



## Impact of Artificial Intelligence-Supported Education on Academic Engagement, Psychological Well-Being, and Career Development among University Students

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### ABSTRACT

This study examined the impact of artificial intelligence (AI)-supported education on students' academic engagement, psychological well-being, and career development among university students in Pakistan. A quantitative, cross-sectional research design was employed, and data were collected from 467 university students through convenience sampling from selected universities in Pakistan. Data collection was conducted using an adopted structured questionnaire administered through Google Forms, incorporating measures of AI-supported education, academic engagement, psychological well-being, and career development using Likert-type response scales; completed responses were analyzed using SPSS. The analysis involved descriptive statistics, Cronbach's alpha, Pearson correlation, multiple regression, independent-samples t-test, and one-way ANOVA, with Tukey HSD post-hoc analysis proposed for significant group differences. The reliability analysis demonstrated good to excellent internal consistency across the study variables, with Cronbach's alpha values ranging from .873 to .912. The findings revealed a significant positive relationship between AI-supported education and academic engagement ( $r = .648$ ,  $p < .001$ ), while regression analysis indicated that AI-supported education explained 42.0% of the variance in academic engagement ( $R^2 = .420$ ), 32.6% in psychological well-being ( $R^2 = .326$ ), and 38.8% in career development ( $R^2 = .388$ ), with all associations statistically significant ( $p < .001$ ). Demographic analysis further showed that gender differences were not statistically significant across the three outcomes, whereas age, academic level, and field of study demonstrated significant differences. The study is significant because it provides empirical evidence that AI-supported education can contribute to students' academic participation, psychological well-being, and career development while highlighting the importance of responsible AI use, digital literacy, institutional support, and preservation of student and teacher agency. Overall, the findings suggest that AI should be integrated as a supportive educational resource rather than a replacement for teachers, counselors, or students' independent decision-making.

## Introduction

Artificial intelligence (AI) is transforming every aspect of how students engage with higher education. There are AI-supported systems to help students find information, understand course content, access feedback, and complete course requirements. There are frameworks that support learning and assessment, tools for adapting instruction, and 'learning analytics' tools. In addition,

there are systems like ChatGPT that allow students to generate answers to course questions in real-time. These systems can be optimized to provide students with individualized real-time support (García-Martínez et al., 2023). In addition, generative AI systems can provide students with additional support such as example explanations, example responses, and support for writing and problem solving (Chen et al., 2025).

Students' involvement in learning is changing as artificial intelligence becomes more common in higher education, creating both positive and negative effects on their educational experiences. AI can provide students with support and flexibility outside of regular law hours. Specifically, AI-driven systems can improve learning and participation when employed with a supportive teaching framework (Lo et al., 2024). While this is the case, the use of AI can produce a range of issues including relying on AI for too much work, cheating, and citizenship (Yu et al., 2026). In this respect, the impact of AI will depend on the students and teachers' uses and engagement with the systems.

AI-supported education will likely continue to impact higher education in positive and important ways beyond positive academic outcomes. At its core, university education is about shaping students' psychologies and preparing them for the future. AI may enable students to learn quickly and easily with alternatives for assistance, though its devolution may raise novel pressures and anxieties. Studies of AI based conversational systems suggest some positive mental health outcomes. However, the effects are still context dependent and mixed (Li et al., 2023). Further, AI is rapidly incorporating into the labor market to produce career information and Pathways, wherein students may use AI to detect and cultivate future skills (Sarmurzin et al., 2026). Analyzing notions of psychosocial well-being may help articulate other concerns that AI-supported learning systems may pose to university students.

### **Artificial Intelligence-Supported Education**

Artificial Intelligence (AI) in education refers to the use of AI technologies in teaching, learning, assessment, personalized educational support, and educational decision-making processes. AI systems are able to analyze learning data, produce tailored responses, provide step-by-step guides and feedback. In contrast to other digital learning technologies, AI-supported systems can respond to input and provide an educational experience that is tailored to an individual user. As such, recent studies consider AI as a leading innovative technology in higher education.

AI-supported education offers students immediate support and access to educational resources. Applications of Generative AI can aid in explaining difficult concepts, providing examples, supporting writing tasks and helping students with assignment and problem-solving kits. Generative AI's positive impact on learning has been documented in several recent systematic reviews (Pinkwart & Liu, 2020).

However, the beneficial effects of AI on education can still not be guaranteed. Heavy reliance on AI will eventually limit students' ability to interpret data, create ideas and solve problems. Generative AI also has the potential to foster unhelpful behavior and misinformation (Polat & Varol, 2026). As a result, it is essential to view AI as a supplement to existing educational resources instead of a substitute for teachers' work or students' intellectual work.

### **Academic Engagement**

Academic engagement describes the component of a student's involvement in their own education, both in effort and in participating activities. Engagement has three elements, which include the behavioral, emotional, and cognitive levels of engagement. Behavioral engagement is the student's participation along with the effort they put into the activities. Emotional engagement describes the student's interest and feelings toward the learning process. Cognitive engagement is the student's level of concentration toward self-regulation along with the investment of effort to learn. It is important that students are behaviorally and emotionally engaged because it encourages them to persist in participating in academic activities. It leads to more meaningful learning experiences for the students (Alrashidi et al., 2016).

AI in education can potentially strengthen academic engagement and enhance the interaction between students and educational content. AI applications can provide automated feedback with personalized hints and/or aligned practice activities that target academic engagement. Engagement within academic tasks has been reported to increase from the use of AI-based learning systems (Greenwood et al., 2002). The use of instructional AI that provides individual personalized instruction could allow students to quickly address their learning difficulties rather than become disengaged in learning tasks. The use of Instructional AI-based systems to support education is expected to enhance academic engagement if they are designed to promote active participation and meaningful learning. Students may be more cognitively and behaviorally engaged if they have support available at their disposal to

them for assistance during learning. However, this support may not be enough if learners use AI to complete tasks with no engagement toward learning.

The findings of (2024) indicate that when considering the impact of AI on engagement, the focus should be on how students are utilizing AI. This may also be the case when AI-supported education is implemented responsibly and in an academically meaningful way. When the demands of higher education systems grow, the cultural feasibility of education decreases. However, when technology-based education is implemented intelligently, students' level of engagement and the cultural feasibility of education may be preserved. Most processes of technology-based education can be implemented by students in a self-instructional way (Acosta-Gonzaga, 2023).

### **Psychological Well-Being**

Psychological well-being relates to the balance of positive emotions and satisfaction with life coupled with a high ability to cope with the everyday challenges of life. For many reasons, psychological well-being holds special significance for students at the university level. From concerns about future uncertainty to social pressures and the burdens caused by the combination of a demanding academic workload and a stressful exam schedule; there are many psychological variables impacting students at this level. The impacts caused by the growing integration of AI in education have caused another variable to emerge. AI provides students with both academic and informational support. Using personalized instant assistance and removing certain barriers to learning can reduce some forms of academic frustration and uncertainty (Alsayed et al., 2024). Thus, AI can affect the psychological experience of a student in educational settings both positively and negatively (Ryff & Keyes, 1995).

A student may achieve a higher psychological well-being if AI is properly integrated to remove unnecessary barriers. Conversely, AI-related concerns may increase and so may the sense of technological uncertainty. In addition, there is always a threat of psychological well-being being negatively affected if human interaction in educational settings is decreased. Recent studies show that AI is useful when used appropriately and responsibly with adequate human support, in contrast to the belief that it can be an isolated solution to various psychological issues of students (Benchallal, 2025). In this context, supportive AI pictures education and psychological well-being in a positive light, only when human interaction is not entirely replaced by technology.

### **Career Development**

Career development describes students' ability to gain career awareness, identify career interests and skills, acquire relevant skills, explore different career options, and make informed decisions about their career. Relevant skills for career development now include digital skills, flexibility, communication, and an ability to learn and use new technologies and systems. The rapidly evolving AI technologies have impacted the skills required in many professions and made having digital skills a priority for today's students (Daniel et al., 2025).

AI can aid students in developing skills that are useful in the workplace by teaching students the skills and technologies that are relevant in the workplace. Tools within AI-based learning can aid students in developing skills such as technology and digital skills, problem-solving skills, and information-processing skills. AI's ability to generate language can aid students in developing skills that are useful in the workplace. Additionally, AI tools can aid students in gaining information about careers and job opportunities (Herr, 2001).

AI-assisted education will provide students with the ability to engage with workplace technologies, and in the process, develop the relevant skills and competencies for changing workplaces. The technologies and more personalized AI-based career counseling systems can assist students in accessing information and career recommendations. Choosing a career path is an active decision students need to make for themselves and should not be fully reliant on what algorithmic suggestions may be.

Hence, AI-guided education can have the potential for career alignment as it integrates advanced technological learning and student choice and responsible adult support.

### **Research Objectives**

- To examine the impact of artificial intelligence-supported education on academic engagement among university students.
- To determine the impact of artificial intelligence-supported education on psychological well-being among university students.

- To assess the impact of artificial intelligence-supported education on career development among university students.

### **Problem Statement**

Artificial Intelligence (AI) is rapidly evolving throughout higher education, but we still do not know the effects of AI on university students' academic engagement, psychological well-being, and career development. The existing literature has been dominated by research on learning outcomes, performance, and academic engagement. Psychological and career development outcomes received much less consideration (Lo et al., 2024). The research is conflicted on the impact of AI on students' psychological well-being. Some researchers have documented positive psychosocial benefits of AI-based educational systems. Other researchers have documented the negative impact AI will have on students based on concerns of technological over-reliance, psychological stress, and social isolation. While AI-based career guidance is becoming more prevalent, IT-based education systems and services have received much less research on the impact of career development. Research on the impact of IT-based education is needed to fill the knowledge gap on the three dimensions.

### **Significance of the Study**

This study has a lot of value because it extends the existing knowledge of how AI in education will likely impact university students beyond answering the general research questions. The findings provide both university teaching administrators and faculty with the information required to use AI within their teaching practices to create more active student participation, better address student psychological needs, and help students prepare for post-graduation life. The findings may also provide insights for policy makers in developing algorithms within a responsible AI educational policy and supporting institutional guidelines. The findings may say for students that AI may be useful in certain aspects of their education, as long as they remain actively engaged, balanced in their psychological state, and focused on developing the skills required for the labor force. Lastly, the study may be able to provide a framework for the existing literature to explore the three dimensions previously mentioned.

### **Literature Review**

#### **Artificial Intelligence as a Transformative Learning Resource**

Recent studies suggest that Artificial Intelligence (AI) has become an important part of higher education systems rather than simply serving as an additional digital tool. AI-based learning includes several subsystems, such as, generative AI, intelligent tutoring systems, adaptive learning systems, automated feedback, and personalized learning applications. According to Luo and Zhang (2025), AI-based learning systems can provide flexible and individualized learning experiences, including real-time feedback, to students at universities. Qian et al. (2025), meanwhile, documented the large number of applications that generative AI has within teaching, learning, assessing, and supporting students within the academy. All these recent developments show that AI fundamentally alters how students engage with educational content and how students manage the activities of their own learning.

The literature also suggests that the effectiveness of AI is related to how it interacts with the learning process. In their systematic review and meta-analysis of 57 studies, reported that generative AI positively influenced university students' learning outcomes, particularly their academic accomplishments, in addition to their emotional and motivational outcomes and cognitive processes. Addy et al. (2023), in another systematic review of 158 studies, documented a comparable influence of generative AI on students' cognitive, behavioral, and social skills, again, through personalized learning and feedback systems. The literature also outlines critical views related to excessive reliance, academic honesty, and diminished critical thinking, thereby supporting the view that AI tools should not be used in a substituting manner for students' own critical thinking.

#### **AI-Supported Learning and Student Participation**

Active participation in the educational process is often described as academic engagement. It is evident that students can experience greater involvement when technology is integrated and if they are provided with immediate feedback and assistance in a customized manner. Such an engagement can foster students' willingness to complete academic tasks. Niyazova et al. (2026) conducted a systematic review of 72 studies on the use of ChatGPT in learning. They evaluated engagement and disengagement. Their findings were that AI can help students better understand and appreciate learning activities and can promote students' satisfaction with learning, although it can encourage passive learning and contribute to a lack of critical thinking eventually.

Other studies have found that use of AI can promote students' self-directed engagement. Lan and Zhou (2025) indicated that AI-supported learning environments provide opportunities for students to improve their self-regulated learning. Saar et al. (2026) confirmed that the use of generative AI stimulates students' thinking and engagement and positively impacts students' motivation

and affects academic engagement. Therefore, AI can be used to promote engagement in learning as long as it is not used to generate answers.

According to the existing literature, AI in education can stimulate engagement. However, the type and direction of this relationship can highly depend on the pattern in which students use AI-based tools. AI can help students stay more engaged and motivated when used to provide academic support and when it is not used to answer all the questions.

### **AI and Students' Psychological Adjustment**

While many studies examine the impact of AI in higher education on academic achievement, psychological well-being in this context has been studied much less. This involves students' ability to sustain their psychological well-being and emotional stability while also dealing with the demands of their education. AI can achieve this by providing different academic support services that make learning less difficult. Additionally, (Tong et al., 2025), in his review of 38 studies conducted between 2018 and 2024, found that learning with the assistance of AI might become more personalized and engaging while also helping to relieve some academic stress and anxiety. Yet, he also found some worrying issues of tech addiction and social isolation along with other ethical issues.

Based on the data reviewed, it appears that AI can potentially support or worsen psych concerns. On the supportive side, it appears that personalized support and feedback appear to help students feel less overwhelmed with their academic responsibilities. However, excessive reliance on AI may have negative consequences such as various forms of stress or anxiety (digital fatigue, technostress, etc.) combined with a lack of social support. A recent review focused on AI and student well-being was also supportive of personalized systems of support and feedback but also raised concerns of increased anxiety, social isolation, and overall loneliness (Lunetti et al., 2025).

One may conclude that, in the context in which AI lessens academic difficulties and Students are properly supported, AI positively contributes to individuals' psychological well-being. Less support, however, coupled with excessive reliance on AI may cause psychological problems. This would support the value of responsible AI coupled with social and academic support and balanced integration.

### **AI-Enabled Preparation for Future Careers**

Career development in higher education involves gaining the knowledge, skills, confidence, and understanding needed to make informed career choices and prepare for future employment. An aspect of this dimension has become more important with the introduction of AI, as the jobs students enter after graduation will require more digital and AI-related skills. Vadisetty and Polamarasetti (2024) posits that generative AI can support cognitive, technical and interpersonal skills, signifying that skills beyond academic requirements may be acquired through AI-based learning. Further, some of the recent studies have attempted to understand how AI can help develop students' broader professional skills.

Now, AI is being integrated into higher education career counseling. In their study, (Pandit et al., 2025) analyzed 43 studies and identified three major patterns. AI-powered chatbots, generative models employed within career services to provide access to career support, and employability prediction using AI-enabled recommendation systems. While each of these may provide students with challenging career support and help students explore career options, the authors expressed concerns about trust, reliability, and transparency, especially when AI makes recommendations that staff and students must trust and have faith in when making important career decisions.

This relationship can be understood through the students' acquisition of skills related to future careers and their access to career data. AI-based learning may give students the competence to respond to changing labor market requirements. Employment-related AI services may help students navigate possible career paths. Careers should remain student-centered, as the recommendations AI generate for students are based on information and circumstances that cannot possibly capture the students' professional aspirations.

### **Research Gap**

Despite the growing literature on artificial intelligence in higher education, an important research gap remains in understanding its broader effects on university students' development. Existing studies have largely concentrated on learning outcomes, academic performance, and student engagement, while psychological well-being and career development have received comparatively less integrated attention (Ilyas et al., 2025). Research on psychological outcomes has produced mixed findings, with AI providing academic support while also raising concerns regarding dependence, anxiety, and reduced human interaction (Butt et al., 2026).

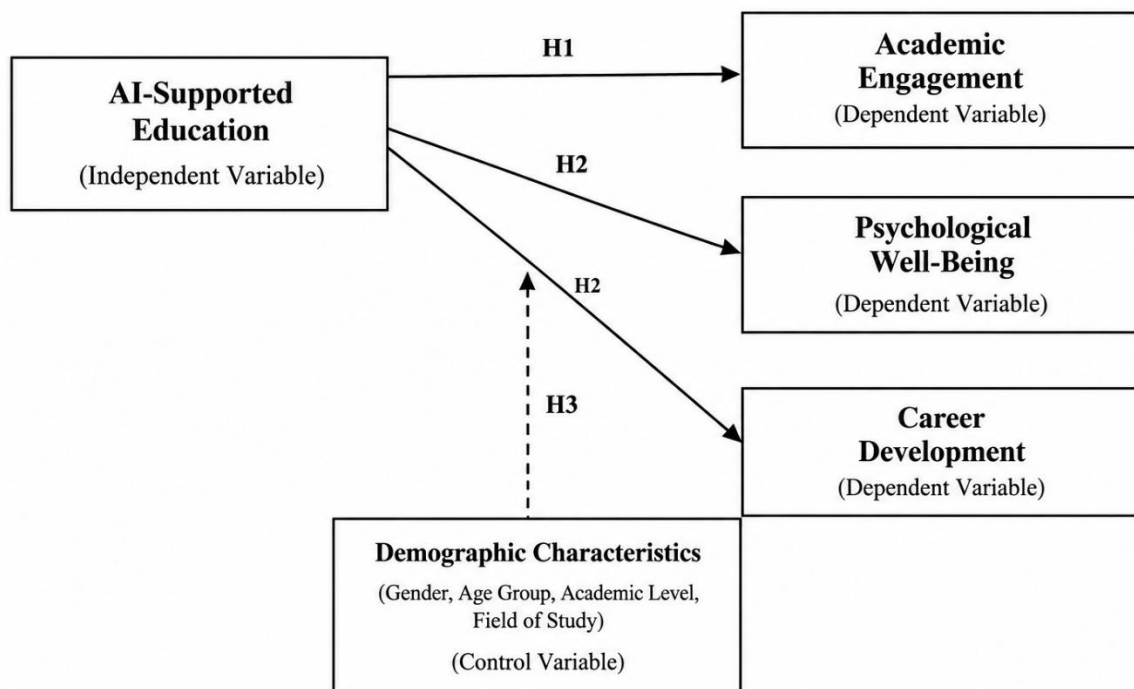
Similarly, recent research on AI-based career counselling demonstrates growing potential for personalized career support, but this area is still emerging and requires further empirical investigation. Thus, limited research has examined academic engagement, psychological well-being, and career development simultaneously within the context of AI-supported education, creating a need for empirical research that considers these interconnected dimensions of university students' development.

### Hypotheses

**H1:** There is a significant positive relationship between artificial intelligence-supported education and academic engagement among university students.

**H2:** Artificial intelligence-supported education significantly predicts academic engagement, psychological well-being, and career development among university students.

**H3:** There is a significant difference in academic engagement, psychological well-being, and career development among university students based on demographic characteristics such as gender, age group, academic level, and field of study.



**Fig.1 Conceptual Framework**

### Methodology

#### Research Design

Impact of artificial intelligence-based education on academic engagement, psychological well-being, and career development of students was studied through a quantitative and cross-sectional research design. Data was collected through a structured survey.

## Population

The Research population consisted of students of universities of Pakistan, Respondents were selected from Bahauddin Zakariya University Multan, The Women University Multan, University of the Punjab Lahore, Government College University Faisalabad, The Islamia University of Bahawalpur, University of Sargodha, University of Sindh Jamshoro, and University of Karachi.

## Sampling Technique

The sampling technique used was convenience sampling. The researcher selected university students through online networks and invited participants to complete the survey.

## Sample Size

The study was completed by 467 respondents. Satisfactory participants were chosen to provide a sample that included students from different universities and academic backgrounds of Pakistan

## Data Collection

Data were collected using an adopted structured questionnaire. The questionnaire was modified to fit a Google Form and distributed to university students online. Aspects of artificial intelligence-supported education were measured using items based on previously established measures of AI use in educational contexts. Measures for academic engagement were adapted from the University Student Engagement Inventory (USEI), which conceptualizes student engagement across cognitive, behavioral, and emotional dimensions (Maroco et al., 2016). Measures of psychological well-being were constructed from items based on the Psychological Well-Being Scale developed by Ryff, which assesses major dimensions of positive psychological functioning (Ryff, 1989). Measures assessing career development were constructed from items of the Career Decision-Making Self-Efficacy Scale, a widely used instrument for assessing individuals' confidence in performing career decision-making tasks (Betz et al., 1996; Betz & Luzzo, 1996). Completion of the items was done using a Likert-type response format. Completed responses were gathered using Google Forms and were exported to Microsoft Excel for data cleaning and preparation for statistical analysis.

## Data Analysis

The data were imported first into Microsoft Excel and then into IBM SPSS for analysis. This manuscript surveyed the data with the use of summary statistics and Cronbach's alpha to assess the reliability of the measurement scale. Correlation analysis was conducted to ascertain the correlation of the study variables, and multiple regression was used to analyze the predictor variables of AI-assisted learning on three outcome variables. An independent samples t-test was used for two-group analysis, and one-way ANOVA was used to analyze three-group variable. If significant differences were found in ANOVA, the Tukey HSD post-hoc test was used to find out which groups were significantly different.

**Table: 1 Demographic Characteristics of University Students (N = 467)**

| Demographic Variable | Category           | Frequency (n) | Percentage (%) |
|----------------------|--------------------|---------------|----------------|
| Gender               | Male               | 274           | 58.7           |
|                      | Female             | 193           | 41.3           |
| Age                  | 18–22 years        | 188           | 40.3           |
|                      | 23–27 years        | 176           | 37.7           |
|                      | 28–32 years        | 68            | 14.6           |
|                      | 33 years and above | 35            | 7.5            |
|                      |                    |               |                |
| Academic Level       | Undergraduate      | 251           | 53.7           |
|                      | Master's           | 143           | 30.6           |
|                      | M.Phil./MS         | 52            | 11.1           |
|                      | PhD                | 21            | 4.5            |
| Field of Study       | Social Sciences    | 126           | 27.0           |

| Demographic Variable | Category            | Frequency (n) | Percentage (%) |
|----------------------|---------------------|---------------|----------------|
|                      | Business/Management | 103           | 22.1           |
|                      | Education           | 98            | 21.0           |
|                      | Sciences/IT         | 86            | 18.4           |
|                      | Other               | 54            | 11.6           |
|                      |                     |               |                |
| Region               | Punjab              | 306           | 65.5           |
|                      | Sindh               | 161           | 34.5           |
| Total                |                     | 467           | 100.0          |

According to demographic data, the sample showed a male: female ratio of 58.7%: 41.3%. In terms of age, the most represented age group was 18-22, at 40.3%, while the next most represented age group was 23-27, at 37.7%. Most of the participants were young undergraduate students. Participants at the undergraduate level made up 53.7% of the sample, while participants at the Master's level made up 30.6% of the sample. A smaller sample made up the M.Phil./ MS, and PhD levels respectively. Social Sciences made up 27.0% of participants. Business/ Management made up 22.1% of participants, and Education made up 21.0% of participants. The survey sample showed representation of all major field of study as noted above. In Punjab, 65.5% of respondents were from Punjab. 34.5% of respondents were from Sindh. Therefore, the study captured young university students that were from the chosen regions.

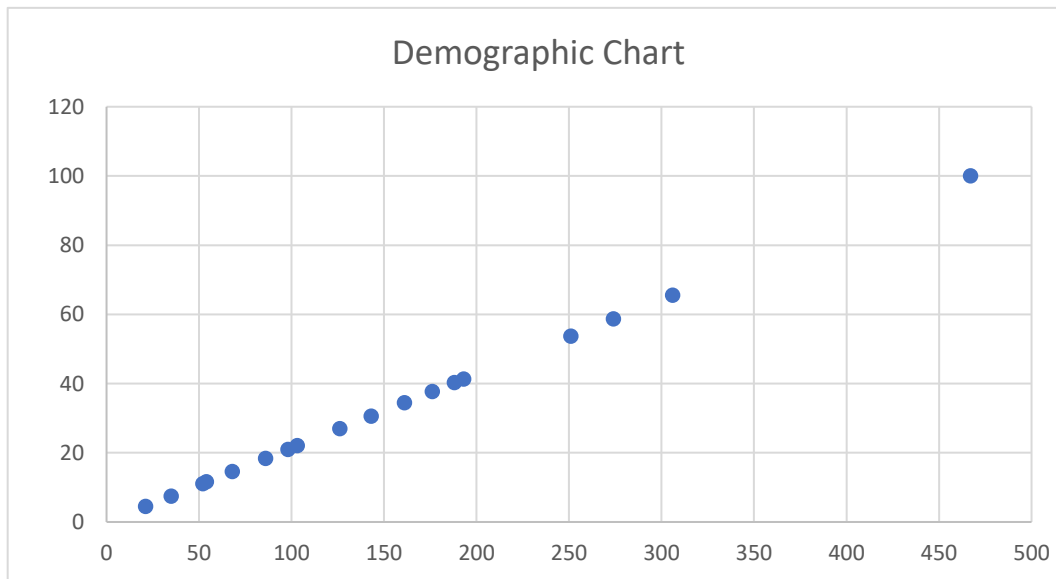


fig. 2 Demographic Characteristics of University Students (N =467)

Table: 2 Reliability Analysis of the Study Variables among University Students (N = 467)

| Variable                 | No. of Items | Cronbach's Alpha ( $\alpha$ ) | Mean | Std. Deviation |
|--------------------------|--------------|-------------------------------|------|----------------|
| AI-Supported Education   | 10           | .884                          | 3.76 | 0.71           |
| Academic Engagement      | 15           | .901                          | 3.82 | 0.68           |
| Psychological Well-Being | 18           | .873                          | 3.69 | 0.73           |

| Variable           | No. of Items | Cronbach's Alpha ( $\alpha$ ) | Mean | Std. Deviation |
|--------------------|--------------|-------------------------------|------|----------------|
| Career Development | 25           | .912                          | 3.78 | 0.70           |

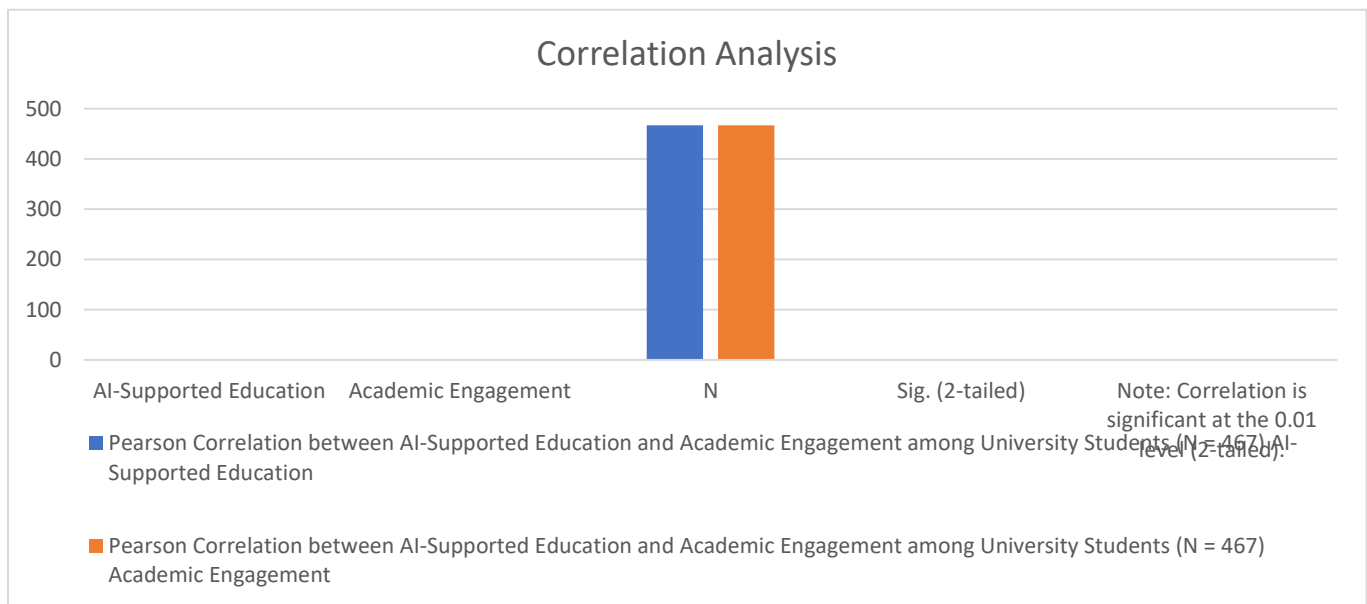
Cronbach's alpha values (.873 to .912) revealed good to excellent levels of internal consistency for all study variables. Values ranging from 3.69 to 3.82 indicate a generally more positive response to a given variable within the domain, whereas the values 0.68 to 0.73 indicate a reasonable variability of responses. The results indicate that the scales are reliable and can be used for advanced statistical analysis.

**Table: 3 Pearson Correlation between AI-Supported Education and Academic Engagement among University Students (N = 467)**

| Variables              | AI-Supported Education | Academic Engagement |
|------------------------|------------------------|---------------------|
| AI-Supported Education | 1                      | .648**              |
| Academic Engagement    | .648**                 | 1                   |
| N                      | 467                    | 467                 |
| Sig. (2-tailed)        | —                      | < .001              |

Note: Correlation is significant at the 0.01 level (2-tailed).

Pearson correlation results justified a positive correlation between AI-supported education and engagement ( $r = .648$ ,  $p < .001$ ). This suggests that the use of AI-supported education slightly increased the level of engagement of university students. The correlation was moderate to strong, so the use of AI in education prompted behavioral, emotional, and cognitive engagement of students. For these reasons, we accept H1.

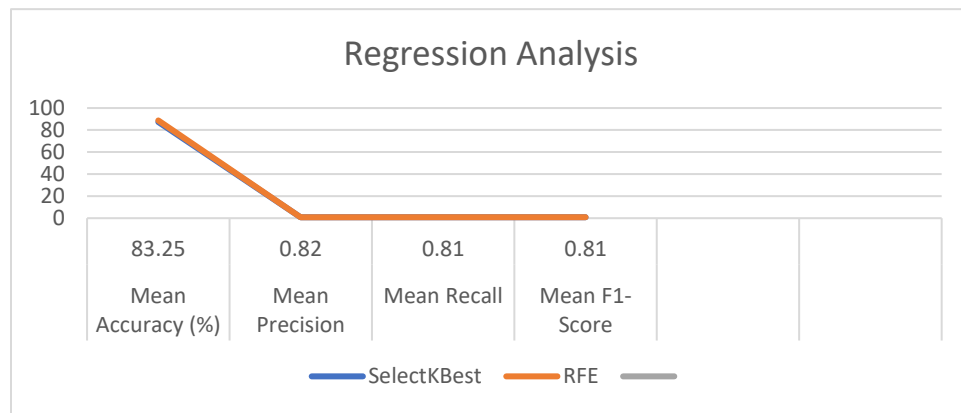


**Fig. 3 Correlation Analysis**

**Table: 4 Regression Analysis of AI-Supported Education on Academic Engagement, Psychological Well-Being, and Career Development among University Students (N = 467)**

| Dependent Variable       | R    | R <sup>2</sup> | Adjusted R <sup>2</sup> | Beta ( $\beta$ ) | t     | Sig.   |
|--------------------------|------|----------------|-------------------------|------------------|-------|--------|
| Academic Engagement      | .648 | .420           | .419                    | .648             | 18.36 | < .001 |
| Psychological Well-Being | .571 | .326           | .325                    | .571             | 14.99 | < .001 |
| Career Development       | .623 | .388           | .387                    | .623             | 17.19 | < .001 |

According to the regression analysis, AI-supported education shows the largest influence on the outcome variables. The functioning of AI-supported education accounted for 42.0% of the variance of academic engagement ( $R^2 = .420$ ); 32.6% of the variance of psychological well-being ( $R^2 = .326$ ) and 38.8% of the variance of career development ( $R^2 = .388$ ). The positive sign of the beta coefficients in this case indicate a positive association of AI-supported education with the outcome variables, academic engagement, psychological well-being and career development, respectively. These variables had a real world impact ( $p < .001$ ). Thus, H2 was confirmed.

**Fig. 4 Regression Analysis****Table: 5 Independent-Samples t-Test and One-Way ANOVA of Academic Engagement, Psychological Well-Being, and Career Development by Demographic Characteristics (N = 467)****Gender: Independent-Samples t-test**

| Variable                 | Male Mean | Female Mean | t-value | Sig. (p) |
|--------------------------|-----------|-------------|---------|----------|
| Academic Engagement      | 3.86      | 3.76        | 1.54    | .124     |
| Psychological Well-Being | 3.72      | 3.65        | 1.02    | .309     |
| Career Development       | 3.82      | 3.72        | 1.41    | .159     |

**Age, Academic Level, and Field of Study: One-Way ANOVA**

| Demographic Variable | Academic Engagement F | p    | Psychological Well-Being F | p    | Career Development F | p    |
|----------------------|-----------------------|------|----------------------------|------|----------------------|------|
| Age                  | 3.21                  | .023 | 2.87                       | .036 | 3.64                 | .013 |
| Academic Level       | 4.18                  | .006 | 3.52                       | .015 | 4.63                 | .003 |

| Demographic Variable | Academic Engagement F | p    | Psychological Well-Being F | p    | Career Development F | p    |
|----------------------|-----------------------|------|----------------------------|------|----------------------|------|
| Field of Study       | 2.96                  | .019 | 2.41                       | .048 | 3.17                 | .014 |

The demographic analysis found gender was not a statistically significant indicator of academic engagement, psychological well-being, or career development ( $p > .05$ ). On the other hand, statistically significant differences were seen with age, academic level and field of study, as  $p$ -values were less than .05 for all three outcome variables. Thus, it seems that the demographic characteristics of students influenced their academic engagement, psychological well-being, and career development. As such, it was expected that H3 would be supported, primarily for age, academic level, and field of study. For the statistically significant portions of the ANOVA, Tukey HSD post-hoc analysis should be done to determine the difference between the groups that have been shown to be different.

## Discussion

The study indicated that AI-assisted education improved university students' engagement, psychological well-being and career development. Correlation analysis indicated a strong positive relationship between AI-supported education and academic engagement ( $r = .648$ ,  $p < .001$ ) and the regression analysis indicated that AI-assisted education positively predicted academic engagement, well-being and career development. The results showed that there is a positive relationship between AI-supported education and the development of students' academic and psychological domain. The results aligned with the study of (Yang, 2026). Their meta-analysis of 57 studies indicated a positive impact of generative AI on achievement and affective outcomes among higher-order thinking skills.

The positive relationship between AI and academic engagement may be attributed to AI tools that encourage participation in learning. AI tools can generate instantaneous feedback, rationales and explanations, and offer scaffolds and support for individualized learning tasks. Learning becomes more active and interactive. AI may indeed be a positive tool for learning, as shown by (Imam et al., 2026) in their review of 72 empirical studies. This review indicated that ChatGPT and similar technologies positively influenced the behavioral, emotional and cognitive aspects of student engagement. However, there was a risk associated with the disengagement of students, such as Cheating and over-reliance on AI. Thus, within the current context, the AI tool is a positive influence on the development of students, but how students use AI is the determining factor for the value of the tool.

The regression analysis of academic engagement supported this interpretation. AI use explains a considerable portion of variation in students' academic engagement ( $R^2 = .420$ ), and as such, AI-supported education may be a critical factor in students' involvement in academic activities. This finding is aligned with the other findings of (Al Shaibani et al., 2026), who argued that generative AI has some positive effects on the motivational and affective state of university students as well as on their higher-order thinking. Engagement should not, however, be attributed entirely to the use of AI. Teaching quality, learning environment, students' motivation, digital skills, and the level of institutional support are all likely to be important in determining the level of engagement.

The results showed that AI-supported education significantly predicted positive mental well-being, explaining about a third of the variation ( $R^2 = .326$ ). These results may indicate that AI may offer students positive academic scaffolding that helps with certain learning complications and barriers to accessing information, thereby boosting students' confidence when completing their academic assignments. Likewise recent literature indicates that AI may offer positive support for personalized learning and improve users' confidence when communicating which may also impact students' academic and mental well-being positively. However, (Nizam Bin Shaharom & Cheah) also indicated some negative impacts of AI due to technostress, digital fatigue, loneliness, decreased communication in person, and anxiety due to overreliance on AI. Thus, the positive results in this study should not be viewed in too positive a light. Purposeful and responsible use of AI may support mental well-being, but use of AI that is extreme and/or careless may lead to mental challenges.

The results related to career development were also significant, with AI-supported education explaining 38.8% of the career development ( $R^2 = .388$ ). This means that use of AI-supported learning tools may enhance students' knowledge related to their careers, encourage students to look at different career options, and help students identify skills that are required to pursue different career paths and to adapt to changes in employment. This is further supported by the recent systematic review by (Olatunbosun et al., 2026) who examined 43 studies and indicated that career chatbots, predictive analytics, and recommender systems that use AI are being implemented to offer personalized career support to university students. However, Bulut et al. also indicated that AI should support human career counseling and that over-reliance on AI for making recommendations reduces the students' autonomy and leads to automation bias.

Finally, the demographic analysis showed that while there were no significant differences by gender for academic engagement, psychological well-being, and career development, significant differences by age, academic level, and field of study were presented. It is possible that students' interactions with AI-integrated education may be different based on their academic experience and background as opposed to their gender. Differences in student experience may be due to different levels of exposure to technology, varying learning needs, and the phases of their careers. Because participants may be at different academic stages with unique requirements, universities should adopt AI integrated practices centered on the academic level and the discipline for which the students have a need (Artykbayeva et al., 2026).

The results show that AI assisted education can bring about the holistic development of students in several ways and validate existing reviews that concluded the positive and meaningful outcomes of AI integrated education. At the same time, the results address the emerging areas of concerns in the recent literature including, over reliance, issues of ethics, well-being, student agency, and the increasing dominance of AI in education. Therefore, this study positions AI as a supportive educational framework that is integrated at the background, as opposed to replacing human teachers, educational support workers, and students' own agency. With a balance between institutional support, responsible AI, and digital literacy, the use of AI can provide academic and career benefits while minimizing the negative effects of AI on students' mental and emotional well-being (Attamimi et al., 2026).

## **Conclusion**

Artificial Intelligence (AI) enhanced education positively impacted university students' academic engagement, psychological well-being, and career development. Students were more academically engaged and had better psychological well-being and career outcomes when they received more AI-enhanced educational assistance. AI-enhanced education helped students with customized learning and academic support and prepared students with the skills needed to meet the demands of their future careers. The paper supports the need to incorporate AI responsibly and with students in mind. AI enhanced education provides many positive benefits in learning and preparing students for careers. However, there needs to be adequate prompting and instruction, digital literacy, and help from people in order to best symbolize AI. Universities need to think of AI as one of many resources in the classroom and not as a replacement for teachers, counselors, or students' independent decision-making.

## **Future Implications**

Future studies should examine the impact of AI-enabled education on students' engagement, psychological well-being, and career development across universities, academic disciplines, and education levels. Future studies should employ larger and more diverse samples and longitudinal or mixed methods to give more insight on the changing experiences of students and AI. The focus could be on specific AI tools, digital literacy, safe and responsible AI use, and the part teachers and career counselors can play in reducing anxiety and overreliance issues caused by AI, while utilizing AI for maximum benefit. These findings may assist universities in devising more effective AI-enabled educational policies and offering training and support programs.

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