

INTEGRATION OF CHATBOT TECHNOLOGY AS AN ADAPTIVE LEARNING MEDIA TO IMPROVE LEARNING OUTCOMES OF PGMI IAIN BONE STUDENTS IN LEARNING SCIENCE AND RELIGION

Syamsidar HS

Madrasah Ibtidaiyah Teacher Education IAIN Bone, Watampone, South Sulawesi
Email: idarhs@gmail.com

Samsinar S

Postgraduate IAIN Bone, Watampone, South Sulawesi
Email: samsinarakbar20@gmail.com

ABSTRACT

The integration of chatbot technology into education offers innovative opportunities to enhance learning outcomes, particularly in adaptive learning environments. This study explores the implementation of chatbot technology as an adaptive learning medium to improve the learning outcomes of PGMI (Madrasah Ibtidaiyah Teacher Education) students at IAIN Bone in the subjects of science and religion. By leveraging the interactive and responsive capabilities of chatbots, this research aims to address individual learning needs, foster active engagement, and bridge gaps in understanding complex concepts. A method approach was employed is quantitative data collection through surveys, interviews, and share assessments. Descriptive statistical method with data analysis techniques using pie charts. The findings indicate a significant improvement in students' comprehension, motivation, and performance, demonstrating the chatbot's potential as an effective supplementary learning tool. This chatbot is a quite effective application for student learning outcomes in science and religious studies value P (66,67%) is in the range of 65-79 on the effectiveness criteria This study underscores the importance of integrating technology into educational practices to promote adaptive, personalized, and efficient learning experiences, particularly in interdisciplinary fields like science and religion.

Keywords: Chatbot technology, adaptive learning media, improve learning outcomes

INTRODUCTION

The development of science and digital technology in the world of education has opened up various new opportunities for lecturers in teaching and students in learning. One of the sophisticated and popular innovations currently is the use of chatbots as a learning medium. Chatbots are defined as computer programs designed to stimulate conversations with human users over the internet (Adamopoulou & Moussiades, 2020). Chatbots can interpret and respond to human input through inputted keywords and respond with the most similar keywords or word patterns from the data in a previously created database. Chatbot has two main components, namely "Chat" which refers to conversation, and "Bot" which is a program containing a number of data that will provide answers when given input. Chatbots can answer questions by

reading text typed by the user via the keyboard (Putri & Ramadhan, 2024).

Chatbot is an application based on artificial intelligence (AI), which can function as a virtual assistant that provides automatic responses, allowing direct interaction with students to provide information, answer questions and provide real-time feedback. In an educational context, the use of chatbots as a learning medium has a positive impact on increasing knowledge and understanding for users (Adesfiana et al., 2022). Apart from that, the use of chatbots in learning can provide teaching materials tailored to student needs and provide fast and accurate feedback, as a material presenter, interactive and interesting quizzes for users (Zulkarnain et al., 2020).

Chatbots have become an important innovation in education, which can interact with humans via text and can enhance a more personalized and adaptive learning experience.

Adaptive learning refers to a learning system that can adapt to students' individual needs and abilities, so that they receive material that is appropriate to their level of understanding and development (Dinata et al., 2024). This is very relevant for improving the quality of education, both in science and Islamic learning. Science, which requires a logic and experiment-based approach, requires media that can provide structured and easy-to-understand explanations. Meanwhile, studying Islamic religion requires an in-depth approach, which not only includes aspects of knowledge, but also spiritual and moral values that must be well understood by students. Therefore, both science and Islamic learning require adaptive learning media to meet student needs and competencies. Adaptive learning media is media whose attributes meet the needs and conditions of learning components which include learning objectives, type of material, user conditions, and learning environment. Adaptive learning media used as a learning tool has been supported by learning theories, educational regulations, and Islamic religious teachings (Husein Batubara & Noor Ariani, 2019).

Chatbot technology as an adaptive learning medium has offered various advantages in learning, especially in improving student learning outcomes. Learning outcomes are the level of ability or mastery achieved after following the learning process in accordance with the learning objectives (Tohari et al., 2019). Through this chatbot technology, it will improve student learning outcomes which include increasing retention, motivation, learning engagement, providing relevant information, resources and guidance for students, bridging the gap between lecturers and students, and facilitating peer-to-peer learning, as well as allowing students to learn from each other and share knowledge (Eko Suryanto et al., 2024).

Apart from the advantages above, there are still big challenges faced in effectively integrating this technology in science and Islamic learning. Some of the problems that arise include how to design a chatbot that can provide adaptive learning that suits the characteristics of the material in

these two fields and can improve learning outcomes, as well as how to ensure that the content delivered by the chatbot is in accordance with the values taught in the Islamic religion. In addition, there are still limitations in terms of emotional interaction and in-depth understanding of the context, which may be an obstacle in facilitating students' comprehensive understanding.

Based on this background, this study aims to explore and analyze the potential of integrating chatbot technology as an adaptive learning medium to improve learning outcomes in science learning and Islamic religious learning. This study will examine how chatbots can be used to improve student engagement and learning outcomes in the learning process, as well as how effective this technology is in delivering relevant material that is in accordance with student needs. Thus, this study is expected to contribute to a deeper understanding of the use of chatbots in learning and provide recommendations for its implementation in a broader context.

METHOD

The method in this study is to use a descriptive statistical method through a quantitative approach. This method is defined as a research method used to determine the effect of one treatment on another treatment under controlled conditions.

Descriptive statistical method with data analysis techniques using pie charts. Pie chart analysis is a statistical technique that tests the correlation of independent variables (X_1) and one dependent variable (Y_1) through the distribution of questionnaires and divides the data into relative parts. This research was conducted in Science lectures (IPA 2) and Islamic Religion courses, namely students of the 2023 Class of PGMI Study Program, Faculty of Tarbiyah, IAIN Bone. The population in this study was the total number of 33 semester 3 students with a sample size of 60 people. The variables of this study consist of:

- a. Chatbot technology as adaptive learning (X_1)
- b. Learning outcomes of PGMI students in science and religion learning (Y_1)

The instrument used in collecting data was a questionnaire and the effectiveness of the chatbot media was tested on student learning outcomes. Data collection using a questionnaire on science and religion learning with a choice of users and a score weight consisting of Strongly: 1, Very not good: 2, not good : 3, pretty good: 4, good: 5. Very good. independence of student learning is designed so that respondents provide answers with a scale and a score weight, namely : 1, Very not good: 2, not good : 3, pretty good: 4, good: 5. Very good. To test the effectiveness of chatbot technology media, the formula is used

$$P = \frac{f}{n} \times 100\% \dots (1)$$

p = Effectiveness value

f = Score obtained

n = Maximum Score

The percentage of the effectiveness of the media used in learning can be seen from table 3 below.

Table 3. Media Effectiveness level Criteria

No.	Echievment Level (%)	Categori
1	90 - 100	Very Effective
2	80 - 89	Effective
3	65 - 79	Quite Effective
4	55 - 64	less Effective
5	0 - 54	Ineffective

(Fitra: 2021)

In this study, the population of all PGMI semester 3 students was 63 people to assess the problems to be studied. The sample determination used a purposive sampling technique, which means that the sample determination was done intentionally. Researchers determine the sample by considering certain elements. The elements that underlie researchers in taking samples are based on 3 classes with the highest learning outcomes. So that a saturated sample was obtained, n totaling 35 people, where the learning process uses chatbot media in the direct instruction learning model where the learning process is without using chatbot media in the direct instruction learning model So that the total sample used in this study is 33 people.

to measure improvements in student learning outcomes, the things that need to be considered in the instrument are cognitive, affective and psychomotor aspects.

RESULTS AND DISCUSSION

Chatbots in Science and Religion Learning

Based on respondent data (PGMI IAIN Bone second year students, semester 3, Class of 2023), data on the use of chatbots in Science and Religion Learning for feedback, communication in learning, progress and weaknesses in learning, understanding and so on is shown in Table 2.

Table 2. Use Chatbots in Science and Religion Learning

No.	Assessment Aspects	Percentage (%)
1.	Interact directly with the learning system	75,0
2.	Provide opportunities to ask questions	63,9
3.	Receive feedback in real-time	63,9
4	Means of communicating with learning media	69,4
5	Able to identify learning progress and difficulties	58,3
6	Adapt material or assignments based on level of understanding and ability	72,2
7	Providing a learning experience that is more tailored to individual needs	63,9
8	Increase learning effectiveness	63,9
9	Motivating in learning science and religion	66,7
10	Involvement in the learning process	55,6
11	Providing fast and timely feedback	66,7
12	Immediately understand the strengths and weaknesses in learning science and Islam	58,3
13	Improve understanding of learning material	63,9
14	provide additional suggestions or explanations according to the errors or difficulties I encounter	66,7
15	Adapt material to relevant context	58,3
16	According to learning needs or interests	47,2
17	A more engaging and effective learning experience	63,9
18	Integrate various media, such as text, images, video and sound	63,9
19	Provides a more dynamic and interesting learning experience	72,2
20	Give feedback in learning	63,9

(PGMI Students Class of 2023:2024)

Adaptive learning media that is specially designed, created and selected for learning so that it can be useful for learning and in the Table 1 there are 58,3%, This means there are around 21 students who have used the application. The results of previous research state that the use of creative pedagogical design based on digital technology includes four

aspects of creative assessment: potential, product, climate and personality (personalization of learning) (Maulidah, 2023).

Likewise, this chatbot media provides an interesting experience in learning, obtained by 72.2% of respondents or 26 second year PGMI students class of 2023 who have used chatbots for learning integration, especially in learning science and Islamic religion. Meanwhile, learning integration of various media such as text, image, video and sound is always around 63% or 22 students.

Student Learning Outcomes in Learning Science and Islamic Religion

The important thing to measure a student's success in studying. During the semester they are taking is the final grade. Grades are a measurement of students' abilities or learning outcomes regarding lecture material. According to Fikri Hasil Belajar Mahasiswa dalam Pembelajaran Sains dan Agama Islam (2023) that chatbot media and learning activities through the direct instruction model without using chatbot media both have an influence on student learning outcomes, however learning activities through the direct instruction model without using chatbot media have a focus that only comes from the teacher and/or textbooks only. Meanwhile, the limited number of textbooks means that not all students have access, which results in students getting bored and paying less attention to the material during the learning process. Apart from that, teachers also have limitations when presenting material in class. So chatbot media has been proven to improve student learning outcomes. With chatbot media, students can access information and learning materials interactively, enabling them to gain better understanding and optimize their learning outcomes.

The real conditions in the field during research and the feedback given by students regarding the use of chatbots in the direct instruction learning model, the small effect size results are likely caused by several factors, including the choice of learning model. Because each learning model has a different approach and characteristics in delivering material and interactions between teachers and students. Apart from that, there are other factors such as disruption to internet network access that can occur at the research location, thus affecting students' access to the chatbot. Chatbots as learning media also require further development so they can provide even better results. Based on data on student interest in using chatbot media, the percentage values below are obtained:



Figure 1. Shows an interest or importance towards the science and Islamic religious material being studied

Figure 2. Perform practical tasks or experiments according to correct procedures

The diagram above shows that 72.2% (26 students) said it was good and 16.7% (6 students) said it was very good if the use of chatbots could create a feeling of confidence in completing course assignments, especially in science (science) courses and IPI. Likewise, the level of practical assignments, experiments and appropriate procedures, 75% (27 students) said they strongly agreed and 13.9% (5 students) said they agreed. According to previous researchers that The results of the hypothesis testing show: (1) There is an increase in student learning outcomes in the experimental class with an average pretest score of 41.82 and a posttest score of 81.56. (2) There is an increase in student learning outcomes in the control class, with an average pretest score of 35.29 and a posttest average of 76.74. (3) There is a difference in the increase in learning outcomes in the experimental class and the control class, with a comparison of the n-gain average value of the experimental class being greater than that of the control class, equal to 0.69 and 0.63. So, using *chatbot* media in the direct instruction learning model can improve student learning outcomes (Fikri, 2023). Chatbots are intelligent agents that can imitate human abilities to carry out conversations with users, namely humans. Chatbots in the education sector can be used to develop learning media as presenters of interactive and interesting material and questions (Parina et.al, 2022)

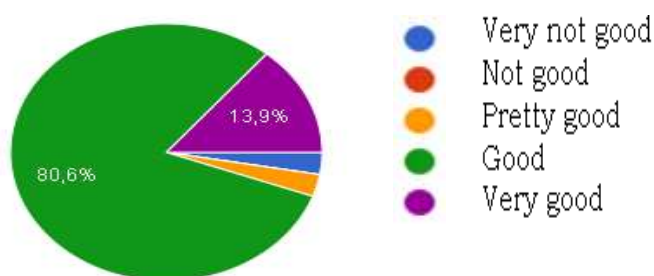


Figure 3. Technological devices effectively to complete tasks

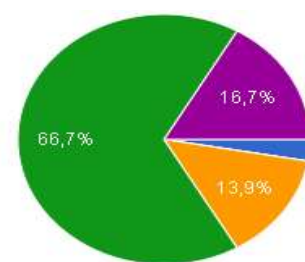


Figure 4. the most effective learning strategy according to the situation and needs

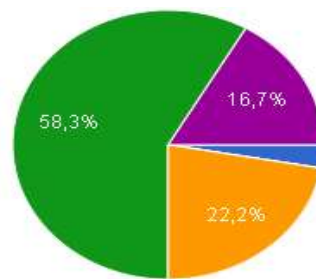


Figure 5. Plan and manage study time efficiently

Based on the response diagram of first level PGMI students class of 2023, Tarbiyah Faculty of IAIN Bone, 69.4% of the science and religion learning process using chatbots can generally assess and understand the material being taught. According to Halik (2021), a modern campus is an integrated and web-based campus and users can interact online (electronically) without having to come to campus with more flexible times. Students can also complete and send assignments via e-mail and WhatsApp group.

The applications commonly used by students to complete their assignments independently and integrated with Artificial Intelligence (AI) are chatbot, Gemini, GPT chat, Canva, Google Translator, Koran.ai application. Based on research data, it is in Table 2 (Syamsidar HS, 2024)

Test the effectiveness of the Chatbot on Student Learning Outcomes

Chatbots can be used in a variety of ways and for a variety of purposes, but they tend to be used for the same things. The following are the benefits of Chatbot learning for schools:

1. Provide accurate information
2. Timely communication
3. Serve all students simultaneously
4. Wide Reach and Personalized Messages.

At the level of media effectiveness, the percentage of learning completeness is 100%. So it can be concluded that Chatbot media is very suitable for use test the effectiveness of the Chatbot on Student Learning Outcomes (Dhamantara, 2022) Adaptive learning is an alternative learning process. It is called adaptive learning because when designing learning, teachers consider the availability of tools, conditions and students' learning environment. This consideration of course aims to maximize learning (Nugroho.2022). Based on the results of the effectiveness test, the P value was 80%.

$$P = \frac{f}{n} \times 100\% \dots\dots\dots(1)$$

p = Effectiveness value

f = Score obtained

$$P = \frac{24}{36} \times 100\% = 66,67\%$$

n = Maximum Score

The P value (66.67%) is in the range of 65-79 for quite effectiveness criteria, so this shows that chatbot technology media is effective on student learning outcomes.

CONCLUSION

Learning outcomes are an important process in lectures, but supporting factors are needed that can make this happen, such as the availability of digital-based media that can help students complete their assignments so that their learning outcomes are as expected. One of them is the current trend and is commonly used by everyone, including in the learning process on campus. The most familiar WhatsApp chatbot media or other applications can make it easier for someone to complete their work. This chatbot is an effective application for student learning outcomes in science and religious studies value P (66,67%) is in the range of 65-79 on the quite effectiveness criteria so this shows that chatbot technology media is effective on student learning outcomes.

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