supervised to prevent misuse by students during the learning process.

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#### Author Contributions

Conceptualization, methodology, validation, formal analysis, investigation, resources, data curation, writing—original draft preparation, writing—review and editing, visualization, D.R.R; R.H; A.Y; M.H.H; L.M; M.H; H.W; Z.F. All authors have read and agreed to the published version of the manuscript

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#### Conflicts of Interest

The authors declare no conflict of interest.

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