Generative AI in Higher Education: Challenges and Opportunities for Course Learning[1]

Jinbao Zhang
Beijing Normal University, Beijing, China

ABSTRACT

Generative Artificial Intelligence (GenAI) is transforming course learning in higher education. This study, based on two rounds of action research in two college courses, reveals critical challenges in this transformation. Findings indicate that students' reliance on GenAI can hinder their autonomy, critical thinking, and affective-social learning, while also raising concerns about content accuracy, intellectual property rights, and privacy. Although teacher guidance partially mitigates these issues, enhanced strategies are crucial. This study provides practical implications for optimizing curriculum design, teaching methods, and evaluation criteria, emphasizing the need to incorporate ethics education and strengthen emotional-social guidance. Future research directions are suggested to address the challenges of GenAI and ensure educational quality and student development.

Keywords: Generative Artificial Intelligence, Higher Education, Course Learning, Challenges, Ethical Concerns, Teaching Strategies, Student Development.

INTRODUCTION

Generative AI is rapidly changing education, presenting both opportunities and challenges (Tariq, 2024; Batta, 2024). Its ability to generate content has significant implications for teaching and learning (Mittal, Sai, & Chamola, 2024), impacting code writing (Gottlander & Khademi, 2023), humanities assignments (Kumar et al., 2023; Hutson, 2025), and personalized feedback (George, 2023; Guettala et al., 2024).

However, concerns remain about its potential impact on student learning, ethics, and social skills (Hoernig et al., 2024). While some research suggests AI can enhance learning (Hooda et al., 2022), others caution against over-reliance (Aymen & Zakarya, 2024). Ethical considerations, such as intellectual property and data privacy, are also paramount (Kong, Li, & Zhang, 2024).

This study addresses existing research gaps by examining GenAI's application in two university courses: "Computational Thinking and Social Sciences" and "Modern Educational Technology." Using action research, the study analyzes AI's influence on learning, ethics, and social skills, aiming to provide a comprehensive understanding of its role in higher education.

LITERATURE REVIEW

Generative AI (GAI) is rapidly gaining traction in education, particularly in college courses. While it offers promising potential, it also presents challenges that necessitate careful consideration.

Current Applications and Benefits

GAI is being used in higher education to enhance teaching and personalize learning (Guettala et al., 2024). It can increase student engagement, improve test scores, and accelerate skill development (Guettala et al., 2024). Additionally, GAI provides educators with innovative tools and resources for course design, enriching the learning experience (Moundridou et al., 2024). When used effectively, GAI can increase teacher productivity and enhance instructional capabilities (MacDowell et al., 2024).

Challenges and Concerns

Despite its potential benefits, GAI presents several challenges:

- **Technology Dependence:** Over-reliance on GAI can hinder students' independent thinking and problem-solving abilities (Le-Nguyen & Tran, 2024; Shah & Asad, 2024).
- **Content Accuracy:** GAI-generated content may contain misinformation or biases due to limitations in training data and algorithms (Ozbay & Alatas, 2020).
- **Ethical Issues:** The use of GAI raises concerns about intellectual property infringement and data privacy breaches (Shukla et al., 2022; Vaza et al., 2024).
- **Social and Emotional Impact:** Excessive GAI use may negatively affect students' social interactions and teamwork skills (Wach et al., 2023).

Addressing the Challenges

Researchers propose several strategies to mitigate these challenges:

- **Digital Literacy:** Educators need to strengthen students' digital literacy skills to help them critically evaluate and use GAI responsibly (Kazanidis & Pellas, 2024; Cha et al., 2024).
- **Critical Thinking:** Students should be encouraged to think critically about GAI-generated content and verify information using reliable sources (Hammer, 2024; Holmes et al., 2023).
- **Ethical Guidelines:** Educational institutions must establish clear ethical guidelines and norms for GAI use to promote responsible and ethical practices (Holmes et al., 2023; Kasneci et al., 2023).

This study aims to build upon existing research by investigating the practical applications of GAI in college courses, its impact on student learning, and strategies for addressing ethical concerns.

THEORETICAL FRAMEWORK

This study examines the impact of generative AI on higher education, focusing on technology dependence, ethical issues, and assessment, through a multidisciplinary lens (Chiu, 2023). The theoretical framework integrates:

- **Educational Technology:** The Technology Acceptance Model (TAM) (Davis, 1989) is used to analyze factors influencing students' AI adoption. The study also examines

technology dependence, echoing the concept of "AI literacy" (Zawacki-Richter et al., 2023), where students must critically evaluate AI tools.

- **Social Cognitive Theory (SCT):** Bandura's (1997) theory of self-efficacy is used to explore how AI affects students' confidence. The study also analyzes students' outcome expectations related to AI use.
- **Ethics:** The study addresses academic integrity concerns, such as plagiarism and cheating, raised by AI use (Yi, 2021). It also examines potential intellectual property issues.
- **Constructivist Learning Theory:** Drawing on constructivism (Hein, 1991), the study investigates how AI impacts students' knowledge construction process.

Based on this framework, the study proposes hypotheses regarding technology dependence, academic integrity, assessment, and knowledge construction. It suggests that self-efficacy and outcome expectations influence AI dependence, with potential implications for academic integrity. AI use may also necessitate changes in assessment methods. Finally, the study recognizes the dual impact of AI on knowledge construction, acknowledging its potential to both promote and hinder deep learning.

The study aims to test these hypotheses through action research and provide recommendations for the ethical and effective integration of generative AI in higher education.

RESEARCH DESIGN

This study employs an action research approach (Kemmis & McTaggart, 1988) to investigate the impact of generative AI on college course learning. This method emphasizes a cyclical process of planning, acting, observing, and reflecting, allowing for continuous improvement throughout the research.

Focus Areas

The study focuses on several key areas:

- **Technology Dependence:** Examining whether students over-rely on generative AI, potentially hindering their independent learning and critical thinking skills.
- **Social Cognitive Impact:** Analyzing how generative AI affects students' self-efficacy and outcome expectations in the learning process.
- **Ethical Considerations:** Investigating potential ethical dilemmas related to academic integrity and intellectual property rights when using generative AI.
- **Assessment Impact:** Exploring how generative AI influences teachers' ability to accurately assess student learning and understanding.

Research Subjects

The study involves undergraduate students enrolled in two courses at a university: "Computational Thinking and Social Sciences" (third-year students) and "Modern Educational Technology" (first-year students). These courses were selected for their distinct student populations, allowing for a comprehensive examination of how different student groups engage with generative AI.

Rationale for Course Selection:

- "Computational Thinking and Social Sciences": Third-year students in this course may

have a higher tendency to over-rely on AI tools due to their focus on problem-solving and research.
- "Modern Educational Technology": First-year students in this course are likely to have a more basic understanding of AI and its capabilities, potentially leading to misuse.

Research Process
The study was conducted in two rounds of action research, each involving problem identification, subject selection, research design, implementation, and reflection and analysis. Data collection methods included classroom observation, assignment analysis, and student interviews.

ANALYSIS OF ISSUES
This section analyzes key issues observed in the study concerning students' use of generative AI in the two courses.

Technology Dependence and Deviation from Learning Principles
Students in both courses exhibited a strong reliance on generative AI, confirming the hypothesis that students tend to depend on such technology.[1] They often sought answers directly from AI instead of engaging in independent thinking and utilizing their knowledge base. This over-reliance reflects a neglect of developing essential learning skills and aligns with the hypothesis that students with low self-efficacy are more prone to AI dependence.

Variances:
- **Degree and Scenarios:** Third-year students in "Computational Thinking and Social Sciences" showed greater dependence when applying professional knowledge, reflecting their lower self-efficacy and desire for quick solutions to complex tasks. First-year students in "Modern Educational Technology" relied heavily on AI across all tasks, indicating a lack of active learning habits and a desire for shortcuts.
- **Impact Focus:** Over-reliance on AI hindered the development of critical thinking and problem-solving skills in third-year students, while first-year students struggled with independent program design, highlighting the negative impact of AI dependence on professional competence.

Content Accuracy and Ethical Concerns
Both courses encountered issues with the accuracy of AI-generated content and related ethical concerns, linking to academic integrity considerations. Students often used inaccurate information without verification, potentially leading to unintentional academic dishonesty. Additionally, they demonstrated a weak awareness of ethical issues like intellectual property and privacy protection, highlighting the risk of violating academic norms when using AI.

Variances:
- **Course Content:** In "Computational Thinking and Social Sciences," inaccurate information and ethical oversights in assignments and projects revealed the potential for AI to negatively impact research validity. In "Modern Educational Technology," issues included inaccurate information about emerging technologies and the use of copyrighted materials, demonstrating that AI challenges manifest differently across disciplines.

- **Behavioral Impact:** Ethical issues in "Computational Thinking and Social Sciences" highlighted students' lack of ethical decision-making skills in research. In "Modern Educational Technology," the use of inaccurate or infringing content not only affected individual learning but also had the potential to mislead others, emphasizing the broader consequences of unethical AI use in education.

Emotional and Social Learning Deficits

Students in both courses experienced negative emotional impacts and reduced social interaction due to AI use. This stemmed from decreased opportunities for communication and collaboration, leading to feelings of loneliness, anxiety, and decreased motivation.

Variances:

- **Affective Experiences:** Third-year students experienced anxiety due to the limitations of AI in fieldwork and loneliness from reduced group interaction. First-year students felt frustration when AI-assisted work proved impractical and experienced loneliness in blended learning environments. This highlights the diverse emotional impacts of AI across learning stages.
- **Social Interaction Impact:** In "Computational Thinking and Social Sciences," AI use reduced active classroom discussions and collaboration, hindering the development of teamwork skills. In "Modern Educational Technology," online and offline interactions decreased, negatively affecting learning outcomes and teacher-student relationships. This emphasizes the varied ways AI can disrupt social learning across different courses.

These findings underscore the complex challenges associated with integrating generative AI in education. While offering potential benefits, its use can lead to technology dependence, ethical concerns, and negative emotional and social impacts.[2] Addressing these issues requires careful consideration and the development of effective strategies to guide students toward responsible and ethical AI use in learning.

CONCLUSIONS AND DISCUSSION

This study examined the application of generative AI in two university courses, revealing significant issues related to technology dependence, content accuracy, ethical concerns, and social-emotional learning deficits (Zhang & Xu, 2024; Baron, 2024; Aguilera-Hermida, 2024; Slimi & Carballido, 2023; Tuomi, 2022). These interconnected challenges negatively impact student learning and outcomes.

While instructional interventions showed some positive effects, limitations remain. Many students continued to exhibit technology dependence, and ethical and social-emotional concerns persisted. This highlights the need for ongoing efforts to refine educational strategies and address these complex issues (Rane et al., 2024).

Discussion and Implications

This study offers several implications for educational practice:

- **Curriculum Design:** Integrate the ethical and effective use of generative AI into curricula, emphasizing responsible application and potential challenges (Zhang & Xu, 2024).

- **Teaching Methods:** Provide practical guidance on using AI, incorporating case studies and group discussions to enhance critical evaluation and social interaction.
- **Assessment:** Develop comprehensive evaluation criteria that consider the influence of AI on student work, focusing on understanding and application of knowledge.
- **Social-Emotional Learning:** Encourage active learning and social interaction through group activities and projects, fostering collaboration and emotional well-being.
- **Ethical Integration:** Embed ethical considerations throughout the curriculum, emphasizing intellectual property, privacy, and responsible AI use.

Future Research Directions

Future research should focus on developing targeted interventions, such as educational toolkits and modules, to cultivate critical thinking and digital ethics in students using generative AI. Exploring technological solutions for monitoring and guiding AI use can also enhance responsible application and improve assessment accuracy.

Further investigation into the disciplinary nuances of AI application is crucial. Examining how different fields engage with AI can inform tailored pedagogical strategies and promote effective integration across diverse learning contexts.

By addressing these challenges and pursuing further research, educators can harness the potential of generative AI while mitigating its risks, ultimately fostering a more effective and ethical learning environment for students.

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