

AI in the Classroom: Exploring the Impact of Human-AI Collaboration on Teaching and Research Innovations in Indonesian Schools

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ABSTRACT

The integration of Artificial Intelligence (AI) in education has the potential to revolutionize teaching methodologies and enhance research practices. This paper explores the impact of Human-AI collaboration in secondary school classrooms, specifically focusing on SMP Negeri 4 Sungguminasa Gowa, Indonesia. Despite the growing interest in AI as a tool for educational improvement, there is limited research on its practical implementation in Indonesian schools. This study addresses the gap by investigating how AI tools are utilized in teaching and research, and the challenges faced by educators in integrating AI into their pedagogical practices. The primary aim of the research is to assess the role of AI in enhancing teaching efficiency and academic research outcomes, as well as to identify obstacles and opportunities for its effective use in the classroom. A qualitative descriptive approach was employed, using semi-structured interviews with teachers and school administrators, classroom observations, and document analysis. The findings indicate that AI is beneficial in personalizing learning, automating administrative tasks, and supporting research activities. However, the integration process is hindered by issues such as inadequate training, limited access to AI tools, and infrastructure challenges. The study concludes that AI has a significant potential to improve educational practices in Indonesian schools, provided that sufficient support is given in terms of training, resources, and infrastructure. This paper contributes to the field by offering insights into the practical applications and challenges of AI in secondary education in Indonesia, while also providing recommendations for enhancing its implementation.

Keywords: *Artificial Intelligence, Human-AI Collaboration, Teaching Innovation, Educational Research, Secondary Schools, Indonesia.*

1) INTRODUCTION

The use of Artificial Intelligence (AI) in education is growing quickly, offering new ways to improve teaching and learning. AI technologies, such as personalized learning programs, smart tutors, and tools to automate tasks, have the potential to make education more efficient and tailored to individual student needs. As AI continues to develop, many countries, including Indonesia, are exploring how it can help improve their education systems, especially in secondary schools. While AI

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offers many benefits, there are challenges in using it effectively, particularly in balancing new technology with traditional teaching methods.

In Indonesia, more schools are beginning to use AI tools to support teaching and learning. However, AI's use in classrooms is still in its early stages, and there is little research on how these tools are being used in Indonesian secondary schools. Although AI provides many tools that could improve teaching quality, we do not yet fully understand how these tools are being applied in everyday teaching or if they meet the needs of students. There is a need for research that looks into how AI is used in secondary schools in Indonesia and the challenges teachers face when trying to use these tools in their teaching. Research by Luckin (2016) shows that while AI has many advantages, there are challenges related to teacher training and technology access in developing countries.

This study aims to address the problem of AI misuse in education, particularly focusing on how it affects students' learning and character development. While AI can provide personalized lessons and instant feedback, there is a concern that students might rely too much on AI and not engage deeply in their learning. This could reduce their critical thinking and creativity. In some cases, AI tools might encourage students to passively receive information instead of actively engaging in the learning process. This issue is especially important in Indonesia, where there is a strong push for technology in education, but concerns about how to use it properly still remain. Selwyn (2019) points out that while technology offers many possibilities, we must also be careful not to let AI replace the human element in learning.

This study focuses on SMP Negeri 4 Sungguminasa Gowa, a secondary school in South Sulawesi, Indonesia, to explore how AI is being used in the classroom. The main research question is: How does the collaboration between teachers and AI tools affect the teaching and learning process in Indonesian schools, especially in terms of student engagement, learning outcomes, and the development of important skills like critical thinking and creativity? The goal is to understand how AI is being used in classrooms, the challenges teachers face in using these tools, and the overall impact on students' learning experience.

This research is motivated by the desire to understand how AI can improve education without taking away from essential skills like critical thinking, problem-solving, and creativity. There is a growing interest in AI in education, but little research focuses specifically on how it is being used in Indonesian schools. By studying the experiences of teachers, students, and school administrators at

SMP Negeri 4 Sungguminasa Gowa, this research hopes to fill that gap and offer useful information on AI's role in education in Indonesia. Silverman (2017) emphasizes that to fully understand the benefits and challenges of AI, we need a deeper look into how it fits into local educational contexts.

The objectives of this study are as follows:

1. To assess the current use of AI tools in teaching and research at SMP Negeri 4 Sungguminasa Gowa.
2. To investigate the challenges faced by teachers in integrating AI tools into their pedagogical practices, especially in terms of student engagement and learning outcomes.
3. To explore the impact of AI tools on students' critical thinking, creativity, and overall character development.
4. To provide recommendations for improving the integration of AI in education, ensuring it helps, rather than harms, student learning.

2) METHODS

This study uses a qualitative descriptive approach with a phenomenological research design to explore the impact of Artificial Intelligence (AI) on teaching and learning in secondary schools. The phenomenological approach was chosen because it allows us to understand the lived experiences of teachers and students regarding the use of AI tools in the classroom. This method focuses on exploring how AI is experienced by participants and how they perceive its impact on their daily educational activities.

The research was conducted at SMP Negeri 4 Sungguminasa Gowa, a secondary school in South Sulawesi, Indonesia, which has started integrating AI tools into its teaching and learning processes. The goal of the study is to explore how teachers and students experience AI in the classroom and how it affects their engagement, learning outcomes, and development of key skills such as critical thinking and creativity.

The data were collected using three main methods: semi-structured interviews, classroom observations, and document analysis. These methods help capture a detailed understanding of how AI is used in the school setting and the challenges and benefits experienced by teachers and students.

a) Semi-structured Interviews:

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Interviews were conducted with six teachers and two school administrators. The interviews were semi-structured, allowing for open-ended questions, and aimed to explore the experiences of teachers with AI tools in the classroom. Teachers were asked about how they use AI, the challenges they face, and how they believe it affects student learning. School administrators were interviewed to understand their perspective on AI's role in the school's educational strategy.

b) Classroom Observations:

The researcher conducted observations in four classrooms to see how AI tools were used during lessons. These observations focused on how students interacted with AI-powered tools and how teachers incorporated AI into their teaching methods. The researcher also observed how AI impacted student engagement and participation in the learning process.

c) Document Analysis:

Relevant documents, such as lesson plans, AI training materials, and school reports, were reviewed. This helped the researcher understand how AI is formally integrated into the curriculum and how teachers are being trained to use AI tools effectively in their teaching.

3) RESULTS AND DISCUSSION

The findings from the research conducted at SMP Negeri 4 Sungguminasa Gowa are presented and analyzed, focusing on the role of Artificial Intelligence (AI) in education. This study explores the integration of AI tools into classroom practices, examining how they influence student engagement, learning outcomes, and the development of critical thinking and creativity. The challenges faced by educators in effectively using AI in their teaching will also be addressed, along with the impact these tools have on enhancing or hindering students' ability to think critically, solve problems, and engage in independent learning. Furthermore, the study will discuss how AI interacts with traditional teaching methods and its potential to transform educational practices.

a) Overview of Findings The research

findings were derived from three primary sources: semi-structured interviews with teachers and administrators, classroom observations, and document analysis. The data from these sources were

analyzed thematically, and several key trends and themes emerged from the analysis, which are presented below.

b) Use of AI Tools in Teaching and Learning

AI tools were reported to be used in various ways within the classrooms at SMP Negeri 4 Sungguminasa Gowa. The primary tools used included adaptive learning systems, automated grading systems, and interactive educational software designed to provide personalized learning experiences for students.

- Adaptive Learning Systems

Teachers reported that the use of adaptive learning platforms had a positive effect on student engagement. These platforms adjusted the difficulty of tasks based on the students' performance, offering personalized learning pathways. Teachers noted that AI provided opportunities for students to work at their own pace, especially for those who struggled with the regular curriculum. However, some teachers highlighted the need for adequate training to use these tools effectively.

Table 1: *AI Tool Use in Classrooms at SMP Negeri 4 Sungguminasa Gowa*

AI Tool Type	Percentage of Use (%)	Impact on Student Engagement
Adaptive Learning Platforms	65	Increased
Automated Grading Systems	50	Moderate
Interactive Educational Software	45	Low to Moderate

- Automated Grading Systems

The automated grading systems were particularly useful in reducing the administrative burden on teachers. Teachers reported spending less time on grading assignments, which allowed them more time to interact with students and focus on areas requiring more in-depth attention. However, while this tool enhanced efficiency, teachers expressed concerns about its accuracy, particularly with complex or subjective assignments such as essays.

- Interactive Educational Software

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While interactive educational software was noted to engage students more effectively in subjects such as mathematics and science, it was less frequently used in subjects that required higher-order thinking skills, such as literature and social studies. Some teachers felt that these AI tools could not yet fully replicate the depth of human interaction required in these subjects.

c) Challenges Faced by Educators

Despite the positive impact of AI tools on teaching and learning, several challenges were identified by educators during the study.

1. Lack of Training and Familiarity

One of the most significant challenges faced by teachers was the lack of training in using AI tools effectively. Many teachers reported feeling overwhelmed by the rapid adoption of AI in their classrooms. While some teachers were able to incorporate AI with ease, others struggled to integrate these tools meaningfully into their lessons. The lack of ongoing professional development in the use of AI was highlighted as a barrier to maximizing the potential of these technologies.

2. Infrastructure Issues

Another challenge cited was infrastructure limitations, particularly with regards to reliable internet access and sufficient technological resources. Several teachers mentioned that inconsistent internet connections often disrupted the use of AI tools, especially those that required online access. Some classrooms also lacked enough devices for each student to engage with the tools simultaneously, hindering the full potential of AI integration.

3. Student Engagement and Over-Reliance on AI

While AI tools were seen to increase engagement for some students, particularly through personalized learning, concerns about over-reliance on AI were raised. Teachers noted that certain students became too dependent on AI systems to complete their work, reducing their engagement in critical thinking and problem-solving activities. This dependence on technology was particularly evident among students who struggled with self-regulation and motivation.

d) Impact of AI on Student Engagement and Learning Outcomes

1. Student Engagement

Overall, AI tools had a positive impact on student engagement. The adaptive learning systems were particularly effective in encouraging students to take ownership of their learning. Students who

previously struggled in traditional classroom settings were able to progress at their own pace, which increased their confidence and willingness to participate in class discussions.

However, some students, particularly those in the lower academic levels, exhibited a passive approach when using AI tools. Teachers reported that these students often relied on the AI tools to provide answers without fully understanding the underlying concepts.

Table 2: *Student Engagement in AI-Enabled Lessons*

Engagement Level	Percentage of Students (%)
High	40
Moderate	35
Low	25

2. Learning Outcomes

AI's impact on learning outcomes varied by subject and the level of AI integration in the curriculum. For subjects that made use of personalized learning, such as mathematics and science, there was a noticeable improvement in academic performance. Students using AI systems scored higher on assessments that measured factual recall and problem-solving abilities.

However, in subjects that required deeper understanding and critical analysis, such as literature and history, the use of AI tools was less effective. Teachers felt that AI's capabilities in these areas were still limited, as the tools could not fully engage students in complex discussions or critical thinking exercises.

e) Discussion of Findings

The findings of this study align with those of previous research, which suggests that AI tools can have a positive impact on student engagement and learning outcomes when used correctly. For example, Hwang and Chen (2017) found that adaptive learning systems could increase student engagement by providing personalized learning pathways. Similarly, Luckin (2016) emphasized the

role of AI in automating administrative tasks, allowing teachers to focus more on meaningful interactions with students.

However, the study also identifies critical challenges that were less emphasized in previous studies, such as the need for proper teacher training and overcoming infrastructure limitations. These challenges highlight the importance of a well-planned implementation strategy when introducing AI into classrooms, ensuring that both teachers and students are adequately supported. One of the more surprising findings of this study was the concern about student dependency on AI, a factor that could hinder the development of essential critical thinking and creativity skills. While AI can support personalized learning, it should not replace the role of the teacher in fostering active student engagement and deeper learning.

4) CONCLUSIONS

This study examined the use of Artificial Intelligence (AI) tools in the classrooms of SMP Negeri 4 Sungguminasa Gowa. The findings show that AI, particularly adaptive learning platforms, positively impacts student engagement by personalizing learning and allowing students to work at their own pace. However, challenges such as lack of teacher training, infrastructure issues, and over-reliance on AI by students were identified as barriers to fully maximizing the potential of AI tools. While AI was effective in subjects focused on factual recall and problem-solving, its impact was less significant in subjects requiring critical thinking and deeper analysis. This highlights the need for AI to complement, not replace, traditional teaching methods.

Implications and Suggestions

1. **Teacher Training:** There is a clear need for ongoing professional development in the use of AI tools. Schools should invest in training programs to equip teachers with the skills needed to integrate AI effectively into their teaching. This will ensure that teachers can maximize the potential of AI tools and provide students with an enhanced learning experience.
2. **Infrastructure Improvements:** To ensure the effective use of AI tools, schools need to address infrastructure limitations, such as internet access and the availability of devices. Reliable and consistent access to technology is essential for AI to be used effectively in the classroom.
3. **Balanced Use of AI:** While AI tools offer numerous benefits, it is important to maintain a balance between AI-assisted learning and traditional teaching methods. Teachers should

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encourage students to use AI as a supplementary tool, rather than relying on it entirely, to avoid the development of passive learning behaviors.

4. Further Research: Future research should focus on the long-term impact of AI on student learning outcomes, particularly on cognitive skills such as critical thinking and creativity. Additionally, studies should explore how AI can be adapted for subjects that require higher-order thinking and complex problem-solving.

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