

Influence of Generative AI on Student Engagement and Motivation in Higher Education: A Study of Three Southern Districts of Punjab, Pakistan

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Received: 18-02-2026

Revised: 31-02-2026

Accepted: 19-03-2026

Published: 30-03-2026

ABSTRACT

Generative Artificial Intelligence (GenAI) is a key educational technology and has the potential to revolutionize how educators and learners engage with the learning process in higher education. ChatGPT, Google Gemini, Microsoft Copilot, and other large language model-based applications of generative AI can offer personalized explanations, immediate feedback, academic support, brainstorming assistance, language correction, and interactive learning opportunities. These abilities can affect students' involvement and motivation, especially in the higher education setting where students are supposed to become more independent and self-regulated learners. This study aims to examine the impact of Generative AI on student engagement and motivation in Higher Education Institutions (HEIs) of three southern districts in Punjab, Pakistan: Multan, Bahawalpur, and Dera Ghazi Khan (DG Khan). The study draws its theoretical foundation from two basic theories: the theory of Self-Determination (Ryan & Deci) and the multidimensional theory of student engagement (Hidi & Kossou). The survey design employed is quantitative, cross sectional, the target population of the study is the students who are enrolled in public higher education institutions in three districts. The population of the study was 118400 students, and a sample of 384 students was selected based on the suggestions of Krejcie and Morgan (1970). The study results indicated that there is a significant relationship between the main constructs of the study and that AI has a significant effect on students' engagement and motivation.

Keywords: *Generative AI; Student Engagement; Student Motivation; Higher Education; Artificial Intelligence.*

INTRODUCTION

Generative Artificial Intelligence (GenAI) is a rapidly evolving area that is presenting new opportunities and challenges for higher education. Unlike traditional digital learning technologies, which are designed to deliver access to predetermined content, GenAI systems can create new content in response to users' questions and instructions. Tools like ChatGPT can clarify concepts, create examples, summarize text, give feedback, help write, come up with practice questions, and help with problem-solving. As a result, using GenAI has become a mainstream approach in school life for learners.

The launch of ChatGPT has sparked a lot of discussion around the possible implications for university teaching and learning. Studies from around the world suggest that ChatGPT can have a positive impact on students' behavioural, cognitive, and emotional engagement. The results of Heung and Chiu (2025) indicated a medium overall effect of ChatGPT-supported learning on student engagement based on 17 empirical studies with a total sample size of 1,735 students. Medium effects were identified for cognitive and emotional engagement, and a large effect was identified for behavioral engagement. The

authors found three mechanisms to be important for engagement with ChatGPT: personalized tutoring, technical assistance, and content generation or collaboration.

Likewise, another systematic review of 72 empirical studies showed that using ChatGPT in learning can lead to either engagement or disengagement. Some positive responses were satisfaction, interest, understanding, and positive perceptions, but academic dishonesty, anxiety, decreased critical thinking, and reliance on AI were concerns (Lo et al., 2024).

The motivational aspect is also significant. GenAI can help create a sense of autonomy for the students by providing them with support whenever and wherever they need it. It can also enhance self-competence through explanation and feedback, based on individual needs. Self-Determination Theory suggests that satisfaction of three psychological needs—autonomy, competence, and relatedness (Deci & Ryan, 2000)—has a significant impact on students' motivation.

These issues are of special significance in the Pakistani context of higher education. There are significant variations in technological, socioeconomic, linguistic, and institutional settings across universities in Pakistan. There is great variation among students in access to digital resources and in their digital literacy. The differences could affect the impact of GenAI on learning engagement and motivation.

The southern part of Punjab is particularly apt for this purpose. Multan, Bahawalpur and DG Khan are the prime centres of education for the students of urban and rural regions. The Higher Education Department of Punjab has also enlisted major public sector institutions in these areas, such as Bahauddin Zakariya University, other institutions in Multan, The Islamia University of Bahawalpur, Government Sadiq College Women University in Bahawalpur, and Ghazi University in DG Khan.

The findings from the region indicate that university students already use GenAI. In Bahawalpur, Zafar et al. (2024) conducted a study on 354 graduate and post-graduate students and found that 51% used ChatGPT regularly. Students appreciated its prompt academic support, tailored instruction, ease of access, and other learning methods, but noted issues of dependency, critical thinking, and academic integrity.

Later, Shaheen et al. (2025) conducted a study on 298 Bachelor's-level students of Bachelor's level from The Islamia University of Bahawalpur and Government Sadiq College Women University, Bahawalpur. The results showed moderate to high frequencies of GenAI use, primarily for academic support, assignment writing, and conceptual understanding, and that there was a positive correlation between the frequency of GenAI use and conceptual understanding. But there are risks of superficial engagement and overreliance, the authors noted.

Likewise, a study has been done in Multan about the use of AI & ChatGPT by students. The study conducted by Qureshi et al. (2024) focused on students of public-sector universities in the city of Multan and aimed to examine the impact of AI and ChatGPT on students' achievement in learning. A study with university students in Southern Punjab was conducted on the attitude of university students towards ChatGPT in English language classes and provided university experiences with ChatGPT in public and private universities.

In spite of these emerging studies, there is a need for a comparative study that focuses specifically on students' engagement and motivation in Multan, Bahawalpur, and DG Khan. The aim of the present study is to fill this void.

Problem Statement

Although generative AI has swiftly made its way into higher education, its impact on students' engagement and motivation is still under-researched in many emerging educational settings.

There has been a recent surge of research on the adoption of ChatGPT and its consequent learning outcomes in Pakistan, but research from southern Punjab is still emerging. Existing studies have primarily focused on academic achievement, conceptual understanding, English-language learning, or general attitudes toward ChatGPT. In the context of Bahawalpur, for instance, research has revealed significant student engagement with GenAI tools and noted both perceived educational value and concerns about overreliance and critical thinking. The research in Multan also explores the role of AI and ChatGPT in learning achievement and students' attitudes.

Little comparative evidence exists, however, regarding the change in students' behavioral, cognitive, and emotional engagement and Academic motivation in the study areas of Multan, Bahawalpur, and DG Khan after the use of GenAI.

This is important as the three districts have different institutional infrastructure, different socio-economic statuses, different urban-rural compositions, different access to educational resources, and different higher educational opportunities. As a result, students can experience and utilize GenAI in their own way.

The question that this study would like to answer is: So, what is the relationship between GenAI use and students' engagement and students' motivation in the three southern districts of Punjab in the HEC-approved higher education institutions?

Objectives of the study

The research will aim to achieve the following goals:

1. To find out if the higher education students of Multan, Bahawalpur, and DG Khan use Generative AI tools in their academic activities.
2. To investigate the impact of the use of GenAI on students' engagement.
3. To understand the connection between the use of GenAI and students' academic motivation.

Research Questions

The following questions will be explored in the study:

1. How much do students use Generative AI in Higher Education in Multan, Bahawalpur, and DG Khan for study-related tasks?
2. What are the major purposes for which students use Generative AI?
3. What is the correlation between the use of GenAI and the level of behavioral engagement?
4. How is GenAI use linked to cognitive engagement?
5. How does GenAI usage relate to emotional involvement?
6. How do students' academic motivations differ when using GenAI compared to when they do not?

7. What are the implications for academic motivation if students consult with GenAI instead of relying on their own knowledge?

Research Hypotheses

The following hypotheses were suggested for quantitative testing:

- **H1:** Students in higher education have a strong positive association between generative AI use and overall student engagement.
- **H2:** There is a strong positive association between the use of generative AI and behavioral engagement.
- **H3:** There is a substantial positive relationship between the use of generative AI and cognitive engagement.
- **H4:** Emotional engagement is positively related to generative AI usage.
- **H5:** Students' academic motivation is positively related to generative AI use.
- **H6:** The perception of usefulness of GenAI is a significant predictor of student motivation.

Significance of the study

The study will have implications for a number of stakeholders.

➤ **University Students**

Students may gain insight into the potential of responsible use of GenAI to aid learning while maintaining the importance of independent thinking. It can also raise awareness of the dangers of over-dependence.

➤ **University Teachers**

The results can assist teachers in comprehending the use of GenAI and its impact on participation, motivation, and learning behavior. This can be used to inform the design of teaching activities with AI.

➤ **Higher Education Institutions**

The results can inform the creation of policies by universities and colleges on acceptable and ethical use of GenAI within institutions.

➤ **Policymakers**

The results can inform policy-making at the Higher Education Commission and provincial level, as well as at the university administration level, for context-specific solutions to AI literacy, academic integrity, digital access, and teacher training.

➤ **Researchers**

The study can supply empirical evidence to South Punjab and can be a foundation for longitudinal, experimental, and mixed-methods research.

The Scope of the study

The study was conducted at the higher education institutions in three districts of southern Punjab, namely:

- Multan
- Bahawalpur
- Dera Ghazi Khan

The prospective users were undergraduate and postgraduate students of selected universities and degree-awarding institutions.

LITERATURE REVIEW

Generative AI in Higher Education

There is an emergence of Generative AI's impact on college education and learning. Generative AI is on the rise, impacting teaching and learning in the university space. It can be used to create content, for tutoring, language learning, coding help, brainstorming, feedback, and research.

UNESCO (2023) highlights that GenAI can offer educational value, but also poses privacy, equity, ethical concerns, and institutional readiness issues. UNESCO thus proposes a human-centred approach where GenAI is incorporated as part of an appropriate pedagogical design and ethical protections.

Some recent evidence from Pakistan shows that students are increasingly adopting the use of the internet. Ashraf et al. (2025) studied Pakistani university students' usage of ChatGPT and determined that behavioral intention, habit, and hedonic motivation were crucial factors linked to real use. They also found beneficial impacts of the use of ChatGPT on academic performance in their study.

The results illustrate that the students in Pakistan are aware of GenAI and are applying it in their academic tasks.

Student engagement and Generative AI

Student engagement in learning is a key component of successful learning. Fredricks et al. (2004) list three broad dimensions: behavioral, emotional, and cognitive engagement.

GenAI can enable behavioural engagement by making the initiation of academic tasks easier. For example, students may ask an AI to elaborate on a complex subject, create practice questions, or give examples.

Students can enhance their cognitive engagement by critically engaging with the information produced by AI. But when students just copy responses generated by AI, the level of cognitive engagement can drop.

Emotional involvement could be heightened due to the fact that AI gives instant answers and alleviates the irritating experience of challenging college functions.

This relationship is bidirectional, as shown by the systematic review by Lo et al. (2024). Evidence of engagement was identified in terms of satisfaction, interest, and understanding, but evidence of disengagement was identified in terms of academic dishonesty, anxiety, reduced critical thinking, and overreliance.

There are more recent meta-analytic studies that come back with stronger evidence of a positive relationship. Heung and Chiu (2025) discovered a medium effect of ChatGPT-supported learning on student engagement.

Generative AI and Student Motivation

Motivation affects students' initiation, maintenance, and control of academic performance. According to Self-Determination Theory (SDT), quality of motivation is partly determined by the satisfaction of autonomy, competence, and relatedness (Deci & Ryan, 2000). Autonomy might be achieved with the support of GenAI, as students choose when and how to get support. It can help develop competence if it offers personal explanations and feedback. But it's not as simple as it is with relatedness, as AI isn't a substitute for meaningful relationships with teachers and peers. Meta-analysis studies recently suggest that GenAI positively affects students' motivation and engagement in the University context. Xia et al. (2025) uncovered significant positive effects for all the examined dimensions of engagement and some of the examined dimensions of motivation, and that the positive impact can be moderated according to learning strategy, subject area, and context. There were correlations between increased cognitive and emotional engagement and individual and small group learning with GenAI, in this case, ChatGPT.

RESEARCH METHODOLOGY

Research Design

The study is suggested to use a quantitative cross-sectional survey design. A quantitative approach would be suitable because the study is interested in quantifying the relationship between the use of GenAI, student engagement, and motivation, and in comparing students from three districts.

Population

The population included undergraduate and postgraduate students in selected higher education institutions in Multan, Bahawalpur, and DG Khan. The population is illustrated below:

Division	Universities	No. of Male students	No. of Female Students	Total
Multan	BZ University	14500	14000	33500
	The Women's University	0	5000	
Bahawalpur	The Islamia University of Bahawalpur	31000	30000	70000
	Government Sadiq College for Women University	0	9000	
DG Khan	Ghazi University	6000	4900	14900
	University of Layyah	2100	1900	
Grand Total				118400

Sample and sampling

A multi-stage sampling procedure was used.

Stage 1: District selection

To minimize threats to the study's internal validity, the three districts were purposively chosen as the geographical focus and the major academic hubs in the higher education system in southern Punjab.

Stage 2: Institutional selection

At this stage, the universities were chosen from each district.

Stage 3: Student selection

The students were sampled using stratified sampling as illustrated below:

Division	Universities	No. of Male Students	No. of Female Students	Total
Multan	BZ University	45	45	106
	The Women's University	0	16	
Bahawalpur	The Islamia University of Bahawalpur	96	96	227
	Government Sadiq College for Women University	0	35	
DG Khan	Ghazi University	20	17	51
	University of Layyah	7	7	
Grand Total				384

Research Instrument

The questionnaire was designed in a structured format, with constructs taken from the literature.

The following were the major sections of this questionnaire:

- **Section A: Demographic Information:** Questions about age and gender, district, etc were asked of the respondents.
- **Section B: Generative AI Use:** What is the frequency of using Generative AI, the type of AI tool used, how much time is spent using Generative AI, etc., were the questions asked in this section of the questionnaire.
- **Section C: Student Engagement:** Items measuring different types of students' engagements
- **Section D: Student Motivation:** Items that assess intrinsic motivation; extrinsic motivation; academic persistence; autonomy; competence.

Validity and Reliability

The questionnaire should be reviewed by experts in education, educational technology, psychology, and research methodology.

A pilot study was done with 30 students who were not part of the final sample. The internal consistency of the measure was evaluated using Cronbach's alpha, with a coefficient of more than .70 for research questionnaires.

Data Collection Procedure

Permission was sought from the heads of the universities, and questionnaires were given to selected students. The respondents were briefed about the research and filling out the questionnaire; participation in the survey was voluntary, and they were given the right to withdraw at any time. Participants were not required to share personally identifiable information when using GenAI, as this can raise sensitive academic integrity issues.

DATA ANALYSIS

The descriptive as well as inferential statistical analysis was done for the analysis of data: The descriptive statistics used were frequency, percentage, mean, and standard deviation, while inferential statistics were Pearson correlation, independent-samples t-test, and multiple regression;

Findings

1. The findings revealed a positive relationship, which was statistically significant and highly robust ($r = .647$, $p < .001$), between the adoption of Generative AI and students' engagement. The more students engage with Generative AI, the more engaged they are.
2. The second step of the research involved a correlation analysis of the academic motivation of the students with the use of Generative AI. The use of Generative AI is positively, moderately, and significantly related to academic motivation ($r = .465$, $p < .001$). This suggests that the greater the use of Generative AI, the higher students' academic motivation is.
3. The empirical analysis tests the correlation between the employment of Generative AI and students' engagement. The analysis results indicate a positive and statistically significant relationship between the use of Generative AI and student engagement ($B = 0.605$, $\beta = 0.647$, $t = 16.585$, $p < .001$). This R^2 value of 0.419 suggests that the variance in student engagement can be accounted for by about 41.9% of the variation in Generative AI usage.
4. The results of the regression analysis on the influence of using Generative AI on students' academic motivation indicated that the use of Generative AI positively influenced academic motivation, with the t-statistic having a p-value of $< .001$, $B = 0.459$, and $\beta = 0.465$. With an R^2 value of 0.217, 21.7% of the variance in students' academic motivation can be attributed to the use of Generative AI. The results indicate that the higher the students' usage of Generative AI, the higher their academic motivation.

CONCLUSION

Results of the study indicated that the students are more engaged with the use of Generative AI. The study also showed that students' engagement in learning increased as their usage of Generative AI increased. The correlation between the use of Generative AI and students' engagement was strong and statistically significant. The regression analysis further indicated that the use of Generative AI accounted for a significant amount of variance in students' engagement. Therefore, the study concludes that Generative AI is an important factor associated with enhanced student engagement.

Academic motivation is positively related to the use of Generative AI. The results depict a positive correlation between students' academic motivation and their increased use of Generative AI. Academic motivation was significantly correlated with the use of Generative AI, with a moderate, positive relationship. The regression results further revealed that the use of Generative AI was a significant predictor of academic motivation. Therefore, the study finds that the use of Generative AI has a positive impact on the academic motivation of students.

Student engagement is a significant factor in student motivation. The results of the study showed that academic motivation was higher when the students' academic participation was more active. Student engagement was found to have a positive effect on academic motivation, and this effect was strong and significant. This indicates that engagement is an important predictor of students' academic motivation.

RECOMMENDATIONS

The following recommendations are suggested based on the results of the study:

1. AI literacy needs to be taught in Universities. Students must be trained in prompting, verifying, source assessment, privacy, and ethics.
2. The teacher has to create AI-supported learning activities. Students should not just regurgitate AI-generated text but be encouraged to question, check, enhance, and consider content created with AI.
3. Assessment practices need to be rethought. Oral presentations, project work, reflective writing, portfolios, classroom activities, and process-based assessment should be used more by universities.
4. Teachers should help students think deeply about the use of AI. Pupils should be asked to spot mistakes, inaccuracies, bias, incomplete evidence, and unsubstantiated claims within AI-generated answers.
5. Specifically, universities in DG Khan should be given special consideration for future research and capacity-building activities. The empirical literature on the use of GenAI in the context of higher education in DG Khan is found to be less voluminous compared to Multan and Bahawalpur.
6. Ensure equal opportunity is considered. AI-enabled learning opportunities should not be denied to students from disadvantaged socioeconomic communities.

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