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The Impact of Artificial Intelligence-Supported Learning on Students' Academic Self-Confidence: The Moderating Role of Psychological Resilience

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ARTICLE INFO	ABSTRACT
Submission: August 02, 2026 Revised: August 17, 2026 Accepted: September 06, 2026 Available Online: September 21, 2026 Keywords: Artificial Intelligence-Supported Learning, Academic Self-Confidence, Psychological Resilience, Higher Education, AI in Education, Student Development, Educational Technology, Academic Learning Corresponding author: Dr. Syed Azhar Hussain Email: drazhar118@yahoo.com	Artificial Intelligence (AI) is increasingly becoming an important component of higher education, providing students with personalized learning support, immediate feedback, adaptive assistance, and opportunities for independent academic engagement. The present study examined the impact of Artificial Intelligence-Supported Learning on Students' Academic Self-Confidence, with particular emphasis on the moderating role of Psychological Resilience. The study was significant because it extends the discussion of AI in education beyond academic performance by examining its relationship with students' psychological perceptions of their academic capabilities and by considering resilience as an important individual factor that may shape this relationship. A quantitative, cross-sectional survey research design was employed, and data were collected from 413 university students enrolled in higher education institutions in Pakistan. A purposive sampling technique was used to select students who had experience with AI-supported learning, and data were collected through a structured questionnaire administered electronically using Google Forms. The questionnaire measured AI-Supported Learning, Students' Academic Self-Confidence, and Psychological Resilience using established measurement approaches, with responses recorded on a five-point Likert scale. The collected data were analyzed using descriptive statistics, reliability analysis, Pearson correlation, simple linear regression, PROCESS-based moderation analysis, an independent-samples t-test, and one-way ANOVA. The findings demonstrated that AI-Supported Learning was positively associated with Students' Academic Self-Confidence and significantly contributed to explaining differences in students' confidence in academic activities. The results further showed that Psychological Resilience significantly moderated the relationship, indicating that the positive association between AI-supported learning and academic self-confidence was stronger among students with higher levels of resilience. A significant difference in academic self-confidence was also observed between male and female students, whereas no statistically significant difference was found across the examined age groups. Overall, the study demonstrates that AI-supported learning may contribute to students' academic confidence while highlighting the importance of psychological resilience in shaping students' experiences and responses to AI-enabled educational environments. The findings provide useful implications for educators, higher education institutions, and researchers seeking to develop AI-supported learning approaches that address both students' academic needs and psychological development.

Introduction

Artificial Intelligence (AI) is transforming the ways students engage with educational materials and expediting the automation of academic tasks. One of the attributes of AI in education is the integration of various technologies to improve teaching and learning. Recent studies suggest the positive influence of AI in personalizing learning and accessing and utilizing learning materials. Refined predictive and prescriptive approaches offer great potential to foster student-centered learning (Almasri, 2024). Rising AI applications in the field of education have been documented to foster teaching and learning across the educational spectrum, including instruction, evaluation and assessment, and learning (Weng et al., 2024).

While the major focus of research in AI in education has been on academic performance, effects on students' motivation and wellbeing are likely. Positive effects of scaffolding learning and facilitating learning tasks with AI suggest that students have a better understanding of academic tasks and develop a more favorable outlook on their learning potential (Mustafa et al., 2024).

Artificial Intelligence-Supported Learning

Artificial Intelligence (AI) in education refers to the use of AI-based technologies to support students in their learning. Unlike traditional digital learning tools, AI systems can process, analyze, and interpret the information provided by students. This allows them to respond to students' needs in a more interactive and personalized way. As a result, AI systems can give student-specific feedback and generate instructional responses. There are several learning systems that integrate AI, including intelligent tutoring systems, virtual learning assistants, and adaptive learning systems. These systems can help structure instruction and create individualized learning pathways for students. They also can provide students with immediate feedback and instructional responses. Research has shown that educators are increasingly integrating AI systems in teaching to individualize and improve learning.

AI in education has the potential to reshape how learning and instructional support are delivered. Using AI in learning enables students to get support with learning in an asynchronous and individualized manner. Students can get help to learn and understand new concepts, write and edit academic tasks, and get feedback on their academic work. A synthesis of research shows the use of AI in education has a positive impact on student learning, including improvement in student achievement and learning, interest, and motivation (Kim et al., 2024). Studies show students' use of AI-supported learning resources builds academic confidence. This is because adaptive learning technology offers students opportunities to practice, receive feedback, and correct mistakes. Students can then master a concept before moving to the next one. This type of learning gives students control, builds confidence, and improves academic performance.

As students achieve academic goals with the help of AI, and their self-efficacy beliefs do not significantly change, it can be inferred that the AI has no significant impact on students' self-efficacy beliefs. Although this may not always be the case, it indicates that AI-supported learning influences other academic outcomes and psychological outcomes (e.g. self-efficacy beliefs) in different ways. Consequently, the effects of AI interventions on academic outcomes should not be relied upon to clarify the influence of AI on students' self-efficacy beliefs.

Students' Academic Self-Confidence

Academic self-confidence is an individual's belief in their capacity to achieve academic objectives and deals with an individual's confidence in interpreting academic information and participating in academic activities. Self-confidence, in the academic domain, is closely related to and distinguished from academic self-efficacy. As explained by Bandura (1997), academic self-confidence encompasses more broadly academic situations and indicates an individual's generalized confidence and belief in their capability to engage in academic activities, while academic self-efficacy refers to an individual's belief in their academic capability in performing certain academic tasks. In the case of university students, research shows that academic self-confidence is related to students' perception about academic challenges and their reactions to evaluation-related stress (Akin et al., 2017).

This essay will discuss academic self-confidence. When students believe they can perform a task, they are more likely to participate, talk about their findings, and attempt more difficult tasks. Students with low academic self-confidence will often avoid more difficult tasks and may not be willing to participate. Students with low self-confidence may have an anxiety disorder or may fear failure. There is evidence to suggest that confidence is related to student's perceived anxiety about their performance and academic concerns. It is also related to how students cope with and adjust to academic situations. More recent work has focused on students' self-concepts, self-confidence, and self-efficacy and how they adjust to different academic situations (Xiao et al., 2026).

With regard to the integration of AI in education, it is expected that a positive impact will be seen on student's academic self-concept and self-confidence. This is due to the fact that AI can provide instant feedback to students and help students in asking and answering questions. From the evidence to date, it appears that AI has a positive effect on a student's self-concept and self-confidence (Deng, 2025). It is anticipated that in the future, studies focusing on academic self-concept and academic self-confidence will become even more important as educational institutions integrate more AI in teaching and learning.

Psychological Resilience

Psychological resilience is the ability to adapt to and recover from negative experiences while still functioning effectively. School is full of different kinds of pressure and challenges including performance expectations and evaluations. Failure is also common. Because of this, psychological resilience is very relevant to the school setting. Although some people view resilience as a personal quality, recent research views it as an adaptable quality that is influenced by many conditions and factors. Research on university students shows that psychological resilience helps students adapt to and endure academic situations that require endurance (Fletcher & Sarkar, 2013).

In the school setting, psychologically resilient students tend to view challenges as barriers that they can overcome, and don't think of failures as permanent. Challenges can also be emotionally draining. Resilient students tend to be persistent in the face of challenges and can regulate their emotions. Because of the challenges and barriers in the school setting, psychologically resilient students can tend to engage and work on overcoming academic barriers (Vella & Pai, 2019). Research suggests that psychological resources like social support and personal confidence can positively affect students' resilience. Resilience also affects academic challenges and barriers, and can positively influence students' perception of their academic self and skills.

More resilient students may be better equipped to benefit from AI feedback, get past AI-locked answers, and use AI to solve problems where complete solutions are not readily available. On the other hand, less resilient students may become rapidly frustrated when using educational technologies, including AI, that offer assistance but do not resolve learning problems. Psychological resilience may positively affect a student's academic self-confidence. A student may use educational technologies to strengthen academic self-confidence; however, self-regulatory mechanisms, e.g., self-discipline and self-control, are necessary for a student to achieve academic self-confidence and educational outcomes. There is a paucity of research regarding psychological resilience and AI in educational contexts; therefore, the current study is novel and fills a research gap (Sisto et al., 2019).

Research Objectives

- To examine the impact of Artificial Intelligence-supported learning on students' academic self-confidence.
- To determine the moderating role of psychological resilience in the relationship between Artificial Intelligence-supported learning and students' academic self-confidence.
- To assess whether psychological resilience influences the strength of the relationship between Artificial Intelligence-supported learning and students' academic self-confidence.

Problem Statement

The use of Artificial Intelligence (AI) in education has transformed how students learn and engage with their studies. AI-powered tools enable students to access learning support more easily, receive immediate feedback, and obtain assistance with academic tasks. As a result, students can experience a more interactive and responsive learning process. From psychological standpoints, the effects of AI in education have not been as well documented. Increasing evidence suggests that using AI in education can positively influence a student's self-efficacy (Arshad et al., 2026). In other psychological contexts, using ChatGPT has been shown to enhance a student's academic motivation and performance without directly improving self-efficacy. Considering self-efficacy, the focus is typically on the individual's general sense of self and not necessarily academic self-confidence. For students who are psychologically resilient, using AI in education may positively influence academic self-confidence. On the other hand, students may be psychologically brittle and using AI in education may actually negatively influence academic self-confidence. Thus, the aim of this study is to assess if using AI in education influence academic self-confidence. Further, it will assess psychological resilience and see if it positively influences the relationship between AI in education and academic self-confidence (Batoool et al., 2025).

Significance of the Study

This study investigates how the use of Artificial Intelligence (AI) in education affects students' academic self-confidence. It takes into account the role of psychological resilience. Given the growing use of AI in education, it is important to assess the effects of AI in learning beyond academic performance. The study aims to develop a learning environment that is appropriate and responsive to the needs of individual students. It proposes a conceptual framework for the integration of AI in education, and defines the role of psychological resilience. From the findings of this study, different groups of users (i.e. teachers and school personnel) and target audiences (i.e. educational institutions) may improve the use of AI in educational practices to improve students' academic self-confidence and persistence to learn, especially in overcoming challenges related to academic self-regulated learning. The study may provide educational stakeholders with the means to address the challenges related to the use of AI in education, and consider the diverse and often contradictory psychological responses of students to education.

Literature Review

Artificial Intelligence-Supported Learning and Student Development

The use of AI in education offers many opportunities for individualized instruction and feedback as well as automated assessment. Yavuz et al. (2025), in his systematic review of 74 studies, noted the pervasive use of AI in education for learning and for improvement of teaching. Additionally, Wang et al. (2024) indicated that AI in education moves beyond "telephone technology" and becomes individualized and data-based learning. Therefore, AI affects the content and the process of learning. A focus on the effects of AI on learning autonomy and self-regulated learning has developed in more recent research. In their (2025) systematic reviews, (Pinkwart & Liu, 2020), as well as Chen, reported positive effects of the use of AI and learning technologies on learning autonomy, self-regulated learning, learning outcomes, and academic engagement in higher education. In summary, the findings of recent research indicate that AI affects not only the content of learning (i.e., what students learn), but also the process (i.e., how students learn and learn self-directed and self-regulated).

AI-Supported Learning and Academic Self-Confidence

Students' beliefs in their academic abilities are largely based on their perception of their understanding and their capabilities to accomplish intellectual tasks. The term self-efficacy is often used to refer to this belief; however, the more recent literature on AI in education focuses on academic confidence. A systematic review on the use of artificial intelligence in education noted that 13 out of 14 studies reported an improvement in self-efficacy of students. Khalil et al. (2026), noted that students appreciated immediate feedback and individualized, on-demand tutoring in an AI-supported learning environment which, in turn, improved students' learning outcome and self-efficacy.

In a more recent study, Alqurni (2026), reported results of a meta-analysis that confirmed the use of AI in education improved students' self-efficacy. Li et al. also noted the differences in the size of the effect estimate based on students' field of study and the function of AI in education. Domingo (2025) integrated 69 studies on ChatGPT and noted enhancements in academic outcomes and some affective and motivational outcomes. They found no impact on self-efficacy. The authors concluded that, in certain contexts, the use of AI in learning may function to strengthen students' confidence. The nature of AI use and the context of instruction may influence the outcomes. Given the outcomes above, it may be logical to assume that students who use AI in their learning may feel academically self-confident, especially if they use it to explain and practice academic skills and concepts that they find difficult. The evidence regarding academic self-efficacy, however, underscores the need to explore other psychological constructs related to self-efficacy. Based on the available body of knowledge, the use of AI in education may facilitate students' academic self-confidence to perform academic tasks.

Psychological Resilience in Academic Learning

Psychological resilience can help students adapt to different conditions within and outside of the classroom. The nature of university study requires a high level of psychological resilience, as students must adapt to new academic environments and asynchronous ways of learning, while at the same time managing rigorous study load, varying evaluation systems and strict time-constraints. Students must be resilient to academic failure and other challenges. It is equally important to develop psychological resources that enhance students' academic engagement and Well-being, including resilience (Bagdžiūnienė et al., 2025). The results of psychological and social resources, such as self-esteem and supportive relationships, also influence students' academic resilience. In a study conducted in Pakistan, 498 students of sociology reported that self-esteem and teacher and peer support helped them solve academic problems (Rodríguez-Fernández et al., 2018).

Resilient students are likely to engage with more difficult learning tasks, despite the presence of barriers. In learning situations enhanced by artificial intelligence (AI), psychological resilience could be a considerable resource. The use of AI in education will not immediately solve all academic challenges. Students may have to interact with confusing information generated by AI, and may have to learn to work with AI to complete a task. Other challenges may include reliance on AI for help with learning tasks. Students who have psychological resilience may be able to cope with such challenges and obstacles. Psychological resilience is one of several personal characteristics of students that determine their level of acceptance of technology in the field of teaching and learning. In addition, psychological resilience provides a basis for the consideration of individual differences students may have when engaging with learning resources offered by AI.

AI-Supported Learning, Academic Self-Confidence, and Psychological Resilience

There is evidence to suggest that use of AI in academic situations can help students perceive academic tasks as less threatening. This is largely attributed to the personalized feedback and supports provided by the AI. However, it is known that students utilize various psychological strategies to resolve and cope with academic challenges, and that these strategies influence students' academic outcomes and performances in the long run. For example, more resilient students are most likely to benefit from, and transform, AI-based supports, and derive positive academic outcomes from the feedback provided by the AI (Makni et al., 2025).

Although many studies have focused on the relationship between AI in education and students' academic performance, behavior, and motivation, very few focused on students' academic self-confidence. In addition, psychological resilience has not been considered in these studies. However, recent meta-analyses pointed out that differences in the effects of AI in education vary based on the discipline and the role of AI. Furthermore, they pointed out that less research has focused on the moderating role of psychological resilience to understand the relationship between AI in education and its effects on students' self-confidence and academic outcomes. Based on the above, this study focuses on the effects of AI in education on students' academic self-confidence and the role of psychological resilience (Al Mohsen, 2026).

Research Gap

Although recent research has established that Artificial Intelligence-supported learning can improve students' academic outcomes, engagement, and several learning-related psychological outcomes, important gaps remain in understanding its specific influence on students' academic self-confidence. A recent meta-analysis reported a positive overall effect of AI on learners' self-efficacy, but also found that the effect varied according to academic discipline and the role performed by AI (AYDOGAN et al., 2026). In contrast, a large systematic review and meta-analysis of 69 experimental studies found that ChatGPT improved academic performance and affective-motivational outcomes but did not produce a significant overall improvement in self-efficacy, demonstrating that psychological effects of AI-supported learning are not yet consistently established (Bekdaş, 2026). Furthermore, existing research has primarily examined academic achievement, engagement, self-efficacy, and self-regulated learning, whereas comparatively limited attention has been given to academic self-confidence as a distinct outcome and to the psychological conditions that may explain differences in students' responses to AI-supported learning. Although recent meta-analyses have examined moderators such as discipline, instructional mode, and intervention characteristics, the potential moderating role of psychological resilience has received considerably less empirical attention (Bhatti & Saat, 2025). Therefore, the present study addresses this gap by examining the relationship between AI-supported learning and students' academic self-confidence while specifically investigating whether psychological resilience changes the strength of this relationship.

Hypotheses

- **H1:** There is a significant positive relationship between Artificial Intelligence-Supported Learning and Students' Academic Self-Confidence.
- **H2:** Artificial Intelligence-Supported Learning significantly predicts Students' Academic Self-Confidence.
- **H3:** Psychological Resilience significantly moderates the relationship between Artificial Intelligence-Supported Learning and Students' Academic Self-Confidence.
- **H4:** There is a significant difference in Students' Academic Self-Confidence between male and female students.
- **H5:** There is a significant difference in Students' Academic Self-Confidence across different age groups.

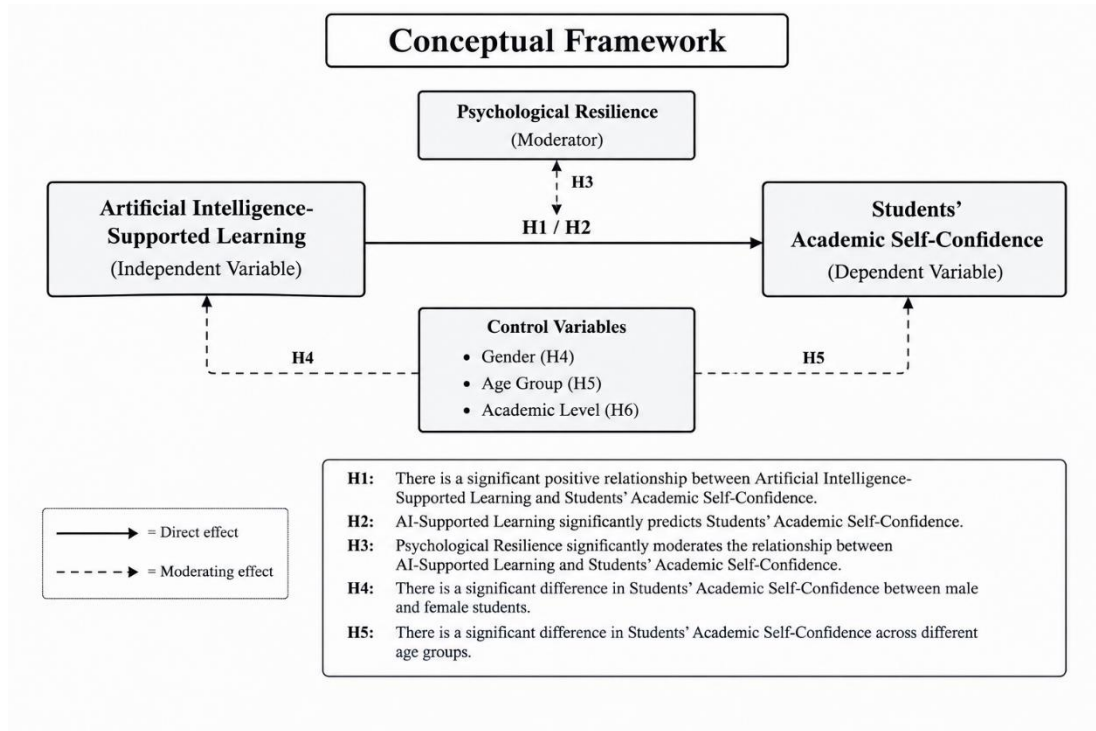


Fig.1 Conceptual Framework

Methodology

Research Design

This research used a quantitative approach to study the relationship between students' use of Artificial Intelligence (AI) for learning, students' academic self-confidence and students' psychological resilience. The research used a questionnaire as its main tool of data collection. The research was of a cross-sectional nature. Since the variables of the study could be measured in a numerical form, and since numerical data could be subjected to statistical analysis to test the relationships and other research questions, it was considered appropriate to use a quantitative approach for the study.

Population

The population of the study was undergraduate students of universities in Pakistan. Data was collected from students of universities located in Punjab, Sindh, Khyber Pakhtunkhwa and the Federal Capital Territory, and from students of Bahauddin Zakariya University Multan, The Islamia University of Bahawalpur, University of Punjab, Government College University Faisalabad, University of Sargodha, Karachi and Sindh Universities, Jamshoro and International Islamic University, Islamabad. The universities were chosen because students of these universities were likely to have enough exposure to educational resources and other applications developed and integrated with Artificial Intelligence.

Sampling Method

A convenience sampling technique was used to recruit participants for the study. Students were eligible to participate if they were enrolled in undergraduate programs at universities in Pakistan and had experience using AI-based tools for learning purposes. Data were collected through an online questionnaire, which was distributed to provide easy access and encourage participation from students across different institutions.

Sample Size

A total of 413 valid responses were included in the final analysis. The participants were students enrolled in different universities across Pakistan. Data were collected through a questionnaire, and only fully completed responses were retained for the study. Incomplete questionnaires were excluded to ensure the accuracy and quality of the data used for analysis.

Data Collection and Measurement Scales

The research instrument was developed by adapting measures from previous studies and was administered through Google Forms. The questionnaire was shared online through official university groups and communication channels to reach potential participants. Before completing the questionnaire, respondents were provided with a brief explanation of the study, including its purpose and objectives, to ensure that they were informed about the research. Items on the measure of use of artificial intelligence for education and learning were modified from previous studies based on students' perception of AI's help and support with learning and education. Based on published research, the measure along with other similar instruments, are necessary to assess students' perception and experience with the integration of AI in education. Students' academic self-confidence was assessed by adoption of items of the Academic Behavioral Confidence scale (Sander & Sanders, 2009). Items assess confidence of students' engagement in academically related activities. Measurement of psychological resilience was based on the Brief Resilience Scale (Smith et al., 2008). The instrument employed a 5-point Likert scale with items phrased negatively. Reverse scoring was implemented. Smith et al. (2008) validated the scale in several populations including undergraduates. Resilience was conceptualized as the capacity to bounce back from the effects of stress. Each item was composed of 5 response options ranging from completely disagree to completely agree. Items were adapted to the local situation. The online version of the questionnaire was created using Google Docs. The secured online version was generated using Google forms. The secure online form was embedded in a Web page created by the researcher. Responses were saved automatically and exported to Microsoft Excel.

Data analysis

The Excel file was saved in a secure location on a university server. SPSS was used for data analysis. The data was first digitized and arranged in Excel, and upon verification that the dataset was in order, it was imported to SPSS for further analysis. Descriptive analysis was run to profile the major variables of the study and the respondents. The relationship between AI-supported learning and academic self-confidence was analyzed using correlation. The former analysis was also done using Simple Linear Regression. The effect of Psychological Resilience on the AI-learning and academic self-confidence relationship was analyzed using the PROCESS macro tool, with the interaction of the two as the key predictor. Comparisons of means for different demographic groups were done using independent samples t-test for groups consisting of two members. One-way ANOVA was done for comparisons for groups containing more than two members. When one-way ANOVA revealed differences in the means of the groups, the samples were further analyzed using Tukey HSD post-hoc test.

Table 1: Demographic Characteristics of Respondents (N = 413)

Demographic Variable	Category	Frequency (f)	Percentage (%)
Gender	Male	220	53.3
	Female	193	46.7
Age	18–22 years	214	51.8
	23–27 years	143	34.6
	28–32 years	56	13.6
Education Level	Bachelor's	242	58.6
	Master's	136	32.9
	MPhil/PhD	35	8.5
Study Discipline	Social Sciences	119	28.8
	Education	98	23.7
	Business/Management	77	18.6
	Computer/IT	63	15.3
	Other	56	13.6

Demographic Variable	Category	Frequency (f)	Percentage (%)
University Sector	Public	267	64.6
	Private	146	35.4
Total Respondents	—	413	100.0

Table 1 describes the sample of 413 participants enrolled in the study. Of these, 53.3% were male and 46.7% were female. The female to male ratio in the study was almost even. Of the participants in this study, 51.8% were between the ages of 18 and 22, 34.6% were between the ages of 23 and 27, and 13.6% were between the ages of 28 and 32. Of the participants, 58.6% were pursuing a Bachelor's degree, 32.9% were pursuing a Master's degree, and 8.5% were pursuing a doctoral degree (either MPhil or PhD). The largest field of study was Social Sciences (28.8%). Other fields of study included Education (23.7%), Management (18.6%), Computer Sciences (15.3%), and other fields (13.6%). A total of 64.6% of the participants were enrolled at public universities, and 35.4% of the participants were enrolled at private universities. The participants in the study were pursuing a wide range of degrees at various educational levels.

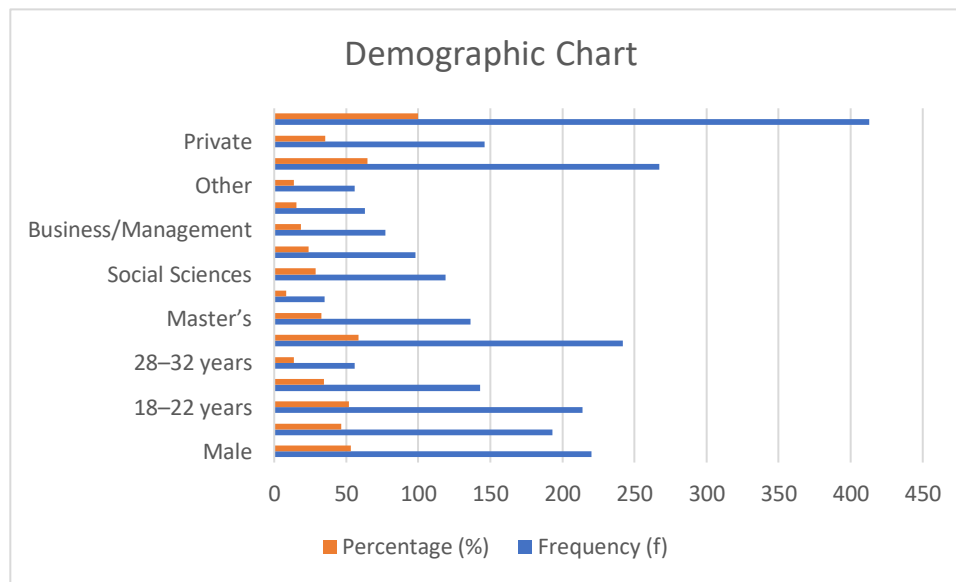


Fig. 2 Demographic Characteristics of Respondents (N= 413)

Table 2. Reliability and Descriptive Statistics of Study Variables (N = 413)

Variables	No. of Items	Cronbach's Alpha (α)	Mean (M)	Std. Deviation (SD)
Artificial Intelligence-Supported Learning	8	0.884	3.71	0.68
Students' Academic Self-Confidence	8	0.901	3.76	0.65
Psychological Resilience	6	0.872	3.69	0.71

Interpretation

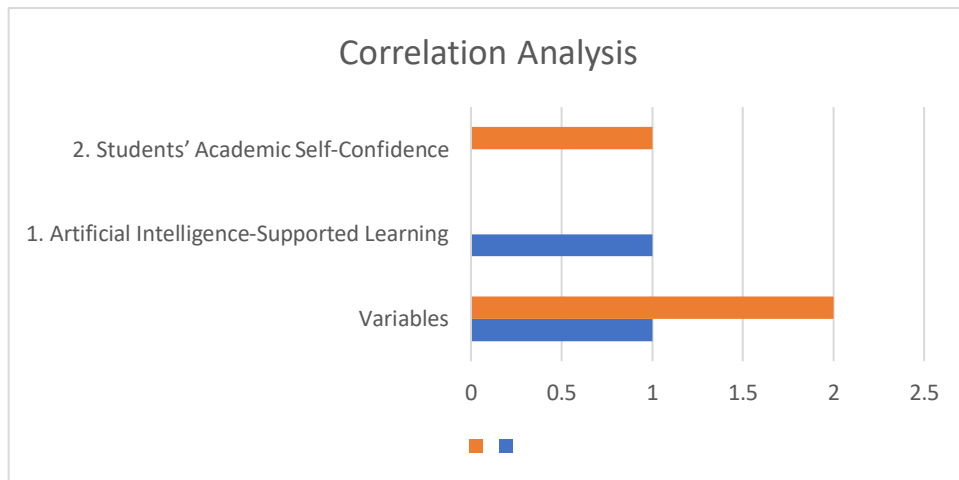
Descriptive statistics and reliability estimate for core study variables are presented in Table 2 for 413 samples. Items on the questionnaire showed Cronbach's alpha levels of 0.872 to 0.901 and were therefore considered to have good levels of internal consistency. The average scores for Artificial Intelligence-Supported Learning and Students' Academic Self-Confidence were 3.71 ($\sigma = 0.68$) and 3.76 ($\sigma = 0.65$), respectively. Psychological Resilience was rated 3.69 ($\sigma = 0.71$). It was generally perceived positively. Standard deviation values for the items indicated that perceptions of the sampled population regarding each of the items was not the same.

Table 3. Pearson Correlation Between Artificial Intelligence-Supported Learning and Students' Academic Self-Confidence (N = 413)

Variables	1	2
1. Artificial Intelligence-Supported Learning	1	0.624**
2. Students' Academic Self-Confidence	0.624**	1

Note. $p < .01$ (2-tailed).

Positive relationships indicate that as one variable increase, the other increases as well. Negative relationships mean that as one variable increase, the other decreases. The near zero correlation indicates no relationship. Table 3 shows the Artificial Intelligence-Supported Learning and Students' Academic Self-Confidence correlations. The results show a positive and significant relationship ($r = 0.624$, $p < 0.01$). This implies that the more students engaged with artificial intelligence-supported learning, the more their self-confidence in academic activities. The correlation is positive and shows a moderate to strong relationship. The findings thus support the first hypothesis that artificial intelligence-supported learning is associated with academic self-confidence of students in a positive and significant manner.

**Fig. 3 Correlation Analysis****Table 4. Simple Linear Regression Analysis of Artificial Intelligence-Supported Learning Predicting Students' Academic Self-Confidence (N = 413)**

Predictor	B	SE	β	t	p
Constant	1.184	0.168	—	7.048	< .001
Artificial Intelligence-Supported Learning	0.694	0.045	0.624	15.422	< .001

Model Statistics	Value
R	0.624
R ²	0.389
Adjusted R ²	0.388
F	237.84
p	< .001

Results of a simple linear regression are presented in Table 4, to assess the impact of Artificial Intelligence-Supported Learning on Students' Academic Self-Confidence, using a sample of 413 respondents. Artificial Intelligence-Supported Learning was a positive predictor of Students' Academic Self-Confidence ($\beta = .624$, $p < .001$). The regression model allowed an approximate understanding of 38.9% of the variability in the sample regarding academic self-confidence. The model was significantly explanatory ($p < .001$), thus supporting the role of the predictor in academic self-confidence. The finding means that with an increase in Artificial Intelligence-Supported Learning, Students' Academic Self-Confidence also increased. Therefore, the research hypothesis H2 was also supported.

Table 5. Moderation Analysis of Psychological Resilience in the Relationship Between Artificial Intelligence-Supported Learning and Students' Academic Self-Confidence (PROCESS Model 1; N = 413)

Predictor	B	SE	β	t	p
Constant	3.760	0.032	—	117.500	< .001
Artificial Intelligence-Supported Learning (X)	0.515	0.046	0.463	11.196	< .001
Psychological Resilience (W)	0.284	0.044	0.309	6.455	< .001
AI-Supported Learning $\times$ Psychological Resilience	0.118	0.039	0.127	3.026	.003

Model Statistics	Value
R	0.687
R ²	0.472
Adjusted R ²	0.468
F	121.79
p	< .001

Conditional Effect of AI-Supported Learning on Academic Self-Confidence

Level of Psychological Resilience	Effect	SE	t	p
Low (−1 SD)	0.431	0.058	7.431	< .001
Mean	0.515	0.046	11.196	< .001
High (+1 SD)	0.599	0.055	10.891	< .001

Moderation analysis for the effect of Psychological Resilience on the association between Artificial Intelligence (AI) in Learning and students' academic self-confidence, based on the PROCESS Macro Model 1, is shown in Table 5. The results showed that the use of AI in learning was positively related to students' academic self-confidence ($B = 0.515$, $p < 0.001$). Also, psychological resilience was positively related to academic self-confidence ($B = 0.284$, $p < 0.001$). The effect of the interaction of AI in learning and psychological resilience was positively significant ($B = 0.118$, $p = 0.003$). This means that the influence of AI in learning on students' academic self-confidence is dependent on the level of psychological resilience. Using the psychological resilience level as the condition, a positive influence of AI in learning on academic self-confidence was noted at all the levels (i.e., low, average, and high). The influence became more significant with an increase in psychological resilience. The model predicted 47.2% of the variability in students' academic self-confidence ($R^2 = 0.472$). Thus, psychologically resilient students who undertook AI-supported learning were more confident about their academic self.

Gender	N	Mean (M)	Std. Deviation (SD)
Male	220	3.82	0.62
Female	193	3.69	0.67

Test Statistic	Value
Mean Difference	0.13
t	2.058
df	411
p	.040

Table 6 presents results of an independent-samples t-test to determine if there are differences in Students' Academic Self-Confidence by gender. The results indicated the mean level of academic self-confidence for males was $M = 3.82$ ($SD = 0.62$), and for females was $M = 3.69$ ($SD = 0.67$). The difference was found to be significant, $t(411) = 2.058$, $p = 0.040$. Given the results, it can be concluded that gender played a role in the sample, and, therefore, supporting the hypothesis, indicated there was a difference in the level of Students' Academic Self-Confidence between males and females.

Table 7. One-Way ANOVA of Students' Academic Self-Confidence Across Age Groups (N = 413)

Age Group	N	Mean (M)	Std. Deviation (SD)
18-22 years	214	3.82	0.62
23-27 years	143	3.71	0.65
28-32 years	56	3.61	0.71

Source of Variation	Sum of Squares	df	Mean Square	F	p
Between Groups	2.046	2	1.023	2.508	.083
Within Groups	167.262	410	0.408		
Total	169.308	412			

Results of a one-way ANOVA to assess differences in academic self-confidence of students based on their age are shown in Table 7. Students between the ages of 18-22 showed the highest level of academic self-confidence ($M = 3.82$, $SD = 0.62$) followed by students 23-27 ($M = 3.71$, $SD = 0.65$) and students 28-32 ($M = 3.61$, $SD = 0.71$). In the case of mean academic self-confidence based on age, some differences were noted, however these differences were not substantial enough to be of statistical significance ($F(2, 410) = 2.508$, $p = .083$). Consequently, the authors failed to identify a significant effect of age on the sample population, and, therefore, Hypothesis 5 is rejected.

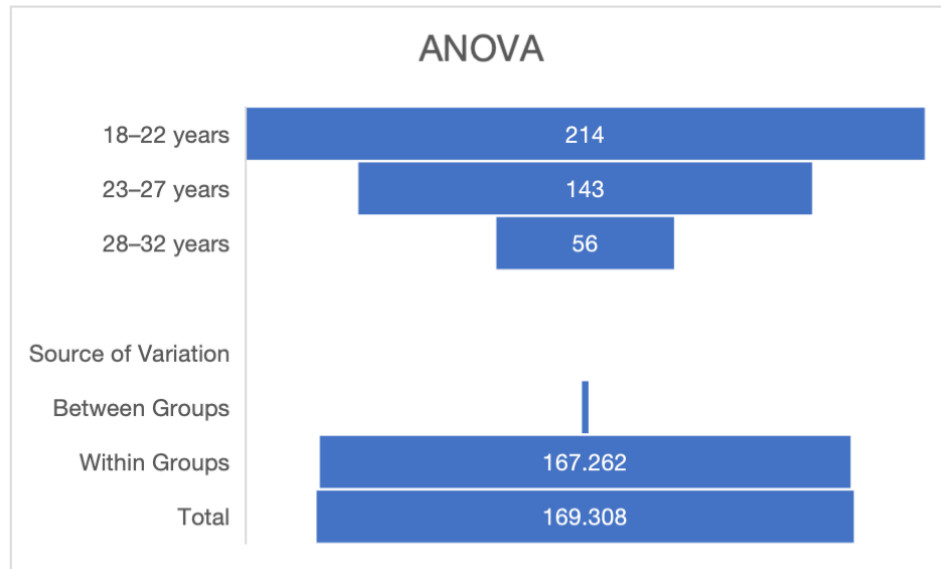


Fig. 4 ANOVA

Discussion

The study investigated the relationship between Artificial Intelligence-based Learning and the Academic Self-Confidence of Students. It also assessed Psychological Resilience of Students as it related to the above relationship. Results showed that use of Artificial Intelligence in learning enhanced the Academic Self-Confidence of Students and helped to explain and predict the level of confidence Students had in participating in activities related to academic learning. Results further indicated that Psychological Resilience of Students defined the level of confidence Students had in their Academic Self-learning and that the relationship between use of Artificial Intelligence in learning and Academic Self-learning was positive and reinforcing. Results of this study further indicated that there was confidence difference in Academic Self-learning between Females and Males, while there was no confidence difference among the three Age groups assessed. Results further indicated the potential positive impact of Artificial Intelligence in Learning beyond Academics and may possibly influence the psychological well-being of Students in a positive manner (Domingo, 2025). These experiences can build students' perceptions of their academic capabilities by giving them the opportunity to work independently and clarify questions.

This finding is also in agreement with the meta-analysis performed by Elshaer et al. (2025), where the authors reviewed 23 studies and found that the use of AI in the classroom enhanced students' self-efficacy. From their analysis, the interaction between students and AI enhanced the students' beliefs about learning. There were, however, differences in the types of impacts, depending on the field of study and the role of AI in the interaction. The current study adds to this body of knowledge by focusing on academic self-confidence (Hamkah et al., 2025). There are, however, distinctions between self-confidence and self-efficacy. Self-confidence is broader and encompassing in academic situations (Khodabandeh, 2026).

The positive effects of AI should also be considered alongside findings from other studies that have reported different psychological effects associated with the use of AI. Regarding changes in self-efficacy as a result of using ChatGPT, Oubibi (2025) reported no major changes in self-efficacy in their meta-analysis and systematic review. Improvements in self-efficacy may take more time and/or additional use of the technology. Based on the research evidence to date, various factors may influence the use of AI in the learning process. These factors include the area of learning, the duration of use of AI in learning, the reason for using AI (as a tutor, for example, or to replace learning), the student's effort and initiative, and the student's interaction with the AI. From the researcher's viewpoint, positive results in this and other studies should not be generalized to suggest that AI, in all cases, increases students' academic confidence (Sisto et al., 2019).

Positive psychological resilience was found to moderate the effects of AI on students' academic self-confidence. As reported, psychological resilience moderated the effects of AI on students' academic self-confidence, and the higher the resilience, the more

positive the effects. Similar to resilience, students may have varied the ways and the extent to which they benefitted from AI in learning, and this may include the use of other learning resources as well (Simatupang & Heryono, 2026).

More resilient students may be able to work around difficulty caused by emerging technology. These students may be more effective in asking for and seeking clarification of answers, verifying the accuracy of answers, and adjusting their learning methods in light of the answers provided. Resilient students may be able to use technology and AI to improve their perception of their academic skills. Less resilient students may become increasingly frustrated if they are unable to identify and/or solve an academic problem with the assistance of AI. In the end, the application of AI may have the opposite effect on students' perception of their skills if the students are unable to answer an academic problem with the assistance of AI.

The other findings from the research studies (Schoon, 2021) in which variation in student's response to the AI assistant was reported, support the notion that psychological resources of students should be considered. The independent samples t-test showed that the mean score for academic self-confidence of the male students in the sample was greater than that of the female students. The results from the one-way ANOVA showed that the mean score for academic self-confidence of the three age groups was not significantly different.

There were some differences in mean confidence levels for the 18–22-year-old group compared to the 23–27-year-old and 28–32-year-old groups; however, these differences were not large enough to be considered statistically significant. Therefore, it can be concluded that, in this case, there were no significant differences in academic confidence based on age. Since factors other than age, such as students' familiarity and comfort level with artificial intelligence (AI) and other information technologies, their learning and achievement styles and strategies, and other psychological factors may influence students' academic confidence. Statistical results showed that the combination of students' psychological factors and the use of AI in academic learning play a positive role in academic confidence. Considering both the technological and psychological aspects of students' experiences is important (Putri et al., 2025).

Understanding the role that the integration of AI in education plays on students' perceptions of academic confidence and other related psychological outcomes in the field of higher education is important. Other psychological outcomes of the integration of AI in other fields may also be positive. However, further research is needed educational institutions may integrate differing methods to support students' academic confidence, like independent learning and persistent learning, and help students learn to monitor and adjust their use of the AI learning companion, verify learning outcomes, and manage learning obstacles.

The research shows that AI-supported learning increases students' academic self-confidence and that the presence of psychological resilience enriching this learning positively strengthens this relationship. The research innovates from other studies by investigating AI-supported learning and its relationship with academic self-confidence and by identifying psychological resilience as a modulating factor. The existence of significant differences based on students' sex and the absence of differences based on students' age groups suggests that AI-supported learning environments help students with self-regulated learning. Additional research using different methodologies, especially ones based in the learning environment for a longer period of time and ones that focus on improving students' psychological resilience, may increase students' academic self-confidence and help students better utilize AI-supported learning.

Conclusion

The findings of this study show that Artificial Intelligence (AI)-supported learning is positively associated with university students' academic self-confidence. Students who reported greater use of AI for learning also tended to show higher levels of confidence in their academic abilities. This suggests that AI-based learning tools can provide useful academic support and may help students feel more confident about completing academic tasks and dealing with learning challenges. The findings also indicate that psychological resilience plays a moderating role in this association. Students who are better able to adapt to academic difficulties may experience greater benefits from AI-supported learning in terms of their academic self-confidence. Overall, the study highlights that the value of AI in education extends beyond academic support, as its use may also contribute to students' confidence and positive psychological resources. This study found males and females had different levels of academic self-confidence. To find differences among age groups, the researchers created four different groups: 14–18 years old, 19–29 years old, 30–39 years old, and 40 years and older. The researchers found no statistical difference in academic self-confidence among any of the groups. Therefore, self-confidence in academic abilities, in this case, is not likely to be related to age. In the study, the researchers focused on psychological factors of students and how technology would help facilitate the factors. The researchers found the Psychological and the Technological factors of Higher Education integrations work hand-in-hand. The researchers believe the reluctance of some students to engage educational

and technological opportunities is primarily due to their psychological state rather than a complete absence of educational opportunities and/or technological aids. Therefore, technological tools integrated with education must consider students' self-regulatory abilities and psychological factors.

Future Implications

Future research should examine AI-supported learning, academic self-confidence, and psychological resilience among students from different educational levels, academic disciplines, and backgrounds. Longitudinal studies could provide a better understanding of how continued use of AI-based learning tools affects students' academic self-confidence over time. Experimental research could also be conducted to examine whether changes in students' psychological resilience influence the way they respond to AI-supported learning. Such studies may provide deeper insight into how AI use and psychological factors work together in shaping students' academic experiences. Simultaneously, educational institutions can implement the use of AI in education to work synergistically with other strategies aimed at developing students' psychological resilience and self-learning skills. Other positive outcomes, such as students' critical reflection and constructive engagement towards academic challenge, can also be targeted with the use of AI. Still, to ensure the use of AI in education achieves a positive impact on students' psychological wellbeing, other factors, such as students' digital and academic self-discipline and autonomy, must also be taken into account. Other studies, concentrating on the use of AI in education to promote users' psychological wellbeing, can help educators and schools create more integrated, positive and psychologically responsive teaching and learning environments.

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