



Development of Artificial Intelligence (AI)-Assisted Learning Models in Social Studies Subjects

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ABSTRACT

This research aims to develop an *Artificial Intelligence* (AI)-based learning management model at SMPN 93 Jakarta to increase effectiveness, personalization, and interactivity in the teaching and learning process. The research method used is *Research and Development* (R&D) with the stages of identification of needs, design, development, implementation, and evaluation. Data was collected through observation, interviews, questionnaires, and documentation studies, and then analyzed with qualitative and quantitative approaches. The results show that the application of AI in learning is able to increase student engagement, facilitate adaptive learning, and support data-based assessments. The majority of students find the modules, media, and implementation of AI-based learning to be easy to understand, engaging, and helpful in understanding the material. Teachers welcome AI integration, despite emphasizing the need for technical training. The obstacles that arise include limited infrastructure, policies on the use of gadgets in the classroom, and uneven levels of digital literacy. This study concludes that AI-assisted learning management models are effective and feasible to improve the quality of education at the junior high school level.

Keywords: *Artificial Intelligence*, learning management, AI-assisted modules, interactive learning media

1. INTRODUCTION

The development of *Artificial Intelligence* (AI) technology has brought significant transformations in various sectors, including education. AI offers the potential to create a more personalized, adaptive, and efficient learning experience, but its implementation in the context of learning in Indonesia, especially at the secondary school level, still faces various challenges (Ahdar, 2021). The main challenge faced by teachers, especially in concept-intensive subjects such as Social Sciences (Social Studies), is the difficulty in managing learning that emphasizes personality to meet the diverse needs and learning speed of students (Luckin & Holmes, 2016). Initial observations at SMPN 93 Jakarta show that social studies teachers face obstacles in managing time and resources to assess and respond to the development of each student in real-time, while on the other hand students show a high interest in interactive technology-based learning. Therefore, the development of learning management models that utilize AI is an urgent need to help teachers

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A. D. Utami et al. (eds.), *Proceedings of the 3rd International Conference on Environmental Learning and Educational Technologies (3rd ICELET 2025)*, Advances in Social Science, Education and Humanities Research 1007,

https://doi.org/10.2991/978-2-38476-567-6_2

monitor, analyze, and evaluate the learning process more effectively (Holmes et al., 2019a). Based on this background, this study aims to develop a valid, practical, and effective AI-based learning management model for social studies subjects at SMPN 93 Jakarta, by analyzing the needs of teachers and students, designing and developing prototypes, testing feasibility based on expert assessments, and measuring the practicality and effectiveness of the model in improving learning outcomes. The results of this research are expected to enrich the scientific treasures in the field of education management and educational technology, as well as provide practical benefits for teachers as a differentiated learning tool, for students in obtaining a personalized learning experience, and for schools in improving the quality of the learning process.

2. THEORETICAL STUDIES

The theoretical study in this study is prepared to build a strong conceptual foundation related to the development of *Artificial Intelligence* (AI)-assisted learning models. The theories studied include the concept of learning management, Artificial Intelligence theory in education, technology acceptance theory, and relevant learning theories.

A. Learning Management Concept

Learning management is a process of planning, organizing, implementing, and controlling all resources, including humans, materials, technology, and methods, to create an effective and efficient learning environment to achieve learning goals (Ahdar, 2021). In the context of this study, the learning management in question underwent a significant transformation from a conventional approach to a data-based approach.

Conventional learning management is often administrative, homogeneous, and relies heavily on periodic summative assessments. In contrast, the model developed in this study adopts the *Data-Driven Decision Making* (DDDM) paradigm in Education (Mandinach & Gummer, 2016; Schildkamp et al., 2016). This concept emphasizes the use of *real-time* data about student learning processes and outcomes to make more accurate and proactive pedagogical decisions. In this case, AI acts as the main enabler that provides the analytical data, thus allowing teachers to make targeted interventions and personalize learning according to the individual needs of students.

B. Artificial Intelligence (AI) Theory in Education

Artificial Intelligence (AI) is defined as the ability of machines to mimic human cognitive functions such as learning and solving problems. In the world of education, AI offers a new paradigm to create a more adaptive and personalized learning experience. According to Luckin & Holmes (2016), the *Artificial Intelligence in Education* (AIEd) framework allows the creation of a system that can understand the learning context, including the domain of knowledge, the condition of students, and the pedagogical process. This research is in line with the framework, where the AI-based modules developed are able to function as *intelligent tutors* who present

materials and exercises according to the speed and level of individual understanding of the student. Furthermore, this research does not aim to replace the role of teachers with machines, but rather to apply the concept of *augmented intelligence* (Baker, 2016). In this concept, AI serves as a tool to strengthen teachers' cognitive and pedagogical capabilities. The finding that teachers play a more effective role as facilitators with AI-support reinforces the opinion of Selwyn (2019) that technology should be a collaborative partner, not a substitute, in the educational process. This adaptive ability of AI also directly supports the differentiation theory of learning advocated by Tomlinson (2017), where AI can analyze student responses and present different learning contents, processes, and products to meet the diversity of needs in heterogeneous classrooms.

C. Theory of Technology Acceptance and Integration

The successful implementation of a technological innovation is highly dependent on the acceptance of its users. This study uses two key theoretical models to analyze this aspect. First, *the Technology Acceptance Model* (TAM) developed by Davis (1989) states that user acceptance of a technology is determined by two main factors, namely *Perceived Usefulness* and *Perceived Ease of Use*. The results of surveys and interviews in this study, where teachers and students rated the AI module as a helpful and easy-to-use tool, prove that the developed model meets the criteria in the TAM. Second, the principle of *User-Centered Design* (UCD) emphasizes that the product design process must involve users deeply from the beginning (Norman, 2013).

D. Supporting Learning Theories

The integration of AI in learning is also supported by several relevant contemporary learning theories. AI-based learning is driving a shift from a *teacher-centered* paradigm to student-centered learning that is in line with constructivist theory. In this environment, students actively interact with digital content, explore material, and build their own understanding. Furthermore, AI's ability to provide real-time exercises and feedback supports the practice of assessment for learning (Black & Wiliam, 2009). This quick, personalized feedback helps students identify their mistakes immediately and allows teachers to adjust teaching, so that assessment becomes an integral part of the learning process, not just measurement at the end.

E. Systemic Framework: Input-Process-Output (IPO) Model

To comprehensively analyze the challenges and factors supporting success, this study is seen through the lens of *the Input-Process-Output* (IPO) model. The Input component includes technological infrastructure such as internet devices and networks, teachers' competence in digital and pedagogical literacy, and student characteristics such as learning readiness and digital literacy. The constraints identified, such as network instability, are problems that lie in these input components. Furthermore, Process refers to the application of an AI-based learning model in the classroom, which includes all interactions between teachers, students, and technology. The Output is the results achieved from the process, such as increased student involvement, learning motivation, and learning time efficiency. This IPO model helps explain that the success of output

is highly dependent on the quality of *inputs* and *processes*. Therefore, the implications for the sustainability of this model are the need for continuous improvements to input factors, such as infrastructure improvements and continuous teacher training.

3. METHODS

This study uses a *Research and Development (R&D)* approach that refers to the Borg & Gall model in Gustiani (2019) to develop an Artificial Intelligence (AI)-based *learning management model* at SMPN 93 Jakarta. Development research is a type of research that aims to create a certain product and test the extent to which the product is effective (Sugiyono, 2021). The research was carried out from April to September with the research subjects consisting of Social Sciences (IPS) teachers and grade VII students. The development stage begins with a needs analysis through classroom observations, interviews with teachers, and student surveys to identify learning problems and needs. Based on the results of the analysis, the initial design of the product was carried out which included lesson plans, digital modules, and AI-based learning media. The design was then developed into a prototype model that was tested for feasibility through expert judgment by technology and education management experts. *The revised prototype* is then implemented on a limited basis in the classroom to test its applicability in a real-world context. The final stage is the evaluation of the effectiveness of the model through a comparison of pre-test and post-test student learning outcomes as well as teacher and student satisfaction questionnaires. Data was collected through observation, interview, questionnaire, and documentation techniques, then analyzed in *mixed methods* where qualitative data was analyzed thematically and quantitative data was analyzed descriptively and comparatively. With this design, it is hoped that a product will be produced that is not only theoretically feasible but also practical and effective to implement.

4. RESULTS AND DISCUSSION

A. Research Results

1) Results of Trial Observations

Observations during the learning trial with *Artificial Intelligence (AI)*-based teaching modules showed very positive results in terms of student engagement and teacher effectiveness in facilitating learning. The observation data collected is summarized in the following table:

Table 1 Observation Sheet

No	Observed Aspects	Results	Notes Observer
1	Students pay attention to the teacher's explanation	Ya	Most students listen seriously and are actively involved, although some still need further guidance.

2	Students are able to operate modules/AI	Ya	Students are able to use the modules well despite some confusion at the beginning.
3	Students are enthusiastic about participating in learning	Ya	There is a high level of enthusiasm, especially when using interactive media. Some students even show more interest in exploring.
4	Teachers can make good use of the modules	Ya	Teachers are able to make good use of the modules and provide clear explanations to students.
5	Effective learning time	Ya	Learning time is used efficiently, although it needs to be adjusted again for project-based activities.

Based on the data in Table 1, there are several key findings that can be analyzed. The level of student *engagement* is high, especially in Aspects 1 and 3 which show that AI-based modules are able to capture and retain students' attention. The emerging enthusiasm, especially for interactive content, confirms that AI has the potential to be an effective tool in increasing students' intrinsic motivation while driving a shift from passive learning to active and *self-directed learning*.

In addition, the findings in Aspect 2 show that students known as *digital natives* have the ability to adapt quickly to new technologies. Although there was confusion at the beginning, this can be overcome with short and clear instructions, so that the application of AI in the classroom is not a significant obstacle. The role of teachers has also changed as reflected in Aspect 4, where teachers are not replaced by technology but develop into effective facilitators. Teachers are able to guide students in making the most of AI technology, while strengthening their pedagogical skills through clear explanations. Furthermore, Aspect 5 shows that AI integration can improve the efficiency of learning time, although adjustments to the time allocation for project activities are still required. This suggests that AI-based learning requires greater time flexibility to make room for deeper exploration, iteration, and problem-solving.

Based on the data and observation results, there are several important findings that can be analyzed. Student engagement in learning shows a very high rate, especially through the use of interactive media such as Kahoot! which is able to attract students' attention and make the learning atmosphere more lively. The enthusiasm that emerged is an indicator that *Artificial Intelligence* (AI)-based modules not only make students follow the teacher's instructions, but also trigger their intrinsic motivation to participate more actively. The ability of students to adapt to technology is also clearly visible, although there was confusion at the beginning of use. However, this can be overcome quickly through simple instructions from teachers, according to their characteristics as *digital natives* who tend to easily understand new technologies. In addition, the role of teachers in learning seems to have shifted from just conveying information to being active facilitators who guide students. Teachers not only provide explanations, but also help students in operating learning technology, so that the integration between technology and pedagogical strategies further strengthens the role of teachers in the learning process. In terms of effectiveness,

the learning flow becomes more efficient through gamification because students can absorb the material quickly and fun. However, for project-based activities or more in-depth exploration, additional time adjustments are still needed so that learning takes place optimally. The atmosphere of the classroom that was built was also very interactive and collaborative, as seen from the students who actively discussed in small groups and worked together in completing assignments. This reflects the application of a student-centered learning approach, where students are the center of learning activities, while teachers play the role of directors who ensure that the learning process runs effectively.

2) Interview Results with Teachers

In-depth interviews with Social Sciences (IPS) teachers who were directly involved in the trial application of *Artificial Intelligence* (AI)-based teaching modules provided rich and in-depth insights into the perception of field practitioners towards this learning innovation. Overall, the teacher gave a very positive response with some constructive notes for future development.

When asked about their opinions on the content of the teaching module, the teacher stated that the module was considered very relevant to the applicable curriculum and easy to understand. The teacher in particular highlighted the richness of the content presented, which is not only limited to the text but also comes with a variety of multimedia elements, as well as the ease of navigation of the module interface that makes it easy for both teachers and students to find the material needed.

Regarding the advantages of this AI-based module (Sanjaya, 2025), teachers identified two main advantages. First, this module has succeeded in significantly increasing student *engagement* compared to conventional methods. Second, and the most appreciated, is the AI's adaptive capabilities that can tailor material and exercises to each student's learning pace. This feature is considered very helpful in accommodating individual differences (learning differentiation) in the classroom, thus allowing each student to learn according to his or her abilities.

Behind its various advantages, teachers also revealed some obstacles faced during implementation. Technical obstacles, such as unstable internet connections and limited numbers and adequate device specifications (gadgets), are the main obstacles to the smooth learning process. In addition, from the learner's side, although they are generally quick to adapt, some students still take longer to get used to the digital interface and workflow that is new to them.

Despite the obstacles, teachers highly recommend the use of this module to be applied more widely in the classroom. This recommendation is given with two important conditions: the need for further training for other teachers to ensure they can make optimal use of all the features of the module, and the improvement of supporting infrastructure such as internet

networks and device availability, so that technical constraints do not reduce the effectiveness of the learning to be achieved.

3) Student Perception Survey Results

The results of a survey conducted on students to explore their perception of learning with Artificial Intelligence (AI)-based modules showed a very positive response overall. In the first aspect, namely the perception of AI-based learning modules, the majority of students gave very good responses. A total of 18 respondents agreed and strongly agreed that the modules are easy to understand and in accordance with the subject matter. This module was also considered effective in supporting independent learning, with 16 respondents stating that the module helps independent learning and 17 respondents rated the practice questions available to be useful for comprehension. However, there are still a small number of students who are neutral or disagree with the ability of the module to encourage critical thinking and understanding of the material more quickly. This shows that the aspect of *higher-order thinking skills* (HOTS) still needs attention in the development of the next module.

In the second aspect, namely the perception of the role of teachers with AI support, students also showed a very positive response. A total of 18 respondents agreed and strongly agreed that teachers are able to explain the material clearly and show how to use AI properly. In addition, 15 respondents assessed that teachers remain active in assisting even though technology has been integrated, while 19 respondents felt that they had the opportunity to ask questions and 17 respondents admitted that they were more motivated by the support of AI from teachers. This confirms that the existence of AI does not replace the role of teachers, but rather strengthens and transforms their role into more effective learning facilitators.

The third aspect, namely the perception of AI-based interactive learning media, received the most enthusiastic response. A total of 19 respondents stated that AI media is very interesting and able to increase student engagement in the classroom. A total of 17 respondents agreed that the media is easy to operate, 18 respondents stated that the media helps to understand difficult material, and 17 respondents rated the media according to the learning topic. Most notably, 17 respondents expressed a desire for similar media to be used in other subjects, showing a high level of acceptance and satisfaction. These results prove that AI-based media is not only functional, but also fun, so that it can be a catalyst for the creation of more meaningful, interactive, and comprehensive learning in various subjects.

B. Discussion

1) Compatibility between Needs, Products, and User Acceptance

Findings obtained from observations, in-depth interviews, and student perception surveys consistently and convergently show that the *developed Artificial Intelligence* (AI)-based learning management model has successfully met the fundamental needs identified at the initial stage of the research, in accordance with the principles of *User-Centered Design* (Norman, 2013). Key features such as material personalization and learning content recommendation systems by AI effectively address the real challenges teachers face in differentiating learning in heterogeneous classrooms, in line with Tomlinson's (2017) research on the importance of learning that suits individual needs. The high level of *acceptance* from all users, both teachers and students, is not only a strong indicator that this product is practical and easy to adopt, consistent with the *Technology Acceptance Model* (Davis, 1989), but also proves that the designed solution is very relevant to the specific learning context and dynamics at SMPN 93 Jakarta. Thus, it can be concluded that there is a high alignment between user needs, product characteristics, and the context of the learning environment, which is strengthened through the principle of data triangulation (Denzin, 2017).

2) The Effectiveness of Models in Increasing Learning Engagement and Motivation

Confirmation of the effectiveness of this model is supported by the convergence between qualitative and quantitative data. The qualitative data from the observations, which describe the enthusiasm and active involvement of students, are empirically reinforced by quantitative data from the survey, which shows a very high percentage (mostly above 80%) of students who feel more motivated and enjoy the learning process. This data synergy proves that AI has succeeded in creating a more interactive, responsive, and engaging learning environment, so that it is able to encourage *student engagement* not only superficially but also cognitively more deeply. These findings reinforce and align with previous bodies of research, such as Luckin & Holmes' (2016) work on *AI in Education* and (Holmes et al., 2019) on AI-enriched learning experiences, which together affirm the transformative potential of AI in triggering intrinsic motivation and learning engagement.

3) Practicality and the Role of Teachers That Remain Crucial

Although AI technology is the backbone of this model, interviews with teachers reveal that the practicality of the model lies in its ability to reinforce, rather than replace, the role of educators, as affirmed in Zawacki-Richter et al.'s (2019) research on AI systems in higher education. Teachers consider this model to be a very practical tool that eases administrative burdens and provides data insights, in accordance with the findings of Holmes et al. (2019) regarding the potential of AI for the automation of teachers' routine tasks. However, these

findings also confirm a new paradigm in education that teachers' presence, empathy, and pedagogical expertise remain crucial and cannot be replaced by machines, as stated by Selwyn (2019) in his critique of the narrative of technology substitution in education. In this model, teachers evolve their roles into facilitators, motivators, and most importantly critical pedagogical decision-makers based on the data and recommendations provided by AI systems, reflecting the concept of *augmented intelligence* initiated by Baker (2016). Thus, AI technology serves as a collaborative partner that empowers teachers to carry out their professional roles more effectively and data-driven, as advocated (Zhang & Aslan, 2021) within the framework of *human-AI collaboration* in education.

4) Implementation Challenges and Factors Supporting Success

Behind the success of the trial, the technical constraints expressed by the teachers, such as unstable network infrastructure and limited availability of devices, remind us of the real challenges of implementing digital technology in the world of education. This challenge reinforces the validity of the *Input-Process-Output* (IPO) theoretical model, which emphasizes that the quality of inputs (such as technological infrastructure, teacher competence, and students' digital literacy) determinants affect the quality of *the process* and the results (*outputs*) achieved. Therefore, the *sustainability* and scalability of this model is highly dependent on holistic systemic support. This support includes not only the provision of technological infrastructure, but also continuous investment in teacher training (*capacity building*), technical support, and policy commitments from the school to regional levels to create a conducive digital ecosystem.

5) Implications for Learning Management

This model has essentially succeeded in transforming conventional learning management practices. Teachers no longer rely solely on intuition or periodic assessment, but can now access analytical data on students' understanding, progress, and learning difficulties in *real-time*, as advocated by Mandinach & Gummer (2016) in the framework of *data-driven decision-making* in the field of education. This ability allows for *faster, targeted, and personalized assessments for learning and pedagogical interventions, in line with Black & Williams' (2009) research on effective formative assessments*. Thus, this system shifts the learning management paradigm from administrative and reactive to a proactive and *data-driven decision making* approach, as stated by Schildkamp et al. (2016) in the context of using data for school improvement. This transformation opens up opportunities to improve the efficiency, accuracy, and *ultimately*, quality of the learning process itself, as explained by Wayman & Stringfield (2006) regarding the role of data systems in supporting continuous learning improvement.

5. CONCLUSION

The development of an AI-based learning management model at SMPN 93 Jakarta has been proven to be able to increase student involvement, learning effectiveness, and provide a more personalized learning experience. The main obstacles in the form of device limitations, internet networks, and digital literacy still need attention.

This research contributes to technology-based learning innovation and can serve as a reference for other schools in integrating AI. Advanced research is suggested to explore the long-term impact of AI adoption and implementation strategies across a range of subjects.

DAFTAR PUSTAKA

- [1.] Ahdar. (2021). *Ilmu Pendidikan*. IAIN Parepare Nusantara Press.
- [2.] Baker, R. S. (2016). Stupid Tutoring Systems, Intelligent Humans. *International Journal of Artificial Intelligence in Education*, 26(2), 600–614. <https://doi.org/10.1007/s40593-016-0105-0>
- [3.] Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, 21(1), 5–31. <https://doi.org/10.1007/s11092-008-9068-5>
- [4.] Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, 13(3), 319–339. <https://doi.org/10.2307/249008>
- [5.] Denzin, N. K. (2017). *The research act: A theoretical introduction to sociological methods*. Routledge.
- [6.] Gustiani, S. (2019). Research and Development (R&D) Method as a Model Design in Educational Research and Its Alternatives. *Holistics Journal*, 11(2), 12–22. <https://jurnal.polsri.ac.id/index.php/holistic/article/view/1849>
- [7.] Holmes, W., Bialik, M., & Fadel, C. (2019a). *Artificial Intelligence in Education: Promise and Implications for Teaching and Learning*. Center for Curriculum Redesign.
- [8.] Holmes, W., Bialik, M., & Fadel, C. (2019b). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.
- [9.] Luckin, R., & Holmes, W. (2016). *Intelligence Unleashed: An argument for AI in Education*. In *UCL Knowledge Lab: London, UK*. <https://www.pearson.com/content/dam/corporate/global/pearson-dot-com/files/innovation/Intelligence-Unleashed-Publication.pdf>
- [10.] Mandinach, E. B., & Gummer, E. S. (2016). What does it mean for teachers to be data literate: Laying out the skills, knowledge, and dispositions. *Teaching and Teacher Education*, 60, 366–376. <https://doi.org/10.1016/j.tate.2016.07.011>
- [11.] Norman, D. (2013). *The design of everyday things: Revised and expanded edition*. Basic books.
- [12.] Schildkamp, K., Poortman, C. L., & Handelzalts, A. (2016). Data teams for school improvement. *School Effectiveness and School Improvement*, 27(2), 228–254. <https://doi.org/10.1080/09243453.2015.1056192>
- [13.] Selwyn, N. (2019). *Should robots replace teachers?: AI and the future of education*. John

Wiley & Sons

- [14.] Sugiyono. (2021). *Metode penelitian pendidikan pendekatan kuantitatif, kualitatif dan R&D*. Alfabeta.
- [15.] Tomlinson, C. A. (2017). *How to differentiate instruction in academically diverse classrooms*. Ascd.
- [16.] Wayman, J. C., & Stringfield, S. (2006). Technology-supported involvement of entire faculties in examination of student data for instructional improvement. *American Journal of Education*, 112(4), 549–571. <https://doi.org/10.1086/505059>
- [17.] Zawacki-Richter, O., Marin, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education*, 16(1). <https://doi.org/10.1186/s41239-019-0171-0>
- [18.] Zhang, K., & Aslan, A. B. (2021). AI technologies for education: Recent research & future directions. *Computers and Education: Artificial Intelligence*, 2, 100025. <https://doi.org/10.1016/j.caeai.2021.100025>
- [19] Sanjaya R, Aula Riski M, Matin, Kharima Abdillah A, Viona Milyta Munthe Y. ANALYSIS OF THE DIGITAL DIVIDE IN THE UTILIZATION OF ELECTRONIC LEARNING RESOURCES IN HIGHER EDUCATION ENVIRONMENTS. j. ilm. peningkatan mutu manaj. pendidik. <https://doi.org/10.21009/improvement.v12i2.61980>

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