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Implementation of Teaching Module Development based on Artificial Intelligence (AI) Chat GPT

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Abstract

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Implementation of Teaching Module Development based on Artificial Intelligence (AI) Chat GPT

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Abstract

This study examines the implementation of the Artificial Intelligence (AI)-based teaching module ChatGPT at SDN Batu Ampar 02, focusing on teachers' challenges in utilizing AI technology due to limited technical knowledge and supporting facilities. The aim is to explore how ChatGPT can improve the quality and innovation of teaching modules. The study used a descriptive qualitative method with primary data through interviews, observations, and documentation, as well as secondary data from related literature. The results show that teachers are able to develop teaching modules that are more creative, relevant, and adaptive to students' needs. The implementation of AI also accelerated the module design process and strengthened teachers' digital literacy. These findings emphasize the importance of AI training and utilization in elementary education.

Keywords

Teaching Module, Artificial Intelligence (AI), ChatGPT, Elementary Education



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INTRODUCTION

The rapid development of artificial intelligence (AI) technology, particularly generative AI models, has transformed various sectors, including education, by supporting the development of innovative learning resources and intelligent teaching systems (Chen, 2024). However, the reality in educational institutions indicates that many teachers continue to experience a digital competency gap in utilizing AI effectively for lesson planning and teaching module development (Fu, 2022). Limited technical knowledge, insufficient understanding of AI-based pedagogical applications, and a lack of familiarity with intelligent educational technologies hinder educators from integrating AI into systematic and contextual instructional design (Yang, 2022). This challenge is further compounded by inadequate technological infrastructure, including limited access to computers, digital learning platforms, and stable internet connectivity, particularly in public elementary schools and underserved areas (Huang, 2021). Consequently, the implementation of AI in teaching module development remains uneven and is often conducted without structured pedagogical guidance. This condition reflects a significant

gap between the promising capabilities of AI technologies and teachers' readiness to adopt them effectively in educational practice, highlighting the urgent need for research focusing on the implementation of ChatGPT-based teaching module development in elementary education.

A teaching module is a systematically designed instructional resource intended to facilitate students' learning processes and enable them to achieve predetermined learning outcomes independently or with teacher guidance. Teaching modules include learning objectives, instructional materials, learning activities, assessment strategies, and reflective components that are aligned with students' characteristics and curriculum requirements. In elementary education, teaching modules play an essential role because they assist teachers in presenting abstract concepts according to children's cognitive development. Moreover, contemporary teaching modules are expected to be flexible, adaptive, and technology-enhanced to support active learning and personalized instruction (Xu, 2023). The integration of AI into instructional design also enables educators to generate multimedia learning materials efficiently and improve the quality of educational resources (Chen, 2024). Therefore, teaching modules can be understood as comprehensive pedagogical instruments that bridge curriculum implementation, instructional strategies, and students' contextual learning needs.

Artificial Intelligence (AI) refers to the capability of computer systems to simulate human cognitive functions such as language understanding, learning from data, reasoning, problem-solving, and generating meaningful responses. One of the most rapidly evolving AI technologies in education is generative AI, which supports automated content creation, personalized learning, and intelligent educational assistance (Amini, 2024). Recent advances in AI have demonstrated its ability to generate adaptive educational materials, provide personalized feedback, and facilitate interactive learning experiences across different educational contexts (Yang, 2022). AI-powered technologies also enable automatic generation of multimedia instructional content and support teachers in designing engaging learning experiences more efficiently (Chen, 2024). Accordingly, ChatGPT can be conceptualized as a generative AI application with substantial potential to function as a pedagogical partner that assists teachers in lesson planning, instructional material development, academic feedback, and the creation of contextual teaching modules, thereby improving the effectiveness and efficiency of elementary education..

METHODS

The object of this research is the implementation of ChatGPT in creating teaching modules at SDN Batu Ampar 02, focusing on the phenomenon in which teachers experience limited technical knowledge and insufficient understanding of artificial intelligence technologies. Many educators encounter difficulties in utilizing AI to design lesson plans due to limited experience, digital literacy, and practical skills in applying intelligent educational systems. Other challenges include inadequate access to supporting hardware, such as personal computers and stable internet connections, which remain significant barriers to the implementation of AI-based learning technologies (Xu, 2023). The research specifically examines how teachers overcome

these limitations through direct guidance, case-based learning, and practical training using ChatGPT, enabling them to produce more creative, innovative, and curriculum-aligned teaching modules. This research object was selected because of its relevance to improving teachers' digital literacy and promoting the integration of AI into elementary education, thereby providing a comprehensive understanding of the challenges, implementation practices, and effectiveness of AI technologies in authentic classroom settings (Duan, 2020).

This study employed a descriptive qualitative approach to provide an in-depth understanding of the phenomenon without manipulating variables or establishing causal relationships. Primary data were collected through in-depth interviews with teachers, school principals, and curriculum coordinators who were directly involved in developing ChatGPT-based teaching modules, allowing researchers to obtain authentic information regarding participants' experiences, challenges, and implementation strategies (Tang, 2022). Secondary data were gathered through a comprehensive literature review on teaching modules, artificial intelligence, and AI-assisted educational practices to strengthen the analytical framework and connect empirical findings with current theoretical perspectives (Dickson, 2024). This qualitative approach enabled the study to generate a systematic and comprehensive description of AI implementation in teaching module development while providing valuable insights into teacher competency enhancement and the effective integration of educational technologies (Luo, 2021).

The research participants consisted of three key stakeholder groups that served as primary sources of information. The first group included the principal of SDN Batu Ampar 02, who provided institutional perspectives regarding school policies and organizational support for the implementation of ChatGPT in learning activities. The second group comprised classroom teachers who were directly responsible for developing teaching modules and applying ChatGPT in instructional planning, thereby contributing essential primary data regarding classroom practices and pedagogical experiences (Moro, 2024). The third group consisted of curriculum coordinators who explained the alignment of AI-assisted teaching modules with national curriculum standards and learning objectives (Yang, 2022). Participants were selected using purposive sampling to ensure that only individuals possessing direct experience and knowledge relevant to the research phenomenon were included as data sources (Duan, 2020). The combination of perspectives from these stakeholder groups enabled researchers to obtain a comprehensive understanding of the challenges, strategies, and best practices associated with implementing AI-based teaching modules while strengthening data triangulation and analytical validity (Amini, 2024).

The research process employed three complementary data collection techniques: in-depth interviews, participant observation, and documentation. Interviews were conducted to explore teachers', principals', and curriculum coordinators' experiences with ChatGPT, the challenges they encountered, and their strategies for developing AI-assisted teaching modules (Moro, 2024). Participant observations were carried out during classroom instruction and teacher training sessions to document teachers' interactions with ChatGPT and observe the practical implementation of AI-supported instructional design (Chen, 2024). Documentation analysis

involved reviewing teaching modules, lesson plans, training materials, and institutional records to obtain contextual evidence supporting the research findings. The integration of these three techniques enabled the collection of comprehensive, reliable, and in-depth qualitative data, thereby providing a holistic understanding of ChatGPT implementation in elementary education (Zheng, 2025).

Data analysis followed the interactive model proposed by Miles and Huberman, consisting of data reduction, data display, conclusion drawing, and verification. Data reduction involved selecting, simplifying, and organizing information obtained from interviews, observations, and documentation to identify key themes and meaningful patterns. Data were then presented using tables, matrices, and conceptual diagrams to facilitate interpretation and illustrate relationships among emerging themes (Morel, 2023). Conclusions were drawn iteratively by relating empirical findings to the theoretical framework and research objectives, while source triangulation was employed to verify data credibility through comparisons among information obtained from teachers, school principals, curriculum coordinators, and supporting documents. This analytical process ensured the validity, credibility, and trustworthiness of the research findings, resulting in a comprehensive and objective understanding of the implementation of ChatGPT in developing teaching modules for elementary schools (Dickson, 2024)..

RESULTS AND DISCUSSION

Based on interviews, observations, and documentation, the use of ChatGPT in developing teaching modules at SDN Batu Ampar 02 demonstrates that teachers are able to design learning materials that are more systematic, structured, and responsive to students' learning needs. The teaching modules produced include learning objectives, achievement indicators, instructional materials, learning methods, and assessment strategies that are comprehensively integrated. Classroom observations indicate that teachers can prepare teaching modules with the assistance of ChatGPT more efficiently than through conventional manual methods, particularly in formulating learning outcomes and designing assessment indicators. Documentation analysis further reveals that the resulting teaching modules are consistent with the national curriculum while incorporating contextual case studies and interactive learning resources relevant to students' experiences. These findings suggest that artificial intelligence significantly supports teachers in improving both the efficiency and quality of teaching module development, which is consistent with previous studies highlighting AI's contribution to personalized instructional design and educational resource generation (Xu, 2023; Chen, 2024).

Interview findings further reveal that teachers perceive ChatGPT as an effective pedagogical assistant rather than a replacement for their professional role. Teachers reported that practical training sessions, accompanied by case-based learning and expert guidance, enabled them to understand how AI could be integrated into lesson planning while adapting instructional materials to the specific needs of their students. As a result, teachers became more

confident in utilizing AI technologies to produce relevant and contextual learning materials. Classroom observations support these findings, showing that teachers who regularly used ChatGPT were able to develop more detailed teaching modules containing interactive activities, authentic case studies, formative assessments, and digital learning resources. Documentation analysis also demonstrates that AI-assisted module development improves curriculum alignment and competency mapping, thereby facilitating student-centered learning. These findings are consistent with previous research emphasizing that AI can strengthen personalized feedback systems and enhance instructional effectiveness (Chen, 2024; Xu, 2023).

The findings also indicate that implementing ChatGPT substantially reduced the technical barriers previously experienced by teachers. Initial limitations related to digital literacy, technical skills, and familiarity with artificial intelligence were gradually minimized through continuous mentoring, practical exercises, and repeated interaction with AI systems. Observation data demonstrate that teachers completed teaching modules more efficiently while maintaining curriculum quality standards. Documentation further confirms that the resulting modules were better organized, richer in instructional content, and more capable of supporting interactive learning activities. These results reinforce previous studies suggesting that AI implementation can improve educational efficiency while simultaneously enhancing teachers' digital competencies and instructional innovation (Fu, 2022; Yang, 2022).

The research further demonstrates that ChatGPT functions as an intelligent instructional assistant that supports teachers throughout the entire teaching module development process. Teachers acknowledged that AI-generated suggestions facilitated the formulation of learning objectives, competency indicators, instructional content, learning activities, and assessment instruments appropriate for students' developmental levels. Classroom observations confirmed that ChatGPT accelerated module preparation without diminishing teachers' professional judgment, as educators continued to revise and contextualize AI-generated content according to classroom needs. Documentation analysis also shows that ChatGPT contributes to integrating multimedia learning resources and enriching educational materials while maintaining alignment between curriculum objectives and instructional activities. These findings support the view that generative AI serves as a pedagogical partner capable of enhancing instructional quality, efficiency, and creativity in elementary education (Amini, 2024; Chen, 2024).

Furthermore, triangulation of interview, observation, and documentation data indicates that ChatGPT assists teachers in overcoming challenges related to limited technological experience and digital literacy. Teachers reported that interacting with AI systems enabled them to receive step-by-step guidance during teaching module development, thereby strengthening both technical competence and pedagogical confidence. Observation data similarly indicate improvements in teachers' ability to organize learning materials logically and systematically, while documentation demonstrates noticeable improvements in module quality after AI integration. These findings are consistent with previous studies emphasizing

that AI-supported educational systems contribute to teacher competency development and facilitate more adaptive instructional planning (Tang, 2022; Yang, 2022).

The overall findings demonstrate that the implementation of AI-based teaching modules at SDN Batu Ampar 02 was conducted systematically according to institutional needs and curriculum requirements. Teachers successfully adapted AI-generated instructional content to accommodate students' characteristics, learning abilities, and classroom contexts. Documentation confirms that each teaching module contains comprehensive instructional components, including learning objectives, competency indicators, instructional materials, learning activities, and evaluation instruments that comply with elementary education standards. Interview participants further emphasized that technical guidance and practical experience with ChatGPT significantly increased their confidence in developing innovative teaching modules. Consequently, AI technology not only improves instructional quality but also promotes teacher professionalism, digital literacy, and sustainable educational innovation in elementary schools (Fu, 2022; Chen, 2024).

Overall, data analysis indicates that implementing ChatGPT in teaching module development provides substantial educational benefits by enabling teachers to design more structured, adaptive, and student-centered instructional materials. Teachers were able to personalize learning content according to students' individual learning characteristics while maintaining alignment with curriculum standards. The use of ChatGPT also reduced administrative workloads, increased instructional efficiency, and encouraged greater creativity in designing innovative learning activities. Consequently, the integration of generative AI contributes not only to improving teaching quality but also to strengthening teachers' digital competencies, which are essential for supporting twenty-first-century learning environments and fostering continuous professional development in elementary education (Yang, 2022; Amini, 2024; Chen, 2024).

. Direct quotation:

"Participants are provided with relevant case studies and challenges to address with this technology under the guidance of a team of experts." – Informant 2, Teacher at SDN Batu Ampar 02.

The relationship between the research findings and the identified educational challenges demonstrates that the implementation of ChatGPT-based teaching modules effectively addresses many of the obstacles experienced by elementary school teachers. Classroom observations revealed that teachers who previously encountered difficulties in developing lesson plans because of limited technical knowledge and inadequate experience with artificial intelligence were subsequently able to design teaching modules that were more systematic, contextual, and responsive to students' learning needs. Documentation analysis confirmed that the AI-assisted teaching modules contained comprehensive instructional components, including learning objectives, instructional materials, learning methods, and assessment

strategies that were well aligned with the elementary school curriculum. Interview findings further indicated that ChatGPT enabled teachers to personalize instructional content according to students' characteristics, reduce the time required for lesson preparation, and improve the overall quality of classroom instruction. These findings support previous studies suggesting that AI technologies enhance instructional planning, curriculum alignment, and personalized educational resource development while strengthening teachers' digital competencies (Chen, 2024; Xu, 2023; Yang, 2022). Consequently, the findings demonstrate a strong alignment between the implementation of ChatGPT and efforts to improve teachers' professional competence in developing teaching modules for elementary education.

Direct quotation:

"Instructors are encouraged to create lesson plans tailored to the unique needs of their students in the classroom, so that the results are more relevant and in line with real-world circumstances." – Informant 2, Teacher at SDN Batu Ampar 02.

The findings also demonstrate that implementing ChatGPT significantly improves the effectiveness of lesson planning in elementary schools. Analysis of interview data, classroom observations, and supporting documentation indicates that teachers who previously struggled to prepare lesson plans were subsequently able to develop teaching modules that were more structured, creative, and adapted to students' learning characteristics. This finding confirms that ChatGPT functions as an instructional facilitator that enables teachers to optimize available time and educational resources while reducing administrative workloads. Furthermore, AI-assisted lesson planning provides teachers with rapid access to relevant and updated instructional materials, thereby enabling learning activities to remain responsive to curriculum development and classroom needs. From a pedagogical perspective, the integration of generative AI contributes to strengthening digital literacy and twenty-first-century competencies, including critical thinking, creativity, collaboration, and problem-solving. These findings are consistent with previous research highlighting AI's role in personalized learning, intelligent instructional support, and innovative educational practices (Amini, 2024; Chen, 2024; Fu, 2022). Therefore, ChatGPT should be viewed not merely as a technological tool but as a strategic innovation for improving the overall quality of elementary education.

Direct quotation:

"In addition to acquiring technical skills, this program teaches teachers how to maximize AI technology as a tool to speed up their work processes." – Informant 2, Teacher at SDN Batu Ampar 02.

Although the implementation of ChatGPT generated substantial educational benefits, this study also identified several challenges that require continuous attention. Classroom observations showed that some teachers experienced technical difficulties when operating ChatGPT, particularly those with limited prior exposure to artificial intelligence and digital technologies. Interviews further revealed that unstable internet connectivity and insufficient technological infrastructure constrained the effective use of AI in developing teaching modules. Documentation from teacher training activities indicated that although intensive workshops improved teachers' competencies, several participants continued to require additional mentoring to understand more advanced AI features. These findings reinforce previous studies indicating that successful AI adoption depends not only on technological capability but also on teachers' digital literacy, institutional readiness, and adequate infrastructure (Fu, 2022; Yang, 2022). Consequently, sustainable professional development programs, continuous technical assistance, and improvements in digital infrastructure are essential for maximizing the educational benefits of ChatGPT in elementary schools.

Direct quotation:

"Participants are provided with relevant case studies and challenges to address with this technology under the guidance of a team of experts." – Informant 2, Teacher at SDN Batu Ampar 02.

Analysis of the research data further demonstrates that ChatGPT positively contributes to teachers' professional competence, particularly in instructional planning and teaching material development. Teachers participating in AI training programs were able to utilize ChatGPT to produce teaching modules that were more systematic, contextual, and pedagogically appropriate. Classroom observations confirmed that teachers adapted AI-generated instructional materials according to students' learning characteristics and classroom contexts more effectively than before AI implementation. In addition, the automation of administrative and planning tasks substantially improved teachers' work efficiency, enabling them to devote greater attention to pedagogical interaction and student engagement. These findings are consistent with previous studies showing that AI enhances teachers' professional capacity by facilitating access to educational resources, intelligent content generation, and personalized instructional support (Xu, 2023; Amini, 2024; Chen, 2024). Therefore, integrating ChatGPT into classroom practice not only strengthens teachers' technical competence but also enriches pedagogical innovation and supports adaptive learning environments.

Direct quotation:

"Instructors are encouraged to create lesson plans tailored to the unique needs of their students in the classroom, so that the results are more relevant and in line with real-world circumstances." – Informant 2, Teacher at SDN Batu Ampar 02.

The research findings also indicate that ChatGPT enables teachers to process educational information more efficiently by integrating curriculum requirements, instructional resources, and previous teaching experiences into coherent teaching modules. Observations showed that teachers employed AI to generate structured instructional materials, adjust learning complexity according to students' abilities, and integrate relevant multimedia resources into classroom instruction. Documentation analysis confirmed that AI-assisted teaching modules were more comprehensive and systematically organized than those developed through conventional approaches. Furthermore, interview participants explained that ChatGPT supported quality assurance by identifying writing inconsistencies, improving language accuracy, and maintaining logical coherence throughout the instructional materials. These findings support previous research emphasizing that AI facilitates evidence-based educational decision-making, improves instructional design quality, and increases efficiency in developing learning resources (Chen, 2024; Xu, 2023; Tang, 2022). Accordingly, ChatGPT substantially enhances the processes of collecting, organizing, and presenting instructional information in ways that are faster, more accurate, and more responsive to educational needs.

Direct quotation:

"In addition to acquiring technical skills, this program teaches teachers how to maximize AI technology as a tool to speed up their work processes." – Informant 2, Teacher at SDN Batu Ampar 02.

Finally, although ChatGPT demonstrates considerable potential to improve the quality of teaching modules, its implementation also presents organizational and technological challenges that require strategic attention. Field observations identified teachers' limited understanding of advanced AI features as one of the principal barriers, highlighting the importance of continuous mentoring and practical training. Interviews additionally revealed infrastructural constraints, including insufficient hardware, unstable internet connectivity, and limited access to digital educational resources, all of which reduced the effectiveness of AI integration in teaching module development. Some teachers also demonstrated initial resistance to changing traditional instructional practices and required additional time to adapt to AI-supported pedagogical approaches. Documentation analysis further indicated that inadequate training occasionally resulted in teaching modules containing less contextualized content or inconsistencies in instructional structure. These findings are consistent with previous literature emphasizing that the successful implementation of artificial intelligence in education requires simultaneous investments in teachers' digital literacy, institutional capacity building, and technological infrastructure (Yang, 2022; Fu, 2022; Amini, 2024). Therefore, continuous professional development, institutional support, and sustainable technological investment are fundamental prerequisites for optimizing the integration of ChatGPT into elementary school teaching practices.

Direct quotation:

"Participants are provided with relevant case studies and challenges to address with this technology under the guidance of a team of experts." – Informant 2, Teacher at SDN Batu Ampar 02.

The findings of this study demonstrate that the implementation of ChatGPT in developing teaching modules substantially enhanced teachers' ability to design relevant, interactive, and student-centered learning materials. Teachers who initially experienced technical difficulties were able to operate AI applications effectively after participating in practical workshops and case-based learning activities, resulting in more innovative teaching modules. Classroom observations indicated that AI-assisted instructional design accelerated the module development process, enabled teachers to solve instructional problems more efficiently, and promoted students' digital learning experiences. Documentation analysis further revealed that the combination of hands-on practice and expert mentoring increased teachers' confidence in utilizing AI as an instructional support tool. These findings are consistent with previous studies emphasizing that AI facilitates instructional innovation, personalized learning, and intelligent educational support systems (Chen, 2024; Xu, 2023; Yang, 2022).

Direct quotation:

"Instructors are encouraged to create lesson plans tailored to the unique needs of their students in the classroom, so that the results are more relevant and in line with real-world circumstances." – Informant 2, Teacher at SDN Batu Ampar 02.

This study demonstrates several advantages over previous research that primarily discussed the theoretical potential of artificial intelligence without emphasizing practical teacher training. Earlier studies have identified major barriers to AI adoption in education, including inadequate digital literacy, insufficient pedagogical readiness, and unequal access to technological infrastructure (Fu, 2022; Yang, 2022). In contrast, this research shows that intensive mentoring, practical workshops, and classroom-oriented case studies enable teachers to overcome these barriers and optimize the development of AI-assisted teaching modules. Consequently, this study contributes new empirical evidence highlighting the importance of structured professional development and institutional support in maximizing the educational benefits of generative AI technologies, thereby extending current literature on AI-supported teaching and learning (Amini, 2024; Chen, 2024).

Reflection on these findings indicates that the implementation of ChatGPT not only strengthened teachers' technical competence but also enhanced their readiness to design adaptive, creative, and curriculum-oriented instructional materials. The research objectives were successfully achieved because teachers acquired both practical AI skills and a deeper understanding of how generative AI can accelerate pedagogical tasks while maintaining

instructional quality. These findings demonstrate important educational benefits, including improved curriculum implementation, enhanced digital literacy, and increased instructional innovation that responds effectively to learners' diverse needs. Therefore, ChatGPT should be regarded not merely as a technological application but as a strategic pedagogical partner capable of strengthening teacher professionalism and improving learning effectiveness (Xu, 2023; Chen, 2024).

The practical implications of this study suggest that elementary schools adopting AI-assisted teaching module development can significantly improve both instructional efficiency and educational quality. ChatGPT enables teachers to produce learning materials that are more systematic, contextual, and innovative while providing students with learning experiences that reflect the demands of the digital era. The findings further indicate that continuous professional development, institutional support, and adequate technological infrastructure are essential prerequisites for successful AI implementation. Consequently, educational policies should encourage the systematic integration of artificial intelligence into teaching practices by prioritizing teacher competency development and investment in digital learning resources (Fu, 2022; Yang, 2022).

The positive outcomes observed in this study resulted from the interaction of several complementary factors, including intensive practical training, classroom-based case studies, and continuous expert mentoring throughout the implementation process. These factors enabled teachers to overcome initial technological barriers while improving their understanding of AI-supported instructional design. Furthermore, teachers' active involvement in developing learning materials tailored to students' characteristics ensured that instructional content remained relevant, contextual, and pedagogically appropriate. These findings reinforce the perspective that successful AI implementation depends not only on technological sophistication but also on teacher readiness, institutional commitment, and supportive educational systems (Tang, 2022; Amini, 2024).

Based on the research findings, several strategic actions should be considered to optimize the implementation of ChatGPT in elementary education. These include providing continuous professional development programs for teachers, improving digital infrastructure and technological resources, and developing practical implementation guidelines for AI-assisted teaching module development. Schools should establish mentoring systems to facilitate knowledge sharing among teachers, while educational policymakers should ensure equitable access to digital devices and reliable internet connectivity. Furthermore, integrating authentic classroom case studies into teacher training programs will strengthen teachers' ability to produce teaching modules that remain innovative, relevant, and responsive to learners' needs in rapidly evolving digital learning environments (Fu, 2022; Chen, 2024).

One of the most significant findings of this research is that teachers who initially experienced considerable technical difficulties in utilizing artificial intelligence were eventually able to develop innovative, adaptive, and curriculum-aligned teaching modules

after receiving practical guidance in using ChatGPT. The study demonstrates that AI integration extends beyond functioning as a technological tool by fundamentally transforming teachers' perspectives on instructional material development, accelerating instructional design processes, and substantially improving learning effectiveness. Classroom observations and documentation revealed remarkable improvements in the quality of teaching modules, as teachers successfully adapted instructional content dynamically according to students' learning characteristics, an achievement that had previously been difficult to accomplish through conventional instructional planning. These findings confirm the transformative potential of generative artificial intelligence for elementary education and support previous literature emphasizing AI's role in educational innovation (Chen, 2024; Xu, 2023; Amini, 2024).

From a theoretical perspective, this study contributes to the growing body of knowledge regarding artificial intelligence in education by demonstrating how AI functions as a catalyst for pedagogical innovation and teaching module development. By emphasizing practical training and authentic classroom case studies as integral implementation components, the research strengthens theoretical understanding of the relationship between teachers' digital readiness and the effectiveness of AI-supported learning. From a practical perspective, the findings provide concrete guidance for teachers, school leaders, and policymakers regarding strategies for optimizing ChatGPT in developing creative, effective, and curriculum-aligned instructional materials. Accordingly, the study highlights that strengthening teachers' digital literacy, providing sustainable professional development, and ensuring adequate technological infrastructure are fundamental determinants of successful AI implementation within educational settings (Yang, 2022; Amini, 2024; Chen, 2024).

Although this study provides meaningful insights into the implementation of ChatGPT in elementary education, it is limited to SDN Batu Ampar 02 and participants directly involved in teaching module development, making the findings most applicable to comparable educational contexts. Nevertheless, this limitation provides valuable opportunities for future research to investigate AI implementation across different schools, educational levels, and subject areas. Future studies may also examine the effectiveness of alternative AI technologies, evaluate long-term impacts on students' academic achievement and digital literacy, and compare different AI-supported instructional models. Such investigations would further enrich understanding of how artificial intelligence can be integrated more comprehensively and systematically into educational practice while supporting sustainable educational transformation (Chen, 2024; Yang, 2022).

CONCLUSION

Based on the description above, it can be confirmed that the application of Artificial Intelligence (AI) ChatGPT in the creation of teaching modules has a significant impact on the effectiveness of learning planning. ChatGPT makes it easier for educators to design learning materials that are structured, time-efficient, and in line with the learning outcomes set. In

addition, AI technology supports the development of more diverse, flexible content that can be tailored to the characteristics and needs of students, so that...

Furthermore, the implementation of AI ChatGPT-based teaching modules not only serves as a technical support tool, but also represents a form of innovation in learning practices. However, its successful use is highly dependent on the ability of educators to select, review, and adapt the material produced so that it remains in line with educational objectives, academic values, and curriculum requirements. Therefore, the use of AI ChatGPT needs to be balanced with improved digital literacy and an understanding of the ethics of technology use, so that its integration into the development of teaching modules can be optimal, wise, and sustainable..

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