

Generative AI as a Catalyst for Innovative Collaboration: Enhancing Group Projects Among Saudi Students in Digital Learning Environments

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ABSTRACT

In the contemporary era defined by rapid technological advancements and shifting educational paradigms, the integration of artificial intelligence (AI) into learning environments has emerged as a transformative force (Hassan, 2023). This research article explores the role of generative AI as a catalyst for innovative collaboration in group projects among Saudi students in digital learning environments, highlighting its potential to foster creativity, engagement, and effective teamwork. The landscape of education in Saudi Arabia is evolving, particularly with the increasing emphasis on digital learning platforms. As universities and educational institutions adapt to the demands of a globalized economy, there is a pressing need to cultivate skills that prepare students for the complexities of the modern workforce (Sporn & Godonoga, 2024). The effectiveness of group projects can often be hampered by challenges such as unequal participation, communication barriers, and varying levels of engagement among group members (Fittipaldi, 2020). Generative AI can enhance the collaborative process and empower students to engage more meaningfully with their peers and course materials. Furthermore, the application of generative AI aligns with Saudi Arabia's Vision 2030, which seeks to foster innovation, enhance the quality of education, and prepare the next generation for a technology-driven future (Saudi Vision 2030). This study aimed to investigate how generative AI can be leveraged to enhance collaborative projects among Saudi students, focusing on the benefits, challenges, and best practices associated with its implementation in digital learning environments (Bamasoud et al., 2025). By examining the perceptions and experiences of students who engage with generative AI tools in group projects, this research seeks to contribute valuable insights into the evolving role of technology in education. The findings of this study shed light on providing actionable recommendations for educators and policymakers aiming to enhance student engagement and success in an increasingly digital academic landscape. Ultimately, this research endeavoured to position generative AI as a key driver of innovative collaboration, equipping Saudi students with the skills and experiences necessary to thrive in a rapidly changing world.

Keywords: Generative AI, Innovative collaboration, Group projects, Digital learning environment, Creativity, Effective teamwork, Saudi vision

INTRODUCTION

Generative AI is leading an educational revolution, impacting teaching strategies and methodologies. Academics have observed that the use of AI is facilitating collaborative projects; AI applications enhance this collaboration through communication tools, knowledge sharing, and coordination. It offers equal opportunities and promotes inclusive practices in education (Adeleye et al., 2024). Large Language Models are helping to generate ideas and improve novelty. These tools provide opportunities to explore a spectrum of possibilities, supporting creativity (Gindert & Muller, 2024).

The study analysed the role of generative AI as a catalyst for innovative collaboration by scientifically observing the practices of the targeted population and collecting their feedback on how artificial intelligence can foster creativity, improve communication, and facilitate effective teamwork.

METHODOLOGY

Research Paradigm

The study is grounded in a constructivist research paradigm, which posits that knowledge is constructed through social interactions and experiences. This paradigm is particularly relevant when investigating collaborative learning, as it emphasizes the importance of context, interactions, and the subjective experiences of participants (Chand, 2024). By adopting a constructivist approach, the research seeks to understand how generative AI influences the collaborative processes and experiences of Saudi students in group projects, allowing for an exploration of the nuances of their engagement with technology and each other.

Research Design

A mixed-method research design was selected to facilitate the collection and analysis of data an online survey regarding students' perceptions and experiences with generative AI in group projects. This design is appropriate for identifying patterns, drawing correlations, and quantifying relationships between the use of generative AI and collaborative outcomes (McLeod, 2024).

Sample Selection

The study targeted students at a private university in Saudi Arabia, focusing on a sample of 135 participants, the study ensures a level of homogeneity regarding the educational context, resources, and technological access, which helps control for external variables that may influence the results.

Data Analysis

Data collected from the online survey were analyzed using descriptive statistics, Qualitative responses from open-ended questions were analyzed thematically to identify recurring themes and insights related to students' experiences with generative AI in group projects (Chintakrindi et al., 2022).

Literature Review

Group projects have been recognized as powerful pedagogical tools that promote active engagement and collective problem-solving among students. As education increasingly shifts towards digital learning environments, the dynamics of collaboration are being redefined, necessitating the exploration of innovative tools and technologies that can facilitate effective teamwork (Mahmadov, 2025).

Generative AI refers to algorithms that can create new content, ideas, or solutions based on existing data, enabling users to generate innovative outputs that can enhance learning experiences. In the context of digital learning environments, generative AI serves as a valuable resource, offering students and educators new ways to collaborate, brainstorm, and develop projects (Lee et al., 2024). By leveraging the capabilities of generative AI, students can access a wealth of information, receive personalized feedback, and engage in creative processes that were previously unattainable.

This review aims to synthesize existing research on the effectiveness of generative AI as a catalyst for enhancing group projects and to identify best practices for integrating this technology into educational frameworks (Ohri, 2024). By examining the current state of knowledge in this area, the literature review provided insights into how generative AI can foster innovative collaboration, ultimately contributing to improved educational outcomes and preparing students for the demands of an increasingly digital world.

Theoretical Framework

The theoretical framework explored Constructivist Learning Theory, Social Learning Theory, and Collaborative Learning Models, highlighting how these theories underpin the use of technology in facilitating group projects in digital learning environments.

According to constructivist theorists such as J. Piaget, J. Bruner and L. Vygotsky, knowledge is not merely transmitted from teacher to student; rather, it is built through social interactions and collaborative endeavors (Chand, 2024). By allowing students to collaborate in real-time on projects, generative AI aligns with constructivist principles, promoting a learner-centered approach that fosters creativity and critical thinking (Marzano, 2025).

Generative AI tools can facilitate discussion forums, peer reviews, and collaborative document editing, allowing students to learn from one another's perspectives and expertise (Salman et al., 2025). As students engage with generative AI in collaborative settings, they can observe and model effective teamwork strategies, thereby enriching their learning experiences.

By integrating generative AI into collaborative learning models, educators can create dynamic learning environments where students can work together more effectively, leveraging technology to enrich their collaborative efforts (Memon & Kwan, 2025).

The intersection of these theories illustrates how technology can significantly enhance collaborative learning. Generative AI serves as a catalyst for innovative collaboration by providing resources that align with constructivist, social, and collaborative learning principles. The use of

generative AI does not only support the construction of knowledge through active engagement but also fosters social interactions and collaborative processes that are essential for effective learning (Cress & Kimmerle, 2023).

Generative AI can serve as a powerful tool in educational settings, enhancing collaborative projects among students by providing them with a dynamic platform for idea generation and creative exploration (Wu & Zhang, 2025).

Existing studies often lack a comprehensive examination of the specific mechanisms through which generative AI enhances collaborative processes. Although some research highlights the benefits of AI tools in facilitating idea generation and feedback, there is limited empirical evidence detailing how these processes unfold in real-time collaborative settings. Understanding the dynamics of AI-supported collaboration is crucial for identifying best practices and optimizing the use of these technologies in educational contexts (Przegalinska et al., 2025).

There is a need for research that bridges the gap between technology and pedagogy, exploring how educators can effectively integrate generative AI tools into their teaching practices to foster meaningful collaboration among students. This includes understanding how to design collaborative tasks that leverage AI to promote critical thinking, creativity, and engagement.

The review has underscored the importance of addressing challenges such as inequitable access to technology, data privacy considerations, and the need for comprehensive teacher training. It also emphasizes the necessity for further research to explore the unique experiences of Saudi students with generative AI tools in collaborative learning environments (Allehyani et al., 2025). By focusing on this demographic, the current study aimed to contribute valuable insights that can inform the development of effective strategies for integrating AI into educational practices.

Findings and Interpretation

The survey contained 25 questions including 5 questions intended to provide demographic information, 16 closed-ended questions and 4 open-ended questions. The research engaged 135 undergraduate students (both female and male) of Prince Mohammad Bin Fahd University (the oldest Saudi private university) aged 18–20 (70.4%), 21–25 (25.9%) and under (3.7%), specializing in engineering (59), business (41), computer sciences, as well as other fields of study. The students were freshmen (86), sophomore (27), junior students (15), and senior students (7).

An overwhelming majority of the students were familiar with generative AI tools, with 42.2% (very familiar) and 74 (somewhat familiar), and 86.7% of all the respondents having experience in using Gen AI tools for group projects.

As regards to the specific GenAI tools used for group projects, an overwhelming majority of the respondents used ChatGPT (67.4%) and Gemini (20.7%).

Answering the question “How would you rate the impact of generative AI on your collaborative work in group projects?”, 21.5% admitted very positive impact, 38.5% – somewhat positive, while 31.1% stated the impact was neutral, and only 8.9% of the respondents acknowledged somewhat negative (5.2%) and very negative (3.7%) impact of GenAI (see Fig. 1 below).

The Impact of GenAI on Collaborative Work in Group Projects

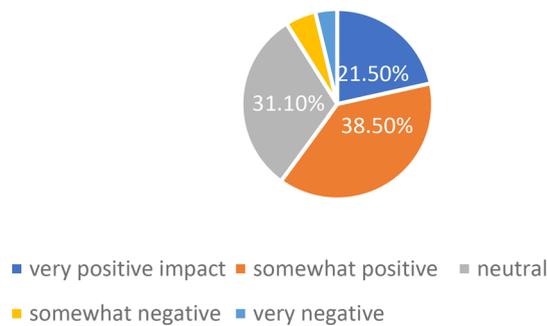


Figure 1: The Impact of GenAI on collaborative work in group projects.

The responses to the question “In what ways has generative AI enhanced your group project experience?” mainly included improved communication (40.7%), streamlined research (25.2%), enhanced creativity (18.5%), and increased efficiency in task completion (10.4%).

Answering the question “How effective do you find GenAI in generating ideas for group projects?” the respondents acknowledged effectiveness (47.8%) and high effectiveness (23.5%) of GenAI tools used for collaborative group projects, while 23.5% stated the effectiveness was neutral, and 6% admitted the tools they used were ineffective or very ineffective (1.5% and 2.9% accordingly) (see Fig.2 below).

Effectiveness of GenAI in generating ideas for group projects

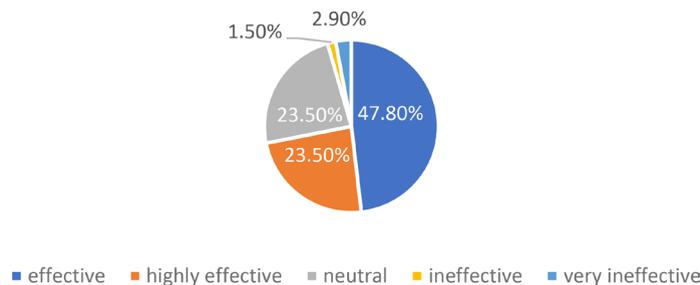


Figure 2: Effectiveness of GenAI in generating ideas for group projects.

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Table1: Students perceptions and practices feedback.

Topic/Question	Scale	%
Workload reduction	Strongly agree	21.5
	Agree	48.1
	Neutral	24.4
Usage frequency	Always	5.9
	Often	31
	Occasionally	48.9
	Rarely	9.6
Outcome quality	Significant improvement	23.7
	Slight Improvement	62.2
	No change	7.4
Challenges	Quality of output	49.6
	Tech dependance/Lack of understanding	48.9
	Communication issue	22.2
Comfort level	Very comfortable	19.3
	Somewhat comfortable	37.8
	Neutral	25.9
	Somewhat uncomfortable	10.4
	Very comfortable	6.7
Collaboration role	Strongly positive	9.6
	Positive	38.5
	Neutral	40.7
	Negative	5.3
	Strongly negative	5.9
Ethical Awareness	Aware	66.7
	Not aware	33.3
Peer recommendation	Very likely	11.1
	Likely	33.3
	Neutral	36.3
	Unlikely	11.9
	Very Unlikely	7.4
Formal training	Received training/guidance	35.6
	Did not receive training	64.4

The Perceived Role of GenAI in Fostering Collaboration among Group Members

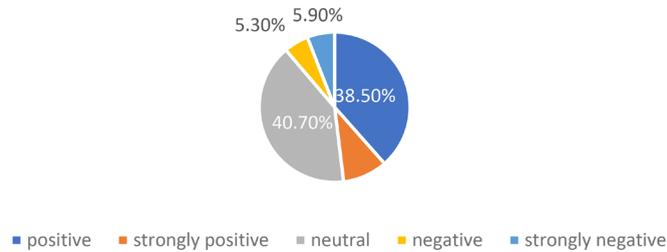


Figure 3: The Perceived Role of GenAI in Fostering Collaboration among Group Members.

The respondents revealed positive (38.5%) and strongly positive (9.6%), as well as neutral (40.7%) attitudes, with only 5.3% of the respondents admitting negative and strongly negative (5.9%) attitudes.

Based on the responses from the students, we can categorize their requests into several key themes, including training workshops and tutorials guidance on best practices, access to resources, resource libraries, AI tool recommendations, ethics and responsible use training, peer support and collaboration.

Many students expressed a desire for structured training sessions. They may have suggested hands-on workshops and online tutorials.

The students frequently indicated a need for guidance on best practices when integrating AI into group projects, including effective use cases and collaborative strategies. Therefore, information on how to appropriately utilize generative AI for brainstorming, research, and writing tasks while avoiding over-reliance on technology.

CONCLUSION

By analysing the experiences of students and educators, we have highlighted the transformative potential of generative AI tools in fostering creativity, improving communication, and facilitating effective teamwork. The findings suggest that when properly integrated, generative AI can significantly enhance collaborative learning experiences, leading to improved academic outcomes and greater student engagement (Yu et al., 2023). Key insights from the study reveal that generative AI not only streamlines collaborative processes but also empowers students to take ownership of their learning. By providing personalized feedback and facilitating the generation of ideas, AI tools create an environment conducive to exploration and innovation. Additionally, the cultural context of Saudi Arabia, characterized by a strong emphasis on collaboration, presents unique opportunities for leveraging generative AI to enhance group dynamics and collective problem-solving.

In conclusion, educators can create dynamic and engaging learning experiences that not only enhance group projects but also prepare students for the challenges of the future (Kohnke et al., 2025). The findings of this

study serve as a foundation for further exploration and implementation of generative AI in Saudi higher education, paving the way for a more collaborative and technology-enhanced learning landscape.

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