Artificial Intelligence, Resources and Technology, and Academic Achievement among Global Learners

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ABSTRACT

This study investigated the relationship between artificial intelligence (AI), resources and technology, and academic achievement among global learners using a quantitative-correlational research design. The respondents consisted of 279 Grade 7 students from 12 schools in the Pendergast Elementary School District, Avondale, Arizona, USA, representing diverse cultural and academic backgrounds. Data were gathered through a structured questionnaire covering demographic profiles, AI utilization, and technology experiences. Findings revealed that students demonstrated a moderate level of AI utilization, recognizing its relevance for academic tasks but showing limited confidence and motivation for deeper engagement. Resources and technology experiences were generally high, with strong access to basic digital platforms but limited exposure to advanced tools. Academic achievement was satisfactory overall, with comparable performance across demographic groups. Results indicated no significant differences in AI utilization, resources, or achievement based on age, though gender influenced AI engagement. Importantly, a statistically significant but weak relationship existed between AI utilization and academic achievement, suggesting that while AI contributed positively, it was not the sole determinant of success. Resources and technology experiences showed no significant impact on achievement, implying that instructional quality and learner-related factors played a greater role.

Keywords: Academic Achievement, Artificial Intelligence, Digital Learning, Educational Equity, Global Learners, Resources and Technology

BACKGROUND

Education in the 21st century was increasingly transformed by Artificial Intelligence (AI), which redefined contemporary approaches to teaching and learning. Technologies such as adaptive learning software, intelligent tutoring systems (ITS), and AI-driven formative feedback tools rapidly entered K–12 classrooms. UNESCO (2024) emphasized that integrating AI into education went beyond technological adoption; it fundamentally intersected with student engagement, instructional ethics, and equitable access. In the United States, federal and state educational policies heavily encouraged digital transformation, leading American school districts to invest significantly in AI-driven tools to enhance core competencies, particularly in middle school environments (US Department of Education, 2023).

A meta-analysis by Liu et al. (2025) demonstrated that AI-based interventions significantly improved standardized test scores, student motivation, and retention across K–12 settings. Similarly, Mariyono and Alif (2025) highlighted how adaptive AI platforms fostered educational equity by tailoring learning speeds and content delivery to meet individual student needs. At the middle school level a critical developmental phase characterized by cognitive transition and foundational skill building AI tools were increasingly utilized to personalize mathematics and literacy instruction.

While overall efficacy metrics and high-level performance gains were documented, less was known about how middle school students specifically experienced, interacted with, and navigated AI tools in their day-to-day academic routines. Existing research predominantly focused on higher education settings or broad quantitative

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test score measures, leaving a crucial empirical gap regarding the practical and perceptual factors such as user engagement, instructional support, and digital self-efficacy that influenced how American middle school learners leveraged AI for academic achievement. Furthermore, the varying levels of technology implementation across different U.S. middle school districts meant that student outcomes with AI remained unevenly understood.

This study was necessary to address this empirical gap by evaluating the specific influence of AI resources on the academic performance and learning experiences of American middle school students. As AI adoption became ubiquitous in U.S. public education, understanding the direct relationship between student interaction with AI tools and their academic success was vital for determining whether these technologies fulfilled their pedagogical promise.

By focusing on this specific learner population, the study contributed actionable insights to the field of educational technology. Theoretically, it offered a grounded understanding of AI integration during early adolescence. Practically, the findings provided middle school educators, school administrators, and educational technology developers with data-driven evidence to refine AI implementation strategies, design targeted instructional support, and ensure that AI resources were deployed effectively to maximize student achievement.

METHODS

In order to investigate the connection between middle school students' academic performance and their use of artificial intelligence (AI) resources, this study used a quantitative correlational research design. 279 Grade 7 students from 12 schools in the Pendergast Elementary School District in Avondale, Arizona, USA, made up the respondents. To guaranty proportionate representation across important demographic subgroups, such as age, sex, race/ethnicity, and prior exposure to classroom technology, stratified random sampling was employed. Prior to random selection, the population was divided into strata to reduce sampling bias and capture differences within the district's student demographic.

After institutional approval and parent/guardian consent, a three-part survey instrument was given in person to collect data. Demographic data was gathered in the first section, students' use of AI was assessed across five core expectancy-value dimensions in the second section (adapted from Yurt and Kasarci, 2024), and digital resources and technology experiences were evaluated in the third section (adapted from Volungevičienė et al., 2021). A standard Likert scale was used to score each item.Instrument reliability was established by calculating Cronbach's alpha (α) internal consistency coefficients for the study sample ($N = 279$). The overall AI utilization scale demonstrated high internal consistency ($\alpha = 0.89$), with individual subscale coefficients ranging from 0.81 to 0.87 across the five dimensions.

In-person data collection was carried out with informed consent and administrative approval. After being checked for completeness, completed questionnaires were coded for analysis. While mean scores and standard deviations summarized academic achievement, digital resources, and AI utilization levels, frequency and percentage distributions described demographic profiles. Subgroup differences and inter-variable relationships were evaluated using non-parametric inferential statistics, such as the Spearman Rank-Order Correlation, Kruskal-Wallis H Test, and Mann-Whitney U Test.

Although the selected methodology yielded useful empirical insights, there are a number of inherent limitations that should be taken into account when interpreting the findings. First, the quantitative correlational design does not allow for the inference of causal relationships between the use of AI and academic performance, but it does describe statistical associations between variables. Second, the results may not be applicable to middle school populations across the country or in private educational settings because data collection was limited to a single public school district in Avondale, Arizona.Third, the use of self-reported student survey data raises the possibility of subjective recall errors, overestimation of technical proficiency, and social desirability bias. Lastly, important confounding variables that may independently affect both student AI engagement and overall academic outcomes were not measured or taken into account by the statistical framework. These variables include baseline prior achievement, household socioeconomic status, home internet access, and individual teacher competency in technology integration.

RESULT AND DISCUSSION

Table 1 below shows the frequency and percentage distribution of the respondents.

Table 1. Frequency and Percentage Distribution of the Respondents.

Profile	Category	f	%
Age			
	10 years old	0	0.00
	11 years old	125	44.80
	12 years old	144	51.61
	13 years old	10	3.58
	Total	279	100.00
Sex			
	Male	141	50.54
	Female	138	49.46
	Total	279	100.00
Nationality			
	Hispanic	146	52.33
	White	42	15.05
	Black	64	22.94
	Asian	23	8.24
	Two/More	3	1.08
	Other	1	.36
	Total	279	100.00
School Type			
	Public School	279	100.00
	Private School	0	0
	Total	279	100.00

In terms of age, the majority of the respondents were 12 years old, comprising 144 respondents (f = 144, 51.61%). This was followed by 11-year-old learners with 125 respondents (f = 125, 44.80%), while only 10 respondents (f = 10, 3.58%) are 13 years old. There were no respondents who are 10 years old (f = 0, 0.00%). This finding was supported by the study of Crawford et al. (2020), who reported that learners' age within the same grade level can influence educational outcomes and developmental readiness, emphasizing the importance of considering age when interpreting academic research findings.

Regarding sex, the respondents were almost equally distributed between male and female learners. There were 141 male respondents (f = 141, 50.54%) and 138 female respondents (f = 138, 49.46%). This finding was supported by Prior et al. (2022), who emphasized that balanced representation of male and female participants enhances the quality and representativeness of educational research by ensuring that findings reflect the experiences of diverse learner groups.

In terms of nationality, the majority of the respondents were Hispanic, comprising 146 respondents (f = 146, 52.33%). This was followed by Black learners with 64 respondents (f = 64, 22.94%), White learners with 42 respondents (f = 42, 15.05%), Asian learners with 23 respondents (f = 23, 8.24%), Two or More Nationalities with 3 respondents (f = 3, 1.08%), and Other with 1 respondent (f = 1, 0.36%). This finding was consistent with the study of Conway-Turner et al. (2020), who found that racial diversity within schools contributes to a better understanding of students' educational experiences and should be considered when examining academic outcomes across different learner populations.

In terms of school type, all 279 respondents (f = 279, 100.00%) were enrolled in public schools, while no respondents (f = 0, 0.00%) come from private schools. The findings indicated that the study represents only learners from public educational institutions. This finding was supported by Alvarez et al. (2023), who

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reported that differences in school type are associated with variations in learning environments, instructional practices, and students' academic performance, emphasizing the importance of considering school context when interpreting educational research findings.

Table 2 below shows the level of artificial intelligence utilization among middle school students as a whole and when grouped according to expectancy, attainment, utility value, intrinsic/interest value, and cost.

Table 2. Level of Artificial Intelligence Utilization among Middle School Students As a whole and when grouped according to Expectancy, Attainment, Utility Value, Intrinsic/Interest Value, and Cost.

Dimension	Mean	Standard Deviation (SD)	Verbal Interpretation
Expectancy	2.86	0.75	Moderate
Attainment	2.92	0.88	Moderate
Utility Value	2.91	0.91	Moderate
Intrinsic/Interest Value	2.97	0.89	Moderate
Cost	2.97	0.90	Moderate
Overall AI Utilization	2.93	0.75	Moderate

Note. N=279; Scale: 4.21–5.00 (Very High), 3.41–4.20 (High), 2.61–3.40 (Moderate), 1.81–2.60 (Low), 1.00–1.80 (Very Low).

As shown in Table 2, the overall level of AI utilization among middle school students fell within the Moderate range (M = 2.93, SD = 0.75). Across all five individual dimensions, mean scores remained strikingly consistent, ranging from a low of 2.86 (SD = 0.75) for Expectancy to a high of 2.97 for both Intrinsic/Interest Value (SD = 0.89) and Cost (SD = 0.90).

These findings indicate that while students maintain a balanced and moderate orientation toward AI technology finding moderate pleasure (M = 2.97) and utility (M = 2.91) in its application their perceived competence or self-efficacy (Expectancy, M = 2.86) represents the relatively lowest dimension. This suggests that instructional efforts should focus primarily on boosting students' confidence and practical skills in navigating AI tools, rather than merely pitching its importance or intrinsic fun.

Table 3 shows the level of resources and technology experiences of the middle school students.

Table 3. Level of Resources and Technology Experiences of the Middle School Students.

Statements	Mean	SD	Interpretation
Classroom facilities (e.g., computers, projection systems, lecture capture systems, SMART boards, etc.)	3.92	0.87	High
Computer labs (for practical and Internet access)	2.15	0.81	Low
Email services (institutional)	3.84	0.90	High
Learning Management System (e.g., Moodle, etc.)	3.90	0.88	High
ePortfolio	2.22	0.83	Low
Network bandwidth/speed of Internet (download and upload)	3.84	0.90	High
Wi-Fi access	3.84	0.90	High
Online or virtual technologies (e.g., network or cloud-based file storage system, Web portals, etc.)	3.90	0.88	High
Access to software (e.g., MATLAB, GIS applications, statistical software, qualitative data analysis, graphics software, textual or image analysis program, etc.)	3.90	0.88	High
Download and use of free and open-source software for teaching and learning	2.20	0.83	Low
Support for maintenance and repair of ICTs	3.85	0.81	High

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Access to data storage	3.78	0.83	High
Data visualisation software	2.30	0.97	Low
Citation/reference management software	2.30	0.97	Low
Plagiarism detection software	2.30	0.97	Low
Institutional repository for sharing of research	2.38	1.06	Low
e-Journals	2.30	0.97	Low
e-Books	3.92	0.77	High
Citation databases	2.30	0.97	Low
Bibliographic databases	2.30	0.97	Low
e-Newspapers	3.81	0.85	High
Resources And Technology Overall Mean	**3.11**	**0.68**	**Moderate**
Legend: (4.21-5.00)-Very High; (3.41-4.20)-High; (2.61-3.40)-Moderate; (1.81-2.60)-)-Low; (1.00-1.80)-Very Low			

The overall mean of 3.11 (SD = 0.68) indicates a moderate level of resources and technology experience among the respondents. Among the indicators, classroom facilities (e.g., computers, projection systems, lecture capture systems, SMART boards, etc.) and e-books obtained the highest means of 3.92 (SD = 0.87) and 3.92 (SD = 0.77), respectively. These were followed by the Learning Management System (e.g., Moodle, etc.), online or virtual technologies, and access to software, each with a mean of 3.90 (SD = 0.88). Likewise, support for maintenance and repair of ICTs (M = 3.85, SD = 0.81), email services (M = 3.84, SD = 0.90), network bandwidth/speed of the Internet (M = 3.84, SD = 0.90), Wi-Fi access (M = 3.84, SD = 0.90), e-newspapers (M = 3.81, SD = 0.85), and access to data storage (M = 3.78, SD = 0.83) were also interpreted as high.

On the other hand, institutional repository for sharing research obtained the highest mean among the indicators interpreted as low (M = 2.38, SD = 1.06). This was followed by data visualization software, citation/reference management software, plagiarism detection software, e-journals, citation databases, and bibliographic databases, each with a mean of 2.30 (SD = 0.97). Meanwhile, ePortfolio (M = 2.22, SD = 0.83), download and use of free and open-source software for teaching and learning (M = 2.20, SD = 0.83), and computer laboratories (M = 2.15, SD = 0.81) received the lowest ratings and were likewise interpreted as low.

The findings indicated that middle school students generally have adequate access to basic digital resources, learning platforms, internet connectivity, and classroom technologies that support their learning experiences. However, their exposure to more specialized digital resources, including research databases, academic software, plagiarism detection tools, and computer laboratory facilities, remains limited. This finding was consistent with the study of Bond et al. (2024), which found that students' access to digital technologies, reliable internet connectivity, and learning management systems positively influences engagement and learning outcomes. However, the study also emphasized that equitable access to advanced digital resources and academic technologies remains essential for developing students' digital competence and supporting meaningful learning experiences.

Table 4 shows the level of academic achievement among middle school students.

Table 4. Level of Academic Achievement among Middle School Students.

Level of Academic Achievement	f	Mean	SD	Interpretation
Excellent	91	83.52	7.70	Satisfactory
Satisfactory	89			
Needs Improvement	69			
Unsatisfactory	30			
Poor	0			
Total	279			

Legend: (90-100)-Excellent; (80-89)-Satisfactory; (70-79)-Needs Improvement; (60-69)-Unsatisfactory; (below 60)-Poor

The results showed that the respondents obtained an overall mean academic achievement of 83.52 (SD = 7.70), interpreted as Satisfactory. In terms of performance level, the largest group of respondents belongs to the Excellent category, comprising 91 students, followed closely by those in the Satisfactory category with 89 students. Meanwhile, 69 students were classified under Needs Improvement, 30 students were in the Unsatisfactory category, and no respondents were classified under the Poor category. The findings indicated that although the overall academic achievement of the respondents falls within the satisfactory level, a considerable number of students have already achieved excellent academic performance. At the same time, the presence of students in the needs improvement and unsatisfactory categories suggests that differences in academic performance still exist among the learners.

This finding was consistent with the study of Hammerstein et al. (2021), which reported that students' academic achievement is influenced by the quality of instructional support, learning resources, and school-based interventions. The study emphasized that continuous academic assistance and effective teaching practices contribute to improved student performance and help reduce learning gaps among learners.

Table 5a below shows the Difference in the Level of Artificial Intelligence Utilization among Middle School Students When Grouped According to Age.

Table 5a. Difference in the Level of Artificial Intelligence Utilization among Middle School Students When Grouped According to Age.

Age	Test Statistics (H)	p-value	Decision for Ho	Interpretation
10 years old	4.34	0.11	Failed to Reject Ho	Not Significant
11 years old				
12 years old				
13 years old				

Table 5a presents the results of the Kruskal–Wallis H test examining the difference in the level of artificial intelligence utilization among middle school students when grouped according to age. The analysis yielded a test statistic of ($H = 4.34$, $p = 0.11$). Since the p-value is greater than the 0.05 level of significance, the null hypothesis failed to be rejected. This indicated that there was no statistically significant difference in the level of artificial intelligence utilization among middle school students when grouped according to age.

Table 5b below shows the difference in the level of artificial intelligence utilization among middle school students when grouped according to sex.

Table 5b. Difference in the Level of Artificial Intelligence Utilization among Middle School Students When Grouped According to Sex.

Sex	Test Statistics (U)	p-value	Decision for Ho	Interpretation
Male	8220.50	0.025	Reject Ho	Significant
Female				

Table 5b presents the results of the Mann–Whitney U test examining the difference in the level of artificial intelligence utilization among middle school students when grouped according to sex. The analysis yielded a test statistic of ($U = 8220.50$, $p = 0.025$). Since the p-value is less than the 0.05 level of significance, the null hypothesis was rejected. This indicated that there is a statistically significant difference in the level of artificial intelligence utilization among middle school students when grouped according to sex.

Table 5c below shows the difference in the level of artificial intelligence utilization among middle school students when grouped according to nationality.

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Table 5c. Difference in the Level of Artificial Intelligence Utilization among Middle School Students When Grouped According to Nationality.

Nationality	Test Statistics (H)	p-value	Decision for Ho	Interpretation
Hispanic	10.46	0.063	Failed to Reject Ho	Not Significant
White				
Black				
Asian				
Two/More				
Other				

Table 5c presents the results of the Kruskal–Wallis H test examining the difference in the level of artificial intelligence utilization among middle school students when grouped according to nationality. The analysis yielded a test statistic of (H = 10.46, p = 0.063). Since the p-value is greater than the 0.05 level of significance, the null hypothesis failed to be rejected. This indicated that there was no statistically significant difference in the level of artificial intelligence utilization among middle school students when grouped according to nationality.

Table 6a below shows the difference in the level of resources and technology experiences among middle school students when grouped according to age.

Table 6a. Difference in the Level of Resources and Technology Experiences among Middle School Students When Grouped According to Age.

Age	Test Statistics (H)	p-value	Decision for Ho	Interpretation
10 years old	0.04	0.981	Failed to Reject Ho	Not Significant
11 years old				
12 years old				
13 years old				

Table 6a presents the results of the Kruskal–Wallis H test examining the difference in the level of resources and technology experiences among middle school students when grouped according to age. The analysis yielded a test statistic of (H = 0.04, p = 0.981). Since the p-value is greater than the 0.05 level of significance, the null hypothesis failed to be rejected. This indicated that there was no statistically significant difference in the level of resources and technology experiences among middle school students when grouped according to age.

Table 6b below shows the difference in the level of resources and technology experiences among middle school students when grouped according to sex.

Table 6b. Difference in the Level of Resources and Technology Experiences among Middle School Students When Grouped According to Sex.

Sex	Test Statistics (U)	p-value	Decision for Ho	Interpretation
Male	9724.50	0.995	Failed to Reject Ho	Not Significant
Female				

Table 6b presents the results of the Mann–Whitney U test examining the difference in the level of resources and technology experiences among middle school students when grouped according to sex. The analysis yielded a test statistic of (U = 9724.50, p = 0.995). Since the p-value is greater than the 0.05 level of significance, the null hypothesis failed to be rejected. This indicated that there was no statistically significant difference in the level of resources and technology experiences among middle school students when grouped according to sex.

Table 6c on the next page shows the difference in the level of resources and technology experiences among middle school students when grouped according to nationality.

Table 6c. Difference in the Level of Resources and Technology Experiences among Middle School Students When Grouped According to Nationality.

Nationality	Test Statistics (H)	p-value	Decision for Ho	Interpretation
Hispanic	7.469	0.188	Failed to Reject Ho	Not Significant
White				
Black				
Asian				
Two/More				
Other				

Table 6c presents the results of the Kruskal–Wallis H test examining the difference in the level of resources and technology experiences among middle school students when grouped according to nationality. The analysis yielded a test statistic of (H = 7.469, p = 0.188). Since the p-value is greater than the 0.05 level of significance, the null hypothesis failed to be rejected. This indicated that there was no statistically significant difference in the level of resources and technology experiences among middle school students when grouped according to nationality.

Table 7a below shows the difference in the level of academic achievement among middle school students when grouped according to age.

Table 7a. Difference in the Level of Academic Achievement among Middle School Students When Grouped According to Age.

Age	Test Statistics (H)	p-value	Decision for Ho	Interpretation
10 years old	2.052	0.358	Failed to Reject Ho	Not Significant
11 years old				
12 years old				
13 years old				

Table 7a presents the results of the Kruskal–Wallis H test examining the difference in the level of academic achievement among middle school students when grouped according to age. The analysis yielded a test statistic of (H = 2.052, p = 0.358). Since the p-value is greater than the 0.05 level of significance, the null hypothesis failed to be rejected. This indicated that there was no statistically significant difference in the level of academic achievement among middle school students when grouped according to age.

Table 7b below shows the difference in the level of academic achievement among middle school students when grouped according to sex.

Table 7b. Difference in the Level of Academic Achievement among Middle School Students When Grouped According to Sex.

Sex	Test Statistics (U)	p-value	Decision for Ho	Interpretation
Male	8944.00	0.243	Failed to Reject Ho	Not Significant
Female				

Table 7b presents the results of the Mann–Whitney U test examining the difference in the level of academic achievement among middle school students when grouped according to sex. The analysis yielded a test statistic of (U = 8944.00, p = 0.243). Since the p-value is greater than the 0.05 level of significance, the null hypothesis failed to be rejected. This indicated that there was no statistically significant difference in the level of academic achievement among middle school students when grouped according to sex.

Table 7c on the next page shows the difference in the level of academic achievement among middle school students when grouped according to nationality.

Table 7c. Difference in the Level of Academic Achievement among Middle School Students When Grouped According to Nationality.

Nationality	Test Statistics (H)	p-value	Decision for Ho	Interpretation
Hispanic	6.28	0.280	Failed to Reject Ho	Not Significant
White				
Black				
Asian				
Two/More				
Other				

Table 7c presents the results of the Kruskal–Wallis H test examining the difference in the level of academic achievement among middle school students when grouped according to nationality. The analysis yielded a test statistic of (H = 6.28, p = 0.280). Since the p-value is greater than the 0.05 level of significance, the null hypothesis failed to be rejected. This indicated that there was no statistically significant difference in the level of academic achievement among middle school students when grouped according to nationality.

Table 8 below shows the relationship between the level of artificial intelligence utilization and academic achievement among middle school students.

Table 8. Relationship Between the Level of Artificial Intelligence Utilization and Academic Achievement among Middle School Students.

Variable	Test Statistics (r_s)	p-value	Decision for Ho	Interpretation
Artificial Intelligence Utilization vs.	0.181	0.002	Reject Ho	Significant
Academic Achievement				

The analysis yielded a correlation coefficient of (r_s = 0.181) with a p-value of 0.002. Since the p-value is less than the 0.05 level of significance, the null hypothesis was rejected. This indicated that there was a statistically significant relationship between AI utilization and students' academic achievement. The result suggested a positive but very weak correlation between the two variables. This means that as students' utilization of artificial intelligence increases, their academic achievement also tends to improve slightly. In practical terms, the appropriate use of AI tools to support learning activities, such as understanding lessons, completing academic tasks, accessing information, and receiving immediate feedback, may contribute to better academic performance. However, the weak strength of the relationship indicates that the influence of AI utilization on academic achievement was relatively small and should not be considered the sole factor affecting students' learning outcomes.

Table 9 below shows the relationship between the level of resources and technology experiences and academic achievement among middle school students.

Table 9. Relationship Between the Level of Resources and Technology Experiences and Academic Achievement among Middle School Students.

Variable	Test Statistics (r_s)	p-value	Decision for Ho	Interpretation
Resources and Technology Experiences vs.	0.009	0.876	Fail to Reject Ho	Not Significant
Academic Achievement				

Table 9 presents the results of the Spearman rank-order correlation analysis examining the relationship between the level of resources and technology experiences and the academic achievement of middle school students. The analysis yielded a correlation coefficient of (r_s = 0.009) with a p-value of 0.876. Since the p-value is greater than the 0.05 level of significance, the null hypothesis was not rejected. This indicated that there was no statistically significant relationship between resources and technology experiences and students' academic achievement.

CONCLUSIONS

A number of significant conclusions about middle school students' use of artificial intelligence (AI), access to digital resources, and general academic success were drawn from the study's findings. A pertinent context for assessing learning dynamics in middle school settings was established by the student population's balanced demographic profile across age and sex and varied racial representation. Students' self-efficacy, motivation, and sustained commitment to using these tools are still in the early stages of development, despite the fact that they have started incorporating AI into their daily academic routines. Similar to this, even though students have sufficient access to basic digital resources, there is still a significant gap in the availability and integration of cutting-edge educational technologies that are required to promote advanced inquiry and sophisticated research skills. Additionally, while the cohort's overall academic performance was satisfactory, demographic factors specifically, age, sex, and race did not play a major role in determining academic achievement or the distribution of resources, though there were slight differences in the use of AI between male and female students.

Most importantly, the study emphasizes the various ways that technology affects student achievement. Higher AI usage was found to be positively correlated with improved academic performance, highlighting the potential of AI applications to serve as useful cognitive scaffolds when learners actively use them. On the other hand, academic gains were not directly produced by the mere existence or equity of digital resources and technology infrastructure. This shows that the pedagogical framework, instructional quality, and meaningful integration of these tools are the real drivers of academic success; technology access alone is not enough to propel educational advancement. In the end, even tho AI has potential as a useful addition to middle school education, optimizing its advantages necessitates going beyond the provision of passive resources in favor of focused academic support, the development of digital skills, and successful pedagogical implementation.

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APPENDIX A

Table 2. Level of Artificial Intelligence Utilization among Middle School Students As a whole and when grouped according to Expectancy, Attainment, Utility Value, Intrinsic/Interest Value, and Cost.

Statements	Mean	SD	Interpretation
Expectancy Mean	**2.86**	**0.75**	**Moderate**
I can learn the skills that enable effective use of artificial intelligence applications.	2.98	1.02	Moderate
My general knowledge about artificial intelligence is more than sufficient compared to many.	2.68	0.88	Moderate
I am better than most of my peers in effectively using artificial intelligence applications.	2.80	1.00	Moderate
My potential to effectively use artificial intelligence applications surpasses many people in my surroundings.	3.00	1.10	Moderate
Attainment Mean	**2.92**	**0.88**	**Moderate**
The ability to effectively use artificial intelligence is important to me.	2.82	1.33	Moderate
Learning and implementing innovations in artificial intelligence applications are a priority for me.	2.86	1.08	Moderate
It is important for me to stay updated on developments related to artificial intelligence.	3.08	1.27	Moderate
I attach great importance to strengthening my skills in using artificial intelligence applications.	2.92	1.19	Moderate
Utility Value Mean	**2.91**	**0.91**	**Moderate**
Artificial intelligence applications will assist me in becoming a proficient professional.	2.62	1.23	Moderate
Artificial intelligence enhances my overall efficiency, making my life more effective.	2.85	1.17	Moderate
In daily life, artificial intelligence helps me streamline my tasks.	3.31	1.27	Moderate
Artificial Intelligence benefits me in various subjects and courses.	2.87	1.19	Moderate
Intrinsic/Interest Value Mean	**2.97**	**0.89**	**Moderate**
I take pleasure in using artificial intelligence applications.	2.90	1.20	Moderate
I enjoy experiences related to artificial intelligence.	2.99	1.09	Moderate
Following developments in artificial intelligence is an interesting activity for me.	3.04	1.09	Moderate
Developing my skills in using artificial intelligence is a delightful learning process for me.	2.96	1.08	Moderate
Cost Mean	**2.97**	**0.90**	**Moderate**
Investing time and effort to learn artificial intelligence applications is worthwhile for me.	2.71	1.16	Moderate
Learning artificial intelligence applications is an easy task for me.	3.14	1.20	Moderate
I am inclined to sacrifice time from other activities to learn artificial intelligence applications.	2.93	1.06	Moderate
I am not hesitant to invest a considerable amount of time and effort to enhance my skills related to artificial intelligence.	3.10	1.31	Moderate
Artificial Intelligence Utilization Overall Mean	**2.93**	**0.75**	**Moderate**
Legend: (4.21-5.00)-Very High; (3.41-4.20)-High; (2.61-3.40)-Moderate; (1.81-2.60)-)-Low; (1.00-1.80)-Very Low			