



AI Opportunities and Challenges for Post PPG Teachers

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Abstract. Education in the era of technology and information development faces various complex challenges. Teachers post the Professional Teacher Education Program (PPG) can utilize artificial intelligence (AI) to increase the effectiveness of their teaching. With the help of AI, teachers can develop learning methods that are more personal and adaptive, according to the needs and abilities of each student, tasks such as assessments, learning tools, analysis of exam results, and managing student data can be carried out more quickly and accurately. There are various benefits and positive impacts from the use of AI by post-PPG teachers in learning, AI also has a negative impact on teachers. AI can support personalization of learning, provide faster feedback, and analyze data to improve the teaching process. Teachers who are able to utilize this technology effectively can provide learning experiences that are richer and focused on individual student needs. Apart from that, AI also allows teachers to allocate more time to aspects of learning that require a human touch, such as character development and interpersonal relationships with students. However, the challenges faced are also significant. Teachers need to continually improve their competency in technology, adapt to new teaching methods, and ensure that their role remains relevant amidst the widespread use of AI. Teachers must also consider the ethical and privacy issues associated with the use of AI, so it is important for teachers to follow technological developments wisely and ensure that the use of AI is done ethically and supports educational goals.

Keywords: AI, Education Goals, PPG Teachers

1 Introduction

Education and technology are increasingly inseparable in this digital era. Technology has opened wider access to information and learning resources, allowing students in various parts of the world to get quality education even in remote locations. With the existence of e-learning and various online education platforms, learning can now be done flexibly, not limited by space and time [1-2]. It also provides opportunities for students to study independently and adjust their learning pace according to personal needs. Apart from that, technology also makes it easier for educators to deliver learning material in a more interactive and interesting way. The use of multimedia, such as videos, simulations and interactive applications, makes learning livelier and makes it easier to understand complex concepts [3-5]. On the other hand, technology also plays a role

in managing educational administration more efficiently, from assessment systems to student data management. Thus, the integration of technology in education not only improves the quality of learning, but also encourages the effectiveness and efficiency of the education system as a whole [6-7].

Education in the era of technology and information development faces various complex challenges. One of the main challenges is the gap in access to technology. Although technology offers many opportunities, not all students have adequate access to devices and the internet. This creates a digital divide that worsens inequality in education [8-9]. Students from remote areas or low-income families are often left behind due to a lack of adequate technological infrastructure. Apart from that, there are also challenges in preparing educators to adapt technology in the learning process, considering that not all teachers have adequate digital skills [10-11]. Apart from access challenges, education is also faced with the risk of reducing the quality of social and emotional interactions in the learning process. Excessive use of technology can reduce direct interaction between teachers and students, which is an important element in the formation of character and social skills [12]. On the other hand, the rapid flow of information also presents challenges in filtering relevant and accurate content [13]. Without proper guidance, students can be exposed to misleading or less valid information, which can affect their learning process. Therefore, although technology offers many benefits, these challenges need to be addressed to ensure education remains effective and inclusive.

Teachers post the Professional Teacher Education Program (PPG) can utilize artificial intelligence (AI) to increase the effectiveness of their teaching. With AI, teachers can develop more personalized and adaptive learning methods, according to the needs and abilities of each student [14-15]. For example, AI can be used to analyze student learning outcome data and provide recommendations for appropriate learning strategies. Apart from that, AI can also help in creating more interactive and interesting learning materials, such as simulations, adaptive quizzes, and learning videos that are tailored to students' learning styles [16-17].

Apart from improving learning, AI can also lighten the administrative burden on teachers. With the help of AI, tasks such as grading assignments, analyzing exam results, and managing student data can be done more quickly and accurately. This allows teachers to focus more on curriculum development and in-depth student learning. However, in order to make optimal use of AI, post-PPG teachers need to continue to improve their digital literacy and technology skills, so that they can integrate AI effectively in the teaching and learning process in the classroom. The use of artificial intelligence (AI) applications for post-PPG teachers opens up new opportunities for more effective and efficient teaching [18-19]. AI applications can be used to create more structured and data-based learning plans, where teachers can utilize AI analysis to understand student learning patterns and adjust teaching strategies. For example, AI applications can identify students' weaknesses and strengths in certain subjects, so teachers can pay special attention to areas that need improvement. With the help of AI, teachers can also access various digital resources that are in accordance with the curriculum, making it easier to create innovative and interactive teaching materials [20-21].

Additionally, AI applications also support administrative tasks, such as automated grading, classroom management, and student progress tracking. For example, AI can

help in grading essays or other assignments more quickly and consistently, allowing teachers to provide quicker feedback to students. This application can also help teachers monitor student progress in real-time, so that necessary interventions can be carried out on time. Thus, the use of AI applications allows post-PPG teachers to improve the quality of teaching, speed up administrative processes, and provide a more personalized and adaptive learning experience for students [22-23]. Apart from the various benefits and positive impacts of using AI by post-PPG teachers in learning, AI also has negative impacts for students and teachers. For this reason, in this article, we will describe the opportunities and challenges of using AI for post-PPG teachers.

2 Method

This research uses a literature review method that discusses a particular topic and aims to provide a summary or overview of the development of that topic. By conducting a literature review, the author can identify and develop theories and methods, closing the differences between theories and their relevance to the research field or research results. Literature review can be defined as an activity that examines and criticizes research conducted on a particular topic in the academic field. The purpose of a literature review is to provide an explanation or discussion of theories that are relevant to research findings or topics [24]. To carry out research and produce scientific work, this theoretical description is very important. A literature review can be accessed from various sources, including books, journals, the internet, and libraries [25].

2.1 Data Collection Technique

The data used comes from research published in national online journals. In this research, researchers used the scholar search engine to search for research journals published on the internet with the keywords development of the world of education, education in Indonesia, educational challenges in the era of technological and information development, use of AI in the world of education, opportunities and challenges of using AI for teachers post PPG. The data collection process is carried out by filtering according to the criteria determined by the author of each journal taken. The following criteria apply to collecting journals, such as the source year taken from the last 10 years, the strategy for collecting journals of various literature using the journal site, namely Scholar, writing keywords correctly for the journal setting, carrying out full text searches and conducting journal searches using abstract to more effectively see its suitability to the research objectives.

2.2 Data Analysis

Research journals that meet the criteria are then collected and compiled into a summary that includes name, title, year, methods and research results. Next, the journal abstract is analyzed regarding the research objectives and the content of the findings or research

results to provide a more in-depth analysis. The analytical method used to conduct journal content analysis.

3 Results and Discussion

3.1 Results

This literature review was carried out to examine the opportunities and challenges of AI for post-PPG teachers using existing literature collection techniques with the keywords development of the world of education, education in Indonesia, educational challenges in the era of technology and information development, use of AI in the world of education, opportunities and challenges use of AI for post-PPG teachers. The collected literature is analyzed using the Critical Appraisal table to answer the purpose of the measurement and comparisons are made with simple measurement results.

Critical Appraisal Analysis

There are three pieces of literature that discuss the opportunities and challenges of AI for post-PPG teachers, all of these journals are national journals and books that were searched on the Google Scholar portal using the keywords: "development of the world of education, education in Indonesia, educational challenges in the era of technological development and information, the use of AI in the world of education, opportunities and challenges of using AI for post-PPG teachers. The following critical appraisal analysis table from the three journals is presented in table 1 below.

Tabel 1. *Critical Appraisal Analysis*

No.	Researcher Name	Title	Year	Method	Result
1.	Ashshid-diqi, et. al. [26]	Utilization of AI in the Independent Curriculum Era: Student Perspective and Middle School Teacher	2024	Qualitative Descriptive	The use of AI by students and teachers is already widely used. Based on the student's perspective, AI is used to help them complete school assignments, while from the teacher's perspective, AI is used to make things easier their work, in making questions, completing teacher administration, and completing assignments on the Merdeka Teaching Platform in the Merdeka Curriculum
2.	Saputra, et.al. [27]	The Role of AI in the World of Education	2023	Literature Study	The application of AI in education has opportunities and challenges. The oppor-

tunities are adaptation of instruction, analysis of educational data, increased management effectiveness, automated assessment systems, curriculum development, accessibility and inclusion, virtual tutoring facilities available around the clock. The challenges are limited infrastructure and human resources, data privacy concerns, dependence on technology, implementation problems, unfairness in access

3.	Gafar, et.al. [28]	AI in Academic Contexts for the Future of Education	2023	Literature Study
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The use of AI in education has both positive and negative impacts. AI can improve the quality of learning, efficiency of time and work on assignments, help in learning, but AI can make students and teachers dependent on technology with minimal social interaction and high costs.

3.2 Discussion

Use of AI in Learning for PPG Teachers. The use of AI in learning for Professional Teacher Education (PPG) teachers is becoming increasingly relevant along with technological developments and educational needs that continue to change. AI can help PPG teachers create more dynamic and adaptive learning experiences. Through data analysis, AI is able to understand student learning patterns and provide appropriate recommendations for each individual. This allows teachers to design more effective teaching strategies, tailored to the unique needs of each student, so that learning becomes more personalized and impactful [29-30].

In addition, AI can increase efficiency in the evaluation and assessment process. In education, the assessment process often requires quite a long time and a lot of resources. With the help of AI, assessments can be done automatically and faster, without sacrificing accuracy. For example, AI can be used to grade written assignments, analyze student answers, and provide constructive feedback. This allows teachers to focus more on teaching and interacting with students, instead of having their time taken up by administrative tasks [31-32].

AI also has the potential to become an intelligent teaching assistant. Through AI-based chatbots or virtual assistants, PPG teachers can provide additional support for students outside formal learning hours [28]. This AI assistant can answer questions, provide additional explanations, or assist students in completing practice questions. In

this way, students can learn independently with the help of technology, while teachers can still monitor and provide intervention when needed [33].

The use of AI in learning also opens up opportunities for the development of more creative and interactive teaching materials. AI can be used to create engaging simulations or learning modules, which can visualize difficult concepts in a way that is easier to understand. For example, AI can help PPG teachers create science simulations that allow students to experiment virtually. In this way, learning becomes more interesting and involves students more deeply [27].

However, applying AI in learning also presents its own challenges, especially those related to ethics and privacy. PPG teachers need to understand how student data is used and ensure that the AI technology implemented meets strict ethical standards. Additionally, it is important for teachers to receive adequate training in the use of AI in order to optimize its benefits. Thus, the use of AI in education is not just a technological trend, but also a strategic step in improving the quality of education in the digital era [28]. In the national education system, pre-service PPG is a program intended to equip prospective teachers with the skills needed to meet the demands of work in schools. Pre-service PPG participants are often burdened with many administrative tasks, which can reduce the time available to concentrate on developing the quality of learning. Assessments, preparing reports, preparing learning implementation plans (RPP), and various other documents are administrative tasks that require a lot of time and attention. Artificial intelligence (AI) technology offers solutions to ease the responsibilities of PPG teachers in the digital era. AI applications such as ChatGPT can automate assignment correction, preparation of questions, and evaluation of learning outcomes.

AI Opportunities for Post-PPG Teachers. After completing the Teacher Professional Education (PPG) program, teachers are faced with the challenge of continuing to improve the quality of their teaching amidst rapid technological developments. One opportunity that can be exploited is the integration of Artificial Intelligence (AI) in their teaching practices. AI opens up many opportunities for teachers to develop more effective, efficient and innovative teaching methods. By utilizing AI, teachers can enrich students' learning experiences, which in turn can improve overall learning outcomes [34-35].

One of the main opportunities of AI for post-PPG teachers is the personalization of learning. AI can be used to collect data on each student's learning preferences, abilities and progress. Based on this data, AI can help teachers to adapt teaching methods to suit individual students' needs. Teachers can utilize AI recommendations to create learning plans that are more relevant and challenging for each student, so that learning becomes more inclusive and supports the development of all students [36].

In addition, AI can support teachers' ongoing professional development. AI can provide access to a variety of learning resources, such as training modules, articles and video tutorials, that are relevant to teachers' needs and interests. With AI, teachers can keep up with the latest developments in the world of education, access new knowledge and improve their skills more easily and quickly. AI can also provide ongoing feedback regarding teachers' teaching performance, helping them identify areas that need improvement and measure their progress objectively [16].

AI also offers the opportunity to automate administrative tasks that often tax teachers' time and energy. With AI, teachers can automate the assessment process, processing

student data, and creating reports, so they have more time to focus on interacting with students and developing learning materials. For example, AI can be used to automatically grade student assignments, identify student performance patterns, and produce comprehensive reports, which teachers can use to design more effective teaching strategies [37-38].

However, to take advantage of the opportunities offered by AI, post-PPG teachers need to develop adequate technological literacy. It is important for teachers to understand how AI works and how this technology can be used ethically and effectively in educational contexts. In this way, AI will not only become a tool, but will also become an integral part of efforts to improve the quality of education and professionalism of teachers in the digital era [39].

Research by Wang & Zhang [40] shows that after participating in PPG, teachers can utilize AI technology to support the development of their pedagogical competencies. AI can help teachers analyze student data, provide more personalized feedback, and create more interactive teaching materials. In this research, AI is used to analyze student learning patterns and provide recommendations to teachers regarding teaching approaches that are more appropriate to individual student needs.

The use of AI in post-PPG teacher performance evaluation shows great potential to provide faster and more measurable feedback. This AI system analyzes teacher performance in the classroom through video observations and interactions with students, identifies areas that need improvement, and provides more specific training recommendations for teachers based on their performance data [41]. AI can be used to provide teachers with more in-depth and ongoing feedback after they complete the PPG. By using AI, educational platforms can monitor the development of teachers' pedagogical skills through analyzing their interactions with students and providing specific suggestions that can help improve the quality of teaching [42]. In addition, [43] in their research found that teachers who have completed PPG can use AI to improve classroom management. This technology can be used to monitor student behavior, provide analysis of class dynamics, and identify potential problems such as students who lack focus or who have learning difficulties. This allows teachers to take action more quickly and effectively in addressing classroom challenges.

AI can help post-PPG teachers to provide a more personalized learning experience to students. By using an AI-based platform, teachers can adapt lesson materials to the needs of each student based on analysis of their performance data, both in academic and social aspects [44]. In a post-PPG context, student data can be analyzed by AI systems to provide teachers with deep insight into each student's development, including their strengths and weaknesses. This allows teachers to design more effective teaching strategies and impact better learning outcomes [45].

AI Challenges for Post-PPG Teachers. The challenges of AI for post-PPG teachers will of course be faced by teachers. The various challenges faced by post-PPG teachers are as follows.

The first, challenge faced by post-Professional Teacher Education (PPG) teachers in facing technological advances, especially artificial intelligence (AI), is adaptation to changes in learning methods. AI offers a variety of advanced learning tools and platforms, such as automatic analysis of student data, personalization of teaching materials,

and adaptive learning. Teachers must be able to integrate this technology into their curriculum and teaching methods. This requires new technical skills and a deep understanding of how AI can be used effectively to improve student learning [46].

Second, one of the main challenges is maintaining the relevance of the teacher's role amidst the rapid development of AI in education. With AI capable of providing immediate feedback and providing personalized learning materials, there are concerns that the role of teachers could be shifted. However, teachers must be able to show that although AI can help, emotional aspects, empathy and the cultivation of values cannot be completely replaced by technology. Teachers must focus on developing soft skills and building strong interpersonal relationships with students, which is a unique aspect of their role [47].

Third, the next challenge is increasing professionalism and continuing competency development. AI continues to develop, and teachers are required to constantly update their knowledge and skills to stay relevant. Continuous professional development programs are essential to ensure teachers can keep up with the latest technological developments and implement them effectively. Teachers also need to learn about the ethics of using AI, including how to handle student data safely and responsibly [48-49].

Fourth, classroom management in the AI era is also a significant challenge. AI enables personalization of learning, but on the other hand, teachers must manage students with different needs and abilities simultaneously. This demands more complex managerial abilities from teachers. They must be able to use AI to identify individual student needs and adjust their teaching methods, while maintaining overall class dynamics. This requires a deep understanding of how AI can support, not replace, the role of teachers in classroom management [50].

Fifth, there are challenges in terms of student assessment and evaluation. AI allows for faster and more accurate assessments, but teachers must remain involved in the process to ensure that assessments are fair and holistic. AI can help identify trends and patterns in student performance, but interpretation and actions taken based on that data still require teacher discretion. Teachers must understand the limitations of AI in assessment and ensure that student evaluations do not only focus on cognitive aspects, but also include affective and psychomotor aspects [51].

Lastly, challenges related to ethics and privacy are also a major concern. AI in education often involves massive collection and analysis of student data. Teachers must understand privacy and data security issues, as well as how AI can affect students emotionally and psychologically. Teachers also need to educate students about how they can use technology safely and wisely [52-53].

4 Conclusion

Advances in artificial intelligence (AI) in education offer great opportunities for teachers post Professional Teacher Education (PPG). AI can support personalization of learn-

ing, provide faster feedback, and analyze data to improve the teaching process. Teachers who are able to utilize this technology effectively can provide learning experiences that are richer and focused on individual student needs. Apart from that, AI also allows teachers to allocate more time to aspects of learning that require a human touch, such as character development and interpersonal relationships with students. However, the challenges faced are also significant. Teachers need to continually improve their competency in technology, adapt to new teaching methods, and ensure that their role remains relevant amidst the widespread use of AI. Additionally, teachers must consider the ethical and privacy issues associated with the use of AI, as well as managing more complex classroom dynamics. Therefore, it is important for teachers to keep abreast of technological developments wisely and ensure that the use of AI is done ethically and supports holistic educational goals.

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