



Generative AI-Supported Classroom Interaction and Student Learning Experience: An Empirical Study

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Abstract. Generative artificial intelligence (AI) is increasingly being integrated into classroom teaching. This study examines the relationship between generative AI-supported classroom interaction, student engagement, and learning perception in a teaching context where AI is incorporated into regular classroom activities. Survey data were collected from 86 students and analyzed using descriptive statistics and correlational methods. The results indicate that students generally hold positive attitudes towards AI-supported classroom interaction and report overall satisfaction with their learning experience. Students particularly recognise the value of generative AI in providing timely guidance and feedback during classroom activities. Further analysis suggests that generative AI contributes to learning experience in two ways: directly, by enhancing the quality of classroom interaction, and indirectly, by promoting higher levels of student engagement. These findings provide empirical evidence that generative AI can support positive learning experiences through strengthened interaction and engagement when integrated into classroom teaching.

Keywords: generative AI, classroom interaction, student engagement.

1 Introduction

Recent advances in generative artificial intelligence have expanded the scope of digital tools available for classroom teaching. Beyond content generation and automated feedback, generative AI systems are increasingly capable of participating in classroom interaction through real-time dialogue, question prompting and adaptive responses. These capabilities raise important questions about how such technologies shape students' learning experiences in authentic instructional settings [1], building on long-established principles of artificial intelligence related to interaction and learning.

Classroom interaction plays a central role in effective teaching and learning. Prior research has consistently shown that active participation, sustained attention and opportunities for dialogue contribute to deeper understanding and more positive learning experiences. From a pedagogical perspective, classroom interaction is closely linked to student engagement and learning experiences in technology-supported instructional contexts [2]. However, in many classroom contexts, meaningful interaction is

constrained by time, class size and the uneven distribution of student participation. Technologies that can support interaction without disrupting instructional flow are therefore of growing interest.

Existing studies on AI-supported education have largely focused on learning outcomes or system performance, often treating classroom interaction as a secondary consideration. Systematic reviews suggest that, despite the growing volume of research, pedagogical integration and classroom-level interaction remain underexplored [3]. Moreover, recent discussions on generative AI and large language models have highlighted both opportunities and challenges for education, while calling for more empirical evidence from instructional practice [4]. In particular, empirical research examining the relationship between AI-supported interaction, student engagement and perceived learning remains limited.

Against this backdrop, the present study examines the role of generative AI in supporting classroom interaction and its association with students' engagement and learning perception. Drawing on survey data collected in an instructional context where generative AI was integrated into classroom activities, the study aims to provide empirical evidence on how students experience AI-supported interaction and how these experiences relate to their participation and perceived learning.

2 Related Research and Analytical Framework

2.1 Generative AI in Classroom Teaching

Artificial intelligence has been applied to education in various forms, including intelligent tutoring systems, adaptive learning platforms and automated assessment tools. Generative AI introduces a distinct interactional dimension by enabling open-ended dialogue and flexible response generation. This shift allows AI systems to participate more directly in classroom communication rather than functioning solely as background support tools.

Studies have reported positive student attitudes toward AI-assisted learning environments, particularly in relation to immediacy of feedback and perceived usefulness. At the same time, researchers have noted that the educational value of AI depends strongly on how it is embedded within instructional practices. Without appropriate pedagogical integration, AI-mediated interaction may remain superficial or underutilized.

2.2 Classroom Engagement and Learning Perception

Classroom engagement is commonly understood as a multidimensional construct encompassing behavioral participation, cognitive involvement and attentional focus. High levels of engagement are associated with improved comprehension and more favorable learning experiences. Learning perception, in turn, reflects students' subjective evaluation of their understanding, satisfaction and overall learning experience.

In technology-supported learning contexts, engagement has often been identified as a key mechanism through which instructional interventions influence learning

perception. Technologies that facilitate interaction and reduce barriers to participation may therefore indirectly enhance students' perceived learning outcomes.

2.3 Analytical Framework and Hypotheses

Based on prior research, this study conceptualises generative AI-supported classroom interaction as an instructional support factor that influences student engagement, which in turn relates to learning perception. The analytical framework positions AI-supported interaction as the antecedent variable, classroom engagement as a process variable and learning perception as the outcome variable (see Fig. 1).

Accordingly, the following hypotheses are proposed:

H1: Students' perceptions of generative AI-supported classroom interaction are positively associated with classroom engagement.

H2: Classroom engagement is positively associated with students' learning perception.

H3: Perceptions of generative AI-supported classroom interaction are positively associated with learning perception.

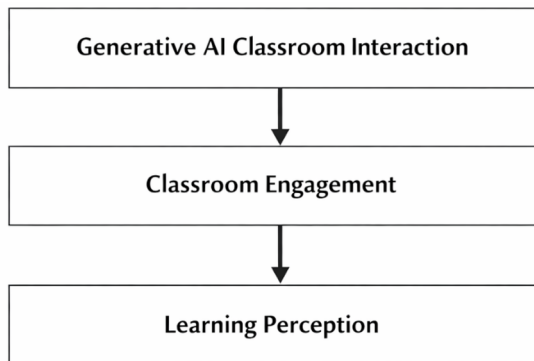


Fig. 1. Analytical framework of AI-supported classroom interaction

3 Methods

3.1 Research Context and Participants

This study was conducted within the instructional context of an Innovation and Entrepreneurship Education course. Generative AI was incorporated into regular classroom teaching to support interaction during instruction. Instructors integrated generative AI with course content to provide question prompts, real-time responses and learning feedback. Following the completion of the course, students who participated in the instructional activities were invited to complete a questionnaire reflecting their learning experiences. A total of 86 valid responses were collected and included in the analysis.

3.2 Instrument Design

The survey instrument consisted of 10 items measured on a five-point Likert scale. The items captured three dimensions: perceptions of AI-supported classroom interaction, classroom engagement and learning perception. The instrument was designed to ensure clarity and relevance to the instructional context.

3.3 Data Analysis

Data analysis focused on descriptive statistics and relational analysis among the key variables. Mean scores and standard deviations were calculated to describe overall trends, and relationships among variables were examined to test the proposed hypotheses.

4 Results

4.1 Descriptive Statistics

As shown in Table 1, beyond the overall positive trend, the relative levels of different indicators reveal distinct patterns in students' experiences of AI-supported classroom interaction. Figure 2 further illustrates these relative patterns, showing that indicators directly associated with AI interaction support-particularly guidance and feedback-received comparatively higher mean scores. This suggests that students most readily perceived the value of generative AI in its capacity to provide timely prompts and immediate clarification during classroom activities.

Table 1. Descriptive statistics of AI-supported classroom interaction variables (n = 86)

Variable	Items	Mean	SD
AI Interaction Support	Q1-Q3	4.35	0.62
Guidance & Feedback	Q1-Q2	4.31	0.60
Classroom Engagement	Q4-Q7	4.09	0.74
Active Participation	Q5-Q6	4.10	0.76
Learning Perception	Q8-Q10	4.19	0.67

By contrast, indicators related to classroom engagement and active participation showed slightly lower mean values, although they remained at a consistently high level. This pattern indicates that while generative AI effectively supports classroom interaction, its influence on students' participatory behaviors tends to be more indirect. In other words, AI support appears to facilitate engagement primarily when embedded within appropriate instructional contexts and supported by teacher guidance. These findings highlight the importance of integrating AI-mediated interaction with pedagogical design in order to translate technological support into sustained student participation.

With respect to learning perception, mean scores ranged between 4.15 and 4.21, indicating that students generally perceived AI-supported classroom interaction as beneficial to their understanding of course content and overall learning experience. Taken together, the descriptive results suggest that generative AI contributes positively to classroom interaction and learning perception, with its most immediate impact observed in interaction quality.

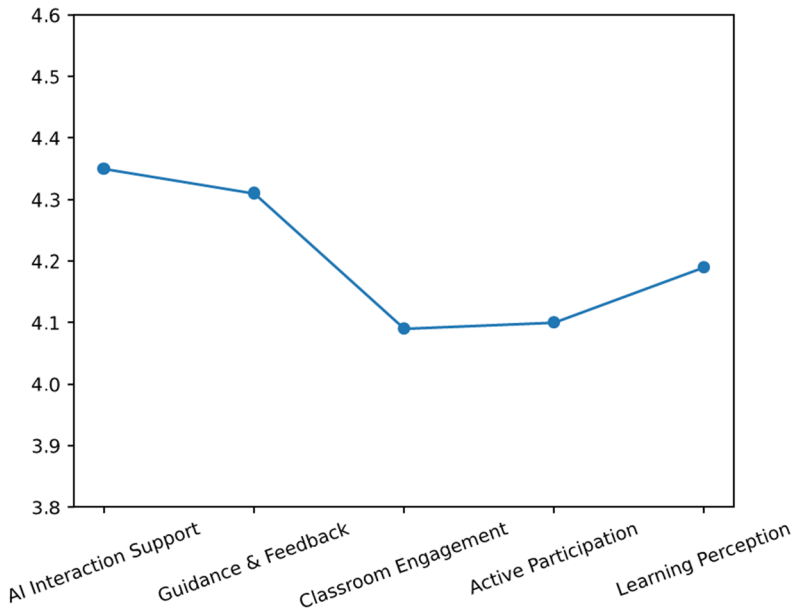


Fig. 2. Mean scores of AI-supported classroom interaction indicators.

4.2 Relationships Among Variables

An examination of Figure 1 and Table 1 reveals a coherent relational structure among AI-supported classroom interaction, classroom engagement and learning perception. Students who reported more favorable experiences of AI interaction support also tended to report higher levels of classroom engagement and more positive learning perceptions, supporting H1.

Further analysis suggests that classroom engagement may function as a connecting mechanism between AI-supported interaction and learning perception, supporting H2. Rather than exerting a direct influence on learning outcomes, generative AI appears to shape students' learning perceptions by reducing cognitive barriers, increasing opportunities for interaction and enhancing willingness to participate. In this sense, the relationship between AI-supported interaction and learning perception also supports H3. Taken together, these findings indicate a structured pathway through which generative AI influences learning experience via interaction quality and engagement.

5 Discussion

The results suggest that the influence of generative AI on classroom engagement is not automatic. Although AI support enhances classroom interaction quality, its translation into sustained engagement depends on instructional design and context. This finding highlights the importance of viewing generative AI as a complement to pedagogical interaction rather than a substitute for the teacher's role.

From a pedagogical perspective, the findings indicate that integrating generative AI into key interaction points—such as questioning, feedback and clarification—may be particularly effective. When aligned with instructional goals, AI-supported interaction can help sustain student attention and encourage active participation, thereby contributing to more engaging and positively perceived learning experiences.

Moreover, the effective use of generative AI requires careful alignment with instructional pacing and classroom organization. Recent studies have suggested that productive interaction with generative AI depends on learners' prompt literacy and their ability to formulate meaningful inputs [5]. Embedding AI-supported interaction at appropriate moments can guide student participation without disrupting instructional flow.

6 Conclusion

This study examined the role of generative AI in supporting classroom interaction and its relationship with student engagement and learning perception. The findings indicate that AI-supported interaction is positively associated with engagement and perceived learning. By foregrounding classroom interaction rather than technology alone, this study provides empirical evidence for the educational value of generative AI. The results suggest that integrated AI support can enhance interaction and contribute to more positive learning experiences. Future research may extend this work by examining these relationships across instructional contexts.

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