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ANALYSIS OF BIOLOGY TEACHERS' READINESS IN RUMBAI TO INTEGRATE ARTIFICIAL INTELLIGENCE (AI) IN BIOLOGY LEARNING

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ABSTRACT

The development of artificial intelligence (AI) in the transition era towards Society 5.0 has significantly impacted education, including biology learning at the high school level. However, the success of AI integration in learning depends heavily on teacher readiness, encompassing aspects of knowledge, skills, infrastructure, and perceptions of the technology. This study aims to analyze the readiness of biology teachers in Rumbai to integrate AI into biology learning. This study used a descriptive quantitative approach with a survey method. The study subjects consisted of eight biology teachers from three public high schools in Rumbai. Data were collected using a 60-item Likert-scale questionnaire covering four main indicators: understanding of AI, teacher preparation for using AI, readiness of facilities and infrastructure, and teacher perceptions of AI. Data were analyzed descriptively using average scores and categorized by level of readiness. The results showed that overall biology teacher readiness was in the very high category. Teachers had a good understanding and positive attitudes toward the use of AI in learning, although improvements were still needed in supporting facilities, particularly internet network stability and technology access.

Keywords: teacher readiness, biology education, artificial intelligence, digital literacy, educational technology

1. INTRODUCTION

The development of information technology in the Industrial Revolution 4.0 era toward Society 5.0 has encouraged the utilization of digital technology in various sectors, including education. Information and Communication Technology (ICT) plays an important role in improving the quality of learning and has become an essential component in the educational process (Faridi, 2022). One of the technological developments widely utilized today is artificial intelligence (AI). AI has great potential to improve the effectiveness of learning. According to Johnson in Abimanto (2023), AI can transform teaching methods to become more efficient and accessible for students from various backgrounds. In the educational context, teachers are required to possess 21st-century skills such as critical thinking, communication, collaboration, and creativity in order to optimally utilize technology in the learning process (Arifka in Azizah & Hariyadi, 2022).

The use of AI in learning can help teachers adjust learning materials, provide

feedback, and enhance students' learning experiences. In addition, AI can assist teachers in designing more innovative and adaptive learning activities that meet students' needs (Puspita et al., 2023). However, the implementation of this technology is not free from challenges, such as limitations in facilities, teachers' digital literacy, and readiness to integrate technology into learning. Therefore, teacher readiness becomes a crucial factor in the successful implementation of AI in education. This study aims to analyze the readiness of biology teachers in Rumbai senior high schools in integrating artificial intelligence (AI) into biology learning.

2. METHODOLOGY

This research uses a descriptive quantitative approach with a survey method. This approach aims to describe the condition of teacher readiness objectively according to the situation on the ground without manipulating variables. The research subjects consisted of eight biology teachers from three public high schools in the Rumbai area: SMAN 3 Pekanbaru, SMAN 13 Pekanbaru, and SMAN 16 Pekanbaru. The sampling technique used total sampling due to the limited population. The research instrument is a Likert scale questionnaire consisting of 60 statement items, covering four main indicators:

1. Understanding of AI
2. Teacher preparation in using AI
3. Preparation of facilities and infrastructure
4. Teachers' perceptions of AI

Data were analyzed descriptively by calculating the average value of each indicator and categorizing them into certain levels of readiness.

Questionnaire Value	Category
1,00-1,74	Low
1,75-2,49	Medium
2,50-3,24	High
3,25-4,00	Very Hegh

(Source: Muhidin in Firda, 2019)

3. RESULTS

His study aimed to determine the readiness of biology teachers in Rumbai District to integrate artificial intelligence (AI) into biology learning. The research data were obtained through the distribution of questionnaires to eight biology teachers from three schools: SMAN 3 Pekanbaru, SMAN 13 Pekanbaru, and SMAN 16 Pekanbaru. Data analysis was conducted using descriptive statistics by calculating the average score of each readiness indicator. Overall, the results showed that biology teachers' readiness to integrate AI was categorized as very high. This indicates that teachers already have a good understanding, readiness in using AI, adequate infrastructure

support, and positive perceptions of the use of AI in biology learning. Teacher readiness was assessed based on four main indicators: understanding of AI, teacher preparation in using AI, readiness of facilities and infrastructure, and teacher perceptions of AI.

a. Teachers' Understanding of AI

The analysis results showed that the AI understanding indicator obtained an average score of 3.5 or 87.5%, which falls into the very high category. This indicates that teachers already understand the basic concept of AI in education, including its definition, benefits, and examples of its application in biology learning. Teachers also understand the potential of AI to improve learning effectiveness, such as assisting in the preparation of learning materials, visualizing abstract concepts, and facilitating the search for learning resources. In addition, teachers are aware of challenges in the use of AI, such as the possibility of students becoming overly dependent on technology and the need for teacher supervision in its use.

b. Teacher Preparation in Using AI

The indicator of teacher preparation in using AI obtained an average score of 3.48 or 87%, which is included in the very high category. This indicates that teachers have good abilities in using AI-based applications and have attempted to apply these technologies in learning activities. This readiness includes teachers' ability to operate AI applications, design technology-based learning activities, and their willingness to participate in training or professional development related to AI usage.

c. Readiness of Facilities and Infrastructure

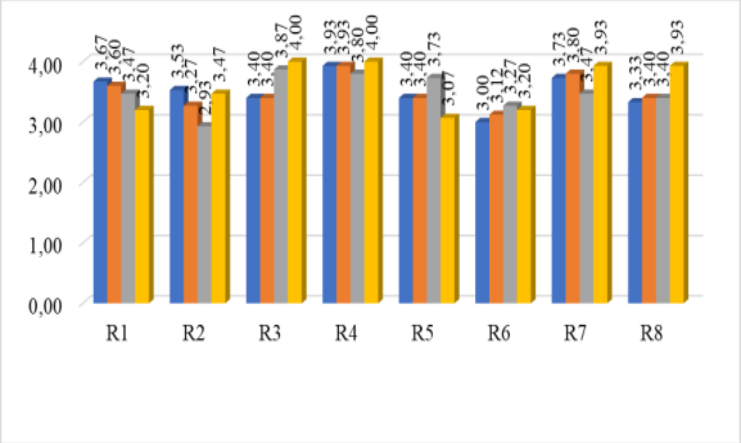
The results showed that the facilities and infrastructure readiness indicator obtained an average score of 3.49 or approximately 87.25%, which is categorized as very high. This indicates that most schools already have sufficient facilities to support the implementation of AI technology in learning. These facilities include the availability of computers or laptops, projectors, and internet access that can be used for digital learning activities. However, several technical challenges were still identified, such as unstable internet access under certain conditions, limited personal devices owned by teachers, and uneven technical support for technology use in schools.

d. Teachers' Perceptions of AI

The teacher perception indicator obtained the highest average score of 3.59 or about 89.8%, which falls into the very high category. This shows that teachers have very positive attitudes toward the use of AI in biology learning. Teachers perceive AI as a technology that can help improve learning quality, simplify the preparation of teaching materials, and assist in the learning evaluation process. Teachers also believe that AI is not a threat to the teaching profession but rather a supportive tool that can enhance creativity and the effectiveness of the learning process.

e. Results of the Open-Ended Questionnaire

The results of the open-ended questionnaire revealed that teachers have used various AI applications in biology learning activities, such as ChatGPT, Canva, Quizizz, Kahoot, Gemini, Perplexity, and Suno AI. These AI applications were used in various biology topics, such as viruses, organ systems, cell structure, ecosystems, metabolism, and biotechnology. This indicates that the use of AI is flexible and can be adapted to the needs of classroom learning. These findings strengthen the results of the study that biology teachers in Rumbai District are not only conceptually prepared but have also implemented AI technology in practical classroom learning.



In general, these findings illustrate that biology teachers in Rumbai are ready to integrate AI into learning, while still requiring improvements in supporting infrastructure aspects.

4. DISCUSSION

The results of the study indicate that the readiness of biology teachers in Rumbai District to integrate artificial intelligence (AI) into learning is categorized as very high. This readiness is viewed from four main indicators: teachers' understanding of AI, preparation for AI use, readiness of facilities and infrastructure, and teachers' perceptions of AI.

a. Teachers' Understanding of AI

Teachers' understanding of AI is a fundamental aspect of implementing technology in learning. The results show that teachers' understanding of AI is in the very high category. This indicates that teachers already understand the basic concepts of AI, its benefits in learning, and the challenges that may arise in its

application. According to Wang and Zhang (2023), teachers' understanding of AI technology greatly influences their readiness to integrate the technology into learning activities. Teachers with strong technological understanding tend to be more confident and more open to utilizing technology as a learning medium.

In biology learning, AI can help teachers explain abstract concepts through visualization, simulations, and interactive media, thereby improving students' understanding of the subject matter.

b. Teacher Preparation in Using AI

Teacher readiness in using AI reflects their practical ability to operate and apply the technology in learning. The results of this study show that teachers have very good readiness in using various AI applications. This indicates that teachers not only understand AI theoretically but are also able to apply it directly in the learning process. Teachers can use AI to prepare learning materials, create learning media, design evaluation questions, and find learning references more quickly and efficiently. Teachers' openness toward technological innovation is also an important factor encouraging the use of AI in learning. Teachers with positive attitudes toward technology tend to adapt more easily to the development of educational technologies.

c. Readiness of Facilities and Infrastructure

Facilities and infrastructure are important supporting factors in the implementation of technology in learning. The results of this study indicate that schools generally already have adequate facilities to support the application of AI in learning. However, several obstacles were still identified, such as limited internet networks, uneven distribution of supporting devices, and insufficient technical support for technology use. These findings are consistent with the studies of Purnama et al. (2025) and Setyawati et al. (2025), which state that technological infrastructure limitations are one of the main factors affecting the success of technology integration in learning. Therefore, support from schools is essential in providing adequate facilities so that the implementation of AI technology can run optimally.

d. Teachers' Perceptions of AI

Teachers' perceptions of AI also play an important role in determining the success of technology implementation in learning. The results show that teachers have very positive perceptions of the use of AI. Teachers view AI as a technology that can help improve learning quality and simplify many teaching tasks. This finding is consistent with the Technology Acceptance Model (TAM) proposed by Davis (1989), which explains that technology acceptance is influenced by perceived usefulness and perceived ease of use.

Furthermore, Shuwaired et al. (2021) state that teachers' positive perceptions of technology can increase their intention and motivation to use technology in

learning activities. However, some teachers also recognize potential risks in the use of AI, such as students' dependence on technology and the possibility of reduced critical thinking skills if technology is used without supervision. Therefore, the use of AI in learning still requires proper monitoring and control by teachers so that the technology is used wisely and in accordance with learning objectives.

e. Reinforcement from the Open-Ended Questionnaire

The open-ended questionnaire results indicate that teachers have used several AI applications such as ChatGPT, Canva, Quizizz, Kahoot, Gemini, and Perplexity in biology learning activities. The use of AI in various biology topics helps teachers prepare teaching materials, create learning media, and design evaluation activities. These findings indicate that teachers are not only theoretically ready but have also implemented AI in real classroom learning practices. This strengthens the conclusion that biology teachers in Rumbai District are highly ready to integrate AI into biology learning.

5. CONCLUSION

The readiness of biology teachers in Rumbai to integrate AI is very high. Teachers have a good understanding, skills, and positive perceptions of AI. Infrastructure improvements and ongoing training are recommended to support optimal AI implementation.

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