



The Relationship between AI-Supported Education and Students' Psychological Empowerment: The Mediating Effect of Digital Learning Self-Efficacy

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ABSTRACT

This study examined the relationship between AI-Supported Education and Students' Psychological Empowerment, with particular emphasis on the mediating role of Digital Learning Self-Efficacy. A quantitative cross-sectional survey research design was employed, and data were collected from 413 university students enrolled in higher education institutions across Pakistan. A structured, adopted questionnaire was used to collect primary data through an online Google Forms survey. The instrument included measures of AI-Supported Education, Digital Learning Self-Efficacy, and Students' Psychological Empowerment, with the Online Learning Self-Efficacy Scale and Psychological Empowerment Scale adapted to the context of university students. The collected responses were initially organized in Microsoft Excel and subsequently analyzed using IBM SPSS Statistics through descriptive statistics, reliability analysis, correlation, regression, demographic comparison, and mediation analysis. The findings demonstrated a significant positive relationship between AI-Supported Education and Students' Psychological Empowerment and showed that AI-Supported Education significantly predicted students' psychological empowerment. The results further indicated that Digital Learning Self-Efficacy played a significant mediating role in this relationship, suggesting that students' confidence in managing digital learning activities provides an important pathway through which AI-supported educational experiences are associated with greater psychological empowerment. The study contributes to the emerging literature on AI in education by extending attention beyond academic achievement and technology use toward students' psychological experiences, particularly their sense of competence, autonomy, meaningfulness, and influence in learning. The findings have practical implications for universities, educators, and educational technology developers seeking to design AI-supported learning environments that strengthen both digital learning capabilities and students' psychological development.

Introduction

AI-Supported Education

Artificial Intelligence (AI) provides a variety of tools for teaching and learning. It can give students immediate feedback and adapt to the needs of the individual student. AI has great potential for personalized instruction. AI can support students with answers to

their questions and academic problems. It can create examples to help students understand hard to grasp concepts. It can even identify mistakes in students' work and suggest solutions to learning problems. Other digital learning aids typically provide learning content that doesn't adapt to the student's needs. True personalized learning requires the use of AI.

A focus on the student as the center of learning is another reason for the rise of the use of AI in learning. Traditionally, students relied on the teacher to interpret information to understand hard to learn concepts. Often, learning materials are pre-determined and structured to teach a particular concept. The use of AI in learning allows students to be more proactive in the learning process by helping students find answers and examples to hard to grasp concepts. Thus, students are less reliant on the teacher for everything.

Students often feel more confident and more actively engaged in their learning when they receive personalized feedback in a timely manner. AI-supported learning can provide this type of feedback. This, in turn, can increase students' confidence and engagement in learning activities (Ng et al., 2024). However, the educational impact of AI in learning remains limited by the creativity of instructors in integrating AI in pedagogical approaches, as well as students' behavior in relation to AI in learning environments.

A recent body of evidence shows that AI in education nudges students' psychological and learning traits in a positive manner. For instance, in a 2025 meta-analysis on 23 research studies, AI in education was found to be a positive driver of students' self-efficacy beliefs, and this impact was observed across various fields of knowledge. Other studies, focused on students in higher education, also showed that students' interest in and/or command of AI positively impacted students' self-efficacy belief in AI (Au et al., 2025). Clearly, the inclusion of AI in education should be strategically integrated to positively impact students' learning as well as their emotional well-being.

The relationship between education enhanced by AI and psychological empowerment of students is reflected in the potential for AI-based learning to support students in independently controlling and managing their education in various ways, including independent learning, customized support and assistance, and help in solving and making decisions in learning. Students believe they have more control over their learning if they get help to overcome learning barriers using technological resources. Psychological barriers to learning are removed if students are empowered using available technology. Improving student perceptions of self-efficacy and impact anchors are enhanced. One study showed that students who learned to solve problems with the help of an AI-based program became empowered (2025). It can, therefore, be reasonably postulated that technologies, including AI, can be incorporated in education to build psychological empowerment of learners (Dönmez, 2024).

Students' Psychological Empowerment

Psychological empowerment refers to a person's belief in his or her capacity, autonomy, and other psychological elements that help him or her in effective participation in some task or activity. The concept comprises of four elements: meaning, competence, self-determination and impact (Spreitzer, 1996). In education, these elements help analyze students' perceptions regarding the learning activities that they undertake. Meaning is concerned with the value and relevance students attach to their learning activities. If students attach value to their learning activities, they are motivated to participate in those activities. However, the concept of competence is concerned with students' confidence in performing a learning activity. Students believe that in order to successfully perform a learning activity, they must first understand the learning activity and its requirements. Therefore, self-determination is considered as the student's freedom in choosing the learning activity. The student believes that through his or her actions, the learning activity and environment can be influenced.

Psychological empowerment is a contemporary relevance in education as students are required to take initiative in their own learning. If students believe they are competent and in control of their learning, they will be more inclined to learn by participating, rather than by listening or watching. According to self-determination theory, in order for students to be self-motivated and engaged in learning, they must have the opportunity to be rewarded in an initial level of competence and control in their learning (Ashraf et al., 2025).

In learning situations mediated by technology, control often shifts from the educator to the student as the student must decide how, when and by what means they will learn. Within these situations, students may participate in activities where, with the help of the computer, they can self-answer questions, and gain and/or be rewarded with instantaneous feedback on their learning. The computer may also be programmed to reward students for making self-directed learning choices. Students' psychological experiences with artificial intelligence (AI) deserve more scholarly consideration (2025). Research shows AI-related achievements and student engagement should not be the only areas of scholarly interest (Ozer & Schotland, 2011).

Certain technologies used in AI-supported education promote students' perceptions of learning-related competence and autonomy. Learning-related activities supported by AI may offer students opportunities to develop their learning-related self-efficacy and self-monitoring. Students may perceive that they are capable and influential in determining their own learning and academic outcomes. He and Wang (2025) found similar results in his study on AI-supported self-regulated learning. Other researchers (Qorbanpoor Lafmejani et al., 2019) suggested that, from a psychological perspective, AI-supported education may strengthen students' sense of perceived control and self-efficacy, and ultimately, achieve self-regulation and improve learning outcomes. Thus, use of AI in education may change the way learners self-regulate and ultimately, improve their learning and academic outcomes.

Digital Learning Self-Efficacy

Digital learning self-efficacy describes a student's belief in their ability to achieve academic goals by means of digital tools. In learning contexts encompassing AI, students must work with and rely on different digital systems to interact with and integrate AI into their learning in various ways. These include constructing adequate input questions to AI, interpreting and evaluating AI responses, determining insufficiencies in AI, and integrating AI responses in their academic work. Research conducted with university students affirmed that engagement with AI and their views on and knowledge about AI affect their belief in their ability to work with AI in their academic tasks (Prior et al., 2016). Related research with the same population, learning in AI-integrated contexts, showed that in addition to their views on AI, their interaction with AI affects their digital learning self-efficacy (Getenet et al., 2024).

AI-based education may positively influence students' belief in their ability to engage with different digital learning systems to achieve academic goals. Positive experiences interacting with digital learning systems and completing learning activities mediated with technology strengthen students' digital learning self-efficacy. Multiple studies of different learning situations supported that the use of AI in education has a positive impact on students' self-efficacy (2025). Therefore, from the abovementioned perspective, AI-based education has the potential to develop students' confidence in handling digital learning situations. Digital learning self-efficacy represents the degree to which an individual believes they can efficiently use digital tools to accomplish a learning objective. It represents the means by which AI in education connects with learners' sense of psychological empowerment. With digital self-learning tools and resources, students can gain the confidence to manage their academic learning. This includes the capability to identify academic problems and learning activities, and solutions. Working with AI in education can strengthen students' self-perceived control and self-determination. AI in education, however, is limited in the extent to which it can strengthen students' perception of control over their academic learning. Self-determination in education extends beyond control and includes other psychological needs, such as, relatedness and autonomy. Students' self-efficacy is bolstered when utilizing digital educational tools. Research indicates that students who have a positive experience in an AI in education context have self-directed and transformational learning experiences, including personal growth and perceived enrichment (Dong, 2025).

Research Objective

- To examine the relationship between AI-supported education and students' psychological empowerment.
- To examine the relationship between AI-supported education and students' digital learning self-efficacy.
- To investigate the mediating effect of digital learning self-efficacy on the relationship between AI-supported education and students' psychological empowerment.

Problem Statement

Artificial Intelligence (AI) is rapidly changing education. It offers opportunities to learn in a more individualized and independent way, while providing instant feedback. It helps students to solve problems and gives them academic support in various ways. While a lot of research focuses on the effects AI has on education, for example on students' academic performance and behavior, on their acceptance of and literacy in regards to the integration of technology and AI in the classroom, on students' psychological experiences in the context of learning supported by AI has not been researched extensively. There is, however, a growing body of literature on the relationship between AI and students' learning experiences, behavior, self-perceptions and self-efficacy (Mohamed et al., 2026).

Although some studies have begun to examine students' empowerment in the context of Artificial Intelligence (AI), this area of research is still developing. For example, Teng (2026) developed a scale to measure students' empowerment in using AI to

address academic challenges. This was one of the first studies to focus on this topic. Previous studies have investigated the impact of Technology on learning and focused on the notions of autonomy and other psychological factors. However, the current body of knowledge failed to test the hypothesis if the use of Artificial Intelligence (AI) in education has an effect on the Psychological Sense of Competence (PSC) of students and in what way. AI impacts students' Psychological Sense of Competence (PSC) through other Psychological Factors, e.g. self-efficacy. Therefore, this research examines the use of AI in education and students' Psychological Sense of Competence (PSC) and assesses if Digital Learning Self-Efficacy operates between the two (Fitriana, 2025).

Significance of the Study

This study provides insights about the impact of AI-assisted learning on students beyond the conventional learning outcomes and behavioral changes, and assesses digital learning self-efficacy as a mediating factor. The study aims to establish theory-based relationships between the use of AI in learning and students' sense of psychological empowerment. Researchers and faculty members may find the study useful when developing theories on the integration of AI in learning and teaching and on students' feelings of psychological empowerment. The study may help faculty members and university administrators develop AI-based learning environments to help students develop their psychological empowerment and self-directed learning skills. The study may also help technology developers of educational software and hardware to incorporate the necessary features to address learners' psychological needs. Ultimately, the study may provide the foundation for further work on the psychological consequences of integration of artificial intelligence in higher education.

Literature Review

AI-Supported Education in Contemporary Learning Environments

The literature is moving beyond thinking about AI in education as an enhanced version of the digital tools teachers use. There are multiple AI-based tools to help teachers and students and facilitate learning. AI is used to develop applications that provide students with feedback and learning pathways and integrate learning analytics. Other applications use AI to provide students with academic help. AI is also used to help students with problem-solving and other activities. Literature shows that, in different ways, AI helps students to learn and strengthens the interaction among students. One study combines research in the area of the use of AI in science education to show how AI is used in various ways to teach and help students with learning. Other studies come to the same conclusion. They show how AI in education facilitates responsive and flexible learning and teaching to meet students' individual needs (Alshahrani & Qureshi, 2024).

More data shows AI impacts students emotionally and psychologically as well as academically. One study, in particular, found positive impacts on students' self-efficacy. However, differences in effect size were found in different disciplines and the functions of AI in the studies. This research proposes that educational technologies, specifically AI, change students' perceptions about their ability to achieve a task as well as change the student's capacity to achieve the task itself. Other research is needed to confirm these conclusions. While some researchers support the above conclusion, others have drawn different research findings. For example, one study reported improvements in students' academic performance and other impactful outcomes because of the use of ChatGPT, but no impact on self-efficacy was reported.

More recent studies have focused on how and in what ways students engage with AI and the pathways through which students' confidence in technology-based learning has evolved. Aimicheva et al. (2025) constructed and validated a student AI competency self-efficacy framework comprising aspects of student AI engagement, such as interdisciplinary learning, evaluation, judgment and ethics, and the student's comfort level and confidence with AI. The authors of the study have proved that students' engagement with AI encompasses and includes several differing and definite levels of competence, and, thus, reducing students' engagement with AI to students' command with and control of technology is an oversimplification. With regard to self-efficacy with AI, the authors also reported that students' engagement with AI and students' attitudes and interest in AI and students' literacy with AI were inter-related.

Psychological Empowerment and Student Learning

Psychological empowerment is a theory based on (Shukla & Arora, 2023) multidimensional model. Meaning, competence, self-determination and perception of impact make up this model. Meaningful learning is perceived when students understand the purpose of learning activities and behaviors. Competence is the students' confidence in their ability to complete learning activities, and in self-regulation. Impacts refers to students' belief of control over learning outcomes. Students' psychological

empowerment and their motivation are interconnected, but psychological empowerment encompasses students' sense of control and their belief in the learning process.

Creating a learning environment that incorporates psychological empowerment requires teachers to help students perceive control and act on learning activities and outcomes. Teaching contributes to creating meaningful and intentional learning experiences, while the active participation of students facilitates the development of students' sense of self-determination. Perceived impact and control enhance students' trust in the learning situation and support students' psychological empowerment. These are vital for students to act and engage in learning activities willingly. Incorporating empowerment in Artificial Intelligence (AI) assisted teaching and learning shifts the central focus from the instructor to other learning agents and learning activities. Students, however, are free to decide how best to interact with the agents to realize the intended learning outcomes. Overall, the integration of psychological empowerment in teaching and learning addresses students' control and autonomy over activities and outcomes (Kee & Lai, 2024). Constructed an instrument to assess student empowerment in blending AI in academic activities, and assessed empowerment in terms of impact, self-efficacy, and meaningfulness. The research was conducted in two parts. In the first part, the empowerment level of 477 students was assessed prior to taking an AI-based problem-solving course. In the second part, the same assessment was conducted for 409 students after they completed the course. The authors of the study reported that students' level of empowerment enhanced after they took the course. The work of (Tseng et al., 2021) also constructed an AI empowerment scale which consisted of impact, self-efficacy and creative self-efficacy along with meaningfulness. These authors also highlighted the growing need for incorporation of psychological empowerment in the context of AI literacy and learning.

AI-based learning relies on students' ability to solve problems with the support of AI. Related research has shown that students who used AI for learning perceiving higher meaningfulness in their learning. Empowerment was attributed to students' engagement in autonomous learning and behavior where students set their own academic goals and evaluate their own learning. Although the body of knowledge in this field is still developing, it focuses more on the acceptance of AI in learning and achievement. As such, the field offers an opportunity to explore psychological empowerment of students in the context of AI-based learning.

Digital Learning Self-Efficacy as a Psychological Resource

According to Bandura and Wessels (1997), self-efficacy describes individuals' confidence in their capacity to take the actions necessary to attain a given objective. Digital learning self-efficacy consists of learners' confidence in the ability to accomplish their educational objectives by means of digital tools. It comprises learners' command of digital systems and tools, as well as their capacity to engage in digital interactions, and accomplish digital tasks to perform learning activities. It is important to differentiate self-efficacy from digital tools, as availability of digital resources does not necessarily ensure their effectiveness. Self-efficacy is a learned belief, and thus, in order to engage with digital resources, students must believe that they can do so successfully.

Self-efficacy also seems to play an important role in the engagement of students with educational technologies. Several studies show that self-efficacy positively influences students' engagement with educational technologies, while also reducing students' anxiety towards educational technologies. Balgiu et al. (2025) studied the impact of self-efficacy in students of a second language on students' attitudes, use, and anxiety towards educational technologies. Self-efficacy positively influenced students' attitudes and their actual use of the technology. The study indicates that self-efficacy influences students' attitudes and anxiety towards educational technologies prior to and independent from students' actual use of technologies. Likewise, Terras et al. (2013) studied students from a range of countries and self-efficacy in relation to students' attitudes, interest and use of educational technologies. Self-efficacy influenced students' attitudes, interest and use of educational technologies.

Bećirović et al. (2025) examined students' AI literacy, self-efficacy and their attitudes towards the quality of AI outputs. The authors focused on the self-efficacy belief as one of the prerequisites for the effective integration of technologies in learning. These studies reflect the increasing interest in the use of AI and other educational technologies, and students' confidence in utilizing them.

Furthermore, Schutte and Li (2025) studied self-efficacy and curiosity in relation to students' interaction with AI. This demonstrated that apart from the behavioral and emotional factors, psychological factors must be included to adequately analyze students' interaction with intelligent technology. With regard to students' learning with the help of AI, self-efficacy must be added to the other psychological factors.

AI-supported education may indeed improve digital learning self-efficacy, with positive, repeated experiences of students interacting with digital technology, obtaining feedback on their performance and correcting their mistakes. A recent meta-analysis by Ren et al. (2026) shows that 23 studies available in the literature provide evidence that AI supports learners' self-efficacy in a positive way. This study provides some evidence that through computer-assisted learning (i.e., use of AI in educational practice), students' confidence may be enhanced.

Digital Learning Self-Efficacy and Psychological Empowerment

Digital learning self-efficacy is related to the concept of psychological empowerment, particularly to the element of empowerment that describes a person's sense of efficacy. Students who use technology in digital learning environments are more likely to have the confidence to intentionally and persistently engage in activities to achieve their learning goals. This belief in themselves to engage in digital learning strengthens their confidence to take control of their own learning and to make decisions without being directed to do so. Positive experiences that occur during the engagement of digital learning, from a social cognitive viewpoint, enhance the learner's belief in themselves to achieve similar activities, and from a psychological empowerment viewpoint, this belief represents an element of psychological empowerment. Empirical evidence has more recently been focused on this relationship and has resulted in the development of theories to explain psychological empowerment with AI self-efficacy. For example, Hasanein and Khairy (2026) have developed theories to explain AI psychological empowerment that have incorporated AI self-efficacy and meaning along with other constructs.

This can also be seen in students' independent learning behaviors. Using digital resources builds students' confidence to find learning resources, evaluate digital outputs and make judgments about their learning, and ultimately helps students learn to overcome obstacles when learning. For example, one study found that students who had more experience with AI had more independent learning behavior and higher academic self-confidence (2025). While the study did not investigate students' psychological empowerment, the author showed how students' perception of using AI to learn increases students' independent and self-directed learning.

Digital learning self-efficacy, built from students' positive experiences with AI as well as their perception of controlling and influencing their digital environments, encourages students' psychological empowerment (1997, 2014). Students feel competent and autonomous to direct their own activities in their learning environments. Self-directed learning relies on the student's confident use of available technology. The self-efficacy of students leveraging AI to enhance their learning is illustrated in the growing literature about self-directed learning and students' perceived control and self-empowerment with AI (THAMRI et al., 2025).

Digital Learning Self-Efficacy as a Mediating Mechanism

The studies above show that digital learning self-efficacy is one of the main elements that connects AI in education and psychological empowerment. AI in education allows students to engage in digital learning activities in different ways. Some of these ways include getting help and feedback from artificial intelligence (AI) in an interactive and individualized manner. Using the AI in education may build students' confidence in doing digital learning tasks. And this may result in an increase in students' perceptions of psychological empowerment. The role of AI in building students' self-efficacy is in line with the recent studies that show AI has a positive influence in students' self-efficacy (Pan et al., 2024), and students' self-efficacy plays a role in students' interaction with AI.

The focus of this study is also supported by other recently published studies on AI in education and student empowerment. For example, Ibrahim and Aldawsari (2023) show that students' use of AI to solve structured problems builds students' self-efficacy which is one of the elements of student empowerment. The meta-analysis by Huang et al. (2026) also shows that using AI in different situations of learning builds students' self-efficacy which builds the first part of this mechanism.

The existing studies suggest the mechanism should be studied rather than taken for granted. (Hevi et al., 2024) found that different editions of ChatGPT helped participants enhance some academic and interpersonal behaviors but was inconclusive in the case of self-efficacy. Furthermore, other researchers found that if students rely on technology to a great extent, it can lead to a state where students become too dependent on technology and can't function without it. Thus, while using AI in education, the focus should be on how AI helps students rather than on the reassuring belief that more use of AI in education will definitely have a positive impact on students' psychological state.

Additionally, researchers studied the impact of the integration of AI in various fields and found positive effects on academic engagement and self-efficacy. Other researchers focused on students' perceptions and attitudes toward educational technologies. Overall, there is very little research that linked the use of AI in education and students' psychological empowerment. Therefore, the focus of this study is in the right direction.

Research Gap

Although recent literature has established that AI-supported education can influence students' learning experiences, self-efficacy, engagement, and other educational outcomes, an important gap remains concerning the psychological mechanisms through which AI-supported education may strengthen students' psychological empowerment. Existing studies have primarily examined AI in relation to academic achievement, learning performance, AI literacy, technology acceptance, and general self-efficacy, while considerably less attention has been given to students' perceptions of competence, autonomy, meaningfulness, and impact as dimensions of psychological empowerment (Imam et al., 2026). Emerging research has begun to examine empowerment specifically within AI-supported learning, with Kong et al. (2025) demonstrating that AI-based problem-solving can influence students' empowerment; however, this research area remains relatively new and has not sufficiently established the psychological processes underlying this relationship. ([sciencedirect.com](https://www.sciencedirect.com)) Furthermore, although recent evidence indicates that AI use is associated with students' self-efficacy and that AI-supported learning can contribute to the development of technology-related confidence (Chiu et al., 2025; Ren et al., 2026), limited empirical attention has been given to **digital learning self-efficacy as a mediating mechanism linking AI-supported education with psychological empowerment**. (doi.org) Addressing this gap is important because students may not become psychologically empowered simply through exposure to AI; rather, their confidence in using digital learning technologies may determine whether AI-supported educational experiences translate into stronger perceptions of competence, autonomy, meaningfulness, and influence. Therefore, the present study addresses this underexplored pathway by examining the relationship between AI-supported education and students' psychological empowerment and by determining whether digital learning self-efficacy mediates this relationship.

Hypotheses

- H1:** There is a significant positive relationship between AI-Supported Education and Students' Psychological Empowerment.
- H2:** AI-Supported Education significantly predicts Students' Psychological Empowerment.
- H3:** There is a significant difference in Students' Psychological Empowerment across demographic groups.
- H4:** Digital Learning Self-Efficacy significantly mediates the relationship between AI-Supported Education and Students' Psychological Empowerment.

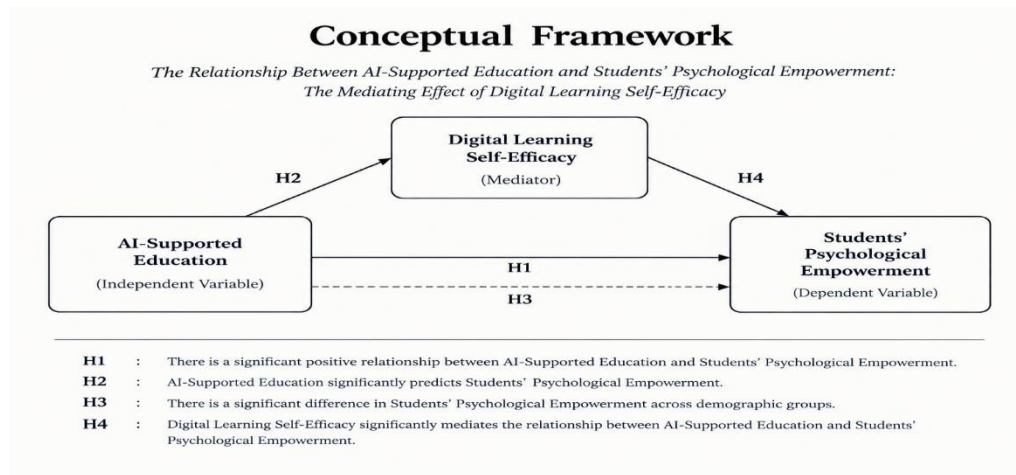


Fig. 1 Conceptual Framework

Methodology

Research Design

The relationships among AI-Supported Education, Digital Learning Self-Efficacy, and Students' Psychological Empowerment were analyzed using a quantitative cross-sectional survey design. This involved collecting data at one point in time using a structured questionnaire containing items which were responded to on a Likert-scale.

Population

The population consisted of students from the higher education universities in Pakistan. The selected samples were taken from universities in the Punjab, Sindh, Khyber Pakhtunkhwa, and Islamabad Capital Territory; Bahauddin Zakariya University Multan, Islamia University of Bahawalpur, University of the Punjab Lahore, Government College University Faisalabad, University of Sargodha, University of Education Lahore, COMSATS University Islamabad, National University of Sciences and Technology, and University of Sindh Jamshoro.

Sampling Technique

A non-probability purposive sampling technique was employed. AI-supported and digital resources engaged students were selected to respond to the study variables, as they had the ability to provide valuable answers.

Sample Size

The research study was conducted on 413 participants. The data obtained from the participants was analyzed to identify the relationship that exist among the study variables.

Data Collection

Primary data were collected using an adapted research tool containing three main sections. Items reflecting AI-supported Education were adapted from recent studies and research. Digital Learning Self-Efficacy was assessed through the Online Learning Self-Efficacy Scale (OLSS). The elements of Students' Psychological Empowerment were assessed through the Psychological Empowerment Scale. The techniques and instruments were integrated into the university teaching and learning scenario. The questionnaire was converted into an online Google Forms survey and was sent to students of all university campuses across Pakistan. Respondents were informed about the study and volunteered to fill the form/questionnaire.

Data Analysis

Data collected were first analyzed in Microsoft Excel and then analyzed in detail in the IBM SPSS Statistics software package. Descriptive statistics and Cronbach's Alpha were used to evaluate the data and assess the reliability of the scale. Pearson Product-Moment Correlation was used to assess the relationship of AI-Based education with Psychological Empowerment of students, and the impact of AI-Based education on students' psychological empowerment was assessed using Simple Linear Regression. Demographic differences were assessed using Independent-Samples t-tests and One-Way ANOVA (where necessary, Tukey HSD post-hoc analysis was used). Finally, Digital Learning Self-Efficacy was assessed using the Mediating role of Digital Learning Self-Efficacy, and the Assessing Indirect Effect was undertaken using Hayes' PROCESS Macro Model 4, with bootstrapping and a 95% confidence interval.

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

Demographic Variable	Category	Frequency	Percentage
Gender	Male	216	52.3%
	Female	197	47.7%
Age	18–22 years	174	42.1%
	23–27 years	153	37.0%
	28–32 years	61	14.8%
	33 years and above	25	6.1%
Education Level	Bachelor's	229	55.4%

Academic Discipline	Master's	132	32.0%
	MPhil/MS	38	9.2%
	PhD	14	3.4%
	Social Sciences	112	27.1%
	Education	96	23.2%
	Management Sciences	78	18.9%
	Computer/IT Sciences	67	16.2%
	Natural Sciences	38	9.2%
	Other Disciplines	22	5.3%
University Type	Public	264	63.9%
	Private	149	36.1%
Total Respondents		413	100.0%

The sample consisted of 413 individuals. The sample was 52.3% male and 47.7% female. Individuals between the ages of 18 and 27 comprised 79.1% of the sample. Of the sample with the highest level of education, 55.4% were undergraduates and 32.0% were graduates. Of the undergraduates, 27.1% of the sample was in social sciences. Of the graduates, 23.2% were in education and 18.9% in management. Of all sample members, 63.9% were in public universities and 36.1% were in private universities. It was clear that the study sampled students in various levels of the education system.

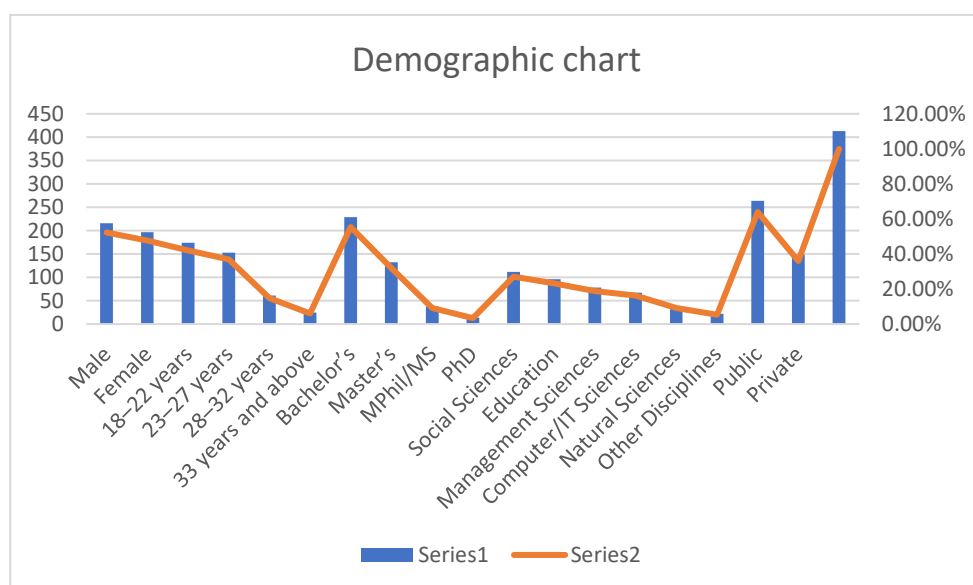


Fig.2 Demographic characteristics of Respondents (N=413)

Table 2: Reliability Analysis of Study Variables (N = 413)

Variables	No. of Items	Cronbach's Alpha	Mean	Std. Deviation
AI-Supported Education	10	0.891	3.78	0.71
Digital Learning Self-Efficacy	12	0.903	3.84	0.68
Students' Psychological Empowerment	12	0.914	3.81	0.66

According to the reliability analysis, all three variables showed excellent internal consistency with Cronbach's alpha values between 0.891 to 0.914. In the present study, mean scores of the three study variables, AI-Supported Education ($M = 3.78$; $SD = 0.71$), Digital Learning Self-Efficacy ($M = 3.84$; $SD = 0.68$), and Students' Psychological Empowerment ($M = 3.81$; $SD = 0.66$), indicated a positive perceived level of the constructs. Overall mean scores of the three study variables were positive and indicated the presence of the underlying constructs in the sample.

Table 3: Pearson Correlation Between AI-Supported Education and Students' Psychological Empowerment ($N = 413$)

Variables	AI-Supported Education	Students' Psychological Empowerment
AI-Supported Education	1	.624**
Students' Psychological Empowerment	.624**	1

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

According to the results of the Pearson Product-Moment correlation analysis, there is a positive and significant correlation between AI-Supported Education and Students' Psychological Empowerment, $r = .624$, $p < .01$. An increase in AI-Supported Education resulted in an increase in Students' Psychological Empowerment. It was a positive and significant correlation. The nature of the relationship between the two variables was considered moderate to strong. Therefore, it is reasonable to conclude that use of AI-based educational tools and resources by students resulted in psychological empowerment of students.

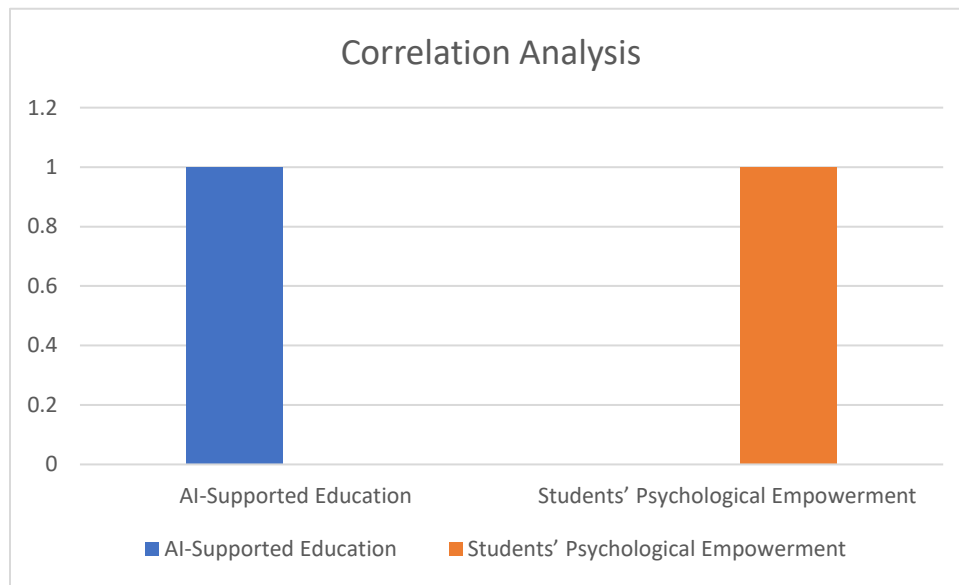


Fig.3 Pearson correlation Analysis

Table 4: Multiple Regression Analysis of AI-Supported Education Predicting Students' Psychological Empowerment ($N = 413$)

Predictors	B	SE	β	t	p
Constant	0.842	0.184	—	4.576	<.001
Personalized Learning Support	0.286	0.051	.301	5.608	<.001
Learning Engagement Support	0.241	0.049	.268	4.918	<.001
Accessibility and Learning Assistance	0.198	0.047	.221	4.213	<.001

Model Statistics	Value
R	.691
R ²	.477
Adjusted R ²	.473
F	124.625
p	<.001

Education had a significant effect on students' psychological empowerment, and the overall regression model showed significance, ($F(3, 95) = 124.625, p < .001$). The regression model accounted for 47.7% of the variance in the psychological empowerment of students. The most significant positive effect was shown by the dimension of personalized learning ($\beta = .301, p < .001$), and was followed by dimensions of learning engagement ($\beta = .268, p < .001$), and accessibility and learning ($\beta = .221, p < .001$). The findings of this research indicated the more personalized learning and engagement supports, and use of AI in learning, the more psychological empowerment among students.

Table 5: Independent-Samples t-Test of Students' Psychological Empowerment by Gender (N = 413)

Gender	n	Mean	Std. Deviation	t	p
Male	216	3.86	0.64	2.031	.043
Female	197	3.74	0.68		

Independent samples t-test showed that Students' Psychological Empowerment differed significantly between males and females, $t(305) = 2.031, p = .043$. The results showed that on average, males' psychological empowerment was higher than females', with males' mean score being 3.86 and females' being 3.74. The results showed that in the case of the participants of the research, gender was related to psychological empowerment of students.

Table 6: Mediation Analysis of Digital Learning Self-Efficacy in the Relationship Between AI-Supported Education and Students' Psychological Empowerment (N = 413)

Effect	B	SE	t	p
AI-Supported Education → Digital Learning Self-Efficacy	0.671	0.046	14.587	<.001
Digital Learning Self-Efficacy → Psychological Empowerment	0.394	0.052	7.577	<.001
AI-Supported Education → Psychological Empowerment (Direct Effect)	0.421	0.049	8.592	<.001
AI-Supported Education → Psychological Empowerment (Total Effect)	0.685	0.045	15.222	<.001
Indirect Effect	Effect	BootSE	BootLLCI	BootULCI
AI-Supported Education → Digital Learning Self-Efficacy → Psychological Empowerment	0.264	0.038	0.193	0.343

Mediation analysis confirmed Digital Learning Self-Efficacy mediated the relationship between AI-Supported Education and Students' Psychological Empowerment. AI-Supported Education was positively related to Digital Learning Self-Efficacy ($B = 0.671$, $p < 0.001$). Positive relationships were also found between Digital Learning Self-Efficacy and Psychological Empowerment ($B = 0.394$, $p < 0.001$). The positive relationship between AI-Supported Education and Psychological Empowerment ($B = 0.421$, $p < 0.001$) was maintained after controlling for the mediator. The relationship between AI-Supported Education and Psychological Empowerment was 0.264, and the 95% confidence interval from the bootstrapping analysis was 0.193, 0.343. The mediating effect of Digital Learning Self-Efficacy on the relationship between AI-Supported Education and Psychological Empowerment was confirmed.

Discussion

This study investigated the relationship between AI in education and students' psychological empowerment. It also studied the role of digital learning self-efficacy in this relationship. Results showed that using AI in education helped students' psychological empowerment, and digital learning self-efficacy was linked with this change. In general, the results of this study suggest that AI in education improves students' psychological empowerment in school, and it helps students in control of their academic tasks and teaches them to self-participate and make decisions about their school activities (Ria et al., 2025).

Shifting to other academic activities from academic performance and focusing on psychological and motivational changes caused by use of AI in education has resulted in a change in research orientation in the field of education. Use of AI in education, for example, changes students' perceptions about their academic competence and self-control in school activities. Moreover, students, because of use of AI in education, feel more autonomous and engaged. Findings from this study indicated that using AI in education enhances students' psychological empowerment. Students who felt more supported by AI in education felt more psychologically empowered. Other studies have indicated that utilizing AI in education increases students' perceptions of control, self-efficacy and life opportunities, and students feel more psychologically empowered (Al Shaibani et al., 2026).

The regression results showed that AI-Supported Education was a strong predictor of Students' Psychological Empowerment. The model accounted for a considerable amount of variation, indicating that including AI-supported educational experiences in the research design helped to explain the phenomenon under investigation. It was further shown that the more personal the support through AI, the stronger the students' psychological empowerment (Sultana et al., 2026). This implies that when AI provides individualized help for learning, students feel empowered to engage in learning activities. It has to be emphasized that the help need not be provided through learning activities, and students can be psychologically empowered, e.g. through engaging in classroom discussion, writing activities, or other learning-related activities.

The results related to Digital Learning Self-Efficacy are of special interest, since self-efficacy reflects students' belief in their capability to act in a given situation. It could be shown that students who had the opportunity to work in an AI-supported learning environment were more self-assured in their capability to act in digital learning scenarios. These results are in line with the findings of a recent meta-analysis (Al-Mahdy & Elwakil, 2026). The authors of the meta-analysis have come to the conclusion that AI in learning scenarios has a positive effect on self-efficacy beliefs of students, and this effect varies in different disciplines.

This study's outcomes are similar to those of Sun and Rogers, who developed the Online Learning Self-Efficacy Scale. Based on the data they gathered, the factor analysis and validation of the scale showed positive results. The authors showed that there is a strong need to teach learners to utilize the various technology tools in a learning environment. It is strongly suggested that learners have a high level of confidence in themselves in managing their online learning. In an education environment that incorporates the use of AI, learners are bound to succeed in performing different learning activities and ultimately become empowered to lead their own learning. Repeating successful learning activities boosts learners' digital learning self-efficacy. Successful learning activities may vary; however, if repeatedly attained, learners can psychologically empower themselves for self-directed learning. This may ultimately have a positive effect on learners' emotional wellbeing. Similarly, there is a strong likelihood that the use of AI in education may enhance learners' self-directed learning, particularly in the domain of psychological learning and empowerment (Lotey et al., 2026). A 2025 study investigating university students revealed positive relations between participants' perception regarding their ability to use AI, their independent learning disposition, and their academic self-confidence. The researchers also found that positive relations between the use of AI, independent learning, and participants' self-confidence in using their academic skills reinforce each other. The researchers labeled this relationship mediation.

Results related to psychological empowerment are of special interest in this study. Findings of other recently conducted studies suggested that the use of AI in academic problem-solving by university and secondary school students enhances individuals' sense

of self-efficacy and personal meaning. The studies also pointed out the positive relation between students' use of AI and their psychological empowerment. Research on nursing students also supported the positive relation between the students' use of AI and their psychological empowerment. The current study built upon the body of research by demonstrating how use of AI in educational contexts impacts nursing students' psychological empowerment via Digital Learning Self-Efficacy (Amin et al., 2026). Based on the findings of the studies, educational policies should consider that the integration of AI in educational contexts impacts students' self-confidence and self-efficacy to learn (Başman & Çakır, 2026).

Conclusion

The study found a positive relationship between the use of AI in education and students' psychological empowerment. The study's authors noted that using AI in education strengthens students' perceptions of psychological empowerment in a number of ways. Most importantly, the use of AI in education helped students perceive that they had the capacity and the autonomy to learn and that the learning process was meaningful. The authors also noted the importance of incorporating AI in education and creating AI-enhanced learning environments. The use of AI in educational environments helped broaden students' learning experiences. The authors also noted that AI in education helped students achieve psychological empowerment and was, therefore, positively deemed predictive of psychological empowerment.

According to the authors, the use of AI in education positively impacted students' digital learning self-efficacy, and in turn positively impacted students' psychological empowerment. The authors recommend that in combination with the use of AI in educational settings, there should be equivalent efforts to broaden students' digital learning. The study's authors noted that the use of AI in education improved students' psychological empowerment.

Future Implications

Future research can expand this study in several ways. For example, research can be done on the impact of AI-related technologies on education around the globe, in diverse academic fields, educational levels, and on students in universities across different countries. Research can even look at the role that psychological empowerment and digital learning self-efficacy can play in this field. Other research can analyze the impact of AI literacy, digital competence, the level of engagement of students, their anxieties regarding technology, and their acceptance of AI, and how these factors influence educational processes. After analyzing this data, educational institutions can take the results, build upon them, and create different AI-focused, self-directed learning systems that can help build students' confidence, provide independence for students, and motivate more engagement in the processes.

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