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The Effect of Artificial Intelligence (AI)-Based Learning Models on Students' Motivation and Learning Interests (Case Study at SMA Negeri 2 Tabang Kutai Kartanegara)

Yohanes Dedi Kurniawan*, Sucipto, Victor Maruli Tua L. Tobing
Educational Technology, Universitas Dr. Soetomo, Surabaya, 60118, Indonesia

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* *Corresponding author:*

E-mail: yohanes.dze@gmail.com

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A B S T R A C T

The research is motivated by the transformative potential of Artificial Intelligence (AI) in education and the challenges of implementation in disadvantaged areas, which create a gap in students' motivation and interest in learning. The purpose of the study was to analyze the influence of AI-based learning models on increasing students' motivation and learning interest at SMA Negeri 2 Tabang, Kutai Kartanegara. The study used a qualitative approach of a case study with thirty student subjects. Data were collected through observation (10 indicators of interest and ten indicators of motivation), interviews, and documentation. Research shows that AI-based models significantly and simultaneously improve both aspects, which is evident from 9 out of ten indicators of interest and all ten indicators of motivation seen. This improvement is fueled by the personalization of exploration and instant feedback from AI, which creates a collaborative and student-centered learning environment. Research proves that despite infrastructure constraints, managed AI integration can transform the dynamics of learning in disadvantaged areas. It is recommended that schools develop guidelines for the use of AI and conduct prompt drafting training for teachers.

1. Introduction

The digital era has brought a paradigmatic transformation in the global education ecosystem, which is characterized by the massive integration of highly advanced technologies such as Artificial Intelligence (AI), Internet of Things (IoT), big data, and cloud computing (Hariyono et al., 2024). This Industrial Revolution 4.0 is driving a shift from traditional learning that is limited to the classroom to a more dynamic, flexible, and globally connected model, one of which is the application of

AI in learning. AI is emerging as a key technology that promises material personalization, seamless collaboration, and increased effectiveness of the teaching and learning process (Entriza et al., 2025; Yanto et al., 2025). The enormous potential of AI to create a structured learning environment and encourage higher student engagement, as that places it as a key driver in preparing students to face the challenges of the 21st century. However, behind its transformative role, the implementation of this technology cannot be separated from the complexity of the challenges, especially when faced with diverse geographical and socio-economic conditions such as in several regions in Indonesia.

The application of AI in education is increasingly evident when it is associated with the psychological aspect of learning, namely the motivation and interest in learning of the students themselves. Strong motivation plays a key driver in academic success, while interest in learning is a fundamental indicator of a student's active involvement in the learning process (Chandra & Khiong, 2024; Juraidah et al., 2025; Utami et al., 2024). For example, AI-based e-learning platforms in Indonesian education have significantly improved both aspects, especially in the STEM field. The AI mechanism in providing an adaptive and flexible learning environment, equipped with real-time feedback, allows students to learn according to their respective pace and learning style (Aly, 2025). It is this personalization that positions AI as a "learning partner" that can help identify students' strengths and weaknesses, thus encouraging more targeted teaching and triggering better learning motivation.

Although some previous studies have shown the positive impact of the use of AI in aspects of life (Farwati et al., 2023; Diantama, 2024). The reality of its implementation in remote areas shows a wider gap. Kutai Kartanegara Regency, with its geographical characteristics, faces multidimensional obstacles in adopting modern educational technology. Minimal supporting facilities, lack of adequate teacher training, and low digital literacy among students and educators are the main obstacles that hinder the pace of digital transformation. This is in line with Rogers' theory of innovation diffusion which explains that the adoption of modern technology requires more than just the availability of tools; Adequate infrastructure support, ongoing training, and a cheerful outlook from users are also needed (Miller, 2015). Therefore, the effectiveness of AI needs to be studied critically and more specifically in areas that are still left behind in terms of infrastructure and human resources.

SMA Negeri 2 Tabang in Kutai Kartanegara is a clear example of this gap, where students' low motivation and interest in learning are reflected in the low attendance rate, class participation, and minimal learning initiatives. This low motivation determines the success of learning and academic achievement of students in their learning process. The learning system that is still one-way and uniform is a real and often encountered obstacle that can meet the individual needs of students, thus aggravating this condition. On the other hand, teachers also face obstacles in creating varied and innovative learning due to limited technological mastery. Vygotsky's theory of constructivism emphasizes the importance of active and experiential learning, which unfortunately is still difficult to realize without the

support of adequate tools and training, thus creating obstacles that can reduce students' enthusiasm for learning (DeVries, 2000; Derry, 2013).

The gap between the theoretical potential of AI and the practical challenges in the field creates a critical research gap. Some previous studies only focused on the educational environment in some areas that are considered advanced or at the university level, so the findings cannot necessarily be generalized to secondary school settings in rural areas. Other research highlights the need for local strategies, but more in-depth exploration of AI's specific influence on motivation and interest in learning in areas such as Kutai Kartanegara is still extremely limited. So, this research is a solution to be able to fill this gap by providing concrete empirical data on how this AI-based learning model can be designed and implemented contextually, considering all forms of existing limitations. AI has become a universal topic nowadays and it is interesting to explore.

Based on the description of these problems, this study aims to analyze the influence of Artificial Intelligence-based learning models on increasing student learning motivation, student learning interest, and its impact simultaneously at SMA Negeri 2 Tabang. This research not only wants to evaluate the effectiveness of the developed model but also makes a real contribution, both theoretically by enriching the literature on educational technology in disadvantaged areas, and by providing strategic recommendations that can be adopted by schools abroad with similar characteristics. So that this research is expected to later become a guideline and reference in the transformation of inclusive and equitable education in the digital era.

2. Methodology

This research uses a qualitative approach with a case study type of research. This approach was chosen because it is in accordance with the research objective to understand in depth and holistically the influence of AI-based learning models on students' motivation and interest in learning in their natural context, namely at SMA Negeri 2 Tabang. Case studies that allow researchers to explore phenomena that are inseparable from their social context, so that the dynamics, interactions, and meanings that emerge during the implementation process can be well recorded (Ridlo, 2023). The focus of the research is not on numerical generalization, but on the depth of understanding of the processes and impacts that occur on the research subject (Sugiyono, 2017).

So that the qualitative approach is considered the most appropriate to answer the formulation of the problem and uncover the complexities in the field. The subjects in this study were thirty students from class 11A of SMA Negeri 2 Tabang who participated in the learning process using an approach that utilizes Artificial Intelligence. The selection of this class was conducted based on the convenience sampling technique, where class 11A is a class that has received socialization about learning technology and has access to the necessary supporting devices. Six key informants who were student representatives were selected to be interviewed to

enrich and support the research data. This sampling technique was chosen with the consideration of time, cost, and access limitations, but can still provide rich and relevant information to be able to answer the research objectives (Golzar et al., 2022).

This research relies on researchers as the main instrument assisted by several tools to collect data. The data collection techniques used were passive participant observation, semi-structured in-depth interviews, and documentation studies (Sugiyono, 2017). The observation sheet is used to record in detail the behavior and attitude of students during the learning process, which includes 10 aspects of learning interest indicators and ten aspects of observed learning motivation indicators. Interviews were conducted with six informants using interview guidelines containing 10 open-ended questions that explored their perceptions, feelings, and experiences related to learning interests and motivations after the application of the AI model. The documentation study includes an analysis of the syllabus, learning implementation plan (teaching module), student work, and photos of classroom activities as supporting data.

The data that has been collected is analyzed using the Miles and Huberman interactive model which includes four stages that run simultaneously, namely data collection, data reduction, data presentation, and conclusion drawing (Sugiyono, 2017). At the data reduction stage, all raw data from interview transcripts, observation notes, and documents are selected, focused, and simplified to bring up important themes. Furthermore, the data that has been reduced is presented in the form of a matrix, tables, and descriptive narrative that makes it easier for researchers to understand the overall information. From the presentation of the data, verifiable conclusions were then drawn by interpreting the meaning and relationships between themes to answer the research questions. This analysis process is cyclical and iterative, where the initial conclusions are continuously evaluated with new data that comes in.

To ensure the validity and credibility of the data, this study applies the triangulation technique, namely by using source triangulation and triangulation method (Nurfajriani et al., 2024). Triangulation of sources is conducted by comparing and checking back data obtained from the results of interviews with teachers, students, and observation results to find the consistency of the information. Meanwhile, the triangulation method was conducted by comparing data from interviews, observations, and documentation to get a complete understanding. In addition, member checking is also carried out by returning the results of data interpretation to the informant to confirm its truthfulness, so that it is expected to ensure that the data presented is in accordance with what is intended and experienced by the research subjects (Motulsky, 2021).

This research was prepared based on a conceptual framework that explains the relationship between the application of AI-based learning models and students' learning motivation and learning interests. The integration of AI in the learning process allows for instant personalization of learning and feedback, providing a learning experience according to each student's needs, speed, and curiosity. This

condition psychologically encourages the emergence of a sense of autonomy, competence, and active involvement of students in learning. Increasing learning motivation is the main mechanism that mediates the influence of the use of AI on students' learning interests. When students feel capable, challenged, and get a direct response to their learning process, then the internal drive to learn will increase. This high motivation to learn further has implications for increasing interest in learning, which is characterized by enthusiasm, curiosity, active participation, and perseverance of students in participating in learning. At SMA Negeri 2 Tabang, the relationship between the use of AI, learning motivation, and learning interest is inseparable from contextual factors, such as the limitations of technological infrastructure and the role of teachers as learning facilitators. AI in this study is positioned as a learning support tool that is integrated in a targeted manner with teacher assistance, not as a substitute for the role of educators. This conceptual framework is the basis for qualitatively analyzing how AI-based learning models are able to increase students' motivation and interest in learning simultaneously. To clarify the flow of research thinking and the relationship between the variables studied, this study was prepared based on a conceptual framework that describes the relationship between Artificial Intelligence (AI)-based learning models, learning motivation, and student learning interests in the context of learning at SMA Negeri 2 Tabang, as shown in Figure 1.

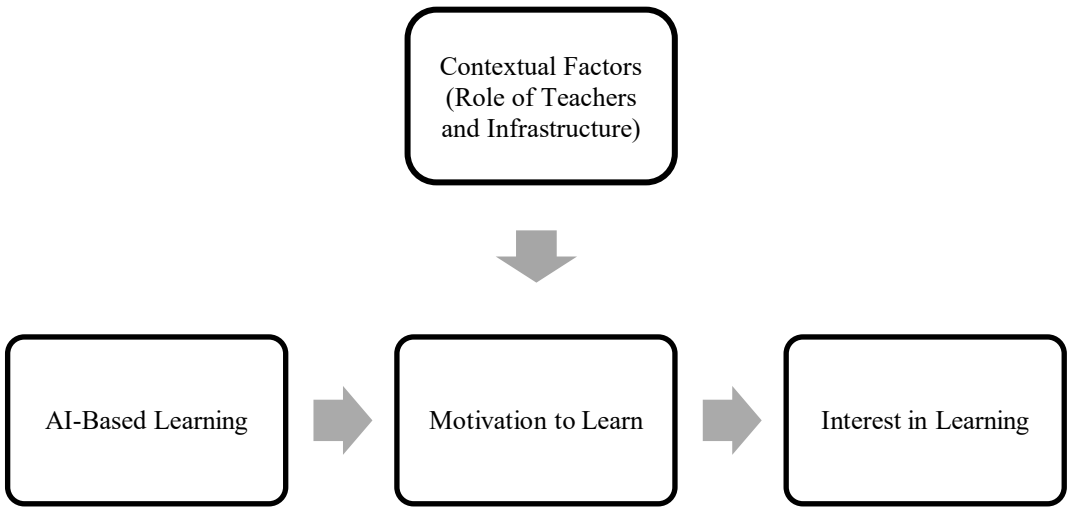

Figure 1. Research Conceptual Framework

The conceptual framework in Figure 1 shows that the application of Artificial Intelligence (AI)-based learning models plays a key role in encouraging increased student learning motivation through learning personalization mechanisms and instant feedback. The increase in learning motivation is reflected in the emergence of initiative, perseverance, confidence, and courage of students in exploring learning materials. Increased learning motivation further has a direct impact on the growth of students' interest in learning, which is characterized by enthusiasm, curiosity, active participation, and continuous student involvement in the learning process. The relationship between the use of AI, learning motivation, and learning

interest is influenced by contextual factors in the form of the role of teachers as learning facilitators and the limitations of school technology infrastructure, so that AI is positioned as a learning support tool that is integrated with teacher mentoring, not as a substitute for the role of educators.

3. Results and Discussion

Based on observations during four meetings, the implementation of the AI-based learning model in class 11A of SMA Negeri 2 Tabang showed a positive impact on students' learning interests. As has been obtained from the data during the research process, of the 10 indicators of learning interest, 9 of them appear significantly and consistently in students. The enthusiasm for learning, which can be seen from the way students welcome the lesson (Indicator 1), is characterized by those who are quick to take a seat and are eager to prepare the device. Curious and concentrated facial expressions (Indicator 6) dominate the classroom, showing learning in contrast to the passive state before the intervention, this gives the students a change in their attitude to the learning process, shown in Figure 2.

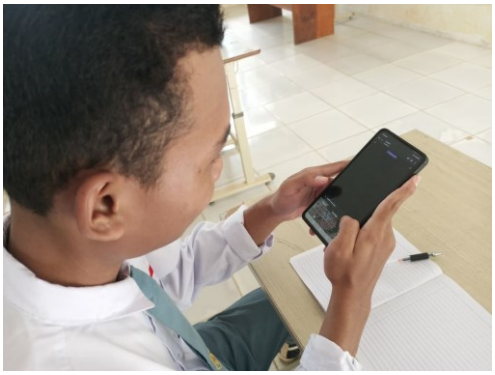

Figure 2. Students Accessing AI Platform on Their HP Devices

Activeness in exploring AI features (Indicator 3) and intensive interaction with tools (Indicator 5) shows that this technology has succeeded in sparking students' intrinsic curiosity. Only indicators of a desire to continue using AI outside of class hours (Indicator 9) appeared in some students, which was strongly suspected to be related to internet quota constraints and device access at home, which is supported by Table 1 data.

Table 1. Observation of Students' Learning Interests in the Use of AI in the Classroom

No.	Observation Aspect	Activity		Information
		Available	None	
1.	Enthusiasm welcomes lessons.	✓		Students rushed into the classroom, looking excited to prepare their cellphones.
2.	Earnestness of attention.	✓		Students who stare at the screen with focus and ignore the distractions around them.

3.	Activeness explores AI features.	✓		Many students tried various AI features such as generating text to image, Q&A, creating Canva designs with generate AI without being told.
4.	Perseverance in the face of obstacles.	✓		Students do not immediately give up when the AI fails, try to refresh or replace questions.
5.	Frequency of interaction with AI.	✓		On average, students do 5-10 interactions (prompts) per learning session.
6.	Interested in facial expressions.	✓		Lots of smiles and active expressions of "wow, cool, wow" as the AI delivers satisfying results.
7.	Initiative to help friends.	✓		Students who understand better seem to be active in helping friends who are still confused about how to prompt.
8.	Desire to continue use.		✓	When the class bell rings, most students immediately stop operating their HP and AI devices.
9.	Talk about the after-hours experience.	✓		There are chatters about AI outside the classroom, such as "I ask various questions in AI, AI can know, yes, Google says but it's more automated"
10.	Disappointing session ends.	✓		Some students complain "well it's over even though it's still exciting"

In addition, in the aspect of student motivation, the impact is even more visible. Based on the indicators of learning motivation (10 out of 10) observed that appear in most students. Initiative to start work (Indicator 1) is extremely high; The teacher only needs to give the assignment at the beginning, and the students immediately work, in contrast to the conventional model where the teacher must constantly remind and direct. Persistent efforts in overcoming difficulties (Indicator 2) and willingness to keep trying or trial & error (Indicator 7) are tangible evidence of intrinsic motivation being awakened. Instant feedback from AI provides a sense of accomplishment that triggers expressions of satisfaction and pride (Indicator 8). The most interesting thing is the emergence of an indicator of internalization of learning objectives (Indicator 10), where some students begin to connect the material with their imaginations, such as a student who imagines asking what happens if there is no social interaction in daily life so that they become very interested in learning the subject matter with the help of AI, there are also those who generate text to image and summaries of what they ask and want to know, shown in Table 2.

Table 2. Observation of Students' Learning Motivation in the Use of AI in the Classroom

No.	Observation Aspect	Activity		Information
		Available	None	
1.	Initiative to start work.	✓		Students immediately open the AI tool and start working as soon as the teacher gives the assignment.
2.	Persistent efforts to overcome difficulties .	✓		Students try to write down the contents of the questions up to 3-4 times until they get the right answer.
3.	Willingness to do additional tasks.	✓		Some students ask "Sir, may I try to ask this to the AI as well?"
4.	Participation in discussions.	✓		A livelier group discussion, students show each other the results of their AI-generated answers.
5.	Curiosity is high.	✓		The questions posed to AI are getting deeper, not just around the basic material.
6.	Confident in presentation.	✓		Students presented smoothly because they felt that the data from AI was accurate and complete, and supported by periodic checks by teachers.
7.	Willingness to try again (trial error).	✓		It is very clearly visible when students play with the image generation feature.
8.	An expression of satisfaction and pride.	✓		Students who show the results of their work to teachers and friends proudly while saying "wow, this is mine".
9.	Focus (on-task) ability.	✓		The student's focus duration increased significantly, averaging >20 minutes per assignment.
10.	Internalization of learning objectives.	✓		A student said "wow, it's cool to be able to ask all kinds of questions, you can try this, that's the point."

Based on observations that have been made during several meetings that clearly answer the three problem formulations. First, an AI-based learning model that can increase student learning motivation. Second, the same model also significantly increases interest in learning. Third, and most importantly, these improvements occur simultaneously and reinforce each other. The researcher who is also a teacher stated, "Students who usually wait for directions, are now more enthusiastic about learning and getting ahead. They have an extraordinarily keen sense of 'curiosity' and 'wanting to'." Meanwhile, an M.S.R student revealed, "Learning to use AI is

like being guided by a personal tutor who never gets tired of answering our questions. So yes, I'm curious to keep trying this and that." This statement is in line with Ryan & Deci's Self-Determination theory which emphasizes the importance of fulfilling the needs of competence, autonomy, and connectedness to motivate a person (Adams et al., 2017). It is this AI that gives students complete autonomy to explore, provides competency-building feedback, and creates new, more enjoyable, and meaningful relationships with the subject matter.

S.W., who described the comparison clearly: "If you study normally, we keep recording the lecturers, sometimes sleepy. If we use this AI, we are the ones who are actively trying to find out." This statement shows a shift from teacher-centered to student-centered learning. It is this personalization and speed of response that sparks students' interest in learning, answering the second problem formulation, because students feel more in control of their knowledge search process. Students become more creative in their learning process and are not hampered by textbook material alone, which tends to be standard and monotonous. Students who seek discussion according to the content of their thoughts and imaginations and ask various things to the AI, but still with the teacher's check, shown in Figure 3.

Figure 3. Teachers Supervise Students on the Use of AI

In answering the formulation of the first and third problems, the results of the interview data revealed that students' learning motivation arises from psychological mechanisms triggered by interaction with AI. R.I. who shared his experience of facing difficult tasks: "In the past, when I got a difficult question, I immediately got lazy and procrastinated. Now, immediately open ChatGPT to be given a clue on how to do it. What makes the enthusiasm is that he tells us the steps slowly, so we feel that we can understand, not just cheat or copy and paste the answers." This shows the fulfillment of a person's competence needs in the theory of Self-Determination (Adams et al., 2017). In addition, S.A.P. explains his confidence boost: "When presenting with Canva's AI-assisted slides, it feels confident. The design is cool; there is a sophisticated and complete text-to-image generator. It's like being a designer." Non-judgmental feedback from AI also reduces anxiety about mistakes, as admitted by S.W. "Ask teachers usually feel afraid of being mistaken for stupid. Ask the AI, just free, the wrong prompt will change again. So, I'm not ashamed to keep trying." This trial and error process directly builds their resilience and motivation in their learning process.

The students' answers to questions about relevance and recommendations for other subjects reinforced the finding that increased interest and motivation occur simultaneously and applicative. L.N. who connects its use to daily life "When I was on socio-economic duty, I tried to ask AI about the role of the MSME economy in the social conditions of the community. Finally, it became an exciting conversation to discuss the material. So, the feeling is not just memorization anymore, but more creative and broaden my mind." This shows the internalization of learning objectives, where the subject matter is no longer abstract but touches on their local context. Socially, this model also sparks collaboration. L.N. adds, "We often talk to friends to find a good prompt. Instead, it becomes a healthy rival, who can get the most creative answers from AI." It is this collaborative dynamic that expands the positive impact of AI on individuals, creating a supportive learning community, which strengthens interest and motivation simultaneously. Although the impact was incredibly positive, the results of the interviews also revealed obstacles that enriched the analysis. I.P.S. who showed his disappointment "I was disappointed when the signal was bad, so I couldn't access. Or sometimes the AI that is even weird does not match what is asked, the answer is deviant, and even afraid of being wrong, and must confirm it to the teacher. Usually I look for common sense, like using different keywords, but to be honest, I'm a bit scared."

The response to this obstacle shows the development of the growth mindset and the ability of students in the problem-solving process. The desire to return to the usual model is not uniform either. While most are eager to continue using AI, S.W. stated, "It still needs to be combined. If you only use AI, the sense of social with teachers and friends can also be reduced, because you only use AI continuously, which tends to adjust to AI, even though we also need many resources to be able to take important things. For me there must be a hybrid, not just one." This statement provides valuable practical implications, AI-based models are not intended to replace the role of teachers, but rather to be used as a powerful tool in blended or hybrid learning approaches. The teacher must remain the primary facilitator providing direction, guidance, contextualization, and a human touch that cannot be replaced by any machine (Inayah et al., 2024; Widyatama et al., 2025). Teachers remain the balancer of the student learning process, which is a control over AI supervision.

The key to the success of this model lies in two key features of AI, personalization, and instant feedback. In Kutai Kartanegara, which is often constrained by infrastructure, the personalization in question is not in the form of complex algorithms, but in the form of students' freedom to choose what they want to learn more deeply through prompt interaction. A student can focus on the part he or she does not understand and instantly ask the AI for a re-explanation without embarrassment. This eliminates anxiety and will make mistakes in front of the class. Instant feedback from AI (as observed in Motivation Indicators Nos. 7 and 8) acts as a direct amplifier, which is effective for the digital generation. This mechanism is in accordance with the ARCS theory where students' Confidence and Satisfaction are built through the experience of success that is immediately recognized (Li & Keller, 2018). The implementation of this model also encourages a shift in the role of teachers from sage on stage to guide on the side. Figure 2 also shows the teacher

going around from providing guidance to each student, paying attention to the use, and helping to compile effective prompts, not just lectures in front of the class. The social dynamics in the classroom are also changing. Students who are usually passive become active in helping their friends (Interest Indicator No. 7), creating a collaborative environment. This is in line with Vygotsky's theory of social constructivism where learning happens through social interaction (DeVries, 2000). AI in this case functions as a tool or cultural artifact that mediates interactions (Suharmawan, 2023). As a material for discussion and collaboration that is more meaningful than just listening to teachers' lectures.

Although the results were positive, the study also revealed unique challenges in remote areas. Limited internet quota and unstable signal are the main technical obstacles. In addition, observations found that at the first meeting, some students experienced cognitive overload due to too much information that could be accessed. They tend to play around with less direction. However, at the next meeting, with the teacher's guidance to draw up a specific prompt, this problem can be resolved. This research supports Rogers' theory of innovation diffusion that technology adoption requires a process and does not happen instantly (Miller, 2015). As well as the importance of teacher training to integrate technology (Pebriana et al., 2025). This research contributes by proving that the principles of motivation and learning theory remain relevant and can be applied effectively through AI technology in Indonesian education, especially in remote areas. This research bridges the literacy gap that has been conducted previously.

This research offers a flexible and affordable model for schools in 3T (Frontier, Outermost, Disadvantaged) areas. This model does not require paid AI but leverages tools that are already available for free with the right pedagogical strategies, namely teacher mentoring and project-based assignments that spark exploration. The AI-based learning model significantly and simultaneously increased the interest and learning motivation of grade 11A students of SMA Negeri 2 Tabang. This increase is triggered by learning personalization, instant feedback, and the creation of a more collaborative and student-centered learning environment. For further development, it is recommended that schools develop guidelines for the use of AI for specific subjects and organize effective prompt preparation training for teachers. For the next researcher, the study of the long-term impact of this model on academic outcomes as well as research is like quasi-experimental design.

4. Conclusion

The implementation of the Artificial Intelligence (AI)-based learning model at SMA Negeri 2 Tabang significantly and simultaneously increases students' motivation and interest in learning. This increase is manifested through the emergence of enthusiasm, initiative, perseverance, and confidence of students during the learning process, which was previously dominated by a passive attitude. The success of this model is primarily driven by two key features of AI, namely the personalization of knowledge exploration according to individual curiosity and the provision of instant feedback that builds a sense of competence, thus creating a

student-centered and more collaborative learning environment. This research reinforces previous learning theories and answers the research objectives by showing that despite the limitations of regional infrastructure, managed AI integration can transform classroom dynamics. For future research, there is a need to research on the long-term impact of this model on academic achievement as well as replication with quasi-experimental designs to strengthen the validity of the findings. The practical implications of this study are the need for the preparation of AI usage guidelines and effective prompt preparation training for teachers so that the adoptability of this model can be optimized in various schools.

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