



The Influence Of AI-Supported Learning on Students Sense of Belonging and Psychological Well -Being Examining The Mediating Role Of Academic Resilience

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ARTICLE INFO	ABSTRACT
Submission: August 31, 2026 Revised: September 29, 2026 Accepted: October 06, 2026 Available Online: October 17, 2026 Keywords: AI-Supported Learning, Sense of Belonging, Academic Resilience, Psychological Well-Being, Higher Education, University Students, Artificial Intelligence, Student Development. Corresponding author: Ayesha Kiren Email: Ayesha.kiren@uaf.edu.pk	This study examined the influence of AI-supported learning on students' sense of belonging and psychological well-being, with particular emphasis on the mediating role of academic resilience among university students in Pakistan. A quantitative, cross-sectional survey design was employed, and data were collected from 405 university students through a self-administered structured questionnaire administered using Google Forms. The collected data were analyzed using IBM SPSS through Pearson product-moment correlation, multiple linear regression, independent-samples t-test, and mediation analysis using bootstrapping. Pearson correlation analysis demonstrated a significant positive relationship between AI-supported learning and students' sense of belonging ($r = .584$, $p < .001$). Multiple linear regression showed that AI-supported learning ($\beta = .29$, $p < .001$) and academic resilience ($\beta = .42$, $p < .001$) significantly predicted psychological well-being, with the model explaining 41% of the variance ($R^2 = .41$, $p < .001$). Independent-samples t-test results indicated significant gender differences in academic resilience ($t = -2.63$, $p = .009$) and psychological well-being ($t = -2.51$, $p = .012$), while differences in AI-supported learning and sense of belonging were not statistically significant. Mediation analysis showed that academic resilience significantly mediated the relationship between AI-supported learning and sense of belonging (indirect $B = .20$, 95% CI [.13, .28]) and between AI-supported learning and psychological well-being (indirect $B = .19$, 95% CI [.12, .27]). The study is significant because it demonstrates that AI-supported learning is associated not only with students' learning experiences but also with their social and psychological functioning, with academic resilience serving as an important explanatory mechanism. The findings provide useful implications for higher education institutions in integrating responsible AI-supported learning with resilience development and supportive educational practices.

Introduction

Artificial Intelligence (AI) has become part of higher education to provide customized learning support, prompt feedback and adaptive resources, and flexible ways for students to interact with academic content. AI supported learning helps students to

manage their learning in a more autonomous and effective way. Its influence is beyond academic performance. The way students interact with AI supported learning may positively shape students' social and psychological experiences (Klimova & Pikhart, 2026).

The increasing use of AI in education may negatively affect students' sense of connection and emotional well-being, and ability to cope with challenges in academic learning. While artificial intelligence may revolutionize and improve the accessibility and efficiency of learning, too much reliance on technology may reduce the quality of interaction with other human beings, and may eventually develop feelings of loneliness and digital fatigue (Shi et al., 2025). Consequently, more research is needed on the psychological consequences of using AI in higher education (Jeilani et al., 2025).

Students' Sense of Belonging and Psychological Well-Being

Students' sense of belonging is the degree to which students feel respected, accepted, and connected in their educational environment. Students with a strong sense of belonging are more engaged in different aspects of university life. It is positively correlated with students' academic and psychological well-being. Existing evidence shows that sense of belonging is associated with students' educational experience, social capital and psychological well-being (Romeo et al., 2024). Positive psychological functioning of a university student is indicated by a sense of emotional balance, contentment, general mental health, and ability to attain healthy adjustment to academic life. Students can experience academic and social challenges and psychologically unsettling circumstances (academic and social uncertainty), thus psychological well-being is relevant to higher education. Previous evidence showed that sense of belonging, social capital, and academic and social engagement are positively associated with psychological well-being of higher education students (Au et al., 2023).

Academic Resilience

Resilience is the ability to endure challenges in education. It includes adapting to obstacles, sticking with goals and working through rough patches to achieve success (Brooks, 2017). Resilient students experience less stress and worry about academic situations and outcomes (Radhamani et al., 2021). Research indicates that, with the help of artificial intelligence (AI) in education, students must learn to be resilient as they learn to manage different digital tools and different methods of interacting with their instructors and classmates (Tudor et al., 2017). Positive academic and psychological outcomes of higher education are associated with academic resilience as well (Cassidy., 2016).

Relationships Among AI-Supported Learning, Belonging, and Psychological Well-Being

AI-supported learning changes the way students communicate and participate in the learning environment. Some students may feel more confident and engaged in learning when they have the support of an AI tutor. However, relying too much on AI in learning may result in social distance and loneliness (Umoru et al., 2026). Thus, we need to study the AI-supported learning and students' sense of belonging.

Students that feel a greater sense of belonging usually have positive psychological experiences and well-being. Academic resilience enables students to overcome academic challenges and maintain psychological balance. These challenges often end up in anxiety and unhelpful coping strategies. Belonging and academic resilience positively influence students' well-being. The current literature supports the importance of belonging in students' well-being, but does not study how academic resilience integrates students' sense of belonging, well-being and the use of AI-supported learning (Schilhabel et al., 2026).

Mediating Role of Academic Resilience

While AI can boost students' academic performance, it may not contribute as much to students' sense of belonging because technology-related academic support is not necessarily transmitted to students' sense of belonging. The presence of academic challenges and academic difficulties does not depend on the time and place, and academic challenges are present all the time. Some students cannot cope with academic challenges due to lack of academic resources. Persistence in the face of academic challenges requires the academic resource that helps students practice coping with academic challenges and strengthens students' academic resilience. Students who gain the resource to cope with academic challenges may improve their confidence in effectively dealing with academic challenges. They will then become more involved with their educational community. Belonging and academic resilience may be inter-connected rather than independent psychological experiences (Aliyev et al., 2021).

Like academic resilience, AI-supported learning may help improve psychological well-being. Managing difficult learning situations with the help of AI may support students' psychological well-being (Fathi et al., 2024). However, persistence and adaptive coping are likely to occur when students make use of the available AI-supported academic services to improve their academic situation and

engagement. It has been recently identified that academic resilience is a key contributor to positive well-being of university students (Au et al., 2023; Study and personal resources of university students' academic resilience, 2025). Taking this into account, the current study suggests that the psychological pathway of AI-supported learning that leads to a better sense of belonging, is academic resilience. This mediation hypothesis goes beyond a straightforward relation and offers a possibility to explain the underlying process of AI-supported educational services to generate various psychological effects (Seçer et al., 2020).

Research Objectives

- To examine the relationship between AI-supported learning and students' sense of belonging.
- To examine the relationship between AI-supported learning and students' psychological well-being.
- To examine the relationship between AI-supported learning and academic resilience.
- To examine the mediating role of academic resilience in the relationships between AI-supported learning, students' sense of belonging, and psychological well-being.

Research Questions

1. What is the relationship between AI-supported learning and students' sense of belonging?
2. What is the relationship between AI-supported learning and students' psychological well-being?
3. What is the relationship between AI-supported learning and academic resilience?
4. Does academic resilience mediate the relationships between AI-supported learning, students' sense of belonging, and psychological well-being?

Problem Statement

Artificial Intelligence (AI) is changing the way students find academic help, engage with learning content, and perform academic tasks. Personalized AI-supported learning has advantages like individualized help and feedback, as well as more control over the timing and location of learning. There has been inadequate consideration about the broader social and psychological impacts of AI-supported learning. Of special importance is how AI-supported learning affects students' sense of belonging and their psychological well-being, particularly if technological support alters students' academic inter-action and engagement. Sense of belonging and psychological well-being are key elements of students' successful adjustment to higher education, while academic resilience is a key element in dealing with academic challenges (Ria et al., 2025). How AI-supported learning may influence these elements is unknown. Thus, the aim of this research is to fill this gap and examine how AI-supported learning influences students' sense of belonging and psychological well-being and academic resilience (Soureh et al., 2026).

Significance of the Study

This study is significant because it provides a comprehensive understanding of how AI-supported learning may shape students' sense of belonging and psychological well-being in higher education while highlighting the mediating role of academic resilience. The findings may help universities and educators understand that effective use of AI should not focus only on academic performance but should also consider students' social connection, psychological functioning, and ability to cope with academic challenges. The study may assist educational institutions in developing supportive AI-integrated learning environments that encourage meaningful student participation, strengthen resilience, and promote positive psychological experiences. It may also provide useful insights for researchers and policymakers seeking to understand the broader educational and psychological implications of AI-supported learning and offer a foundation for future research on technology, resilience, belonging, and student well-being.

Literature Review

Relationship Between AI-Supported Learning and Students' Sense of Belonging

Crawford, Olivier et al., (2025) analyzed the expansion of artificial intelligence (AI) in higher education and possible effects on students' social experiences. They indicated that while AI can offer students convenient academic support, substituting human support with AI can create social costs, such as loneliness and a lack of social connection. Understanding these social costs related to students' sense of belonging is critical because belonging, to some extent, is dependent on students' experiences of social

connection and engagement in their educational environment. Therefore, students' social connection may benefit from AI-supported learning, but may be negatively affected by an overreliance on AI as a learning support.

Results from a review of the literature on the definition and measurement of sense of belonging in higher education by Dias-Broens, Meeuwisse, and Severiens (2024) further corroborated the significance of the role of the educational environment in developing students' sense of belonging. The review highlighted important dimensions of students' belonging as connectedness, acceptance, inclusion, support, respect, and being valued. The findings confirmed that when students' educational environment supports students' involvement and involvement of peers, students' sense of belonging is strengthened. Suggested earlier research has outlined the strength of belonging when students experience positive academic engagement and social connection. Rafique et al., (2026) conducted a study involving students from different departments at a Greek University. They found that students with a greater sense of belonging and academic engagement had reported higher levels of positive psychological outcomes and resilience.

Relationship Between AI-Supported Learning and Psychological Well-Being

Yang et al., (2025) study adopted an interdisciplinary framework to examine AI literacy and self-regulated learning, as well as writing performance and well-being in the context of generative AI in higher education. Based on the findings of the study, the interaction of students with AI-related learning environments can be related to psychological and pedagogical effects. Hence, the authors highlighted the potential effects of AI support on students' general well-being beyond academic performance. When students can benefit from AI to facilitate information access, retrieve and deal with learning-related difficulties in a timely manner, and adjust their learning, they might feel more in control.

Positive effects of the integration of AI in education on students' well-being are also demonstrated in recent studies on AI-enabled student support. In the field of educational research, there is an increasing interest in the risks of using AI in education, such as digital fatigue and cognitive overload. It appears that the psychological impacts of AI-supported learning depend on how the technology is integrated in students' educational trajectory. This means that AI-supported learning may function as both an academic resource, and as something that impacts students psychologically.

This of course is based on the limited available evidence. Erkal et al. (2026) argued that the use of AI in education may have negative psychological and social impacts, as it may substitute human interaction. On the other hand, Olawole et al. (2026) reported that experiences with AI in the classroom improve students' well-being. Therefore, the relationship between AI-supported learning and psychological well-being remains largely unexplored. The current study aims to investigate this relationship, and examine psychological well-being with a focus on academic resilience.

Relationship Between AI-Supported Learning and Academic Resilience

Academic resilience is the ability of a student to show persistence and adapt to different academic situations and remain productive in the face of failure. Some research has linked the use of a particular type of virtual learning environment with academic resilience. Students using these virtual learning environments need to be self-directed and manage their own learning by switching between several academic resources. In a study published in 2026, Alamri and Elashram, examined the use of various types of AI in postgraduate education and found relationships between various AI applications and academic resilience and student burnout. AI-enhanced education can be fruitfully integrated with academic resilience within higher education (Minarni et al., 2026).

It is important to note that using AI for academic tasks may help develop students' academic resilience, offering them academic help when they get stuck. Presenting students with an explanation, and other assistance and resources, in an academic task may help them respond to the academic problem rather than avoid the task. Here AI may act as an external academic resource to scaffold students' ability to be academically resilient. However, developing academic resilience primarily relies on the students actively using their available resources to engineer adaptive responses to academic challenges.

Deng et al. (2025) provided evidence of the significance of psychological and social resources for academic resilience within digitally intensive higher education. Their study showed that digital fatigue was negatively related to academic resilience, while psychological flexibility and a sense of belonging were positively related. From the study findings, we can conclude that there are two factors which affect a student's response to a digitally intensive learning environment, the psychology of the student and the technology available. Given this, exploring the relationship between the use of AI in academic learning and academic resilience is necessary to find out whether AI is a supportive academic resource in learning (Shaikh et al., 2025).

Relationship Between Academic Resilience, Sense of Belonging, and Psychological Well-Being

Arslan et al., (2023) examined the connection between the sense of belonging and academic resilience of college students. They studied 303 college students. They found a positive connection between the sense of belonging and academic resilience. They reported academic resilience as a positive predictor of sense of belonging. Therefore, individuals who have the resilience to overcome the academic challenges they face are more likely to feel a sense of belonging in their educational environment. These findings are particularly important to the current study because they support the notion that the sense of belonging and academic resilience are interconnected.

Further, the resilience positively predicted psychological well-being of university students. Positive psychological functioning of students was associated with students' capacity to cope with difficulties. Likewise, Daniilidou et al. (2025) have shown that university students that reported stronger sense of belonging and greater academic engagement reported higher levels of happiness and resilience. More recently, Bozkur, (2026) have shown how digital fatigue positively influences sense of belonging and negatively influences academic resilience among higher education students. Authors have shown that, in a digitally tense academic environment, sense of belonging may help build students' psychological resilience, and assist them in using psychological resources effectively. Taken together, academic resilience may represent a pathway, through which students convert educational experiences into positive psychological functioning and social integration. Theoretically and empirically, sense of belonging in academically digitally intensive environments, may support the need for psychological resilience to promote students' positive social and psychological functioning, and integrate other adults within the educational setting.

Mediating Role of Academic Resilience

The available literature supports the possibility that academic resilience may function as a mediating mechanism between AI-supported learning and students' sense of belonging. It is conceivable that some students may find AI-supported learning resources and personalized and flexible scaffolding to help them address their academic challenges. Students who use these resources to address academic challenges may develop greater academic persistence and adaptability. More developed academic resilience may enhance students' sense of connection and belonging. The sense of belonging and academic resilience reported by Turan, (2021) also may support the hypothesized connection.

There also may be an association with AI-supported learning and psychological well-being due to academic resilience. Students may use AI-supported learning resources and, in turn, become better able to manage academic challenges and persist in learning. When students develop stronger academic resilience, they may be better able to function psychologically in a positive and efficient way when dealing with academic demands. Bahrami et al. (2017) and Suud et al. (2024) highlighted the importance of resilience and psychological well-being. The recent literature also highlighted the important role of resilience as a psychological resource in a digitally intensive higher education context.

While different studies have established relationships between AI use, academic resilience, belonging and psychological well-being, few (if any) have developed and integrated all four constructs within an explanatory model. An important recent study on AI-enabled student support has suggested academic resilience as the potential mechanism connecting AI-supported educational services with sustainable well-being. Findings from studies in other domains of digitally intensive higher education also provide a compelling rationale for considering belonging and resilience as factors affecting students' adaption. Due to the above, this study has also adopted the view that the relationship between AI-supported learning and students' sense of belonging and psychological well-being is potentially mediated by academic resilience.

Research Gap

Research on AI-supported learning has recently focused on the academic and psychological impacts of students. Other research has shown the importance of sense of belonging and academic resilience on students' psychological well-being and adjustment. Research on these variables has been conducted separately (Yidan et al., 2026). The relationship among AI-supported learning, sense of belonging, academic resilience, and psychological well-being has not been studied. Also, there are few studies that address academic resilience as a mediating variable for the relationship between AI-supported learning and students' sense of belonging and psychological well-being. This study intends to fill that gap (Wattanavit et al., 2026).

Research Hypotheses

H1: There is a significant positive relationship between AI-supported learning and students' sense of belonging.

H2: AI-supported learning significantly predicts students' psychological well-being.

H3: There is a significant difference in AI-supported learning, academic resilience, sense of belonging, and psychological well-being between male and female students.

H4: Academic resilience significantly mediates the relationship between AI-supported learning and students' psychological well-being.

Conceptual Framework

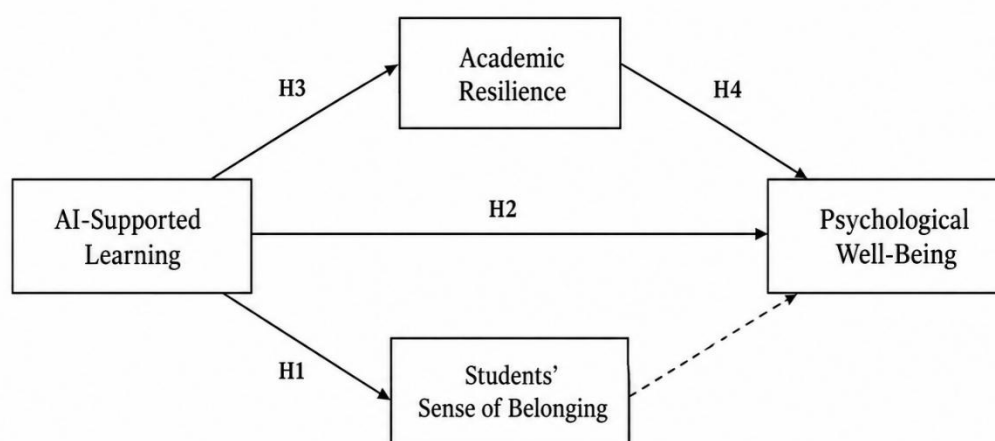


Fig 1: Conceptual Framework

Methodology

Research Design

A quantitative, cross-sectional design, was used to examine relationships among AI-supported learning, sense of belonging, academic resilience, and psychological well-being of students. The study was designed to collect numerical data from university students at a particular point in time. A self-administered questionnaire was used to collect data. The data were collected according to research objectives and hypotheses of the study.

Population

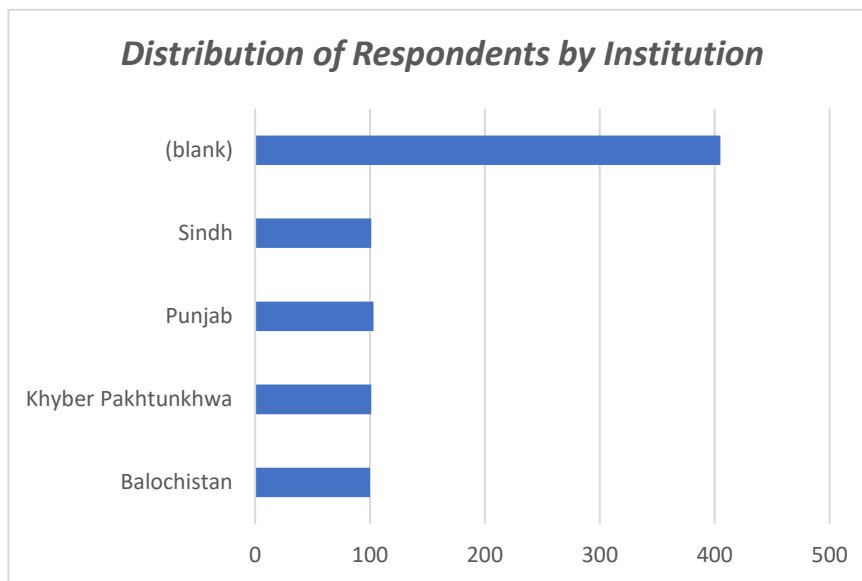
The population consisted of students enrolled in universities of higher education in Pakistan. Students from different geographical areas of the country were approached, e.g. students from the University of the Punjab and Bahauddin Zakariya University; the University of Sindh and Shah Abdul Latif University; the University of Peshawar and Abdul Wali Khan University; and the University of Balochistan and the Balochistan University of Information Technology, Engineering and Management Sciences (BUIEMS). The purpose was to have adequate representation of different university students across Pakistan.

Sample Size and Sampling

A total of 405 university students participated in the study. These participants were chosen using the convenience sampling technique. Students in undergraduate and postgraduate programs and who have experience of AI-supported learning, were potential participants. The participation was voluntary, and potential participants were informed about academic purpose of the research and that their responses would be kept confidential.

Table 1: Distribution of Respondents by Institution (N = 405)

Institution	Province/Region	Respondents (n)
University of the Punjab	Punjab	52
Bahauddin Zakariya University	Punjab	51
University of Sindh	Sindh	51
Shah Abdul Latif University	Sindh	50
University of Peshawar	Khyber Pakhtunkhwa	51
Abdul Wali Khan University	Khyber Pakhtunkhwa	50
University of Balochistan	Balochistan	50
Balochistan University of Information Technology, Engineering and Management Sciences (BUITEMS)	Balochistan	50
Total		405

**Fig 2: Distribution of Respondents by Institution (N=405)**

Research Instrument

Data were collected using a structured, self-administered questionnaire. The questionnaire was designed to include basic demographic information and measurement items related to AI-supported learning, sense of belonging, academic resilience, and psychological well-being. Measurement items related to AI-supported learning, sense of belonging, and academic resilience were adapted, and items related to psychological well-being were adopted, from previously validated instruments, and a few measurement items related to each of the concepts under study were self-developed.

In order to measure AI-supported learning, students were asked to rate their experiences and perceptions on the use of AI in educational settings in relation to learning support, and providing them with personalized feedback and support to engage in and complete academic activities. Researcher-developed items were used in the higher education setting, to capture students' experiences with AI-supported learning. Sense of belonging was assessed by adopting the belonging dimension of the Perceived Cohesion Scale. It measures the extent to which the respondents feel they belong to or are members of a particular social/educational group.

To assess academic resilience, the Academic Resilience Scale (ARS-30) was used. The scale measures the cognitive, affective, and behavioral aspects of students' responses to academic adversity to assess academic resilience. Psychological well-being was assessed with the Scales of Psychological Well-Being (1989). The measure assesses the individual's psychological functioning by dimensions such as self-acceptance, positive relations with others, environmental mastery and purpose in life.

All the items were rated on a Likert type scale. Higher scores represented better functioning and greater well-being. Prior to the administration of the measures, the wording of the items was reviewed to ensure they were clear and appropriate for the higher education context.

Data Collection Procedure

The questionnaire was administered online using Google Forms. A survey link was shared with students, who completed the questionnaire independently. Before participating, students were informed about the purpose of the study, their right to withdraw at any stage, the confidentiality of their responses, and that the collected information would be used only for research purposes. A total of 405 completed questionnaires met the study's inclusion criteria and were included in the final analysis.

Ethical Considerations

Participation in the study was voluntary and respondents were free to choose not to respond. Participants were not pressured to give information they were not comfortable giving. No identifiable information was collected. The collected information was only used for the purpose of academic research. Information was kept private and only the researcher saw the information. Data were reported in an aggregated way.

Table 2: Demographic Characteristics of Respondents (N = 405)

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	210	51.9
	Female	195	48.1
Age	18–22 years	176	43.5
	23–27 years	151	37.3
	28–32 years	52	12.8
	33 years and above	26	6.4
Academic Level	Undergraduate	245	60.5
	Master's	95	23.5
	MS/MPhil	65	16.0
Total		405	100.0

Table 2 shows the demographic characteristics of the 405 participants. Of these, 210 (51.9%) were male and 195 (48.1%) were female. Most participants were between the ages of 18 and 22 years (43.5%), followed by 23-27 years (37.3%), with the least being 28-32 years (12.8%), and 33 years and above (6.4%). In terms of academic level, 245 (60.5%) were undergraduates, 95 (23.5%) were Masters and 65 (16%) were MS/MPhil students. Generally, the sample included students in various demographic and academic backgrounds.

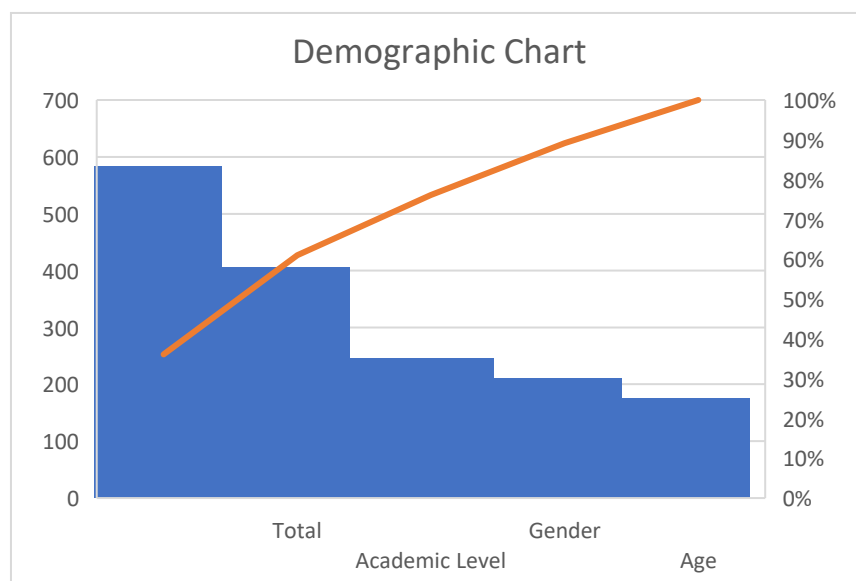


Fig 3: Demographic characteristics of Respondents (N= 405)

Table 3: Reliability Analysis of Study Variables (N = 405)

Variables	Number of Items	Cronbach's Alpha	Mean	Standard Deviation
AI-Supported Learning	10	.89	3.78	0.66
Sense of Belonging	10	.87	3.73	0.63
Academic Resilience	30	.92	3.69	0.58
Psychological Well-Being	18	.90	3.72	0.60

Table 3 shows good to excellent internal consistency of all study variables (Cronbach's alpha between .87 to .92). The highest reliability was recorded for academic resilience, followed by psychological well-being, AI-supported learning, and sense of belonging. Positive mean scores of the study variables were recorded, and standard deviations showed reasonable levels of respondents' variation. Overall, the results of the reliability analysis showed that the measures employed in this study were adequate for the required level of consistency for advanced analysis.

Table 4: Pearson Correlation Between AI-Supported Learning and Students' Sense of Belonging (N = 405)

Variables	AI-Supported Learning	Sense of Belonging
AI-Supported Learning	1	.584**
Sense of Belonging	.584**	1
N	405	405
p-value	—	< .001

Table 4 shows a strong positive relationship between the use of AI-supported learning and students' sense of belonging, $r = .584$, $p < .001$. This suggests that students that reported higher levels of AI-supported learning tended to show a greater sense of belonging.

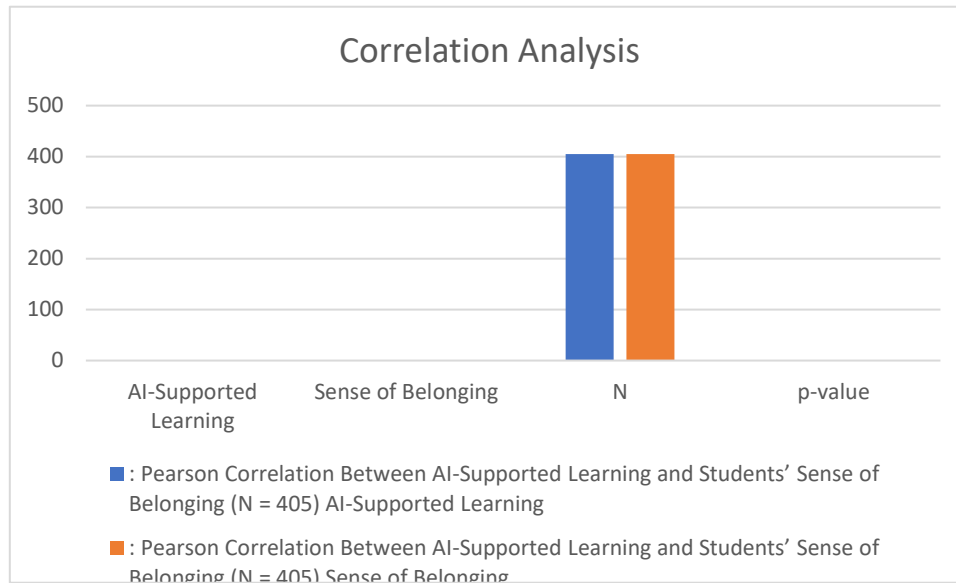


Fig 4: Correlation Analysis

Table 5: Multiple Linear Regression Predicting Students' Psychological Well-Being (N = 405)

Predictors	B	SE	β	t	p
AI-Supported Learning	0.31	0.06	.29	5.17	< .001
Academic Resilience	0.38	0.05	.42	7.53	< .001

Table 5 shows that AI-supported learning and academic resilience positively predicted students' psychological well-being. AI-supported learning was a positive predictor, ($\beta = .29$, $p < .001$) and academic resilience was a positive predictor ($\beta = .42$, $p < .001$). The model explained 41% of the variance in students' psychological well-being, indicating that both predictors contributed to students' psychological well-being.

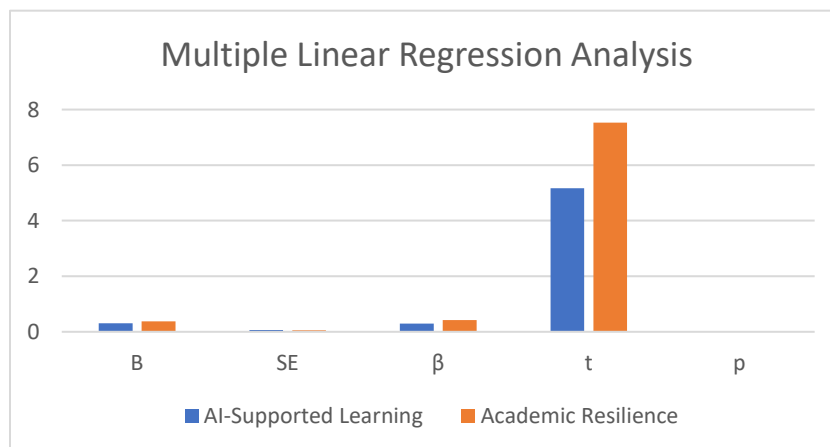


Fig 5: Multiple Linear Regression Analysis

Table 6: Gender Differences in Study Variables (N = 405)

Variables	Male (n = 210) Mean ± SD	Female (n = 195) Mean ± SD	t-value	p-value
AI-Supported Learning	3.72 ± 0.68	3.84 ± 0.64	-1.82	.069
Academic Resilience	3.61 ± 0.59	3.76 ± 0.56	-2.63	.009
Sense of Belonging	3.68 ± 0.65	3.79 ± 0.61	-1.75	.081
Psychological Well-Being	3.65 ± 0.62	3.80 ± 0.58	-2.51	.012

In the case of academic resilience and psychological well-being, differences were observed between genders. Female students indicated a higher level than male students (academic resilience: $t = -2.63$, $p = 0.009$; psychological well-being: $t = -2.51$, $p = 0.012$). Gender differences were not found in the case of the use of AI-supported learning ($t = -1.82$, $p = 0.069$) and sense of belonging ($t = -1.75$, $p = 0.081$). **Table 7: Mediation Analysis of Academic Resilience in the Relationships of AI-Supported Learning with Students' Sense of Belonging and Psychological Well-Being (N = 405)**

Outcome Variable	Relationship	B	BootSE	LLCI	ULCI
Sense of Belonging	AI-Supported Learning to Academic Resilience	0.48	0.05	0.38	0.58
Sense of Belonging	Academic Resilience to Sense of Belonging	0.41	0.06	0.29	0.53
Sense of Belonging	AI-Supported Learning to Sense of Belonging	0.34	0.05	0.24	0.44
Sense of Belonging	AI-Supported Learning through Academic Resilience on Sense of Belonging	0.20	0.04	0.13	0.28
Psychological Well-Being	AI-Supported Learning to Academic Resilience	0.48	0.05	0.38	0.58
Psychological Well-Being	Academic Resilience to Psychological Well-Being	0.39	0.05	0.29	0.49
Psychological Well-Being	AI-Supported Learning to Psychological Well-Being	0.29	0.05	0.19	0.39
Psychological Well-Being	AI-Supported Learning through Academic Resilience on Psychological Well-Being	0.19	0.04	0.12	0.27

As for the mediation analysis, academic resilience completely mediated the relationship between AI-supported learning and sense of belonging (indirect effect = 0.20; confidence interval of the bootstrap = 0.13; 0.28), and partially mediated the relationship between AI-supported learning and psychological well-being (indirect effect = 0.19; confidence interval of the bootstrap = 0.12; 0.27). As a result, we can say that the integration of AI-supported learning has a positive effect on sense of belonging and psychological well-being of the students by increasing their academic resilience.

Discussion

This study analyzed the role of academic resilience in the relationship between AI-supported learning and sense of belonging, while evaluating the effect of AI-supported learning on students' psychological well-being. The results largely demonstrate that AI-supported learning is allied to students' academic and psychological well-being. The results indicate a positive association between

AI-supported learning and sense of belonging. Students using AI-based learning tools to identify and remedy academic challenges, and other feedback and learning support, experience a heightened sense of belonging, and build their confidence, as described in the literature. The review by van Chanda et al. (2025) shows that a sense of belonging at a university is allied to students' psychological well-being and highlights the role of experience of students in a higher learning environment, and in particular the role of students' sense of belonging, and experience of connection and inclusion, in higher education.

The positive relationship between AI-based learning and sense of belonging is even more important because AI can provide students with academic assistance, feedback, and learning support instantly and conveniently. This research shows that, in the opinion of students, when AI-based learning is offered in combination with human (teacher and peer) assistance, students experience improved sense of belonging and psychological well-being. This means that students using AI-based learning to help them to handle academic challenges, and to learn complex academic issues, may feel empowered and supported in the educational environment to participate in learning activities. The review by Irikefe et al. (2026) shows that the excessive use of AI tools to replace human support and interaction may result in students feeling lonely and socially excluded. The current results indicate that the benefits of using AI-supported learning systems may be determined by how AI is integrated into the broader educational environment. In general, AI-supported systems may be more beneficial when they help learners with their learning, and at the same time support them in developing positive learning relationships with teachers, classmates, and the educational institution (Saharudin, 2026).

The results support the notion that the presence of unnecessary academic problems may negatively affect students' well-being. The absence of unexplained academic problems leads students to use their academic resources more effectively. AI supports students' organizational and learning problems by providing structured activities. Students can access feedback and explanation through AI (Nurfaizal et al., 2025). In this respect, the combination of AI-based learning and students' personal resources can support students' learning, and the negative academic problems that may affect students' well-being may be resolved. The present findings, which can only provide evidence of a relationship, should be interpreted with this understanding in mind. It has also been highlighted in the literature that psychological well-being and educational experiences may influence each other over time in both directions (Alwakid et al., 2025).

The gender analysis showed that significant differences existed for academic resilience and psychological well-being, where the former showed higher levels, and for AI-supported learning and sense of belonging, where the differences did not exist. This suggests that, in general, individuals may experience AI-based learning and institutional belonging similarly across genders, and that differences may exist for psychological well-being and coping. The result supports recent studies that have shown variations in students' sense of belonging and well-being exist according to demographic and other individual factors. The gender differences should not be misinterpreted as greater resilience and well-being for one gender in particular (Nendauni, 2025).

Conclusion

This study found that use of AI in learning had a positive impact on students' sense of belonging and psychological well-being. Participants reported sense of belonging in relation to AI-supported learning, and psychological well-being because of both AI-supported learning and academic resilience. Concerning sense of belonging, females and males did not show any differences in AI-supported learning; however, in academic resilience and psychological well-being, females outperformed males. These results highlight the need to integrate technology-based learning tools with students' personal academic resources.

This study also confirmed the mediating role of academic resilience in the relationships between AI-supported learning and students' sense of belonging and psychological well-being. In other words, the use of AI in higher education has the potential to improve students' experiences in the academic world, especially in the area of coping and recovering from psychological academic difficulties. This implies that those Higher Education Institutions that implement the use of AI-supported learning should foster the use of AI while developing students' academic resilience and human contact and social relations. These strategies should be integrated to enhance a safe and caring context, psychological and academic, in universities.

Future Implications

Further study of AI-supported learning, sense of belonging, academic resilience, and psychological well-being should include larger and more diverse student populations in various learning environments. Long-term studies can analyze how the variables change over time. Other studies should focus on students' perceptions and experiences of AI-supported learning. Still other studies may look at the relationship between AI-supported learning and academic engagement, social support, and self-efficacy, as well as other psychological and emotional factors. Educational institutions should work to better understand responsible AI-supported learning

practices to promote academic well-being and psychological resilience of students. Thus, they may develop academic and psychological resilience activities, alongside human interaction.

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