

AI Utilization and User Satisfaction among Science Teachers and Students: A Structural Equation Modelling Analysis

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ABSTRACT

The rapid advancement of artificial intelligence has significantly influenced contemporary educational practices, offering opportunities to enhance teaching and learning while raising concerns about effective and ethical integration. This study examines AI utilization and user satisfaction among science teachers and students, and analyzes its effects on satisfaction, usefulness, ease of use, and reliability. A quantitative research design involved 242 STEM students and 22 science teachers in the Division of Tacurong City. Data were collected through structured questionnaires and analyzed using descriptive statistics and Structural Equation Modeling. Results showed high AI utilization among students ($\bar{x} = 3.79$) and very high utilization among teachers ($\bar{x} = 4.21$). Satisfaction was high among students ($\bar{x} = 3.87$) and very high among teachers ($\bar{x} = 4.38$). SEM findings for the combined sample ($n = 264$) revealed that AI utilization significantly influenced overall satisfaction ($\beta = 0.465$, $R^2 = 0.217$, $p < .001$), usefulness ($\beta = 0.457$, $R^2 = 0.208$, $p < .001$), ease of use ($\beta = 0.336$, $R^2 = 0.113$, $p < .001$), and reliability ($\beta = 0.257$, $R^2 = 0.066$, $p < .001$). Among students ($n = 242$), AI utilization also showed significant positive effects on satisfaction and all dimensions. Among teachers ($n = 22$), AI utilization did not significantly affect overall satisfaction, ease of use, and reliability, but strongly affected usefulness ($\beta = 0.576$, $R^2 = 0.332$, $p = .005$). The findings indicate that AI is widely utilized and positively perceived among science teachers and students.

Keywords: artificial intelligence, educational technology, science teachers, STEM students, user satisfaction

Introduction

Artificial Intelligence (AI) is increasingly used in schools, transforming how teachers teach and how students learn. It simplifies tasks, supports personalized learning, and enhances teaching efficiency and student motivation (Chen et al., 2020, p. 12). Students utilize AI tools in their academic tasks; however, challenges related to skills, support, and connectivity remain (Shubha et al., 2025). Similarly, teachers' readiness to integrate AI depends on their competencies, institutional support, and the availability of appropriate infrastructure (Purnama et al., 2025, p. 11). Globally, artificial intelligence continues to reshape education by improving teaching, assessment, and student engagement. Despite

these advancements, many educators remain uncertain about its ethical use, technical requirements, and the limitations posed by available resources (Almasri, 2024, p. 12). In science education, teachers generally demonstrate a positive disposition toward AI, particularly when influenced by perceived ease of use (Nja et al., 2023, p. 19). Moreover, AI-assisted science activities have been shown to increase student interest and teacher satisfaction; however, challenges such as technical instability and the need for continuous professional development persist (Sun, 2025, p. 56).

In the Asian context, factors such as perceived usefulness, ease of use, and information reliability significantly influence

the acceptance and satisfaction of AI tools (Dahri et al., 2024, p. 50). Additionally, content quality, affective well-being, and perceived usefulness play important roles in determining user satisfaction (Almufarreh, 2024, p. 20). At the K–12 level, AI contributes to enhanced learning experiences by increasing student interest, improving teachers' instructional skills, strengthening engagement, and promoting collaboration and AI literacy. In the Philippines, the integration of AI in education is steadily increasing; however, it remains constrained by issues related to infrastructure, device accessibility, data privacy, inequality, and teacher readiness (Estrellado & Miranda, 2023, p. 22).

Despite the growing body of literature on AI in education, existing studies have largely examined AI utilization and user satisfaction separately, with limited efforts to integrate these variables within a single empirical investigation. Furthermore, there is a lack of localized evidence focusing on both science teachers and students in public secondary school contexts, particularly within the Division of Tacurong City. This gap limits a comprehensive understanding of how AI tools are both utilized and perceived in actual classroom settings.

Therefore, this study aimed to determine the level of AI utilization and user satisfaction among science teachers and students in public schools in the Division of Tacurong City. Specifically, it sought to assess the level of AI utilization and user satisfaction in terms of usefulness, ease of use, and reliability, as well as to develop and test the structural effects of AI utilization on user satisfaction among science teachers and students. The findings of this study may provide valuable insights for educators, school administrators, and policymakers in strengthening the effective and responsible integration of AI in educational environments.

Methods

Pedagogical Setting & Participants

The methodology included the locale of the study, the research design, the variables of the study, including the theoretical/conceptual framework, data gathering procedure, and statistical analysis.

This study was conducted in selected public senior high schools offering the STEM strand in the Division of Tacurong City, specifically Tacurong National High School and Sultan Kudarat State University Laboratory High School. The respondents were science teachers and Senior High School students (Grades 11–12) who actively used artificial intelligence (AI) tools in teaching and learning. A total of 242 STEM students and 22 science teachers participated in the study. Complete enumeration was employed for science teachers due to the small population size, while proportionate stratified random sampling was used for students to ensure adequate representation from both schools. Participation was voluntary, and informed consent was obtained prior to data collection. Respondents were selected based on the inclusion and exclusion criteria established for the study.

Design of the Study

This study employed a quantitative descriptive research design to determine the level of AI utilization and user satisfaction among science teachers and students, and to examine the relationships among AI utilization, perceived usefulness, ease of use, and reliability. This design is appropriate because it describes existing conditions and examines relationships among variables without manipulation, aligned with the study's objectives and the application of Structural Equation Modeling (SEM).

The choice of this method is justified by its strength in providing objective, numerical, and comparable data on respondents' perceptions. It allows systematic analysis of differences between groups (teachers and students) and supports

structural analysis of relationships among variables. However, its limitation lies in its inability to establish causality, which was addressed through careful interpretation of SEM results and validation procedures to ensure analytical rigor.

Data Collection and Analysis

The data were collected using a researcher-made structured questionnaire composed of two main variables: AI utilization and user satisfaction. AI utilization measured the extent and purpose of AI use in teaching and learning using a five-point scale ranging from Never to Always. User satisfaction assessed perceived usefulness, ease of use, and reliability using a five-point Likert scale ranging from Strongly Disagree to Strongly Agree.

Participants were selected based on inclusion criteria from science teachers and students in selected public senior high schools. Data gathering was conducted after securing permission from relevant authorities, and all responses were treated with confidentiality and ethical consideration.

The instrument underwent content validation by six experts, followed by reliability testing using Cronbach's Alpha to ensure internal consistency. Exploratory Factor Analysis (EFA) was then conducted to confirm construct validity and refine the measurement model prior to final analysis.

For data analysis, descriptive statistics (mean and standard deviation) were used to determine the level of AI utilization and user satisfaction. In addition, Structural Equation Modeling (SEM) was applied to examine the structural relationships among variables, as presented in Table 3 and Figures 1–3.

Statistical analyses were performed using appropriate software, ensuring accuracy and rigor in data interpretation. Overall, the integration of validated instruments, appropriate sampling procedures, and robust statistical techniques (EFA, SEM, and descriptive analysis) strengthens the credibility and reliability of the study's findings.

Results

This section presents the findings on the level of AI utilization and user satisfaction among science teachers and students in public schools in the Division of Tacurong City.

Level of AI Utilization among Students and Teachers

This section presents findings on the level of AI utilization among teachers and students, focusing on the frequency of AI tool use. The results provide an overview of how often these tools are used in academic and instructional contexts

As shown in Table 1, students reported a high level of AI utilization ($M = 3.79$, $SD = 0.46$), while teachers demonstrated a very high level of AI utilization ($M = 4.21$, $SD = 0.41$). The findings indicate that students often use AI tools to support learning, research, and collaboration, whereas teachers frequently utilize AI in instructional and professional tasks such as lesson preparation, assessment, and instructional delivery. Overall, both groups actively use AI tools, although teachers reported higher utilization levels compared to students.

Table 1. Level of AI utilization among students and teachers

Group	Indicator	M	SD
Students	AI utilization	3.79	0.46
Teachers	AI utilization	4.21	0.41

User Satisfaction among Students and Teachers in terms of Usefulness, Ease of Use, and Reliability

This section presents the findings on the level of user satisfaction with AI tools among teachers and students in terms of

usefulness, ease of use, and reliability. The results provide an overview of how respondents perceive the effectiveness and quality of AI tools in supporting their academic and instructional needs.

Table 2. User satisfaction among students and teachers

Group	Indicator	M	SD
Students	Usefulness	3.81	0.45
	Ease of use	3.90	0.43
	Reliability	3.88	0.44
	Grand Mean	3.87	0.35
Teachers	Usefulness	4.41	0.46
	Ease of use	4.42	0.36
	Reliability	4.31	0.33
	Grand Mean	4.38	0.27

As shown in Table 2, students reported a high level of user satisfaction ($M = 3.87$, $SD = 0.35$), while teachers demonstrated a very high level of satisfaction ($M = 4.38$, $SD = 0.27$). Among students, ease of use obtained the highest mean, followed by reliability and usefulness. Among teachers, all indicators reflected very high satisfaction, with ease of use receiving the highest rating. The results indicate that both groups perceive AI tools as useful, easy to use, and reliable, although teachers reported higher satisfaction levels compared to students.

Develop and Test the Structural Effects of AI Utilization on User Satisfaction and Its Dimensions with Effect Size Interpretation

This section presents the findings on the effects of AI utilization on overall user satisfaction and its dimensions, including usefulness, ease of use, and reliability across combined, student, and teacher groups. The results indicate generally positive and statistically significant effects in the combined and student groups. In contrast, in the teacher group, only usefulness demonstrates a significant influence, while the remaining relationships are not statistically significant.

Table 3. Structural Effects of AI Utilization on User Satisfaction and its Dimensions with Effect Size Interpretation

	Dependent Variable	β (Standardize d)	R^2	p-value	Effect Size	Interpretation
Combined (n = 264)	Overall Satisfaction	0.465	0.217	< .001	Moderate	Significant
	Usefulness	0.457	0.208	< .001	Moderate	Significant
	Ease of Use	0.336	0.113	< .001	Moderate	Significant
	Reliability	0.257	0.066	< .001	Small	Significant
Students (n = 242)	Overall Satisfaction	0.413	0.171	< .001	Moderate	Significant
	Usefulness	0.392	0.153	< .001	Moderate	Significant
	Ease of Use	0.280	0.078	< .001	Small	Significant

	Dependent Variable	β (Standardized)	R^2	p-value	Effect Size	Interpretation
Teachers (n = 22)	Reliability	0.228	0.052	.0003	Small	Significant
	Overall Satisfaction	0.377	0.142	.083	Moderate	Not significant
	Usefulness	0.576	0.332	.005	Strong	Significant
	Ease of Use	0.298	0.089	.177	Small	Not significant
	Reliability	-0.214	0.046	.340	Small (Negative)	Not significant

Table 3 presents the structural effects of AI utilization on user satisfaction and its dimensions, usefulness, ease of use, and reliability—among the combined sample, students, and teachers. For the combined group, AI utilization had a moderate and significant effect on overall satisfaction ($\beta = 0.465$, $R^2 = 0.217$, $p < .001$). Usefulness showed the strongest effect, followed by ease of use, while reliability had a smaller but significant effect.

For students, AI utilization also had a moderate and significant effect on overall satisfaction ($\beta = 0.413$, $R^2 = 0.171$, $p < .001$). Usefulness had the highest influence, while ease of use and reliability had smaller but significant effects. This indicates that students' satisfaction is mainly driven by the usefulness of AI tools.

For teachers, usefulness was the only significant predictor ($\beta = 0.576$, $R^2 = 0.332$, $p = .005$), while ease of use, reliability, and overall satisfaction were not significant. Overall, the findings show that perceived usefulness is the strongest factor influencing satisfaction with AI tools.

Figure 1 shows the combined structural effects of AI utilization on user satisfaction and its dimensions, namely perceived usefulness, ease of use, and reliability among students and teachers.

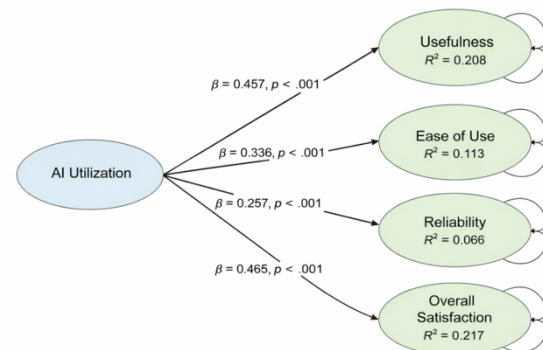


Figure 1. Combined Results of Structural Equation Model of AI Utilization and User Satisfaction.

Figure 2 shows the structural effects of AI utilization on student satisfaction and its dimensions, including usefulness, ease of use, and reliability.

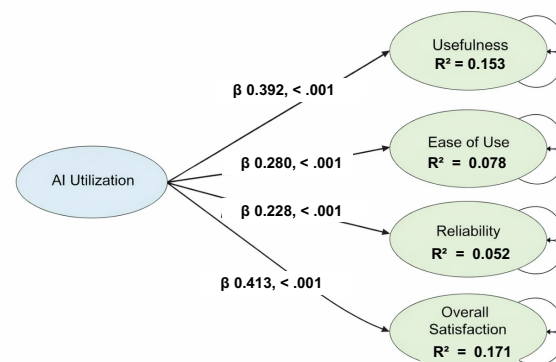


Figure 2. Structural Equation Model of Students' AI Utilization and User Satisfaction.

Figure 3 shows the structural effects of AI utilization on teachers' satisfaction

and its dimensions, including usefulness, ease of use, and reliability.

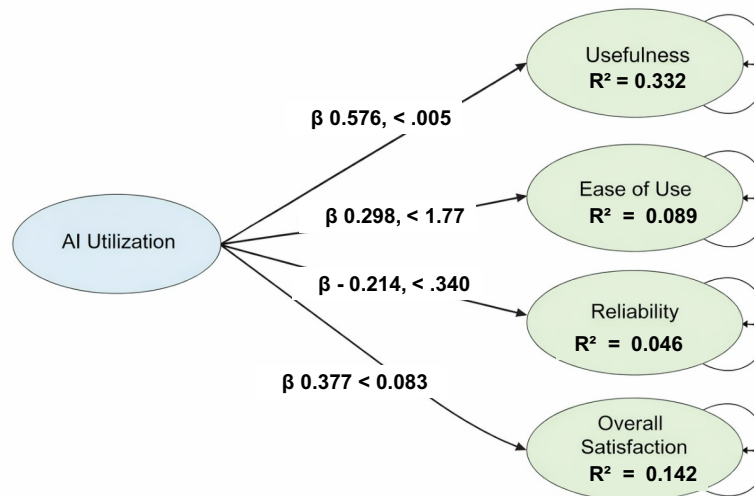


Figure 3. Structural Equation Model of Teachers' AI Utilization and User Satisfaction.

Discussion

The discussion part provides an opportunity to restate the purpose and key findings of the research, interpret the results, compare them with previous literature, and highlight agreements, contradictions, contributions, and implications of the study.

This study aimed to determine the level of AI utilization and user satisfaction among science teachers and students and to examine the structural effects of AI utilization on satisfaction and its dimensions, namely usefulness, ease of use, and reliability. The findings revealed that both teachers and students demonstrate high levels of AI utilization, with teachers showing a higher level ($M = 4.21$, $SD = 0.41$) compared to students ($M = 3.79$, $SD = 0.46$). This indicates that AI tools are more frequently integrated into teachers' instructional and professional tasks, while students mainly use them for academic support. These findings align with Chen et al. (2020), who emphasized that AI improves teaching efficiency and learning processes, and Shubha et al. (2025), who reported active student use of AI tools despite limitations in skills and access.

In terms of user satisfaction, students reported high satisfaction ($M = 3.87$, $SD = 0.35$), while teachers reported very high satisfaction ($M = 4.38$, $SD = 0.27$). Across both groups, ease of use consistently received the highest ratings, indicating that AI tools are perceived as accessible and user-friendly. This supports Nja et al. (2023), who found that perceived ease of use significantly influences AI acceptance in education, and Sun (2025), who highlighted that AI enhances engagement and satisfaction, although concerns about reliability and training remain.

The structural equation model results provide deeper interpretation of these findings. As shown in Figure 1 (Combined SEM model), AI utilization had a moderate and significant effect on overall satisfaction ($\beta = 0.465$, $R^2 = 0.217$, $p < .001$), usefulness ($\beta = 0.457$, $R^2 = 0.208$, $p < .001$), ease of use ($\beta = 0.336$, $R^2 = 0.113$, $p < .001$), and reliability ($\beta = 0.257$, $R^2 = 0.066$, $p < .001$). This indicates that AI utilization enhances satisfaction primarily by improving perceptions of usefulness and ease of use.

Similarly, Figure 2 (Students' SEM model) showed that AI utilization

significantly influenced satisfaction ($\beta = 0.413$, $R^2 = 0.171$, $p < .001$), usefulness ($\beta = 0.392$, $R^2 = 0.153$, $p < .001$), ease of use ($\beta = 0.280$, $R^2 = 0.078$, $p < .001$), and reliability ($\beta = 0.228$, $R^2 = 0.052$, $p < .001$). This suggests that students' satisfaction is mainly driven by perceived usefulness, followed by ease of use and reliability.

In contrast, Figure 3 (Teachers' SEM model) revealed that AI utilization had a moderate but non-significant effect on satisfaction ($\beta = 0.377$, $R^2 = 0.142$, $p > .05$), ease of use ($\beta = 0.298$, $R^2 = 0.089$, $p > .05$), and reliability ($\beta = -0.214$, $R^2 = 0.046$, $p > .05$). However, perceived usefulness showed a strong and significant effect ($\beta = 0.576$, $R^2 = 0.332$, $p < .005$). This indicates that teachers value AI primarily for its practical instructional benefits rather than usability or system reliability.

These results are consistent with Dahri et al. (2024), who identified perceived usefulness, effort expectancy, and reliability as key predictors of satisfaction. Almufarreh (2024) also emphasized usefulness and content quality as major determinants of sustained AI use. For teachers specifically, Malakul (2025) found that perceived usefulness is the strongest driver of AI acceptance, while Delello et al. (2025) stressed the importance of AI literacy and institutional support for effective integration.

For students, the findings align with Almulla (2024), who reported that perceived usefulness and ease of use mediate AI utilization and satisfaction. Falebita and Kok (2024) further emphasized that attitude and readiness influence AI adoption, while perceptions of usefulness and ease of use shape engagement. For teachers, Velli and Zafiropoulos (2024) and Lin et al. (2025) both confirmed that perceived usefulness is the strongest determinant of AI adoption, with ease of use and trust playing secondary roles.

Overall, the study demonstrates both agreements and minor contradictions with previous literature. While most studies confirm that perceived usefulness and ease of use drive satisfaction, this study found that

reliability has a weaker and even negative effect among teachers, indicating emerging concerns about trust in AI systems with increased use. This contributes to existing literature by showing that AI utilization does not uniformly influence satisfaction across user groups.

Theoretically, the study supports technology acceptance perspectives by confirming that perceived usefulness is the strongest determinant of satisfaction. Practically, the findings suggest that educational institutions should prioritize AI literacy training, professional development, and policy support to strengthen meaningful and responsible AI integration among both teachers and students.

Conclusion

The study found that AI tools are widely utilized by both science teachers and students in public schools in the Division of Tacurong City. Teachers demonstrated a very high level of AI utilization, while students showed a high level. In terms of user satisfaction, teachers exhibited a very high level, while students demonstrated a high level. Across all indicators, ease of use was rated highest, followed by reliability and usefulness, indicating that AI tools are generally accessible, functional, and beneficial in educational contexts.

The structural model further confirmed that AI utilization significantly influences user satisfaction, particularly through perceived usefulness and ease of use. However, reliability showed weaker and less consistent effects, especially among teachers, suggesting that trust and system consistency remain areas that need further improvement. Moreover, perceived usefulness emerged as the strongest predictor of satisfaction across both groups, highlighting its central role in the acceptance and continued use of AI tools in education.

Despite these positive findings, the study is limited to selected public senior high schools and relied on self-reported data, which may affect accuracy and

generalizability. In addition, the explanatory power of the model suggests that other relevant factors such as digital literacy, training exposure, institutional support, and system quality may also influence user satisfaction but were not included in the analysis. Therefore, findings should be interpreted within these limitations.

Future research may expand the scope to other divisions and educational levels, include additional variables such as academic performance, behavioral intention, AI literacy, and institutional readiness, and apply more advanced statistical techniques to strengthen model explanation. Further studies are strongly recommended to develop, implement, and evaluate AI policy frameworks and structured training programs that will guide the ethical, responsible, and effective use of AI in education. These frameworks may include clear institutional guidelines on AI usage, academic integrity standards, and data privacy policies, while training programs should focus on improving AI literacy, critical use of AI-generated outputs, and pedagogical integration strategies for both teachers and students.

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Biodata

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