

Generative AI in Higher Education Impact of AI Literacy and Trust on Students' Learning Engagement

¹Parul Singh, ²Ms. Anshu Basera, ³Naveen Mani, ⁴Prof. Dr. Trilochan Nayak

¹Sr. Assistant Professor Department of Commerce and Management Pal College of Technology and Management Kumaun University

²Assistant Professor Department of Commerce and Management Pal College of Technology and Management, Uttarakhand

³Assistant Professor School of Finance and Commerce Galgotias University, Greater Noida

⁴Principal Arya School of Management and Computer Science

Abstract:

Higher education (HE) has been transformed due to rapid proliferation of generative artificial intelligence (Gen AI) and its tools like ChatGPT. Extraordinary opportunities have been offered by GenAI for personalised learning. A dramatic impact of artificial intelligence (AI) has been found on higher education. Traditional concepts of academic integrity and student engagement are being challenged by GenAI. The learning engagement of university students has been influenced by generative AI-based learning analytics technology (GLAT). This also offers new chances for personalised learning and innovative valuation methods as well. Huge transformations powered by technological advancements have been witnessed by higher education. GenAI comes in front with smart tools that has the potential to produce new content like text, descriptions, and codes, on the basis of the prompts it receives. Both transformative opportunities and complicated ethical challenges across teaching, learning, and academic governance have been introduced due to increased integration of AI into higher education. Significant changes in the field of education have been brought by the rapid development of GenAI. 297 students from higher education were surveyed to explore the factors that show different roles of Generative AI in Students' Learning Engagement. The study also measured the impact of AI Literacy and Trust on Students' Learning Engagement. The study concludes that there is a significant impact of AI Literacy and Trust on Students' Learning Engagement.

Keywords: Generative AI, Higher Education (HE), AI Literacy, Trust, Engagement, Learning.

Introduction

In the era of AI where GenAI is reshaping the ecosystem of higher education at an extraordinary speed, it is important to investigate the highlighted mechanism of its effect on academic development of the students. A phenomenal debate within the field of education has been initiated by the potential of GenAI for high-quality text generation (Wang and Li, 2023). GenAI is offering a number of significant advantages in STEM education which shows a positive impact on individual learners, teachers, and the learning and the process of teaching as well (Zhu et al., 2026). On the other hand, tough challenges are presented by broader digital transformation process for cultivating innovative talent which includes possible crises of action for both "teachers and students, data security and ethical dilemmas, academic misconduct, and educational inequality" (Rasul et al., 2023). However, the effectiveness of GenAI is not the same for everyone, "psychological characteristics and cognitive abilities" of an individual is an important factor for its profound impact. There is a strong possibility of new changes in education due to recent advances in GenAI. The importance of AI literacy in higher education is highlighted by the arrival of GenAI like ChatGPT. Another than the simple use of tools, AI literacy includes the understanding of the way the AI works, evaluate it in critical manner, and also utilise it in ethical manner (Ng et al., 2021). This makes the universities and institutes of higher education to seek innovation in their educational programs and move away from conventional ICT education and make steps towards the strengthening of AI literacy. However, having so much growth of AI education, still there is lack of empirical studies on the way the attitude of the students changes after having the experience of GenAI in practice. It will not be good to overstate the importance of understanding

the attitude of the students towards AI in HE. The studies show that the attitude of the students is able to predict their engagement with AI tools. Responsible use of intentions and positive emotions are strong predictors of constructive AI adoption. GenAI is becoming universal in educational environment. This makes it important to understand the way the educational interventions shape these attitudes including initial apprehension and confident innovation for the development of effective AI literacy programs. In HE, the knowledge of “Information and Communication Technology (ICT)” has conventionally focussed on the development of proficiency in office software like “word processing, presentations, and spreadsheets”. However, it is shown by the advancements in AI technology and proliferation of automation that tool proficiency alone is not enough (Long and Magerko, 2020).

In the era where AI is being used for creating the content and making the decisions, it is important to understand AI, assess its reliability, and consider ethical issues involved. Studies on AI literacy in HE has focused on the importance of the development of critical evaluation skills of the students along with the technical knowledge as well. Better judgement in the use of AI tools and more balanced attitudes toward AI capabilities and limitations are shown by the students that have developed comprehensive AI literacy (Walter, 2024). Without having clear guidance from the institutes, students are regularly engaged with Gen tools like “ChatGPT and Grammarly”. The unclear boundary amid “legitimate support and academic misconduct” are creating ethical dilemmas when it comes to “plagiarism, authorship, and intellectual ownership” (Shuvo and Habib, 2024). Additionally, large volumes of behavioral and personal data are collected by AI systems regularly without any transparent disclosure or mistake. This helps in fostering “anxiety about data privacy, fairness, and algorithmic bias” while AI is used in evaluating and assessing contexts. Gen AI is that category of AI which utilizes deep-learning models to create new, original content. Huge amount of existing data like text, images, music, or other forms of media are used to train these models. This also help the model to learn to create new content that look like but is not identical to the training data. On the basis of prompt given by the user, GenAI is able to produce statistically possible outputs which somehow matches with the patterns and structures of the training data (Martineau 2023). GenAI promises to enhance the productivity and nurture the creativity. it also facilitates more strong collaboration amid human and machines.

Literature Review

Wang (2026) supports the mediating effect of academic self-efficacy and suggests that GenAI literacy is helpful in enhancing academic achievements as it boosts the academic self-efficacy of the students. In addition, the relation amid GenAI literacy and academic self-efficacy is moderate by critical thinking. More benefits are offered by GenAI to the students that are skilled with strong critical thinking.

Suh (2025) examined the “impact of a project using generative AI in a class on the use of productivity software at university and university students’ attitudes towards AI” and found a positively significant shift in the perspectives of the students. Meaningful shifts in student’s “attitudes across cognitive, affective, and behavioral dimensions” is produced by structured AI literacy education. This also supports the significance of complete educational methods to AI incorporation.

Saúde, Barros & Almeida (2024) revealed that GenAI improves the academic work and learning feedback. For this it needs educational support fostering “critical, ethical, and digital literacy competencies”. Students demonstrated awareness about risk and benefit linked with GenAI in academic situations. Educational progress is hindered when GenAI is not recognised for its effective uses in higher education.

Otman et al. (2025) investigated the dimensions simultaneously where they have examined the perception of university students regarding GenAI. They focussed on “learning, creativity, motivation, and engagement” along with perceived risks like “overreliance, ethical concerns, and difficulties in verifying accuracy”. Low to moderate positive associations amid GenAI usage and learning outcomes is found while analysis particularly problem-solving and motivation. Diverse usage-perception profiles are revealed in cluster analysis which includes inconsistent cases where frequent users report partial reasoning benefits. Both motivation and learning efficiency are improved by the use of GenAI but still the critical thinking is hindered by overreliance.

Francis et al. (2025) explored the “dual-edged nature of GenAI’s integration into educational practices”. The main focus of the study is on its ability of improving student’s engagement and learning outcomes. Along with this it poses significant challenges to academic integrity and equity. The study highlighted the transformative effect of GenAI on learning and teaching in higher education which includes “enhanced automation, personalised learning, and innovative assessment methods”. Significant challenges are also identified like to maintain the academic integrity and address the ethical concerns in suitable use of AI. It is important for the institutes of higher education to develop comprehensive and consistent policies for GenAI integration and focus more on their ethical use and fairness as well. Effective implementation requires Training programs for GenAI literacy among educators and students. Designing strong framework ensuring GenAI tools to support traditional educational methods and improve student learning experiences is the responsibility of the institution. GenAI promises to transform HE but it is important to manage it carefully in order to save academic integrity and encourage equitable learning opportunities as well.

Dong, Chen & Shen (2026) investigated the way the GenAI-based learning analytics technology (GLAT) affects the students of HE in terms of their learning engagement via the mediating role of the Community of Inquiry (CoI), and how this relation is controlled by digital literacy. The study revealed a significant and direct impact of GLAT on learning engagement, the relation amid GLAT and learning engagement is partially controlled by three dimensions of CoI, the effect of GLAT on each CoI dimension is positively controlled by digital literacy, and the direct effect of GLAT on learning engagement is positively controlled by digital literacy.

Khrisat (2025) investigated “the dual impact of GenAI on undergraduate students' perceptions of academic integrity in assessments and their levels of engagement, motivation, and self-efficacy” and found that GenAI is used by eighty two percent student for their tasks like “brainstorming and essay refinement” with sharp engagement which also increases integrity concerns. Fear of undetected plagiarism and over-reliance is also found among the students. Yet, ethical dilemmas like diminished critical thinking underscores the ability of GenAI that fosters the creativity when ethically integrated in educational system. A positive link amid guided AI use and self-efficacy is found during analysis.

Lee et al. (2024) found that there is no similar sentiment within different staff of the university around AI in HE and there is still a lot of doubt about how AI should be used properly. The staff is more concerned about the concepts related to potential of AI that influence academic integrity.

Vieriu and Petrea (2025) found in their study that significant benefits are offered by AI which includes “personalized learning, improved academic outcomes, and enhanced student engagement”. Along with this there are some challenges like “over-reliance on AI, diminished critical thinking skills, data privacy risks, and academic dishonesty” were also recognised. This makes it important to have a structured framework for the integration of AI. This framework must have a strong support of ethical guidelines maximising the benefits and mitigating the risks as well. The investigators conclude that AI have huge potential of improving learning efficiency and academic performance. It is important to address the concerns related to accuracy, cognitive disengagement, and ethical implications for successful implementation of AI.

Objective

1. To explore the factors that shows different role of Generative AI in Students’ Learning Engagement.
2. To measure the impact of GenAI on AI Literacy and Students’ Learning Engagement.

Methodology

297 students from higher education were surveyed to explore the factors that shows different role of Generative AI in Students’ Learning Engagement. The study also measured the impact of AI Literacy and Trust on Students’ Learning Engagement. “Random sampling method” and “Exploratory Factor Analysis” followed by “Multiple Regression Analysis” are used.

Findings

Male are 54.9 and rest 45.1% are females. 59.3% among them are below 21 years of age and rest 40.7% are above 21 years of age. 19.5% of the respondents are from science stream, 22.6% from commerce, 16.5% from management, 19.5% from arts and rest 21.9% from other streams in higher education.

“Table 1 General Details of Respondents”

“Variables”	“Respondents”	“Percentage”
Gender		
Male	163	54.9
Female	134	45.1
Total	297	100
Age		
Below 21 years	176	59.3
Above 21 years	121	40.7
Total	297	100
Stream		
Science	58	19.5
Commerce	67	22.6
Management	49	16.5
Arts	58	19.5
Others	65	21.9
Total	297	100

“Exploratory Factor Analysis”

“Table 2 KMO and Bartlett's Test”

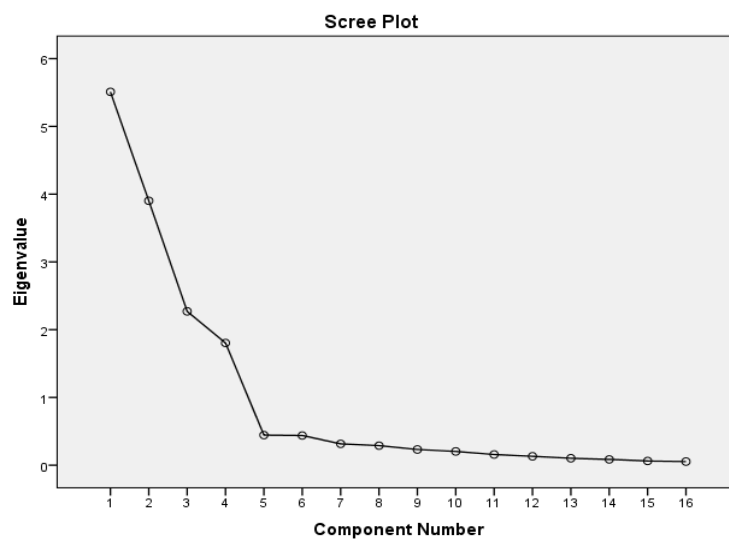
“Kaiser-Meyer-Olkin Measure of Sampling Adequacy”		.805
“Bartlett's Test of Sphericity”	“Approx. Chi-Square”	4906.667
	“df”	120
	“Sig.”	.000

“KMO value” is 0.805 and the “Barlett’s Test of Sphericity” is significant.

“Table 3 Total Variance Explained”

“Component”	“Initial Eigen values”			“Rotation Sums of Squared Loadings”		
	“Total”	“% of Variance”	“Cumulative %”	“Total”	“% of Variance”	“Cumulative %”
1	5.510	34.437	34.437	3.601	22.504	22.504
2	3.902	24.389	58.826	3.419	21.370	43.874
3	2.270	14.188	73.014	3.366	21.035	64.909
4	1.803	11.271	84.285	3.100	19.376	84.285
5	.445	2.779	87.064			
6	.438	2.736	89.800			
7	.315	1.970	91.770			
8	.289	1.805	93.575			
9	.232	1.449	95.024			
10	.203	1.269	96.293			
11	.158	.987	97.280			
12	.131	.822	98.102			
13	.103	.642	98.744			
14	.085	.534	99.277			
15	.062	.387	99.665			
16	.054	.335	100.000			

In a “principal component analysis”, 16 variables were grouped into 4 factors with 22.504%, 21.370%, 21.035% and 19.376% variance respectively and total variance is 84.285%.



“Figure 1 Scree plot of Eigen Values”

Figure 1 shows the “Eigenvalues” derived from the "Total Variance Explained" table, indicating an elbow point at 4 components.

“Table 4 Rotated Component Matrix”

“S. No.”	“Statements”	“Factor Loading”	“Factor Reliability”
	AI Literacy		.961
1	Helps in understanding basic concept and functions of GenAI	.934	
2	Effective use GenAI tools for academic activities	.932	
3	Accuracy and relevance of AI-generated information can be easily evaluated	.928	
4	Helps in understanding the ethical issues associated with GenAI use in education.	.913	
	Trust in GenAI		.940
5	GenAI provides reliable support for academic learning	.949	
6	Provides accurate information for academic purposes	.923	
7	Provides understandable and transparent responses	.882	
8	Students have trust that Personal and academic information is secure while using GenAI	.876	
	Learning Engagement		.938
9	Active participation in learning activities while using GenAI	.910	
10	Encourages to think deeply about academic topics	.887	
11	Learning through GenAI is interesting and motivating	.884	
12	Learning is interactive with GenAI	.879	
	Perceived Usefulness of GenAI		.900
13	Helps in completing academic tasks more effectively	.894	
14	Helps in saving the time and improving learning efficiency	.860	
15	Provides learning support according to individual needs	.856	
16	Helps in understanding and solving difficult academic problems	.792	

Factor “AI Literacy” and its associated variables are helps in understanding basic concept and functions of GenAI, Effective use GenAI tools for academic activities, Accuracy and relevance of AI-generated information can be easily evaluated, and helps in understanding the ethical issues associated with GenAI use in education. Factor “Trust in GenAI” consist of variables like GenAI provides reliable support for academic learning, provides accurate information for academic purposes, provides understandable and transparent responses, and Students have trust that Personal and academic information is secure while using GenAI. Factor “Learning Engagement” includes the variables like Active participation in learning activities while using GenAI, encourages to think deeply about academic topics, learning through GenAI is interesting and motivating, and learning is interactive with GenAI. Factor “Perceived Usefulness of GenAI” includes the variables like helps in completing academic

tasks more effectively, helps in saving the time and improving learning efficiency, provides learning support according to individual needs, and helps in understanding and solving difficult academic problems.

“Table 5 Reliability Statistics”

“Cronbach's Alpha”	“N of Items”
.868	16

“Table 6 Model Summary”

“Model”	“R”	“R Square”	“Adjusted R Square”	“Std. Error of the Estimate”
1	.878 ^a	.770	.767	.37094
Predictors: (Constant), AI Literacy, Trust in GenAI, Learning Engagement and Perceived Usefulness of GenAI				

0.767 is “adjusted R-squared value” with approx. 77% of the variation.

“Table 7 ANOVA”

“Model”		“Sum of Squares”	“df”	“Mean Square”	“F”	“Sig.”
1	“Regression”	134.792	4	33.698	244.904	.000 ^b
	Residual	40.178	292	.138		
	Total	174.970	296			
DV: Overall impact of GenAI on AI Literacy and Students’ Learning Engagement						
Predictors: AI Literacy, Trust in GenAI, Learning Engagement and Perceived Usefulness of GenAI						

Value under significant column indicates a significant relationship between the factors namely “AI Literacy, Trust in GenAI, Learning Engagement and Perceived Usefulness of GenAI” and use of GenAI.

“Table 8 Coefficients”

“Model”	“Un standardized Coefficients”		“Standardized Coefficients”	“t”	“Sig.”
	“B”	“Std. Error”	“Beta”		
(Constant)	4.232	.022		196.632	.000
AI Literacy	.053	.022	.069	2.451	.015
Trust in GenAI	.107	.022	.139	4.945	.000
Learning Engagement	.648	.022	.843	30.062	.000
Perceived Usefulness of GenAI	.145	.022	.189	6.739	.000
DV: Overall impact of GenAI on AI Literacy and Students’ Learning Engagement					

All the factors “AI Literacy, Trust in GenAI, Learning Engagement and Perceived Usefulness of GenAI” are showing significant impact of GenAI on AI Literacy and Students’ Learning Engagement. Learning Engagement is showing highest impact (.843), Perceived Usefulness of GenAI (.189), Trust in GenAI (.139), and AI Literacy (.069).

Conclusion

AI is now an important part of modern academic landscape which offers significant advantages like “personalized learning, enhanced engagement, and improved access to educational resources”. Majority of students have positive views about AI for its potential of improving learning efficiency and academic performance. Along with this there are challenges regarding the “accuracy of AI outputs, the risk of over-dependence, and the potential erosion of critical thinking skills”. Students have shown positive approach towards GenAI for its ability to “streamline academic tasks, enhance motivation, support collaboration, provide real-time feedback, and accommodate diverse learning needs”. These insights are helpful to evolving global discourse on AI in education where it offers “context-specific evidence from academic environment. Knowledge about AI helps in building confidence and trust. This makes it important to integrate AI literacy into the curriculum. Institutions are empowering their students with skills for responsible AI usage by the providing structured AI training. This helps them in improving their willingness for professional environments

The study aims to explore the factors that shows different role of Generative AI in Students’ Learning Engagement and the impact of GenAI on AI Literacy and Students’ Learning Engagement. It is found that AI Literacy, Trust in GenAI, Learning Engagement and Perceived Usefulness of GenAI are the factors showing shows different role of Generative AI in Students’ Learning Engagement. The study concludes that there is significant impact of GenAI on AI Literacy and Students’ Learning Engagement.

References:

- [1] Wang, J., and Li, Y. P. (2023). Cultivating top-notch innovative talents in the wave of ChatGPT: value implications, practical concerns, and ecological reshaping. *China Educ. Technol.* 11, 62 -71.
- [2] Zhu, Y., Jiang, H., and Zhong, L. (2026). Generative artificial intelligence-assisted STEM education: a systematic review and future research agenda. *Eur. J. Educ.* 61: e70462. Doi: 10.1111/ejed.70462
- [3] Rasul, T., Nair, S., Kalendra, D., Robin, M., De Oliveira Santini, F., Ladeira, W. J., Sun, M., Day, I., Rather, R. A., & Heathcote, L. (2023). The role of ChatGPT in higher education: Benefits, challenges, and future research directions. *Journal of Applied Learning & Teaching*, 6(1). <https://doi.org/10.37074/jalt.2023.6.1.29>
- [4] Wang, Y. (2026). The effect of generative artificial intelligence literacy on academic achievement: the mediating role of academic self-efficacy and the moderating role of critical thinking. *Front. Psychol.* 17:1761562. Doi: 10.3389/fpsyg.2026.1761562
- [5] Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education Artificial Intelligence*, 2, 100041. <https://doi.org/10.1016/j.caeai.2021.100041>
- [6] Suh, W. (2025). Generative AI integration in higher education shifts students’ attitudes from tool use to innovation. *Discover Education*, 4(1). <https://doi.org/10.1007/s44217-025-00914-8>
- [7] Long D, Magerko B. (2020). What is AI literacy? Competencies and design considerations. *Proceedings of the 2020 CHI Conference on Human Factors in Computing Systems*, 1–16. ACM. <https://doi.org/10.1145/3313831.3376727>
- [8] Walter, Y. (2024). Embracing the future of Artificial Intelligence in the classroom: the relevance of AI literacy, prompt engineering, and critical thinking in modern education. *International Journal of Educational Technology in Higher Education*, 21(1). <https://doi.org/10.1186/s41239-024-00448-3>

- [9] Shuvo, T. F., & Habib, M. M. (2024). Shifting Market Power: The role of supply chain disruptions in redefining global trade dynamics. *Social Lens.*, 1(1). <https://doi.org/10.69971/sl.1.1.2024.8>
- [10] Martineau, Kim. (2023). What Is Generative AI? IBM Research Blog. April 20. Available online: <https://research.ibm.com/blog/what-is-generative-AI> (accessed on 7 January 2024).
- [11] Saúde, Sandra, João Paulo, Barros, and Inês Almeida (2024). Impacts of Generative Artificial Intelligence in Higher Education: Research Trends and Students' Perceptions. *Social Sciences* 13: 410. <https://doi.org/10.3390/socsci13080410>.
- [12] Otman, S. B., Otman, S. B & Adali, G. K. (2025). The impact of Generative AI on University Students' Learning Experience: A Study on Cognitive and Affective Outcomes. In *Journal of Information and Organizational Sciences*, 49(2), 329-344.
- [13] Francis, N. J., Jones, S. and Smith, D. P. (2025) Generative AI in Higher Education: Balancing Innovation and Integrity. *Br J Biomed Sci* 81:14048. Doi: 10.3389/bjbs.2024.14048
- [14] Dong, H., Chen, X., & Shen, J. (2026). Unpacking the impact mechanism of generative AI-based learning analytics technology on student learning engagement: the mediating role of community of inquiry and the moderating role of digital literacy. *International Journal of Educational Technology in Higher Education*, 23(1). <https://doi.org/10.1186/s41239-026-00591-z>
- [15] Khrisat, Z. (2025). The Impact of Generative AI on academic Integrity and student Engagement in Higher Education: a Mixed-Methods study. *Research Square*. <https://doi.org/10.21203/rs.3.rs-7205885/v1>
- [16] Lee, D., Arnold, M., Srivastava, A., Plastow, K., Strelan, P., Ploeckl, F., Lekkas, D., & Palmer, E. (2024). The impact of generative AI on higher education learning and teaching: A study of educators' perspectives. *Computers and Education Artificial Intelligence*, 6, 100221. <https://doi.org/10.1016/j.caeai.2024.100221>
- [17] Vieriu, A. M., & Petrea, G. (2025). The Impact of Artificial Intelligence (AI) on Students' Academic Development. *Education Sciences*, 15(3), 343. <https://doi.org/10.3390/educsci15030343>.