



Students’ Perspectives on Generative AI’s Role in Transforming, Challenging, and Enhancing Higher Education Learning Practices in Education

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ABSTRACT

This study explored higher education students’ perspectives on the integration of generative artificial intelligence (GenAI) tools within the context of Education 4.0. Based on the best practices on academic transformation using qualitative interview studies focused on 26 undergraduate and postgraduate course students of the University of Sargodha, the study explores the current revolutionized role of GenAI in augmenting academic practice, improving their learning efficiencies, and disrupting the past learning paradigm. Results of thematic analysis identified five themes on the patterns of use of GenAI, academic enhancement and efficiency, critical engagement and thinking, learning outcomes, changes in skills, and ethical and collaborative aspects. The results show that, even though students heavily rely on GenAI applications like ChatGPT, Copilot, and DALL•E to complete various assignments, conduct research, and be creative, their experience depends on the level of active interaction and moral sensitivity. GenAI has a beneficial influence on conceptual clarity, time management, and academic results, but excessive use can hinder the development of critical analysis and learning. The overall conclusion of the study is that responsible and reflective behavior of GenAI can facilitate transformative learning. However, the necessary support must be based on clear policies, digital literacy education, and education-oriented pedagogical strategies delivered by the institutions in the vicinity of Education.



Introduction

The rapid development of generative artificial intelligence (AI) tools and services has already started to change the scenery of higher education, altering how students study, collaborate, and interact with scholarly materials. Universities and students alike have recently taken to incorporating AI technologies as part of daily academic activities, as education paradigms begin to change in tandem with digital innovations in education. This permanent transformation is very much in line with the concepts of Education 4.0 - an emergent model based on leveraging digitalization, automation, and innovative technologies to support individualized, self-paced, and skill-based learning opportunities.

Education 4.0 is an outlook into a new model of learning where the educational systems become adaptive, individualized, and highly networked with the innovations of data science, artificial intelligence, and collaborative networking. Education 4.0 does not ignore traditional ways and relies only on the advanced tools to promote critical thinking, creativity, and lifelong learning, namely chatbots, language models, and creative AI assistants. In this scenario, grasping the practical experiences and perception of students towards the concept of mating generative AI emerges essential to predicting both sides of the coin that these technologies will offer to academic development.

This qualitative study examines the use of generative AI tools among students in higher education, which has become increasingly popular. It is based on interview data and discusses some developing themes about academic practice, effectiveness of learning, creativity, collaboration, and ethics. Putting these experiences of students in the context of the paradigm of Education 4.0, the study hopes to shed light on the fact that GenAI is not only reshaping academic workflows but also redefining the very nature of being a learner within the digital era.

The attitude toward GenAI among students encompasses not only enthusiasm but also some caution. According to (Chan & Hu, 2023), GenAI is valued by students because of the educational benefits it can bring, e.g., helping students with writing, research, and brainstorming, hence making them more efficient students. On a similar note, (Khrisat, 2025) presented the finding that although there is extensive student use of GenAI tools, usage is tempered by issues of academic integrity and skills building. Students are also interested in using GenAI as an addition, not a replacement, to the real learning experience, and most ask to develop institutional policy that would promote healthy and ethical use.

Even though it comes with great benefits, GenAI brings significant issues in post-secondary education. The challenges to the authenticity of academics, the danger of losing critical thinking ability through over-reliance on AI-powered tools, and the difficulty of isolating the role of the technology from the ultimate performance of students to alert them are highlighted by (Haroud et al., 2025). Besides the problem of algorithmic bias, the disparity in access to technology, as well as concerns about digital literacy, should be discussed to promote fair and responsible adoption. (Mikroyannidis et al., 2025) highlight that best practices, such as faculty training and open policies, are essential in avoiding these risks and in facilitating ethical implementation in academia.

Regarding pedagogical change, GenAI is redefining the planning and studying by providing flexible feedback, multimodal content creation, and prompt-guided literacy experiences. (Qian, 2025) examines the role of GenAI in fostering creativity and autonomous learning in learners, as well as in warning of the possibility of a reduced level of deeper cognitive processing. Education 4.0 is becoming process-based and participatory, rather than aimed at rote results. Within this new

conception, GenAI has displaced and catalyzed a new approach to education because now, innovative ways of teaching require a serious reconsideration of conventional practices (Pratschke, 2024). The conceptual framework of the study is discussed in Figure 1:

Conceptual Framework of the Study

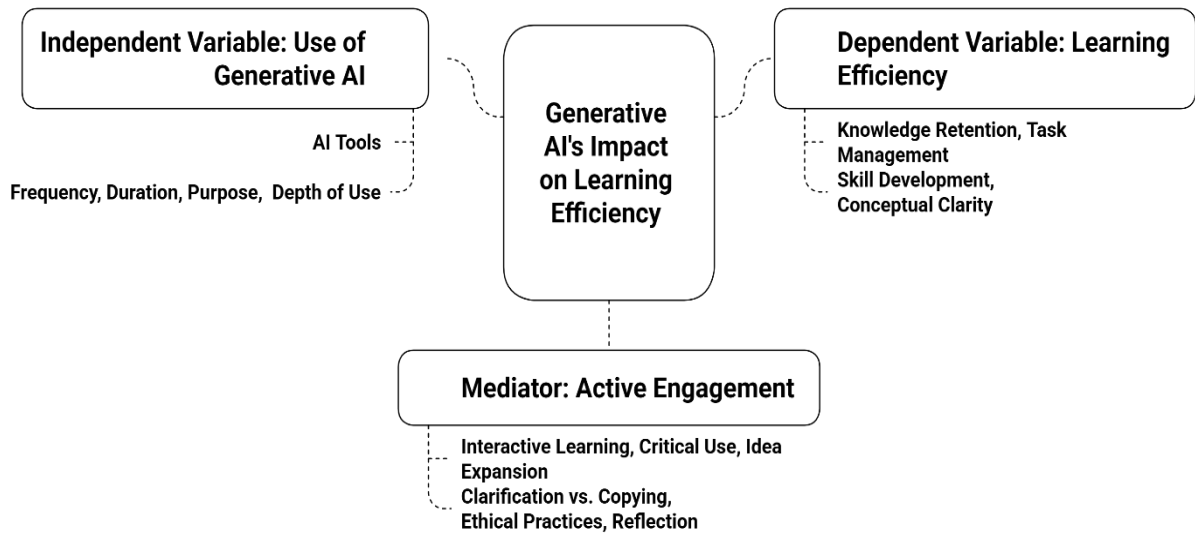


Figure 1: *Conceptual Framework*

Source: *Author's own work*

Embracing generative AI in higher learning has transformed the interactions between learners and educators into knowledge at a high pace that aligns with the future of Education 4.0 (Salmon, 2019). With the changes in universities and their students to digital and innovative tools, it was important to study those changes and perceive them through familiar theories of education. Constructivist learning theory (Hausfather, 1996; Piaget & Cook, 1952) considers the learner as an active participant in the knowledge construction, and that it will be achieved through interaction, reflective thinking, and socialization. In that regard, generative AI models, like ChatGPT and DALL·E, provide a rather dynamic environment to explore tasks and provide feedback on a more individual level, the use of which is well-suited to project and authentic learning tasks. Such tools adhere to the constructivist approach in that they encourage self-determination, originality, and relevant linkages with content (Lee & Hannafin, 2016). (Noroozi et al., 2024) also state that GenAI increases learner motivation and engagement, as it is based on individual needs and, therefore, it supports the active engagement of students in building their knowledge.

Another theory that can be useful to assess the effect of AI on learning efficiency is Cognitive Load Theory (Sweller, 1988). Generative AI has the potential to eliminate extraneous cognitive load by automating repetitive academic activities like grammar corrections, citation styles, and summarizing the level of activity so that students can excel in other aspects of thinking and solving problems. The combined framework by (Twabu, 2025) uses AI with multimedia learning means to help adaptively cope with cognitive loads, enhance schema development, and retention. (Pratschke, 2024) warns that excessive dependence on AI can result in reducing metacognitive activity, which is why it is necessary to combine the automation trend in education with teacher-centered learning.

The ZPD, as rationalized and explained by (Vygotsky, 1978), points to the possibility of AI as a means of learning scaffold. ZPD is traditionally considered a range of tasks that a learner can be guided to do. Generative AI also plays the role of a digital mentor, as students get real-time help and can solve more difficult tasks earlier in the learning process. (Shikina, 2025) have revealed that AI tools individualize learning and increase the ZPD by supporting collaborative learning, providing feedback, and offering adaptation. Still, it is crucial to use AI as a stepping stone but not as a crutch so that students can achieve autonomy and mastery.

The Technology Acceptance Model (TAM), which was developed by (Davis, 1989), is a predominant model used to explain the adoption of technology by users in light of two factors, which include Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). The first is PU, which corresponds to the extent to which a customer feels that using a given computer system can help them improve their performance. The second is PEOU, which describes the extent to which a customer finds using a system easy. TAM argues these perceptions form the direct relationship between a person's attitude towards technology and the behavioral intention and eventual use (Venkatesh & Davis, 2000). TAM has also been utilized extensively in the higher education context when studying student and faculty acceptance of digital tools such as generative AI tools. The recent studies, like those by (Almarashdeh & Alzaqebah, 2023) and (Kamaludin et al., 2023), have added the aspects of trust, motivation, and contextual support into the current depiction of the acceptable technology in the context of Education 4.0, illustrating the developing parameters of technology acceptance in Education 4.0 environments.

Critical pedagogy, as proposed by (Freire, 1970), also adds an ethical and social aspect to the matter. Freire states that education should render its students powerful by enabling them to represent themselves through discussion, thought, and critical awareness. Generative AI can help them achieve such objectives by facilitating inclusive and culturally responsive learning activities. Nevertheless, (Warr et al., 2024) cautions that without careful integration, AI systems can only reproduce the inequalities of data used to train said systems and institutional infrastructure. (Noroozi et al., 2024) identify the necessity to integrate human supervision and moral models in a way that supports AI and AI-based learning without compromising learner agency and equity.

A broader sociotechnical approach to educational ecosystems can be developed based on the Actor-Network Theory (Latour, 2005), which operates on the premise that human and non-human actors belong to the educational ecosystem. The generative AI is not a singular entity, but instead operates within a system of students, educators, software systems, and institutional policies. According to (Venturini & Sorrentino, 2024), AI technologies are creating educational experiences via such networks and impacting how knowledge is produced and consumed. (Dyczek, 2024) also addresses the novel model of social organization and learning through AI-enhanced experience on a social level, and how this model can allow multi-user groups to learn and continue learning from one another continuously.

According to the literature, in terms of the three theoretical perspectives, generative AI has a transformative potential in higher education during the age of Education 4.0. It promotes individualized, effective, and fair learning, but it has problems concerning ethics, engagement, and critical thinking. The need to minimize the adverse effects of AI in the educational sector and ensure the preservation of the same scope and human values associated with this process makes a balanced and theory-grounded approach necessary to tap the available potential of AI.

- How do students perceive the potential of generative AI to shape the future of learning and collaboration in higher education?

Methodology

To have a broad and relevant sampling of the use of generative AI tools in higher education, purposive sampling was employed. The sample consisted of 15 undergraduate (BS) students and 11 masters of philosophy/PhD students from various departments of the University of Sargodha. This wide range of people was meant to have representation at all levels and fields of academia so that the research would gather maximum opinions concerning the demands of academia, generative AIs, and the results in cognition. To ensure sufficient and in-depth information, the interviews were stopped as soon as the saturation of information was achieved, i.e., no new ideas or themes emerged.

Structured protocols on how to do the interview were established to facilitate the qualitative inquiry. The method used here offered a compromise between consistency among participants, allowing some kind of cross-comparison of responses, and flexibility that many participants needed to fully express their experiences and perspectives. The systematic guidelines prompted the participants to provide pertinent and salient experiences relevant to the study's research questions.

Several approaches were used to enhance the validity and reliability of the qualitative results. The so-called triangulation of data was attempted, i.e., the participants were asked to provide their input at various points of study, including question creation and data gathering, which provided a more detailed and complex picture of the subject (Battiste et al., 2018). To get the holistic view, multiple information sources were used, such as interviews, observations, and recordings (Dodgson, 2017). Ongoing reflection of the researcher contributed to recognizing and reducing the possible biases of the researcher (Babchuk, 2017), and respondent validation was also used. After the interview, the participants were asked to look through the transcript of the interview and accept the correctness of the interpreted themes (Guba & Lincoln, 1994). The study results were also enhanced by teamwork with other scholars to reduce bias and build the credibility of the study (Shenton, 2004). Pilot testing has been done to prevent potential problems in the research process. A total of five people who form the target population but not the final sample participated in pilot interviews. This stage put into trial the processes of interviewing, participant, and interview locations, which would resemble those of the primary study. After analyzing the results of the pilot, the research instruments were reshaped, edited, and improved to ensure their comprehensibility and validity (Colton & Covert, 2007). Preliminary feedback from pilot testing was used to make final changes to prepare to collect data effectively.

The structured interviews were used to gather data, which helped to explore the experience and views of the participants in more depth. Though a standard set of questions guided every interview, the methodology gave enough flexibility to let the participating persons expound on their perceptions. This guaranteed that the answers were narrowly focused and meaningful on a personal level with high-quality qualitative data (Moser & Korstjens, 2018).

In this research, thematic analysis was used. The method adopted was a systematic process and included the following steps (1) Familiarity with data (2) Developing preliminary codes (3) Compacting the codes into categories (4) Reviewing and doing stretch and refinement of themes (5) Each theme has a specific definition and (6) Presentation of findings by directly quoting the participants. Thematic analysis helped to identify both emergent and anticipated themes and made sure that the aspects of common and unique perspectives within the sample were reflected comprehensively. The repeated process of assessing the transcripts and the codes allowed the

interpretation of the experience and the opinions the students expressed on the use of generative AI to be reliable and nuanced.

Although this study offered significant findings on how students think of generative AI, there are a few limitations that should be identified. To begin with, the sample was relatively small (N=26) and the group was restricted to students representing some preselected academic fields, which might influence the validity of the results when applied to a broader circle of the higher education population. The study also did not use, besides self-reported data, probed via interviews, the latter being subject to both social desirability bias, where the participant presents themselves in a more positive light, and recall bias. The following limitation is that the study involved the qualitative approach and was not triangulated against the quantitative approach. This limitation could be addressed by incorporating other measures of improvement in academic performance over time or by establishing a control group with or without a counterpart. Also, faculty and administrative voices were not sampled in the research, but this would have painted a more comprehensive picture regarding the impact of generative AI on the teaching and disciplinary actions of institutions. Lastly, the findings are a reflection of a period with AI tools changing rapidly, so this may vary as the tools and their use change. To expand on this research, the researcher ought to resort to longitudinal designs and cross-institutional comparisons in future research.

Ethical Considerations

Ethical standards of high quality were applied in the study to protect the participants. Written informed consent was administered to those who did the interviews in a physical setting and electronically (in the case of online interviews). Consent documentation was straightforward, providing ample details about the study regarding the aim, activities, and risks, as well as the possibilities of benefits, that the study was voluntary, and that the subject could stop at any given point, as per the APA (2017) recommendations. During the research, the principle of confidentiality and anonymity of participants was observed.

Results

The theme analysis was employed to analyze qualitative interviews of higher education students with diverse majors. It has identified patterns, which demonstrate the usage of generative AI tools like ChatGPT, Copilot, and DALL·E in an academic context among students. All the emergent themes were measured in terms of frequency and percentage to determine the effects of AI on learning, engagement, and educational efficiency. This discussion provides an idea of the perception of students about the role of AI in changing the way of education within the frame of Education 4.0.

The thematic analysis revealed critical insights into how students perceive and interact with generative AI in higher education settings, specifically under the framework of Education 4.0, as shown in Table 1.

In the context of generative AI (Independent Variable), a high portion of students (50 percent) indicated that they regularly incorporated generative AI into their academic practices, which indicates that its use was quite frequent and profound. According to Participant 1, AI is becoming essential when doing assignments, presentations, or, more importantly, when it comes to languages such as Java and Python. It means that generative AI is not a side tool anymore but an essential component of study habits in students. The length of use also confirms it. Eighty-eight point four percent of respondents used AI for 1 to 2 years, indicating an increasing familiarity. Other students mentioned task-oriented applications (14.7%), in particular, projects around boarding, coding,

summary, and research structuring. Participant 4 reported that AI assists her in producing context anchors of scholarly articles and even assists in dataset clean-ups in SPSS. The other themes of support during a time of need (17.6 percent), increase in dependence over time (11.8 percent), and selective/experimental use (5.9 percent) also give clues to varying engagement levels, including those who use it on an occasional basis and those who use it more frequently.

Table 1: Variables of the study

Variable	Indicators	Frequency (n)	Percentage (%)
Use of Generative AI (IV)	Frequency of Use (Routine Integration)	13	50.0%
	Duration of Use (1–2 years dominant)	23	88.4%
	Purpose (Support in Difficulty)	5	17.6%
	Tool Type (ChatGPT, DALL·E, Copilot)	Qualitative only	—
	Depth of Use (Task-specific use)	4	14.7%
	Growing Dependence	3	11.8%
	Selective or Experimental Use	1	5.9%
Learning Efficiency (DV)	Time Saved (Efficiency and Time Mgmt.)	4	15.4%
	Conceptual Clarity	5	19.2%
	Workflow Improvement (Boosting Productivity)	3	11.3%
	Grade Improvement (CGPA Increase Post-AI)	18	69.2%
	Task Management (Planning Assignments)	3	11.3%
Active Engagement (Mediator)	Critical Use (Reflective Thinking)	6	23.1%
	Clarification vs. Copying (Passive Use May Inhibit Thinking)	5	19.2%
	Ethical Practices (Academic Integrity)	13	50.0%
	Reflection (Tool for Thought)	3	11.5%
	Idea Expansion (Creativity Catalyst)	11	42.3%

As far as learning efficiency (Dependent Variable) is concerned, several indicators had a positive effect. The substantial finding is the desire to improve conceptual clarity, as reported by 19.2% of the students. To exemplify, Participant 12 stated the idea, “AI assists me in learning theories in gradual steps: it makes difficult concepts less confusing.” Similarly, the ability to accomplish things efficiently and manage time (15.4 %) was another significant advantage. Students stated that AI minimized the time spent on research and drafting. Participant 14 also said, “I would use hours doing research but get summaries in a matter of minutes.” Remarkably, 69.2 per cent of the students showed that their CGPA increased by 3.6-4.0 due to the use of AI, which is evidence of real academic benefits. There was also an increased ability to manage tasks with the assistance of artificial intelligence in planning and organizing assignments. The 11th participant stated, "I use AI to guide me in my assignments, draw drafts, and give me immediate feedback. When I have classwork, I feel like a study assistant who has been trained."

Active engagement is a mediated factor that is crucial to the success of students in using AI. Critical use (23.1%) has been the most notable, and in this respect, students describe how AI makes them think before adopting suggestions. Now, participant 16 reported that AI makes suggestions, but they still prioritize making decisions after careful thought and reflection on whether the information is logical. Nonetheless, 19.2% also mentioned passive use that disallows thinking, as in the example of Participant 17: “I worry maybe that I just mindlessly follow whatever AI tells me, I might not be challenging myself or thinking critically.” Further, the level of ethics amongst students was pretty good (50 percent), with a lot of them being ethically aware of some issues, such as plagiarism. Participant 23 stated, In case I copy directly AI, I feel like I cheat. I need to watch out, I should restate the words and introduce my ideas.” The other level of involvement was idea growth, where 42.3% referred to AI as a stimulator of creativity. Participant 20 said that when they get stuck, AI can assist them to brainstorm: sometimes, it provides them with some ideas that they do not usually have.

The information highlights that generative AI has become a standard and deliberate tool used by students to improve their learning outcomes. It enhances efficiency, conceptual learning, and enables creativity. Nevertheless, how actively engaged people can be, particularly in terms of critical thinking versus copying, defines whether AI contributes to or overwhelms an education experience. The existence of moral issues and the varying levels of reliance on the tool imply a sophisticated implementation, so most educational value can be achieved when the tool is used responsibly, reflectively, and strategically.

Table 2: Themes of the study

Sr#	Core Theme	Key Categories / Sub-Themes	Frequency (n)	Percentage (%)
1	Patterns of Generative AI Use	<ul style="list-style-type: none"> • Routine Integration • Task-Specific Use • Support in Difficulty • Duration of Use 	26	100%
2	Academic Enhancement & Efficiency	<ul style="list-style-type: none"> • Improved Conceptual Clarity • Time Management • Productivity • Real-Time Support 	17	65.4%
3	Critical Engagement & Thinking	<ul style="list-style-type: none"> • Reflective Thinking • Analytical Skills • Creativity Catalyst • Over-Reliance Risk 	20	76.9%
4	Learning Outcomes & Skill Changes	<ul style="list-style-type: none"> • Clearer Writing • Problem-Solving • Interdisciplinary Thinking • Retention Impact 	21	80.7%
5	Ethical & Collaborative Considerations	<ul style="list-style-type: none"> • Academic Integrity • Group Work Efficiency • Citation Confusion • Inequality Risk 	18	69.2%

The summarized Findings. The results presented in Table 2 have been translated into five core themes that explain how students perceive and use generative AI in the scope of higher education and Education 4.0.

Patterns of Generative AI Use is the first key theme that identifies the majority of students as engaged with Generative AI tools to some extent. The most popular was the daily or task-oriented integration of the tool, which participants often referred to during their academic routine using tools like ChatGPT and Copilot. Students mentioned getting help with assignments, presentations, and explaining technical material using AI. Some of them stated that they started to utilize AI experimentally, but later they became more dependent. This indicates the evident tendency of the growing acquaintance and functional integration of generative AI into the daily academic routine.

The second theme, Academic Enhancement and Efficiency, had 65.4% of the students who stressed how AI helped in enhancing their conceptual clarity, time management efficiency, and work process efficiency. The students liked the immediate evaluation and access to AI tools that allowed them to overcome learning obstacles, improve their writing skills, and avoid time-consuming tasks such as summarizing reading materials or structuring research studies. Such answers portray the perceived usefulness of AI in enhancing productivity and comprehension.

Critical Engagement and Thinking, about which 76.9 percent of students replied, focuses on the way students mentally interact with the AI material. Many participants mentioned how AI tools promote critical thinking, promote the development of new ideas, and contribute to creative experimentation. Nevertheless, many believed that it should not be over-reliant on AI but instead rely on training that encourages critical thinking. AI must be used intelligently, with students noting that AI can act as a “tool of thought” and not as a surrogate of intellectual work.

Learning Outcomes and Skill Changes portrayed the fourth theme and were evident in 80.7% of the responses. Students indicated an increase in clarity in writing, problem-solving, and interdisciplinary thinking. Lots of them explained that AI has assisted them in developing more laconic writing and pursuing new creative ways in academic activities. Information retention, however, was also not without mixed opinion. Some discovered that AI helped them clarify aspects that were confusing to them, but some confessed to decreased deep learning or memory in passive use.

Finally, Ethical and Collaborative Considerations, brought up by 69.2 percent of individuals, were student reflections on academic honor, citation mix-ups, and group labor. Although students admitted that AI increased the efficiency of the collaboration process, specifically in task separation and group draft creation, a small number of them voiced concern about how it decreased the interaction between peers. Others would refer to the ethical dilemmas, such as plagiarism, misuse, and inequality in access to the AI tools, all of which pose some challenges that require proper academic policies and rules.

Findings

The use of AI tools, especially ChatGPT, was found to be considerable among the students and was used regularly and frequently. The respondents used ChatGPT most frequently in academic activities, including writing, summarizing, coding, and research planning. The rate of use and the time spent using them were different. However, several learned stated that they had used AI for more than a year and incorporated it into their everyday studies. Students explained how the use of generative AI increased their efficiency in learning, saving time, deepening their understanding,

and improving their work control. Some of them indicated higher grades and felt more in control of academic proceedings.

It is also interesting that active involvement with AI tools is another prominent topic. Although some students have confessed to effectively copying AI-generated material, most of them displayed a critical and reflective usage, as they used AI as a tool to generate ideas, enhance their understanding, and check their academic material. Ethics also appeared heavily in student stories, with distrust of plagiarism and proper citation strategies often coming up. Although some students admit that they have become increasingly dependent on AI tools, the majority state that they use them as study companions, but not as alternatives to thinking.

Also, the importance of AI in the creativity boost came into the spotlight. Students said AI enabled them to overcome creative blocks and come up with new ideas, and assist in interdisciplinary thinking, particularly in the design, writing, and assignments related to research. Nonetheless, others raised the issue of over-dependency and the possible loss of memory retention, whereby excessive use may constrain effective deep learning, depending on how it is handled with lots of caution. Finally, some ethical and collaborative issues have been raised, such as fear of reduced peer interaction in group work, unclear authorship, or disparate access to AI services among the students. The study revealed the following key insights based on students' experiences with generative AI in higher education:

- All participants reported using generative AI tools like ChatGPT, DALL·E, and Copilot in their academic work, with many integrating them into daily study routines.
- Students stated that AI tools helped them save time, manage assignments, and improve overall workflow efficiency.
- Many participants found that AI provided more precise explanations of complex topics, aiding in a better understanding of course content.
- A large number of students reported improvement in their academic performance, including higher CGPAs, after using AI tools.
- Several students shared that AI supported creativity by helping them generate new ideas during writing or problem-solving tasks.
- Those who engaged critically with AI—questioning and reflecting on its output—reported deeper learning and more meaningful outcomes.
- Some students admitted that relying too much on AI led to reduce effort in thinking independently and retaining information.
- Participants showed strong awareness of ethical issues, often mentioning concerns about plagiarism and proper use of AI-generated content.
- While AI tools supported group efficiency, a few students felt they reduced direct interaction and collaboration with peers.
- Concerns were raised about unequal access to AI tools, suggesting a need for institutional support to ensure fairness.

Discussion and Conclusion

This research has discussed Education 4.0 as a concept that presented higher education students with views concerning generative AI and its potential role in changing, disrupting, and improving learning processes. The thematic results identified five primary themes, which include patterns of generative AI use, academic enhancement and efficiency, critical engagement and thinking, learning outcomes and skill changes, and ethical and collaborative considerations. The results can

be positioned within the context of recently surfaced trends in the global community regarding the incorporation of AI in the learning setting (UNESCO, 2023).

Firstly, their inclusion in daily activities and specific tasks proves the increasing relevance of AI tools in academic life, and most notably, ChatGPT and Copilot. Students claimed to use them daily or almost daily, especially to finish their assignments, summarize relevant study material, and understand a technical idea. This is also consistent with what (Dwivedi et al., 2023) presented when they highlighted that AI technologies have become more important rather than experimental in the digital learning ecosystem. The fact that the students gradually become increasingly reliant on AI speaks to the normalization of AI in education mentioned by (Holmes & Tuomi, 2022) in that digital assistants are seamlessly integrated into the course of learning, so that the students hardly notice they use them.

In academic progress, the vast majority of students reported growth in idea elucidation, efficiency in time, and task organization. The perception of AI tools is that they give real-time assistance that can be used to simplify the academic content, and thus, students have the opportunity to use their time and mental space more efficiently. The result is consistent with (Holmes & Tuomi, 2022), where the researchers stated that AI systems can make the learning process more efficient by alleviating the cognitive burden on learners and offering them individualized support. Coupled with that, there is also a conspicuous rise in the CGPA of the students after introducing the AI, which is an added testimony to the academic potential that such tools can produce when utilized positively.

Still, when multiple students emphasized the importance of AI in terms of enhanced efficiency and creativity, the problem of critical engagement and thinking offered a more diverse opinion. Although 76.9 percent of students claimed to be more reflective, idea explorers, or able to analyze more complex assignments due to AI, others feared the possibility of utter passivity that may restrict intellectual activity. It is also reminiscent of (Luckin & Holmes, 2016), who warn us that uncontrolled over-dependence on AI may result in a decrease in the agency of the learner. In the research, learners with a strategic application of AI have an enhanced possibility of receiving cognitive benefits, which affirms the concept that active learner participation is imperative to the utilization of the educational value that AI offers.

The theme of the outcome of learning and skill changes also brought diversity in experiences. Students noted that AI enhanced the style of writing, brought thinking to a more interdisciplinary state, and trained the skills of solving tasks. Nonetheless, a few admitted that the use of AI would impede the deep learning and long-term memorization in case of shortcuts, instead of illuminating. This opens up with the results of (Zawacki-Richter et al., 2019), who claim that although AI can be used in acquiring knowledge, it can undermine meaningful learning when no effort is made to help learners internalize the material.

Another important item on the discussion was the ethics. Many students were worried about the issue of academic integrity, especially the indistinct cutoff between work done with AI and original work. They knew how to appropriately reference AI, or they were afraid of relying on it to the point of compromising academic honesty. This aligns with the recent research of (Floridi & Chiriatti, 2020) that revealed the moral grey zone of generative AI, focusing on authorship, plagiarism, and fairness. Further details were issues of diminished peer communication during group work, unequal access to AI, and AI bias in responses, which also reflect broader concerns of inequality and teaching in AI-enabled education (Selwyn et al., 2023).

In general, the results imply that generative AI is the innovative component of Education 4.0, but its efficiency is highly dependent on its application. Engagement, creativity, and higher achievement can be amplified with a strategic, ethical, and reflective usage. Comparatively, the passive/uninformed usage can cause ethical conduct breaches, shallow learning, and overdependence. These findings justify the need to address higher education with specific institutional policies, digital media literacy practices, and pedagogical frameworks of teaching with AI in a responsible way (Li et al., 2025).

This study offered valuable insights into how students in higher education perceive and experience the integration of generative AI tools within the evolving landscape of Education 4.0. The results indicate that generative AI is also gradually becoming a daily and unavoidable part of the academic life of students, who apply it to writing and research, generating ideas, and solving problems. The majority of learners admit that AI is beneficial to them since it leads to enhanced efficiency in learning, such as clarifying concepts, time management, and good writing. Nevertheless, the study also points out key issues associated with excessive dependence, ethical questions, limited communication with other peers, and the fact that critical thinking and the ability to retain information may also be hindered. Students displayed a mixed picture of effective active responses, with some students being strategically and reflectively active in their use of AI. In contrast, others acknowledged passive patterns of use that have the potential to limit in-depth learning. In the final analysis, generative AI in higher education is disruptive and paradoxical. Its effective incorporation will be based on its responsible and critical use by students, as well as the support of the educators. To achieve this goal, institutions should set ethical standards, encourage digital literacy, and foster a culture of self-moderated and reflective learning to truly enrich learning in Education 4.0. This will ensure that generative AI will just continue to be an empowerment tool instead of a replacement for subpar academic participation.

Recommendations

1. Universities have to implement systematic digital literacy courses with the specific theme of generative AI tool use. Such programs must empower the students to learn how to read and analyze AI-produced content and identify biased and questionable outputs, as well as how ethically problematic such tools can be. Incorporation of such training skills into general education and/or subject-specific courses may guarantee that students are effective in implementing these skills in any given field.
2. Teachers ought to be vocal in encouraging the AI tools to be used in improving learning and not substituting scholarly thoughts. Placement of assignments ought to be structured in such a way that it would demand critical thinking, creativity and analytical skills. The students will be guided to use AI to generate good ideas, simplify complicated topics, and analyse various viewpoints. Experiential tasks like keeping a learning journal or writing in response to the computer-generated suggestion can help to promote a more participative experience and help detract from the passive experience.
3. The academic use of generative AI has to have a clear and defined policy within institutions. The policies are to cover such questions as how to credit AI-generated content, its legitimate use, and academic honesty. It can be encouraged by giving simple illustrations and engaging the students in the process of policy-making, which will help them better understand and be more compliant. After formulating the policies, this should be shared openly and consistently in orientations, course outlines, and online means. Workshops and other support materials can be organized regularly to help the students and faculty navigate these guidelines.

4. Teachers are to be trained on how to interpret generative AI in teaching and how to apply it in its ethical and pedagogical measures. This training may involve, e.g., the teaching of methods to create assignments that foster the agency of students, the methods of grading work done with the use of AI, and the methods of exposing and addressing the phenomena of AI misuse. Faculty development programs may also be used as platforms to exchange best practices and reactions on the best way to use AI in the classrooms.
5. The use of AI tools needs to have fair access. Institutions should make sure that generative AI technologies and the digital infrastructure necessary to utilize them are accessible to every student, irrespective of their socioeconomic status. This may be done by providing institutional licenses to AI platforms, allowing them to access the campus libraries or laboratories and offering them sufficient technical support. In the absence of fairness, the positive implications of AI can be reserved for a closed circle of people and further entrench the disparities.
6. The findings on the effects of AI in education should also investigate the implications of long-term use of AI in education. Research may explore the generation of AI and its impact on critical thinking, creativity, and self-study in various fields and educational levels. The longitudinal studies of institutions and cross-institutional studies would be helpful to identify best practices and possible risks. The coordination of the efforts of educators, researchers, and policymakers is also going to be essential to stay updated about the changing role of AI in higher education.

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