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Learners' Engagement of Artificial Intelligence in Compliance of Formative Assessment Tasks in Mathematics

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ABSTRACT

Purpose – This study aims to evaluate junior high school students' engagement in using Artificial Intelligence (AI) tools in formative assessment activities in Mathematics. The study is grounded in the growing integration of AI in education and the need to understand students' engagement patterns to support an effective, responsible implementation.

Methodology – A quantitative research design was employed. The respondents consisted of 112 junior high school students (55 males and 57 females) from Jose Rizal Institute–Orani, selected through simple random sampling. The sample size was determined using G*Power 3.1.9.4. A researcher-made questionnaire was used as the research instrument, and its validity and reliability were established using Cronbach's Alpha. Data were analyzed using descriptive statistics, the Independent Samples T-test, and the One-Way Analysis of Variance (ANOVA).

Findings – The findings revealed that the majority of students were slightly engaged in using AI tools for formative assessment tasks in Mathematics. A significant difference in AI engagement was observed by sex, with male students demonstrating higher engagement than female students. However, no significant differences were identified across grade levels, except in performance tasks and group activities, where Grade 7 students showed greater engagement.

Novelty – This study provides original empirical evidence on students' engagement with AI tools in formative assessment, highlighting differences by sex and specific assessment activities at the junior high school level.

Significance – The findings benefit educators, school administrators, and policymakers by providing insights to inform the responsible and meaningful integration of AI into formative assessment and mathematics instruction.

Keywords: Artificial Intelligence; Bataan Peninsula State University; Engagement; Formative assessment; Mathematics.

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1. Introduction

Mathematics has always been the foundation for interpreting reality and making connections through numbers, patterns, and logic, making it a high-priority requirement in every field. Promoting one's critical thinking, problem-solving, decision-making, and analytical skills. In recent years, artificial intelligence (AI) has been applied in education, encompassing a wide range of systems and techniques, including rule-based algorithms, machine learning models, expert systems, intelligent tutoring systems, and generative AI. The introduction of AI-based generation tools (e.g., ChatGPT, DeepSeek, Claude, Gemini, and Copilot) has marked a significant turning point in education, drawing attention to how AI has been applied and evaluated (Garzon et al., 2025). In addition, Bilal et al. (2025) state that there has been a significant expansion of Generative AI across platforms such as AI companions in Zoom, AI assistants in Adobe Acrobat Suite, and AI-powered agents in Microsoft, helping transform sectors, particularly education, workplaces, and daily experiences.

In education, formative assessment is a crucial indicator for teachers to adjust their instructions and for students to reflect on their own progress. Based on DepEd Order No. 8, s. In 2015, formative assessment was an ongoing, informal process that enabled teachers to monitor student progress and adjust instruction to meet learners' needs. It also fosters student self-reflection and ownership of learning by providing timely, constructive feedback. Rather than contributing to final grades, formative assessment enhances both teaching effectiveness and student outcomes. In addition, formative assessment may be integrated throughout the lesson (e.g., practice exercises, open-ended questions, assignments, quizzes, performance tasks). A recent study by Lara et al. (2025) found a positive relationship between the integration of AI-enhanced classrooms in secondary education and students' academic achievement, as AI tools provide real-time feedback mechanisms and adaptive learning systems, such as gamification, which supported the study by Bennani et al. (2021). Adaptive gamification promotes active participation and critical thinking in problem-solving, thereby increasing students' motivation. Another study by Vasconcelos and dos Santos (2023) concludes that incorporating GenAI bots such as Bing and ChatGPT helps develop critical thinking and problem-solving skills, fosters discussion, supports independent learning, and helps better understand STEM concepts. Furthermore, according to the article and interview by De Guzman (2025), Ryan Lufkin, vice-president of Global Academic Strategy at Instructure, said that "Filipino students are already actively engaging with AI tools to support their learning".

As the integration of artificial intelligence in education becomes a go-to tool for learners, highlighting its features and benefits, it also raises notable concerns that need to be addressed. According to a study by Rubin (2025), younger age groups showed higher or excessive levels of digital literacy due to frequent exposure to and use of

generative AI, resulting in lower levels of learning independence. Further, brainstorming and time-saving are examples of positive impacts; however, there are also negative impacts, such as not thinking things through (Agarwal & Khattar, 2025). Moreover, Garzon et al. (2025) stated that behind those benefits, overdependence, lack of creativity, and unguided use of AI tools were seen. Also, it emphasizes academic integrity, as AI tools can easily generate answers in a human manner, raising major concerns about identifying plagiarism (Chatterjee & Dethlefs, 2023). Learning can be acquired by understanding the lesson structure and creating an outline. However, features of AI tools prevent learners from doing it on their own; instead, they rely solely on them, resulting in academic and learning loss (Chen & Lin, 2024). In addition, students who rely heavily on AI quick solutions reduce their engagement in the cognitive processes underlying mathematical concepts, specifically critical thinking and problem-solving skills. As a result, students may struggle in higher-level mathematics (Dolapcioglu & Doğanay, 2022; Alam, 2022)

As changes occur in the education field, academic success requires a better understanding of the interaction between AI tools and formative assessment tasks (Mousa, 2020). The purpose of the study is to assess learners' engagement in Artificial Intelligence (AI) in compliance with Mathematics Formative Assessments Among Junior High School Students.

Specifically, it sought answers to the following questions:

1. What is the demographic profile of the students in terms of sex and grade level?
2. To what extent do students utilize Artificial Intelligence in solving mathematics formative assessments?
3. How may the learners' engagement with artificial intelligence be compared in terms of the demographic profile of the students?

2. Methods

Provide the methodology, including the research design, population and sampling, variable definition, data collection, validity and reliability, statistical methods, and ethics and approvals.

2.1 Research Design

The study used a quantitative research method, employing descriptive survey research to assess the level of artificial intelligence use in Mathematics formative assessments of Junior high school students at Jose Rizal Institute – Orani during the school year 2025-2026.

2.2 Population and Sampling

The respondents of the study were the Junior High School from Jose Rizal Institute – Orani. Fifty-five (55) males and fifty-seven (57) females with a total of 112 students. Thirty-five (35) students are in Grade 7, twenty-nine (29) in Grade 8, twenty-eight (28) in Grade 9, and twenty (20) in Grade 10. The stratified random sampling technique is used at every grade level to divide the population into strata and select participants at random from each stratum to obtain a more accurate, representative sample.

2.3 Variable Definition

The study investigated learners' engagement with artificial intelligence in the context of formative assessment tasks in Mathematics. The variables in this quantitative descriptive research were sex and grade level as independent variables used to group students for comparison, and students' level of Artificial Intelligence engagement in solving mathematics formative assessments as the dependent variable. The level of Artificial Intelligence usage was specifically assessed across four different sub-variables of formative assessment such as homework and practice exercises which were given at the end of the lesson to evaluate whether learning intentions and success criteria have been met; quizzes and short assessment that may be conducted during lesson proper to identify learners' strengths and weaknesses as well as to provide immediate feedback; problem - solving task which is a type of assessment in Mathematics that tells and recognizes whether learners can put or apply their knowledge to answer the given tasks and; performance tasks and group activities that assess whether learning objectives were attained for a specific duration.

2.4 Data Collection

This study employed a quantitative descriptive survey using a questionnaire to gather data from junior high school students. The questionnaire was researcher-made; it underwent validation procedures with an evaluator comprising specialists in the field. Using Google Forms, the researcher personally administered questionnaires after obtaining their consent. The researcher gave the respondents sufficient time to respond to all statements in the instrument.

2.5 Validity and Reliability

A researcher-made questionnaire was developed and validated to ensure alignment with the study's objectives. Experts conducted content validation to confirm the clarity, relevance, and appropriateness of each item. After revisions, the instrument was pilot-tested among students not included in the actual respondents. Cronbach's Alpha was used to test the validity and reliability of the instrument. Using the reliability analysis for Home and practice exercises, the Cronbach's Alpha value wa 0.893, indicating that the questions are good; the quizzes and short assessments got 0.895, indicating that the questions are good; the problem-solving task got a 0.935 value, indicating that the questions are excellent; and for performance task and group activities have 0.883 value, indicating that the questions are good.

2.6 Statistical Method

The data gathered using the questionnaire were coded, encoded, and statistically analyzed using statistical software called IBM Statistical Package for the Social Sciences (SPSS) Statistics version 21. The data were analyzed using various statistical tools, including frequency and percentage, weighted mean, Independent Samples T-test, and One-Way Analysis of Variance (ANOVA).

A frequency or percentage distribution was used to display the students' demographic profile by sex and grade level. Moreover, the weighted mean was used to assess how students use Artificial Intelligence to solve mathematics formative assessments across home and practice exercises, quizzes and short assessments, problem-solving tasks, performance tasks, and group activities.

Before conducting hypothesis testing, the assumptions for parametric tests were first evaluated using the Normality Test (Shapiro-Wilk) and the Test for Homogeneity of Variances (Levene's Test). The Independent Samples T-test was employed to determine whether a significant difference exists in the students' level of AI usage when grouped according to sex. Meanwhile, a One-Way Analysis of Variance (ANOVA) was performed to compare students' levels of AI usage across grade levels. Furthermore, a post hoc analysis using the Tukey-Kramer test was conducted to identify which groups differed significantly.

In hypothesis testing, SPSS provides significance or probability values that are then compared with the accepted level of significance, typically 0.05. If the significance or p-value is less than 0.05, the statistical value is considered significant, and therefore, the null hypothesis is rejected. Conversely, if it is not significant, the null hypothesis is not rejected.

2.7 Ethics and Approvals

The Junior High School students of Jose Rizal Institute – Orani, the respondents of this study, were oriented to the study, and their consent to answer the questionnaire was also obtained. This was done by assuring the secrecy and confidentiality of the collected data, and only used for the purpose of writing the study
and enriching the educational practice.

3. Results and Discussion

3.1 Results

The study assesses the level of Artificial Intelligence (AI) Usage in Mathematics Formative Assessments among Junior High School students. Presents the demographic profile of students by sex and grade level.

Table 1 - Demographic Profile of the Students

Profile	Frequency	Percentage
Sex		
Male	55	49
Female	57	51
Total	112	100
Grade Level		
Grade 7	35	31
Grade 8	29	26
Grade 9	28	25
Grade 10	20	18
Total	112	100

Number of respondents=112

According to Table 1, 51% (57 students) are female, whereas 49% (55 students) are male. Regarding their grade level, thirty-one percent (31%) or 35 students are in Grade 7, twenty-six percent (26%) or 29 students are in Grade 8, twenty-five percent (25%) or 28 students are in Grade 9, and eighteen percent (18%) or 20 students are in Grade 10.

Demonstrates how students use Artificial Intelligence to solve mathematics formative assessments, including homework and practice exercises, quizzes and short assessments, problem-solving tasks, performance tasks, and group activities.

Table 2 - Homework and Practice Exercises

Indicator	Mean	SD	DE	Interpretation
I utilize generative AI as a guide in answering my mathematics assignments and practice exercises	2.00	0.77	Sometimes	Slightly Engaged
I rely on AI to help me verify and correct my solutions in practice exercises and assignments.	2.26	0.80	Sometimes	Slightly Engaged
Utilization of AI increases my motivation to finish my homework and practice exercises.	1.99	0.85	Sometimes	Slightly Engaged
The use of AI improves my accuracy and confidence I exhibit in my practice exercises and homework outputs.	2.16	0.87	Sometimes	Slightly engaged
Composite	2.10	0.66	Sometimes	Slightly Engaged

Scale of Means: 4.00–3.26 Almost Always/Fully Engaged; 3.25–2.51 Often/Moderately Engaged; 2.50–1.76 Sometimes/Slight Engaged; 1.75–1.00 Almost Never/Not Engaged at All; SD-Standard Deviation; DE-Descriptive Equivalent

It can be seen from Table 2 that the indicator "I rely on AI to help me verify and correct my solutions in practice exercises and assignments" accumulated the highest rating (Mean=2.26; SD=0.80; Sometimes; Slightly Engaged). On the other hand, the indicator "Utilization of AI increases my motivation to finish my homework and practice exercises." (Mean=1.99; SD=0.85; Sometimes; Slightly Engaged) gained the lowest rating.

Generally, the rating (Mean=2.10; SD=0.66) indicates that students' use of Artificial Intelligence in solving mathematics formative assessments, particularly in home and practice exercises, "Sometimes" occurs. This suggests that students are "Slightly Engaged" with Artificial Intelligence when completing home and practice exercises in mathematics.

Table 3 - Quizzes and Short Assessments

Indicator	Mean	SD	DE	Interpretation
I utilize AI tools to review concepts in preparation for mathematics quizzes/short assessments.	2.29	0.88	Sometimes	Slightly Engaged
AI support increases my readiness in taking quizzes/short assessments.	2.20	0.90	Sometimes	Slightly Engaged
With the help of generative AI, my performance in quizzes/ short assessments improves.	2.21	0.82	Sometimes	Slightly Engaged
Using AI tools helps reduce my anxiety when preparing for quizzes/ short assessments.	2.20	0.93	Sometimes	Slightly engaged
Composite	2.22	0.73	Sometimes	Slightly Engaged

Scale of Means: 4.00–3.26 Almost Always/Fully Engaged; 3.25–2.51 Often/Moderately Engaged; 2.50–1.76 Sometimes/Slight Engaged; 1.75–1.00 Almost Never/Not Engaged at All; SD-Standard Deviation; DE-Descriptive Equivalent

Based on the results in Table 3, the indicator securing the highest rating is "I utilize AI tools to review concepts in preparation for mathematics quizzes/short assessments." (Mean=2.29; SD=0.88; Sometimes; Slightly Engaged). However, the indicators attaining the lowest ratings are "AI support increases my readiness in taking quizzes/short assessments." (Mean=2.20; SD=0.90; Sometimes; Slightly Engaged) and "Utilization of AI tools helps lessen my anxiety when preparing for quizzes/ short assessments." (Mean=2.20; SD=0.90; Sometimes; Slightly Engaged).

Overall, the students' use of Artificial Intelligence to solve mathematics formative assessments, particularly in quizzes and short assessments, "Sometimes" occurs, as indicated by the rating (Mean=2.22; SD=0.73). This recommends that students are "Slightly Engaged" with Artificial Intelligence when answering quizzes and short assessments in mathematics.

Table 4 - Problem-Solving Task

Indicator	Mean	SD	DE	Interpretation
I use AI tools to understand the procedures/steps for solving math problems.	2.54	0.94	Often	Moderately Engaged
With the help of AI, I apply and explore multiple strategies for solving math problems.	2.18	0.80	Sometimes	Slightly Engaged
When assisted by AI, I can solve more complex math problems.	2.23	0.88	Sometimes	Slightly Engaged
AI usage elevates my confidence in performing independent problem-solving tasks.	2.19	0.83	Sometimes	Slightly engaged
Composite	2.29	0.69	Sometimes	Slightly Engaged

Scale of Means: 4.00–3.26 Almost Always/Fully Engaged; 3.25–2.51 Often/Moderately Engaged; 2.50–1.76 Sometimes/Slight Engaged; 1.75–1.00 Almost Never/Not Engaged at All; SD-Standard Deviation; DE-Descriptive Equivalent

It is evident from Table 4 that the highest-rated indicator is "I make use of AI tools to understand the procedures/steps in solving math problems." (Mean=2.54; SD=0.94; Often; Moderately Engaged). In comparison, the lowest-rated indicator is "With the help of AI, I apply and explore multiple strategies of solving math problems." (Mean=2.18; SD=0.80; Sometimes; Slightly Engaged).

As a whole, the rating (Mean=2.29; SD=0.69) implies that the students' utilization of Artificial Intelligence in solving mathematics formative assessments, particularly in problem-solving tasks, "Sometimes" occurs. This indicates that students are "Slightly Engaged" with Artificial Intelligence when solving mathematical problems.

Table 5 - Performance Task and Group Activities

Indicator	Mean	SD	DE	Interpretation
I rely on AI tools to formulate ideas or solutions for performance tasks and group activities.	2.02	0.81	Sometimes	Slightly Engaged
AI usage encourages me to collaborate and improve peer interactions in group activities.	2.12	0.88	Sometimes	Slightly Engaged
AI usage helps me to participate actively in performance tasks.	1.95	0.88	Sometimes	Slightly Engaged

The use of AI makes performance tasks and group activities engaging and meaningful.	2.15	0.84	Sometimes	Slightly engaged
Composite	2.06	0.70	Sometimes	Slightly Engaged

Scale of Means: 4.00–3.26 Almost Always/Fully Engaged; 3.25–2.51 Often/Moderately Engaged; 2.50–1.76 Sometimes/Slight Engaged; 1.75–1.00 Almost Never/Not Engaged at All; SD-Standard Deviation; DE-Descriptive Equivalent

As displayed in Table 5, the indicator "The use of AI makes performance tasks and group activities engaging and meaningful" obtained the highest rating (Mean=2.15; SD=0.84; Sometimes; Slightly Engaged). Inversely, the indicator "AI usage helps me to participate actively in performance tasks." (Mean=1.95; SD=0.88; Sometimes; Slightly Engaged) received the lowest rating.

Altogether, the students' utilization of Artificial Intelligence in solving mathematics formative assessments, particularly in performance tasks and group activities, "Sometimes" occurs, as revealed by the rating (Mean=2.06; SD=0.70). This insinuates that students are "Slightly Engaged" with Artificial Intelligence when accomplishing performance tasks and group activities in mathematics.

Table 6 - Students' Utilization of Artificial Intelligence in Mathematics Formative Assessments

Indicator	Mean	SD	DE	Interpretation
Homework and Practice Exercises	2.10	0.66	Sometimes	Slightly Engaged
Quizzes and Short Assessments	2.22	0.73	Sometimes	Slightly Engaged
Problem-Solving Task	2.29	0.69	Sometimes	Slightly Engaged
Performance Task and Group Activities	2.06	0.70	Sometimes	Slightly engaged
Composite	2.17	0.58	Sometimes	Slightly Engaged

Scale of Means: 4.00–3.26 Almost Always/Fully Engaged; 3.25–2.51 Often/Moderately Engaged; 2.50–1.76 Sometimes/Slight Engaged; 1.75–1.00 Almost Never/Not Engaged at All; SD-Standard Deviation; DE-Descriptive Equivalent

Table 6 portrays all indicators of the Students' Utilization of Artificial Intelligence in Mathematics Formative Assessments. Among these, the indicator "Problem-Solving Task" has the highest rating (Mean=2.29; SD=0.69; Sometimes; Slightly Engaged). Compared with the other indicators, the "Performance Task and Group Activities" indicator has the lowest rating (Mean=2.06; SD=0.70; Sometimes; Slightly Engaged). Taken collectively, the rating (Mean=2.17; SD=0.58) suggests that students' use of Artificial Intelligence in solving mathematics formative assessments occurs "Sometimes." This implies that students are "Slightly Engaged" with Artificial Intelligence when solving mathematics formative assessments.

Presents a comparison of students' levels of AI use based on their demographic profiles.

Table 7 - Comparison of Students' Level of AI Usage Based on Sex

Indicators	Sex	N	Mean	Sd	t-value (110)	p-value	Remarks
Home and Practice Exercises	Male	55	2.25	0.72	2.29 *	.024	Reject the Null Hypothesis
	Female	57	1.96	0.58			
Quizzes and Short Assessments	Male	55	2.36	0.75	2.07 *	.040	Reject the Null Hypothesis
	Female	57	2.08	0.68			
Problem-Solving Task	Male	55	2.39	0.73	1.53 ns	.129	Failed to Reject the Null Hypothesis
	Female	57	2.19	0.63			
Performance Task and Group Activities	Male	55	2.18	0.76	1.87 ns	.064	Failed to Reject the Null Hypothesis
	Female	57	1.94	0.60			
Overall	Male	55	2.29	0.64	2.35 *	.021	Reject the Null Hypothesis
	Female	57	2.04	0.48			

** significant at 0.05 alpha level; ns–not significant at 0.05 alpha level*

In line with the results in Table 7, the corresponding significant values for two (2) sub-variables of the Students' Level of AI Usage are greater than the value of 0.05 significance level. Specifically, "Problem-Solving Task" [t(110)=1.53; p-value=.129] and "Performance Task and Group Activities" [t(110)=1.87; p-value=.064]. Hence, there is no significant difference in these variables when grouped by sex.

However, the sub-variables "Home and Practice Exercises" [t(110)=2.29; p-value=.024] and "Quizzes and Short Assessments" [t(110)=2.07; p-value=.040] posted a significant difference. In Home and Practice Exercises, the level of AI use among male students (Mean=2.25; SD=0.72) was significantly higher than among female students (Mean=1.96; SD=0.58). Moreover, in Quizzes and Short Assessments, the level of AI usage among male students (Mean=2.36; SD=0.75) was also significantly higher than that of female students (Mean=2.08; SD=0.68).

In summary, the test statistic value [t(110)=2.35; p-value.021] indicates that there is sufficient evidence to conclude that a significant difference exists in the Students' Level of AI Usage when they are grouped according to their sex. To be specific, the level of AI usage among male students (Mean=2.29; SD=0.64) was significantly higher than that of female students (Mean=2.04; SD=0.48).

Table 8 - Comparison of Students' Level of AI Usage Based on Grade Level

Indicators	Grade Level	N	Mean	Sd	F-value (111)	p-value	Remarks
Home and Practice Exercises	Grade 7	35	2.23 $_a$	0.71	2.56 ^{ns}	.064	Failed to Reject the Null Hypothesis
	Grade 8	29	2.21 $_a$	0.62			
	Grade 9	28	1.81 $_a$	0.63			
	Grade 10	20	2.14 $_a$	0.59			
Quizzes and Short Assessments	Grade 7	35	2.33 $_a$	0.75	1.58 ^{ns}	.204	Failed to Reject the Null Hypothesis
	Grade 8	29	2.32 $_a$	0.77			
	Grade 9	28	2.14 $_a$	0.77			
	Grade 10	20	2.00 $_a$	0.51			
	Grade 7	35	2.36 $_a$	0.68	2.03 ^{ns}	.120	

Indicators	Grade Level	N	Mean	Sd	F-value (111)	p-value	Remarks
Problem-Solving Task	Grade 8	29	2.47 $_a$	0.76			Failed to Reject the Null Hypothesis
	Grade 9	28	2.04 $_a$	0.62			
	Grade 10	20	2.24 $_a$	0.64			
Performance Task and Group Activities	Grade 7	35	2.36 $_a$	0.67	4.47 **	.007	Reject the Null Hypothesis
	Grade 8	29	2.07 $_b$	0.71			
	Grade 9	28	1.73 $_b$	0.69			
	Grade 10	20	1.98 $_b$	0.51			
Overall	Grade 7	35	2.32 $_a$	0.62	2.68 ^{ns}	.055	Failed to Reject the Null Hypothesis
	Grade 8	29	2.27 $_a$	0.57			
	Grade 9	28	1.93 $_a$	0.57			
	Grade 10	20	2.09 $_a$	0.39			

*** significant at 0.01 alpha level; ns–not significant at 0.05 alpha level; Mean ratings in a row not sharing subscripts are significantly different at 0.05 level*

It can be concluded from Table 8 that the three (3) sub-variables of the Students' Level of AI Usage have a corresponding significant value which are greater than 0.05 alpha level. The sub-variables are "Home and Practice Exercises" [F(111)=2.56; p-value=.064], "Quizzes and Short Assessments" [F(111)=1.58; p-value=.204], and "Problem-Solving Task" [F(111)=2.03; p-value=.120]. These suggests that there is no significant difference in these variables when they are grouped according to their grade level.

On the other hand, the sub-variable "Performance Task and Group Activities" [F(111)=4.47; p-value=.007], posted a significant difference. To further interpret the difference among grade levels, a post hoc analysis was applied with the use of Tukey-Kramer test. The results have shown that Grade 7 students' level of AI usage (Mean=2.36; SD=0.67) was significantly higher than than the Grade 8 students (Mean=2.07; SD=0.71), Grade 9 students (Mean=1.73; SD=0.69), and Grade 10 students (Mean=1.98; SD=0.51).

Overall, evidence collected is still inadequate to claim that there exists a significant difference in the Students' Level of AI usage when grouped according to their grade level, as noted by the test statistic value [F(111)=2.68; p- value=.055].

3.2 Discussion

The result suggests (Table 2) that students are "Slightly Engaged" with Artificial Intelligence when completing home and practice exercises in mathematics, similar to the study conducted by Krecar et. al. (2024). According to Krecar, the purpose of learners in utilizing AI tools for their homework are for finding content that interests them, deeper analysis of the topic, and for writing textual assignments. Moreover, another study conducted by Tamimi, et al. (2024), showed a significant percentage of using generated AI in completing learners' homework due to its ability to lessen or minimize learning challenges. Also, it provides instant feedback on their homework making the necessary assistance needed at home. Most of the learners who had utilized AI tools said the purpose was to complete their school assignments particularly topic related to language arts (writing). (Schiel, et al. ,2023)

The result recommends (Table 3) that students are "Slightly Engaged" with Artificial Intelligence when answering quizzes and short assessments in mathematics. Furthermore, Melchor et al. (2023) emphasized that student engagement through gamification makes the review concepts more enjoyable while fostering essential mathematical skills for Generation Alpha students. Additionally, AI-assisted teaching tools support students in short-term assessments by providing immediate feedback and step-by-step explanations. According to the study conducted by Kakungulu (2024), AI Tools are helping to make better assessment practices and utilize algorithms to accomplish tasks particularly large amounts of data. Also, Learners use generative AI that stimulate curiosity and enable them to think outside the box. Additionally, it also make their engagement by making quizzes and assessments more relevant and interesting (Main, 2025)

The result indicates (Table 4) that students are "Slightly Engaged" with Artificial Intelligence when doing problem-solving tasks in mathematics. This clearly suggests that students often utilize AI tools to help them learn and understand procedural steps in mathematical problems. This finding coincides with the results discussed by the Center for Innovation, Design, and Digital Learning (CIDDL, 2024) which emphasized that to help learners grasp mathematical concepts easily, AI has become their virtual math tutor as it allows them to calculate complicated problems quickly with the step – by – step solutions, while others utilize AI – based calculator app like Photomath and Desmos for an easy access in doing the mathematics tasks. Furthermore, not just AI tools are used by learners but there are also AI-based calculator apps such as Photomath and Desmos which help them to quickly calculate complex problems with procedural solutions and graphs. AI has provided learners an aid to understand procedures/steps in solving math problems, which explains why they often use these apps.

The result insinuates (Table 5) that students are "Slightly Engaged" with Artificial Intelligence when accomplishing performance task and group activities in mathematics. According to Chau, et al. (2025), AI Chatbots gives assistance as guidance and reference when students face difficulties, ensuring that the student's level and abilities are appropriate with the selected problems. They encourage engagement through warm-up tasks that activate curiosity, creativity, and critical thinking. They also support knowledge formation by describing definitions, theorems, concepts, and problem-solving steps. Lastly, they heighten practice through exercises which are appropriate in their level that strengthen students' mathematical thinking, problem-solving, reasoning, and communication skills. Moreover, in the study conducted by Rane et al. (2023), ChatGPT and other generative artificial intelligence distinguish individual learning styles, strengths and weaknesses, adapting educational approaches to reach student's individual needs. Additionally, ChatGPT nurtures a profound understanding of mathematical concepts by equipping customized exercises and explanations. This creates a supportive environment accommodating diverse learning styles to ensure that no students fall behind. Therefore, students gain confidence that leads to enhanced performance and a real interest in the subject.

The result implies (Table 6) that students are "Slightly Engaged" with Artificial Intelligence when solving mathematics formative assessments. Similarly, based on the study conducted by Feng (2025), as learners reported the good side of artificial intelligence, educators and scholars revealed the dark side of it, resulting to learning loss, low engagement and academic integrity within group settings. Unguided AI usage

and lack of policies may not promote authentic contribution. Additionally, the use of AI in the teaching and learning process was still limited and not yet fully integrated due to educators influence, perspectives and responsible use of AI tools, giving partial involvement in collaborative tasks (Wei et al., 2025; Fan et al., 2025). Also, the study conducted by Orhani (2024), personalizing AI system has a notable potential to improve motivation and interest in mathematics and students' performance. Students who used AI system show a significant improvement in their performance than to those among in a traditional learning environment. Their improvement is perceived in the level of results achieved in solving mathematical tasks. According to Kanvaria, et al. (2024), Project-Based Learning (PBL) and Problem-Based Learning (PBL) highlight learning by way of engaging students with real-world problems and project tasks. AI contributes to PBL by offering personalized learning experiences and intelligent tutoring systems that guide students through complex projects and problems, helping them to develop critical thinking, collaboration, and practical problem-solving skills (Thomas, 2000; Hmelo-Silver, 2004). Additionally, AI also generates context-based and activity-based questions that are more fun for the students than just lecturing them and make them interested in what they are learning (Dünser et al., 2012).

The most common role of AI in mathematics education according to Son (2024) is through intelligent tutoring systems which provide personalized learning experiences and guide students step by step through problem-solving processes. Similarly, a recent study by Kestin et al. (2025) found that students who interact with AI tutors at home tend to learn more independently. AI tools enable learners to explore multiple strategies, address their individual learning needs, identify errors in solving procedures, and develop the confidence to solve complex mathematical problems independently.

The level of AI usage among male students (Table 7) was significantly higher than that of female students. Similarly, the study made by Rajki et. al. (2025) concludes that male students are more likely to use AI compared to females, as women begin using such tools only when they already possess a high level of relevant skills. Likewise, Krecar et. al. (2024) found that female students of social sciences were most concerned about the academic integrity, whereas male students showed the least ethical doubt, leading them to utilize the AI more. Consistently, a recent study have shown gender-based difference highlighting students' use of AI-based tools for learning and research demonstrated higher levels of AI use on male than that of females (Ofosh-Ampong, 2023). This notable difference can be further supported by the finding of Brown et al. (2025) which revealed that male students reported to have more frequent use of AI tools, more positive attitudes toward AI, higher levels of self-perceived AI literacy which suggest greater confidence in the ability to use AI compared to female students.

Evidence collected (Table 8) is still inadequate to claim that there exists a significant difference in the Students' Level of AI usage when grouped according to their grade level. In a study conducted by Roig-Villa (2021), students across different levels analyzed according to their usage of AI in relation to their grades, demonstrated better performance than those who did not .Similarly, Melchor et al. (2023) indicated that students' readiness for AI integration in Philippine classrooms is still developing and most learners demonstrate minimal engagement just to meet the requirement rather than actively investigating to gain a deeper understanding. Nevertheless, the results noted in the level of AI usage of Grade 7, which was significantly higher than among other grade levels, may be attributed to their perception and level of generative AI. Also,

younger learners are often more exploratory and open-minded in their use of emerging technologies than older students (Ruiz-Rojas et al., 2024). Moreover, Hu et al. (2022) further emphasized that collaborative learning with AI, supported with structure and teacher guidance, tends to be more effective, which is often more present in lower grade levels. Furthermore, Cho & Ofosu-Anim's (2024) study revealed that younger learners perceived generative AI tools as an important thing for their academic success, whereas older students often viewed them as less critical. Interestingly, according to an online article by the United Nations Regional Information Centre. (2025, July 14), young people are not just merely passive users of AI but are learners, creators, and future leaders. With adequate knowledge, and continuous guidance and reinforcement, we will empower them to think critically about what to ask, critically evaluate societal issues, and thoughtfully lead the way into the future.

4. Conclusions

This study evaluated learners' engagement in artificial intelligence in compliance with formative assessment tasks in Mathematics. The results revealed that most participants were only partially engaged with AI tools, particularly in solving homework, quizzes, performance tasks, and problem-solving activities. In addition, a comparison between learners' engagement and demographic factors was conducted. The findings showed a significant difference between learners' sex and their engagement, with males having higher involvement with AI than females. In contrast, in terms of grade level, there is no significant difference across the various types of formative assessment tasks, except for the performance task and group activities, where lower-level (Grade 7) students interact more with generative AI than those in higher levels.

All in all, as artificial intelligence continues to be present in education, its integration remains intermittent and limited, resulting in only slight engagement from participants. Learners viewed artificial intelligence tools as a support system, likely for intentional use, rather than as tools for developing higher-order thinking skills and promoting autonomous learning. Hence, educators should recognize the importance of elevating responsible AI use, upholding academic integrity, fostering creativity, encouraging independent learning, and promoting ethical awareness as learners dive into the world of Mathematics. The results and findings of the study will serve as a basis for future research. Also, it is essential to note the study's limitations, as factors such as internet connectivity, sample size, access to devices, and educators' influence may indirectly affect learners' involvement with AI. Moreover, teachers and instructors were encouraged to design structured opportunities that incorporate artificial intelligence, adjust teaching strategies, and consider feedback to make learning more meaningful and effective, without affecting students' independence in learning Mathematics.

Researchers conducted the study to assess learners' engagement with artificial intelligence tools in compliance with formative assessment tasks in Mathematics. It is essential to note that certain limitations needed to be considered, even though the results provided helpful and meaningful insights. The population was too small, and findings may vary in different localities and sample sizes. Moreover, external factors that were beyond the scope of this study may have a significant or indirect influence on students' engagement with AI, particularly in solving formative assessment tasks. Limitations mentioned may be addressed and serve as the basis for future studies.

Further, a qualitative or mixed-methods approach may be recommended to fully understand how AI engagement supports or affects students' learning during formative assessment tasks in Mathematics.

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Conflict of Interest

The authors declare no conflicts of interest.

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