Evaluating the Impact of AI-Powered Personalized Learning on Student Engagement and Academic Performance in Remote Learning Environments

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ABSTRACT

This study examined the association between **AI-Powered Personalized Learning** and Grade 10 students' engagement and academic performance in a remote learning environment during School Year 2026–2027. A quasi - experimental, one-group pretest–posttest design was used. Students' engagement was assessed across behavioral, emotional, and cognitive dimensions, while academic performance was measured using grades. The intervention provided differentiated activities, personalized tasks, and immediate feedback. Quantitative data were collected before and after implementation; implementation monitoring and responses of the students showed the analysis of challenges and suggested improvements. Overall engagement increased from a moderate level before the intervention (Mean= 2.69) to a high level afterward (Mean = 4.10). The difference was statistically significant, $t = 15.06$, $p < .001$. Mean academic performance rose from 80.07 (SD = 2.29), rated Satisfactory, to 85.13 (SD = 1.76), rated Very Satisfactory; this difference was also significant, $t = 14.81$, $p < .001$. Students identified weak internet access, limited device availability, digital-literacy needs, inconsistent home support, and difficulty interpreting AI-generated feedback as implementation challenges. It is recommended that schools provide reliable internet access, learning devices, offline learning options, simple platforms, and technical support. Teachers should use AI to support instruction by monitoring students' progress, checking AI-generated information, providing clear feedback, and giving differentiated activities with continuous guidance. Students should be taught to use AI responsibly and think critically, while parents should be guided in supporting learning at home. Schools and DepEd should establish clear AI-use guidelines and provide teacher training and learning resources. Future researchers may conduct similar studies with more participants, longer implementation periods, and different learning settings. Schools should also regularly assess the effectiveness of AI-powered learning and improve activities based on students' needs and progress.

Keywords: Academic Performance; AI-Powered Personalized Learning; Student Engagement; Remote Learning Environments

CONTEXT AND RATIONALE

Artificial Intelligence (AI) is becoming an increasingly useful tool in education because it allows teachers to provide learning experiences that respond to students' individual needs. Through AI-powered personalized learning, students can receive suitable learning materials, activities, and feedback based on their performance and progress. This approach can be helpful in remote learning, where students often study independently and may not always receive immediate assistance from their teachers. In their review of 78 studies, Bayly-Castaneda, Ramirez-Montoya, and Morita-Alexander (2024, 2–4) found that AI-supported personalized learning could provide individualized learning pathways and improve students' learning experiences. Likewise, Du Plooy, Casteleijn, and Franzsen (2024, 5) reported that 59 percent of the studies they examined showed improvements in academic performance, while 36 percent reported increased student engagement. These findings indicate that AI may help address differences in students' learning abilities and needs. However, its benefits depend on how the technology is used and the support provided to learners.

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Despite the opportunities offered by remote learning, students may experience difficulties that affect their participation and academic performance. These include limited interaction with teachers, delayed feedback, low motivation, difficulty completing learning tasks, unstable internet connections, and insufficient access to digital devices. Such concerns are important in the Philippines, where students have different levels of access to technology and support at home. The Organisation for Economic Co-operation and Development (OECD 2023, 2) reported that, in PISA 2022, 84 percent of Filipino 15-year-old students performed below Level 2 in mathematics, 76 percent in reading, and 77 percent in science. These results point to the need for teaching approaches that respond to students' learning difficulties and provide appropriate support. AI-powered personalized learning may help address these needs by adjusting activities to students' abilities, providing timely feedback, and allowing them to work at a suitable pace. Nevertheless, improvements in engagement and academic performance may also depend on the quality of instruction, teacher guidance, students' motivation, access to technology, and the usefulness of AI-generated feedback. Students' engagement should also involve active participation and independent thinking rather than simply relying on AI to complete their tasks.

Although previous studies have shown encouraging results, several concerns still need attention when AI is used in education. These include unequal access to technology, unreliable internet connections, data privacy, inaccurate AI-generated information, possible bias, and teachers' readiness to integrate AI into their lessons. Bayly-Castaneda, Ramirez-Montoya, and Morita-Alexander (2024, 10–11) emphasized the need for further studies on AI-supported personalized learning in different educational settings. Similarly, Du Plooy, Casteleijn, and Franzsen (2024, 20–21) highlighted the importance of examining how personalized adaptive learning is implemented and how effective it is. These issues are relevant to Philippine schools because students differ in their access to learning resources, technological skills, and instructional support. In response to the growing use of AI in education, the Department of Education issued DepEd Order No. 003, s. 2026, titled *Foundational Guidelines on Artificial Intelligence in Basic Education*. The guidelines recognize the potential of AI to support personalized and adaptive learning while emphasizing that its use should be safe, ethical, inclusive, meaningful, and centered on human needs. They also stress that AI should assist teachers in their work rather than replace them (Department of Education 2026, 1–3).

In this context, the present study examined the effectiveness of AI-powered personalized learning in improving students' engagement and academic performance in a remote learning environment. It assessed students' engagement before and after the intervention, compared their academic performance, and identified the challenges they experienced during implementation. Student engagement was examined through participation, motivation, persistence, interaction, and completion of learning activities, while academic performance was measured using appropriate assessment tools. The study focused on the selected learners, grade level, subject, school, AI-supported learning platform, remote learning arrangement, and implementation period. It also considered factors that could influence the results, including internet connectivity, device availability, digital literacy, support at home, previous academic performance, teacher competence, and student motivation. Examining these factors helped provide a clearer understanding of how AI-supported learning worked within the specific context of the study.

The findings of this study may benefit several groups in the education community. Students may benefit from learning activities and feedback that better match their needs and help them participate more actively in class. Teachers may use the findings to improve differentiated instruction, provide timely feedback, and monitor students' progress. School administrators may use the results when planning technology resources, organizing teacher training, improving infrastructure, and monitoring the implementation of AI-supported learning. Parents may also gain a better understanding of how they can guide their children in using AI for learning at home. Meanwhile, education officials and policymakers may use the findings as a reference when developing programs and guidelines for the responsible and equitable use of AI in schools. Although the results may not represent all learners or remote learning environments, the study provides context-specific evidence on the potential of AI-powered personalized learning to improve student engagement and academic performance. It also highlights the importance of keeping AI use ethical, accessible, and focused on students' learning needs..

Innovation, Intervention, and Strategy

The innovation in this study was the use of **AI-Powered Personalized Learning** to respond to students' different learning needs in a remote learning environment. Students differ in their level of understanding, learning pace, motivation, and access to learning support. For this reason, the intervention used AI-supported tools to provide appropriate activities, learning materials, and feedback based on students' performance and progress. It aimed to address common challenges in remote learning, such as limited interaction with teachers, delayed feedback, low motivation, difficulty completing tasks, and lack of reliable internet access and digital devices. By combining personalized activities, timely feedback, self-paced learning, and progress monitoring, the intervention sought to improve students' engagement and academic performance. This approach was consistent with Bayly-Castaneda, Ramirez-Montoya, and Morita-Alexander (2024, pp. 10–11), who discussed how AI could support individualized learning pathways.

The intervention included differentiated activities, practice exercises, immediate feedback, remedial tasks, and enrichment activities suited to students' learning needs. Students were given opportunities to work at their own pace, while teachers monitored their progress and provided additional guidance when necessary. AI was used to support teaching and learning, not to replace the important role of teachers.

The implementation began with an assessment of students' engagement and academic performance to establish their initial level. Based on the results, students participated in appropriate AI-supported learning activities. Their progress was monitored throughout the intervention, and teachers used the results and feedback to identify difficulties and provide further assistance. After the intervention, students' engagement and academic performance were assessed again and compared with their initial results. The study also identified challenges encountered during implementation, particularly those related to internet access, availability of devices, digital skills, and possible overdependence on AI.

The innovation aimed to make remote learning more flexible, engaging, and responsive to students' needs. Previous studies by Bayly-Castaneda et al. (2024) and Du Plooy, Casteleijn, and Franzsen (2024) discussed the potential of AI-supported personalized learning to improve student engagement and academic performance. However, the success of this approach depended on proper implementation, teacher guidance, access to technology, and the quality and accuracy of the feedback provided.

The innovation was considered novel because it introduced AI-supported personalized learning to address the specific challenges of remote learning. It was authentic because it responded to actual learning difficulties experienced by students. It was comparable because students' engagement and academic performance were measured before and after the intervention. It was also adaptable because learning activities could be adjusted according to students' needs and available resources. However, challenges such as unreliable internet connections, limited devices, privacy risks, inaccurate AI-generated responses, and excessive dependence on technology needed to be considered.

Overall, the study aimed to determine whether AI-Powered Personalized Learning could improve students' engagement and academic performance in remote learning. It also emphasized the importance of keeping teachers actively involved and ensuring that AI was used responsibly, ethically, and fairly to support students' learning..

Action Research Questions

This action research aimed to determine the effectiveness of AI-powered personalized learning in improving students' engagement and academic performance. Specifically, it ssought to answer the following questions:

1. What is the level of student engagement in terms of behavioral, emotional, and cognitive engagement before and after the implementation of AI-powered personalized learning?
2. What is the level of students' academic performance before and after the implementation of AI-powered personalized learning in the selected remote learning environment?

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3. Is there a significant difference in the students' level of engagement before and after the implementation of AI-powered personalized learning?
4. Is there a significant difference in the students' academic performance before and after the implementation of AI-powered personalized learning?
5. What challenges do students encounter during the implementation of AI-powered personalized learning?
6. What improvements or changes can be made to make AI-powered personalized learning more effective for students?

ACTION RESEARCH METHOD

Research Design

This study used a pre-experimental research design, specifically the one-group pretest–posttest design, to determine whether AI-Powered Personalized Learning improved students' engagement and academic performance during the School Year 2026–2027. The students were assessed before and after the intervention to determine any changes in their learning outcomes.

Before the intervention, the researcher assessed students' engagement in terms of participation, motivation, persistence, interaction, and completion of learning activities. Their academic performance was also measured using an appropriate achievement test. The researcher then implemented AI-powered personalized learning activities, which included differentiated tasks, practice exercises, timely feedback, and learning activities suited to students' needs. Throughout the implementation, students' progress was monitored, and challenges involving internet access, availability of devices, digital skills, and support at home were identified.

After the intervention, the same or equivalent assessment tools were used to measure students' engagement and academic performance again. The pretest and posttest results were compared to determine whether there were significant differences following the intervention. The researcher also documented the challenges encountered during implementation to identify possible improvements.

This research design was appropriate for the action research because it allowed the researcher to examine changes in the same group of students within their actual remote learning environment without requiring a separate control group. However, other factors, such as access to technology, previous academic performance, student motivation, support at home, and teacher guidance, may also have influenced the results.

Participants and Other Sources of Data and Information

The participants in this study were Grade 10 learners enrolled in a public school during the School Year 2026–2027. They were selected based on the researcher's inclusion criteria and participated in the AI-Powered Personalized Learning intervention. The intervention provided differentiated activities, personalized tasks, immediate feedback, and learning opportunities based on their individual needs and progress.

Instrument

The study used three research instruments to determine whether AI-Powered Personalized Learning improved the engagement and academic performance of Grade 10 students in a remote learning environment.

The first instrument was a researcher-adapted Student Engagement Questionnaire, which measured students' behavioral, emotional, and cognitive engagement before and after the intervention. It used a 5-point Likert scale, with 5 meaning Very Highly Engaged, 4 meaning Highly Engaged, 3 meaning Moderately Engaged, 2 meaning Lightly Engaged, and 1 meaning Not Engaged. The results before and after the intervention were compared to identify changes in students' engagement.

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The second instrument involved students' average grades before and after the intervention. These grades were used to determine whether their academic performance improved following the implementation of AI-Powered Personalized Learning.

The third instrument was the AI-Powered Personalized Learning Activity and Monitoring Tool, which helped the researcher track students' participation, progress, and performance throughout the intervention.

Before the instruments were used, qualified experts reviewed and validated their content to ensure that the items were clear, relevant, appropriate, and aligned with the objectives of the study. Together, these instruments provided the necessary data to assess changes in students' engagement and academic performance and monitor the implementation of AI-Powered Personalized Learning.

Data Gathering Procedures

The data-gathering process followed a series of steps to ensure that the study was conducted properly and ethically. Before the intervention began, the researcher obtained approval from the Schools Division Superintendent through the appropriate division offices and research committee, as well as permission from the school head. Consent from parents or guardians and assent from the student participants were also secured before the study was conducted.

After obtaining the necessary approvals, the researcher selected the Grade 10 students who met the criteria for participation. An orientation was then conducted for the school administrator, teacher, students, and parents or guardians to explain the purpose of the study, the procedures to be followed, the use of AI-supported learning tools, the responsibilities of the participants, and the ethical guidelines.

Before the intervention, the researcher gathered baseline data on students' engagement and academic performance. The Student Engagement Questionnaire was used to assess behavioral, emotional, and cognitive engagement, while an appropriate achievement assessment was used to measure academic performance. The collected results were scored and organized to determine the students' initial levels.

The researcher then implemented the AI-Powered Personalized Learning intervention in the selected remote learning environment. AI-supported tools were used to provide personalized activities, practice exercises, feedback, and learning recommendations based on students' needs and progress. Throughout the intervention, teachers continued to guide the students and provide additional assistance whenever necessary.

During the implementation, the researcher monitored students' participation, motivation, persistence, interaction, completion of learning tasks, and academic progress. Relevant records, assessment results, student outputs, and observation notes were gathered. The researcher also documented difficulties encountered by students, particularly those related to internet connectivity, access to devices, digital skills, support at home, and understanding AI-generated feedback.

After the intervention, the same or equivalent assessment tools were administered to measure students' engagement and academic performance. The pretest and posttest results were checked, organized, and prepared for statistical analysis to determine whether significant differences occurred following the intervention.

The quantitative results and records gathered during implementation were analyzed and interpreted to assess the effectiveness of the intervention and identify the challenges that may have affected its implementation. The findings served as the basis for developing recommendations to improve the use of AI-Powered Personalized Learning in remote instruction.

Throughout the study, the researcher protected the participants' privacy and followed ethical research guidelines, including the applicable provisions of the Data Privacy Act of 2012 (Republic Act No. 10173). Participation was voluntary, and students were informed that they could withdraw from the study without penalty. Their identities were protected through the use of codes or pseudonyms, and all collected data were used only for research purposes and stored securely..

Data Analysis

The data collected in this study were analyzed using both quantitative and qualitative statistical techniques to answer the research questions.

Arithmetic Mean was used to determine the level of students' academic performance before and after the implementation of AI-powered personalized learning in the selected remote learning environment.

Weighted Mean was used to determine the level of student engagement in terms of participation, motivation, persistence, interaction, and completion of learning activities before and after the implementation of AI-powered personalized learning.

The **Paired Samples t-test** was employed to determine a significant difference in the level of students' academic performance before and after the implementation of AI-powered personalized learning in the selected remote learning environment and a significant difference in the level of student engagement in terms of participation, motivation, persistence, interaction, and completion of learning activities before and after the implementation of AI-powered personalized learning

For the qualitative component of the study, **Thematic Analysis**, following the procedures of Braun and Clarke (2006, 2022), was employed to analyze the interview responses of Grade 10 learners. The interview transcripts were systematically coded, categorized, and organized into themes to capture the learners' experiences and identify the challenges encountered by both students and the teacher during the implementation of AI-powered personalized learning, particularly in terms of internet connectivity, device availability, digital literacy, home learning support, and the use of AI-generated feedback. The analysis was further explored how the AI-powered personalized learning intervention influences students' engagement and academic performance in the remote learning environment an served as a basis for proposing appropriate improvements and adaptations to enhance the implementation and effectiveness of the intervention.

RESULTS AND DISCUSSION

The level of student engagement in terms of behavioral, emotional, and cognitive engagement before and after the implementation of AI-powered personalized learning.

Table 1. Summary Table of the Level of Student Engagement before the implementation of AI-powered personalized learning

Level of Student Engagement	Mean	Verbal Description
A. Behavioral Engagement	2.77	Moderate level
B. Emotional Engagement	2.63	Moderate level
C. Cognitive Engagement	2.65	Moderate level
Overall Weighted Mean	**2.69**	Moderate level

Legend:

4.21 -5.00 = Very high level, 3.41 – 4.20 = High level, 2.61 – 3.40 = Moderate level, 1.81 – 2.60 = Low level 1.00 – 1.80 = Very low level

Table 1 presents the level of student engagement before the implementation of AI-powered personalized learning. The results showed an overall weighted mean of 2.69, interpreted as a moderate level. Among the three dimensions, behavioral engagement obtained the highest mean of 2.77, followed by cognitive engagement at 2.65 and emotional engagement at 2.63. This means that students participated in remote learning to some extent, but their motivation, interest, and involvement were not yet consistent. Bond et al. (2020) emphasized the importance of active participation in technology-supported learning, while Fredricks, Filsecker, and Lawson (2016) explained that students' emotions and interest are important aspects of engagement. Similarly, Reeve and Tseng (2011) highlighted the role of students' active effort and thoughtful involvement in learning. These findings suggest that students needed additional support to sustain their participation, develop positive feelings toward learning, and strengthen their thinking skills.

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The results further indicated that behavioral engagement was relatively stronger than the other dimensions, although all three remained at a moderate level. This suggests that students were able to participate in learning activities but may have experienced difficulties maintaining motivation and engaging deeply with their lessons. Emotional engagement had the lowest mean, indicating that students' positive feelings and interest in remote learning needed greater attention. Meanwhile, the moderate level of cognitive engagement suggests that students still needed opportunities to think critically, reflect on lessons, and work independently. These findings highlight the importance of providing meaningful learning activities, timely feedback, and appropriate teacher guidance.

Overall, the results established the students' initial level of engagement before the intervention. Zawacki-Richter et al. (2019) and Celik et al. (2022) discussed the potential of AI-supported educational tools to provide learning experiences suited to individual needs. Therefore, AI-powered personalized learning was introduced to provide differentiated activities, feedback, and learning support based on students' progress. However, its effectiveness in improving engagement could only be established by comparing the pre-intervention and post-intervention results using the appropriate statistical test.

The level of student engagement in terms of behavioral, emotional, and cognitive engagement after the implementation of AI-powered personalized learning

Table 2. Summary Table of the Level of Student Engagement after the implementation of AI-powered personalized learning

Level of Student Engagement	Mean	Verbal Description
A. Behavioral Engagement	4.19	High level
B. Emotional Engagement	4.09	High level
C. Cognitive Engagement	4.04	High level
Overall Weighted Mean	**4.10**	High level

Legend:
4.21 -5.00 = Very high level, 3.41 – 4.20 = High level, 2.61 – 3.40 = Moderate level, 1.81 – 2.60 = Low level 1.00 – 1.80 = Very low level

Table 2 presents the level of student engagement after the implementation of AI-powered personalized learning. The results showed an overall weighted mean of **4.10, interpreted as a high level**. Behavioral engagement obtained the highest mean of 4.19, followed by emotional engagement at 4.09 and cognitive engagement at 4.04. This means that students actively participated in learning activities, developed positive feelings toward learning, and made efforts to understand their lessons. Bond et al. (2020) emphasized that student engagement involves behavioral, emotional, and cognitive participation. Similarly, Heung and Chiu (2025) discussed the potential of AI-supported learning to promote engagement through personalized learning experiences.

Behavioral engagement obtained the highest mean of 4.19, indicating that students showed positive learning behaviors, such as participating in activities, completing tasks, and following instructions. Emotional engagement, with a mean of 4.09, suggests that students generally felt confident and motivated during learning. Cognitive engagement obtained the lowest mean of 4.04, although it remained at a high level. This indicates that students made efforts to understand their lessons but may still benefit from additional opportunities to develop critical thinking, problem-solving, and independent learning skills. Bond et al. (2020) highlighted the importance of active participation, while Lo et al. (2024) emphasized the need for appropriate guidance when integrating AI into education.

Overall, the findings indicate that students demonstrated high engagement across all three dimensions after the intervention. Compared with the pre-intervention overall weighted mean of 2.69, the post-intervention mean of 4.10 reflects a considerable descriptive increase in student engagement. This implies that AI-powered personalized learning may have helped support students' participation, motivation, and involvement in their lessons. However, a statistical comparison of the pre-intervention and post-intervention scores is needed to

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determine whether the observed improvement is statistically significant. Continued teacher guidance, meaningful learning activities, and opportunities for independent thinking remain important in sustaining student engagement.

The level of students' academic performance

Table 3. The level of students' academic performance before and after the implementation of AI-powered personalized learning in the selected remote learning environment.

Performance Before			**Performance After**		
Grade	Std. Dev	Equivalent	Grade	Std. Dev	Equivalent
80.07	2.29	Satisfactory	85.13	1.76	Very Satisfactory

Legend:

90 – 100 – Outstanding

85 – 90 – Very satisfactory

80 – 84 - Satisfactory

75 – 79 – Fairly Satisfactory

Below 75 – Did not meet expectations

Table 3 presents students' academic performance before and after the implementation of AI-powered personalized learning. Before the intervention, students obtained a mean grade of 80.07 (SD = 2.29), interpreted as Satisfactory. After the intervention, their mean grade increased to 85.13 (SD = 1.76), interpreted as Very Satisfactory. The 5.06-point increase indicates an improvement in students' average grades, while the decrease in standard deviation suggests that their grades became less varied. This means that students performed better overall and their academic results were more consistent after the intervention.

These findings are consistent with the work of Zawacki-Richter et al. (2019), who reviewed the use of artificial intelligence in higher education and identified its potential applications in assessment, feedback, and personalized learning. Similarly, Celik et al. (2022) discussed how artificial intelligence can support teaching and learning when integrated appropriately into educational practices. These studies provide a basis for understanding how AI-supported activities and feedback may help address learners' individual needs. In the present study, the improvement in mean grades suggests that personalized activities and learning support may have contributed to students' progress. However, the descriptive results alone cannot establish that the intervention caused the improvement. A statistical test is needed to determine whether the difference between pre-intervention and post-intervention grades is statistically significant. Overall, the findings highlight the potential value of AI-powered personalized learning when combined with meaningful activities, timely feedback, and continued teacher guidance**.**

Testing the significant difference in the students' level of engagement

Table 4. Testing the significant difference in the students' level of engagement before and after the implementation of AI-powered personalized learning

Student level of engagement	**Mean**	**Std. Dev.**	**t-value**	**p-value**	**Decision**	**Interpretation**
Before	2.6880	.59	15.06	0.000*	Reject Ho	Significant
After	4.0395	.74				

** Significant level at $\alpha = .05$*

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Table 4 presents the difference in students' engagement before and after the implementation of AI-powered personalized learning. Before the intervention, students obtained a mean score of 2.6880 (SD = 0.59), while after the intervention, the mean increased to 4.0395 (SD = 0.74). The 1.3515-point increase indicates that students became more engaged after experiencing the intervention. The slightly higher standard deviation after the intervention also suggests that students' engagement scores varied somewhat more than before.
The computed t-value of 15.06 and p-value of less than .001 indicate a statistically significant difference between the pre-intervention and post-intervention engagement scores at the .05 level of significance. Therefore, the null hypothesis is rejected. This means that the observed increase in engagement was statistically significant and unlikely to be explained by random variation alone. However, because the study used a one-group pretest–posttest design, other factors may also have contributed to the improvement.

The findings suggest that AI-powered personalized learning may have helped students become more involved in their learning activities. This result is consistent with Heung and Chiu (2025) and Wang and Guo (2025), whose work discusses the potential of AI-supported learning to improve student engagement through more personalized learning experiences. When activities and feedback respond to students' learning needs, students may find it easier to participate, maintain interest, and work through challenging lessons. This implies that AI-powered personalized learning can be a useful instructional approach for supporting student engagement when combined with appropriate teacher guidance and meaningful learning activities.

Testing the significant difference in the students' academic performance

Table 5. Testing the significant difference between the students' academic performance before and after the implementation of AI-powered personalized learning.

Academic Performance	**Mean**	**Std. Dev.**	**t-value**	**p-value**	**Decision**	**Interpretation**
Before	80.07	2.29	14.81	0.000*	Reject Ho	Significant
After	85.13	1.76				

** Significant level at $\alpha = .05$*

Table 5 presents the difference in students' academic performance before and after the implementation of AI-powered personalized learning. Before the intervention, students obtained a mean grade of 80.07 (SD = 2.29), interpreted as Satisfactory. After the intervention, their mean grade increased to 85.13 (SD = 1.76), interpreted as Very Satisfactory. The 5.06-point increase indicates that students earned higher grades after the intervention. The decrease in standard deviation also suggests that their grades became less varied. This means that students showed better academic performance, with their grades becoming more closely grouped around the average.

The computed t-value of 14.81 and p-value of less than .001 indicate a statistically significant difference between students' grades before and after the intervention at the .05 level of significance. Thus, the null hypothesis is rejected. This means that the improvement was statistically significant and unlikely to be due to random variation alone. However, since the study used a one-group pretest–posttest design, other factors may also have influenced students' performance.

These findings support the potential of AI-powered personalized learning to help students improve their academic performance. Zawacki-Richter et al. (2019) identified personalized learning and assessment as important applications of artificial intelligence in education. Similarly, Celik et al. (2022) discussed how AI can support teaching and learning when appropriately integrated into instructional practices. These studies provide a basis for understanding how AI-supported activities and feedback may help address learners' different needs. In the present study, the higher mean grade suggests that students may have benefited from learning activities and support suited to their progress. This implies that AI-powered personalized learning can be a useful instructional approach when combined with teacher guidance, timely feedback, and meaningful learning tasks.

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Nevertheless, the results should be interpreted with consideration of other factors that may have contributed to the improvement.

Challenges that the students and the teacher encounter during the implementation of AI-powered personalized learning

Theme 1: Technology Access and Learning Support Challenges

The responses of the seven students revealed a major theme: **Technology Access and Learning Support Challenges**. Students shared that slow internet connections, limited mobile data, and the need to share devices with family members made it difficult for them to complete their learning activities. Some also needed help using digital tools and navigating the AI-powered learning activities. These experiences highlight how limited access to technology can affect students' participation in remote learning. Alam et al. (2025) similarly discussed the challenges of implementing AI-supported learning in settings where internet access and computer resources are limited. This means that students need not only access to learning technology but also the digital skills to use it effectively.

Students also explained that help from family members was not always available when they encountered difficulties at home. Although they found AI-generated feedback useful, some had trouble understanding the explanations and still relied on their teachers for clarification. This reflects the importance of human guidance in technology-supported learning. Henderson et al. (2025) reported that students may appreciate the accessibility and speed of generative AI feedback while continuing to value teacher feedback for its reliability and usefulness. This means that AI can assist students in learning, but it cannot always replace the guidance and explanations provided by teachers.

Overall, the findings suggest that successful AI-powered personalized learning depends on more than the availability of AI tools. Students also need reliable internet access, suitable devices, digital skills, and support from teachers and family members. Huang, Xie, and Hew (2026) likewise highlighted the value of combining generative AI feedback with teacher feedback and peer support. This implies that schools should provide basic training on AI tools, offer alternative activities for students with limited connectivity, and ensure that teachers remain available to guide learners. With these forms of support, AI-powered personalized learning can become more accessible, practical, and meaningful for students with different learning needs.

Improvements or changes can be made to make AI-powered personalized learning more effective for students.

Theme 2: Improved Accessibility, Guidance, and Personalization

The theme **Improved Accessibility, Guidance, and Personalization** emerged from the students' suggestions on how to make AI-powered personalized learning more effective. They emphasized the need for a stable internet connection, access to devices, offline learning options, easy-to-use AI platforms, and short tutorials. These suggestions show that students need learning tools that are accessible and simple to use, especially when their digital skills and access to technology differ. Holman et al. (2024) similarly highlighted the importance of accessibility and professional development in implementing AI-powered personalized learning. This means that providing AI tools is not enough; students must also know how to use them and have the resources needed to participate in learning activities.

Students also stressed the importance of clear AI-generated feedback and continued teacher guidance. They preferred feedback that explains how to arrive at an answer rather than simply providing the correct response. They also wanted teachers to be available when AI-generated explanations were confusing. This shows that students value AI as a learning aid but still rely on teachers for clarification and support. Wang et al. (2026) and Sim and Park (2025) discussed the potential of AI-generated feedback to support learning and motivation. These findings suggest that AI should complement teachers' work rather than replace their role in guiding students.

Furthermore, students recommended providing activities suited to their different learning levels and individual needs. This suggests that personalized activities, clear feedback, accessible technology, and teacher support should work together to make learning more meaningful. Overall, the findings imply that AI-powered personalized learning can better support students when learning tools are easy to access, activities match their needs, and teachers provide guidance whenever necessary. These improvements may help students participate more confidently and learn at a pace appropriate to their abilities.

CONCLUSION AND RECOMMENDATION

Based on the findings of the study, **AI-Powered Personalized Learning** was associated with improved student engagement and academic performance. Before its implementation, students showed a moderate level of behavioral, emotional, and cognitive engagement, indicating difficulties in sustaining effort, staying motivated, enjoying learning activities, thinking deeply, and completing tasks. After the implementation, students demonstrated a high level of engagement and improved academic performance. The significant differences between the pre- and post-implementation results further support the usefulness of the innovation in addressing the learning needs of students. However, the findings should be understood as an association because other factors may have also contributed to the observed improvements.

The qualitative findings showed that students still experienced challenges related to internet connectivity, device availability, digital skills, home learning support, and understanding AI-generated feedback. They also emphasized the need for better accessibility, simpler AI platforms, clearer feedback, differentiated activities, offline options, and continuous teacher guidance. These findings suggest that AI-powered personalized learning is most appropriate when it is learner-centered, accessible, and supported by teachers. The study therefore highlights the importance of using AI not as a replacement for teachers but as a tool that complements instruction, provides personalized learning opportunities, and supports students' engagement and learning. The findings also provide a basis for improving school practices and policies on equitable access, AI and digital literacy, teacher capacity-building, responsible AI use, data privacy, academic integrity, and continuous teacher monitoring.

It is recommended that the schools should strengthen the implementation of AI-powered personalized learning by providing adequate internet connectivity, learning devices, and technical support, especially for students with limited access to technology. Teachers should use AI as a support tool rather than a replacement for instruction by regularly monitoring students' progress, explaining AI-generated feedback, checking the accuracy of AI outputs, and providing additional assistance when needed. Learning activities should also be differentiated according to students' needs, learning levels, and interests, with opportunities for critical thinking, problem-solving, questioning, reflection, and application of knowledge. Students should receive guidance on the responsible and effective use of AI, including checking information, thinking independently, and seeking help from teachers. Parents and guardians should also be given simple orientations on how to support students during AI-assisted learning at home.

At the school and policy levels, guidelines should be developed for the responsible use of AI, covering accessibility, digital and AI literacy, data privacy, academic integrity, teacher supervision, verification of AI-generated information, and responsible use of technology. DepEd and education policymakers may provide support through improved infrastructure, teacher training, and appropriate AI-enabled learning resources, particularly for remote and underserved communities. Future researchers may conduct similar studies using larger groups, longer implementation periods, and other learning settings while examining factors such as digital literacy, motivation, self-regulated learning, teacher readiness, and home support. Finally, the innovation should follow a continuous improvement cycle of **assessment, personalization, AI-supported learning, teacher monitoring, feedback, reflection, and further intervention** to ensure that AI remains accessible, purposeful, inclusive, and learner-centered.

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