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# How Generative AI Reshapes Classroom Dialogue in Chinese Higher Education: A Mixed-Method Study of AI-Enhanced Dialogic Teaching

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**Abstract**

This study investigates how generative artificial intelligence (GenAI) reshapes classroom dialogue in Chinese higher education through a mixed-method design grounded in dialogic teaching theory. Moving beyond prior research that emphasizes AI adoption and user perceptions, this study conceptualizes GenAI as a structural mediator of classroom dialogue that influences instructional design, interaction processes, and student engagement. Data were collected from two Chinese universities, including 12 undergraduate courses, 10 teacher interviews, 24 classroom observations, and 221 student questionnaires. Quantitative results show significant increases in classroom participation (+22.2%), contribution frequency ($p < .001$), and higher-order cognitive responses, while overall learning engagement remains relatively stable. Qualitative findings reveal four interrelated mechanisms through which GenAI supports dialogic teaching: AI-assisted lesson design, AI-supported questioning sequences, AI-driven personalized learning support, and AI-facilitated collaboration. These mechanisms correspond to and extend Alexander's principles of dialogic teaching by enhancing purposefulness, reciprocity, supportiveness, cumulativeness, and collectively. The study proposes a GenAI-Enhanced Classroom Dialogue Framework, demonstrating that GenAI does not directly affect learning outcomes but reshapes them through restructuring classroom dialogue. The findings suggest that GenAI primarily enhances teachers' pedagogical design capacity and enables more structured, inclusive, and cognitively demanding classroom interaction.

***Keywords: Classroom Interaction, Dialogic Teaching, Generative AI, GenAI, Higher Education Teaching***

## Introduction

Tahfiz Generative Artificial Intelligence (GenAI), represented by large language models such as ChatGPT, is rapidly reshaping teaching and learning practices in higher education. In contrast to traditional educational AI, which has primarily focused on grading, recommendation systems, and learning analytics, GenAI is characterized by its natural language generation and context-aware interaction capabilities, enabling it to directly participate in curriculum design, classroom interaction, and learning support processes (Kasneci et al., 2023; Tlili et al., 2023). UNESCO (2023) and the OECD (2019)

both highlight that GenAI is transforming knowledge production and reshaping teacher roles as well as the organizational logic of teaching.

Against the backdrop of China's ongoing internationalization of higher education and the national strategy for educational digitalization, the application of GenAI in university teaching has been expanding rapidly. In recent years, Chinese universities have actively explored the use of generative AI tools such as ChatGPT, ERNIE Bot (Wenxin Yiyan), Tongyi Qianwen, and iFlytek Spark in teaching practices, gradually integrating them into curriculum design, learning support, and instructional management (Li & Wang, 2024). From curriculum resource development to personalized learning support, and from structuring classroom discussions to guiding collaborative projects, GenAI is increasingly becoming an important instructional aid for teachers (Cotton et al., 2023).

## Review of Related Literature

Existing research on GenAI in higher education mainly falls into several strands. The first strand focuses on teachers' and students' acceptance of GenAI, their behavioural intentions, and influencing factors, often grounded in the Technology Acceptance Model (TAM) or the Unified Theory of Acceptance and Use of Technology (UTAUT) (Chiu, 2023; Sallam, 2023). The second strand examines the cultivation of AI literacy, exploring how teachers and students understand, evaluate, and use AI technologies (Long & Magerko, 2020; Ng et al., 2021). The third strand concentrates on ethical risks posed by generative AI, including academic integrity, data privacy, algorithmic bias, and students' overreliance on AI (Dwivedi et al., 2023; UNESCO, 2023).

While these studies provide an important foundation for understanding the entry of GenAI into higher education, the existing literature remains largely focused on "AI adoption" and "AI perception," and has not yet fully moved toward examining "how AI reshapes pedagogical processes" (Cui & Teo, 2021). Building on this gap, this study draws on Alexander's (2008) theory of dialogic teaching to explore how GenAI reshapes classroom dialogue mechanisms and influences student participation and learning processes.

### Generative AI in Higher Education

The application of artificial intelligence in higher education has evolved from rule-based systems to generative models. Early research primarily focused on intelligent tutoring systems, automated grading, and learning analytics, with the core objective of improving teaching efficiency and providing personalized support (Holmes et al., 2019). With the development of large language models, GenAI has gradually acquired capabilities in content generation, question design, and feedback generation, shifting from an assistive tool to a collaborative participant in the teaching process (Kasneci et al., 2023).

Existing studies indicate that GenAI can support curriculum design, formative assessment, and the generation of learning resources, while also providing students with immediate feedback and support for self-directed learning (Cotton et al., 2023; Lo, 2023). At the same time, research has highlighted ethical concerns such as academic integrity, bias, and risks of overreliance (Dwivedi et al., 2023; UNESCO, 2023). From the perspective of teacher development, GenAI is reshaping the structure of teaching competencies, particularly in areas such as prompt engineering, AI-based evaluation, and ethical judgment (Benyahia, 2025). Overall, the literature in this area remains largely

focused on the functional dimension of "AI as a tool," with limited attention to its structural impact on classroom interaction processes.

**Dialogic Teaching and Classroom Dialogue**

Dialogic teaching theory, proposed by Alexander (2008), emphasizes that knowledge is co-constructed through sustained interaction. Classroom dialogue is not merely an information exchange process but a core mechanism for promoting reasoning, reflection, and meaning-making (Mercer et al., 2019). Alexander identifies five principles of dialogic teaching: collectivity, reciprocity, supportiveness, cumulativeness, and purposefulness.

In recent years, dialogic teaching theory has been further extended from primary and secondary education to higher education contexts. Research shows that high-quality classroom dialogue can promote students' critical thinking, metacognitive abilities, and deeper disciplinary understanding (Mercer et al., 2019; Asterhan et al., 2015). From a sociocultural theory perspective, classroom dialogue is not only a medium for knowledge transmission but also a key mechanism through which learners co-construct meaning and develop cognitive capacities (Vrikki et al., 2019).

With the development of online learning platforms, collaborative tools, and artificial intelligence technologies, researchers have increasingly examined the impact of digital technologies on classroom dialogue. For example, digital collaborative platforms and intelligent learning environments can expand opportunities for interaction, increase feedback frequency, and support more equitable classroom participation (Firer et al., 2021; Luckin & Cukurova, 2019). The widespread adoption of hybrid learning in the post-pandemic era has further advanced research on technology-supported classroom dialogue. However, discussions on how generative AI intervenes in classroom dialogue mechanisms remain at an early stage.

**Towards GenAI-Supported Dialogic Teaching**

Recent studies suggest that large language models are inherently dialogic systems, and their generative mechanisms are structurally similar to processes of meaning negotiation in classroom interaction (McMurry, 2025). Therefore, GenAI is increasingly considered a potential cognitive tool for supporting classroom dialogue. Existing research indicates that GenAI can support teaching processes in four main ways: curriculum design optimization, question generation, personalized feedback, and facilitation of collaborative learning (Kohnke et al., 2023). Theoretically, these functions may enhance both the depth and frequency of classroom interaction.

Although emerging studies have begun to explore the impact of GenAI on learning engagement and feedback processes, research on how GenAI specifically supports classroom dialogue, transforms interaction structures, and facilitates knowledge co-construction remains limited (Cui & Teo, 2021). In particular, within Chinese higher education contexts, there is still a lack of systematic empirical evidence on how teachers integrate GenAI into dialogic teaching practices and how such integration shapes student participation and learning processes.

**Synthesis and Research Gap**

Overall, the existing literature reveals three structural limitations. First, research on GenAI has largely focused on technological adoption and competency development,

treating AI as an external tool rather than a structural variable embedded in pedagogical processes. Second, although dialogic teaching research emphasizes the importance of classroom interaction, it implicitly assumes teacher-centered dialogue design and lacks theoretical engagement with the intervention of external intelligent systems. Third, studies on the educational value of GenAI tend to focus on learning outcomes while overlooking classroom interaction as a key mediating mechanism. As a result, a central question remains insufficiently addressed: how does generative AI systematically reconstruct classroom dialogue structures by influencing instructional design and interaction organization?

Building on this gap, this study reconceptualizes GenAI as a "structural mediator of classroom dialogue," focusing on how it reshapes the generative logic of classroom dialogue, through instructional design, questioning structures, personalized support, and collaborative mechanisms, rather than merely improving teaching efficiency or learning outcomes. This perspective addresses the theoretical disconnect between "AI-teaching process-dialogue mechanism" and provides a new analytical lens for understanding classroom interaction in the age of AI.

This study is grounded in Alexander's (2008) theory of dialogic teaching and integrates existing research on the application of Generative Artificial Intelligence (GenAI) in higher education to construct an initial conceptual framework. The framework is designed to examine how GenAI influences classroom dialogue practices and student learning engagement.

Alexander (2008) argues that dialogic teaching emphasizes knowledge co-construction through high-quality classroom interaction. Its core features include collectivity, reciprocity, supportiveness, cumulativeness, and purposefulness. The theory rejects the notion of learning as one-way knowledge transmission and instead conceptualizes it as a process of meaning-making through sustained teacher–student interaction. Accordingly, the quality of dialogue becomes a key determinant of students' learning engagement and cognitive development.

Building on this theoretical foundation, this study posits that GenAI does not directly influence student learning outcomes. Rather, it first shapes teachers' teaching practices, which in turn affect classroom dialogic processes, and ultimately influence student engagement outcomes. Based on this logic, an initial conceptual framework is developed (Figure 1).

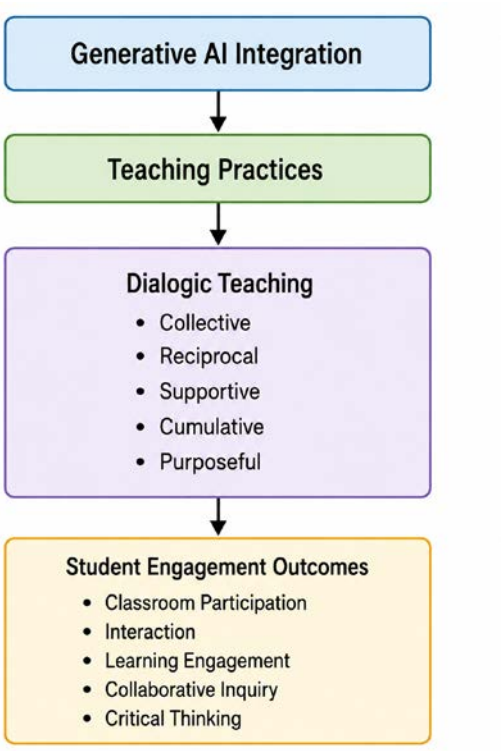


***Figure 1.*** *Initial Conceptual Framework*

Figure 1 presents the initial conceptual framework of this study. It assumes that GenAI indirectly influences classroom dialogue processes by shaping teaching practices, which in turn affect student learning engagement. Specifically, GenAI is conceptualized as a pedagogical enabler that supports teachers in instructional design, classroom interaction organization, and learning support activities. These teaching practices subsequently shape the organization and quality of classroom dialogue, thereby influencing student engagement through dialogic teaching processes.

However, the specific mechanisms through which GenAI affects classroom dialogic practices remain insufficiently evidenced. To address this gap, this study adopts a convergent mixed methods design, combining classroom observations, teacher interviews, and student questionnaires to explore the mechanisms through which GenAI supports dialogic teaching in practice.

## Research Questions

Specifically, this study investigates how teachers use GenAI to support instructional design, classroom questioning, personalized learning, and collaborative learning, and addresses the following research questions:

- RQ1: How do teachers use GenAI to implement dialogic teaching?
- RQ2: Through what mechanisms does GenAI influence classroom dialogue and student participation?
- RQ3: What are the opportunities and challenges of its application?

## Methodology

### Research Design

This study adopts a convergent parallel mixed methods design, in which qualitative and quantitative data are collected simultaneously and integrated during the analysis phase to

achieve a multi-layered interpretation (Creswell & Plano Clark, 2018). Qualitative data are used to uncover the mechanisms through which GenAI operates in classroom dialogue practices, while quantitative data are employed to examine its effects on student participation and learning engagement.

This design is particularly suitable for research at the intersection of educational technology and teaching processes, as it enables both an understanding of the complexity of pedagogical practice and the empirical verification of outcomes (Creswell & Plano Clark, 2018; Tashakkori & Teddlie, 2010). It also facilitates methodological complementarity and triangulation (Poth, 2023), thereby enhancing the explanatory power and rigor of the study.

## Research Setes and Participants

This study selects two representative universities in China as research sites: one public university and one private (non-state) university. The inclusion of different institutional types aims to enhance the external validity of the study (Creswell & Poth, 2018) and to compare how generative AI is applied in teaching practices under different institutional contexts and resource conditions (Merriam & Tisdell, 2016; Yin, 2018), as shown in Table 1. Both universities have incorporated GenAI tools into multiple courses to support classroom discussion design, learning feedback, and project-based instruction.

*Table 1. Research Context and Participants Overview*

| **Component** | **Description** |
|---|---|
| Research sites | Two higher education institutions in China: one public university and one private university |
| Course scope | 12 undergraduate courses in total, covering business, social sciences, and natural sciences |
| Student participants | 221 undergraduate students with varying levels of academic ability and classroom participation |
| Teacher participants | 10 university teachers integrating GenAI into teaching, with 3–18 years of teaching experience across disciplines (e.g., marketing, education, mathematics) |
| Sampling strategy | Purposive sampling (selecting courses where GenAI is actively used in classroom practice) |
| Ethical considerations | All participants signed informed consent forms, and all data were anonymized |

## Data Collection

To ensure data diversity and complementarity (Creswell & Plano Clark, 2018; Flick, 2023), this study employs three data sources: classroom observation, teacher interviews, and student questionnaires, as summarized in Table 2.

*Table 2. Overview of Data Collection Methods*

| **Data type** | **Source and scale** | **Key details (duration / method / purpose)** |
|---|---|---|
| Qualitative data | Classroom observation (24 sessions across 12 courses) | 90–120 minutes per session, totaling approximately 48 hours; records instructional design, questioning strategies, student interaction, group collaboration, and GenAI usage |
| | Teacher interviews (10 teachers) | Semi-structured interviews, 45–75 minutes each; conducted both online and offline; all audio-recorded and transcribed |

| | | |
|---|---|---|
| | | verbatim to analyze teachers' AI pedagogical practices and perceptions |
| Quantitative data | Student questionnaire (221 students) | Five-point Likert scale; measures classroom participation, learning engagement, and perceived AI support; used for statistical analysis and group comparisons |
| Research design integration | Convergent parallel mixed methods design | Qualitative and quantitative data collected simultaneously; integrated through triangulation for comprehensive analysis and interpretation |

# Analysis

## Data Analysis

Qualitative analysis follows Braun and Clarke's (2006) thematic analysis approach, including familiarization with data, initial coding, theme generation, and theme review. Coding focuses on four categories of AI-supported teaching practices: curriculum design support, questioning structure optimization, personalized learning support, and collaborative learning facilitation. The resulting themes are then mapped onto Alexander's (2008) five principles of dialogic teaching to achieve theoretical integration.

Quantitative analysis combines descriptive and inferential statistical methods. Specifically, mean comparisons and paired-samples t-tests are conducted. The key indicators include classroom participation rate, interaction frequency, and learning engagement scores. The significance level is set at $p < .05$ to test changes in these indicators before and after the introduction of GenAI (Field, 2018).

# Findings and Discussion

Based on classroom observations, teacher interviews, and student questionnaire data, this study analyzes teaching practices and learning outcomes of GenAI-supported dialogic classroom interaction. The findings are presented in two parts: quantitative findings and qualitative findings.

## Quantitative Findings

This study adopts a within-subject pre-post design to examine changes in learning behaviors and learning engagement among 221 students before and after the introduction of GenAI-supported classroom dialogue. Data analysis includes descriptive statistics and paired-samples t-tests, with the significance level set at $p < .05$.

## Descriptive Statistics Results

Table 3 presents the descriptive statistical results of changes in classroom participation behaviors and learning engagement among 221 students before and after the introduction of GenAI. Overall, most behavioral indicators show an upward trend in the post-test stage, while changes in learning engagement are relatively small.

*Table 3. Student Classroom Participation and Learning Engagement (n = 221)*

| **Indicator** | **Pre-test (M)** | **Post-test (M)** | **SD (Pre/Post)** | **Change** |
|---|---|---|---|---|
| Classroom participation rate (%) | 56.2 | 78.4 | 14.6 / 18.3 | +22.2 |
| Number of classroom contributions (times/class) | 3.1 | 5.2 | 1.8 / 2.7 | +2.1 |
| Student speaking confidence (1–5) | 3.4 | 3.9 | 0.74 / 0.81 | +0.5 |

| | | | | |
|---|---|---|---|---|
| Learning engagement score (1–5) | 3.52 | 3.47 | 0.68 / 0.79 | −0.05 |

**Paired-Samples t-Test Results**

Table 4 reports the results of the paired-samples t-tests. The findings show that both classroom participation rate and number of contributions reach statistical significance ($p < .001$). Speaking confidence shows a small but significant increase, while learning engagement does not reach statistical significance ($p = .063$).

*Table 4. Differences in Student Performance under Different Classroom Conditions*

| Variable | t-value | df | p-value | Cohen's d | Direction |
|---|---|---|---|---|---|
| Classroom participation rate | 7.18 | 220 | < .001 | 0.63 | Significant increase |
| Number of contributions | 6.02 | 220 | < .001 | 0.51 | Significant increase |
| Speaking confidence | 4.11 | 220 | < .001 | 0.29 | Slight increase |
| Learning engagement | -1.87 | 220 | .063 | 0.13 | Non-significant decreasing trend |

**Observational Behavioral Data**

Table 5 presents changes in classroom behavioral observation data. The results show that total student contributions increased from 214 to 356. The proportion of teacher-led talk decreased from 71% to 58%, while student-led interaction increased from 29% to 42%. The proportion of higher-order cognitive responses increased from 31% to 46%.

*Table 5. Changes in Classroom Interaction Behaviors (Observation Data)*

| Behavioral indicator | Early stage | Later stage | Change |
|---|---|---|---|
| Total student contributions | 214 | 356 | +142 |
| Teacher-led talk (%) | 71% | 58% | −13% |
| Student-led interaction (%) | 29% | 42% | +13% |
| Higher-order cognitive responses (%) | 31% | 46% | +15% |

**Polarization in Learning Engagement**

In the dimension of learning engagement, further subgroup analysis reveals clear differences. Table 6 shows changes in engagement among students with different participation levels. The results indicate that high- and low-participation students show slight increases, while medium-participation students show a decline.

*Table 6. Changes in Learning Engagement by Group (Polarization Effect)*

| Student type | Pre-test | Post-test | Change |
|---|---|---|---|
| High-participation students (Top 30%) | 4.01 | 4.18 | +0.17 |
| Medium-participation students (Middle 40%) | 3.52 | 3.41 | −0.11 |
| Low-participation students (Bottom 30%) | 2.91 | 3.05 | +0.14 |

**Summary of Quantitative Results**

Based on paired-samples t-tests and classroom behavioral statistics, student classroom participation significantly increased in the post-test stage ($p < .001$), and the proportion of higher-order cognitive responses also rose. However, learning engagement did not show statistically significant change ($p = .063$) and exhibited heterogeneous patterns across different student groups.

## Qualitative Findings

### Theme 1: AI-Assisted Lesson Planning

This theme addresses Research Question RQ1, focusing on how teachers use generative AI to design lessons in ways that enhance the purposefulness of classroom dialogue.

The findings show that teachers commonly use GenAI as a "cognitive external brain" in the early stage of instructional design. It is used to generate teaching cases, design discussion topics, anticipate possible student responses, and construct the structure of classroom activities. This process significantly strengthens the goal orientation and structuring of classroom discussions. One teacher noted in the interview:
"*In the past, designing discussion questions took a lot of time because I had to imagine how students might respond. Now I can use AI to simulate students' thinking first and then refine my questions accordingly."*

Classroom observations also indicate that in courses where AI-assisted design is used, teachers' questions tend to be more layered, and classroom discussions are less focused on factual recall and more oriented toward explanation and evaluation. From the perspective of Alexander's (2008) dialogic teaching theory, this mechanism primarily strengthens the principle of "Purposeful," shifting classroom dialogue from spontaneous interaction to a goal-directed learning process.

Specific manifestations include:

- Teaching cases are more closely aligned with real-world contexts
- Discussion questions are more open-ended and challenging
- Student discussions are more aligned with learning objectives
- Teachers are able to anticipate and guide discussion trajectories

Therefore, the role of GenAI in the lesson planning stage essentially lies in enhancing the structural organization and cognitive depth of classroom dialogue.

### Theme 2: AI-Supported Questioning

This theme addresses RQ1 and RQ2, focusing on how GenAI reshapes classroom questioning structures and thereby promotes student participation and deeper dialogue. The findings show that teachers extensively use GenAI to generate three types of key questions:

- Open-ended questions
- Probing questions
- Higher-order cognitive questions

These questions are typically organized in the form of "questioning sequences," which create a progressively layered structure in classroom discussion. Based on this, the study proposes an AI-supported dialogic questioning sequence model (Figure 2).

Knowledge → Understanding → Application → Evaluation → Reflection

*Figure 2. AI-Supported Dialogic Questioning Sequence Model*

This model illustrates how teachers use GenAI to generate progressive questioning sequences. Classroom observations show that teachers typically begin with factual questions to activate prior knowledge (Knowledge), then guide students to explain concepts (Understanding), apply knowledge to solve problems (Application), evaluate

different perspectives (Evaluation), and finally engage in reflection and metacognitive discussion (Reflection).

This progression supports a shift in classroom dialogue from information exchange to knowledge co-construction, and strengthens the principles of Reciprocity and Cumulativeness emphasized by Alexander (2008). Classroom observation data further show that in AI-supported questioning classrooms, discussion is no longer a "single-turn Q&A" process but evolves into a continuous knowledge-building trajectory. One teacher stated:
*"AI helps me turn a simple question into a five-level progressive sequence, so students don't finish discussing quickly—they keep going deeper."*

From Alexander's theoretical perspective, this mechanism strengthens:

- Reciprocity: students respond more frequently and in more diverse ways
- Cumulativeness: discussion continuously builds on prior contributions

**Theme 3: AI-Guided Personalization**
This theme addresses RQ2, focusing on how GenAI enhances student engagement and psychological safety through personalized support.

The findings show that teachers use GenAI to generate differentiated learning suggestions, personalized feedback, and learning pathway guidance, thereby making classroom dialogue more supportive. Key manifestations include:

- Providing differentiated explanations for students of different ability levels
- Adjusting classroom tasks based on AI-generated learning suggestions
- Offering real-time feedback and supplementary learning resources
- Reducing students' anxiety about speaking in public discussions

A student wrote in the open-ended questionnaire:
"I used to be afraid to speak in class because I was worried about being wrong. But after the teacher used AI to organize our ideas, I feel more confident expressing my thoughts."

Classroom observations also show that in AI-supported personalized learning environments, low-participation students demonstrate a noticeable increase in speaking frequency. From Alexander's framework, this mechanism strengthens the principle of Supportiveness by creating a safe and inclusive dialogic environment in which students at different levels can participate in knowledge construction. Thus, GenAI does not merely "provide information," but lowers the threshold for participation, thereby improving equity in classroom engagement.

**Theme 4: AI-Facilitated Collaboration**
This theme addresses RQ1 and examines how GenAI supports classroom collaboration and collective knowledge construction.

The findings show that teachers widely use GenAI to support the following instructional activities:

- Group brainstorming
- Collaborative inquiry tasks
- Project-based learning design

In these activities, GenAI is often used as a "shared cognitive tool," helping students generate initial ideas, structure discussions, or provide informational support. Classroom observations indicate that in AI-supported collaborative classrooms:

- Group discussions are more structured
- Task division is clearer
- Students more frequently reference AI-generated content in discussions
- Discussions are more likely to reach shared conclusions

From Alexander's perspective, this mechanism strengthens the principle of Collectivity, where learning is understood as a social process of group participation. One teacher noted: "*AI makes group discussion no longer a situation of 'having nothing to say,' but gives students a starting point*."

Therefore, GenAI in collaborative learning functions as cognitive scaffolding for collective dialogue, thereby improving the efficiency of group collaboration.

**Theme 5: Opportunities and Challenges**

This theme addresses RQ3 and systematically examines the potential benefits and practical limitations of GenAI-supported dialogic teaching.

**Key Opportunities**

The findings suggest that GenAI offers several major advantages in classroom dialogue:

1. **Efficiency improvement**: Teachers can generate teaching materials and discussion questions more quickly, significantly reducing preparation time.
2. **Enhanced inclusiveness**: Low-participation students are more easily engaged in classroom discussion.
3. **Improved accessibility of learning resources**: Students gain more immediate explanations and learning support.

**Key Challenges**

Despite its positive effects, several challenges were identified:

1. Ethical concerns: Some teachers worry that students may become overly dependent on AI-generated content.
2. Teacher competence gaps: Significant differences exist in teachers' ability to use AI, affecting the consistency of teaching outcomes.
3. Student over-reliance on AI: Some students reduce independent thinking and tend to directly use AI-generated answers.

**Theme 7: An Emergent GenAI-Enhanced Classroom Dialogue Framework**

This study identifies four core mechanisms through which GenAI supports classroom dialogue:

- AI-assisted curriculum design (Purposeful Dialogue)
- AI-supported questioning structures (Reciprocal & Cumulative Dialogue)
- AI-guided personalized learning (Supportive Dialogue)
- AI-facilitated collaborative learning (Collective Dialogue)

Together, these mechanisms improve the quality of classroom dialogue and student engagement, forming an integrated theoretical model: the GenAI-Enhanced Classroom Dialogue Framework (Figure 3). This model illustrates how generative AI influences

classroom dialogue practices through four pedagogical mechanisms, ultimately promoting student participation and learning engagement.

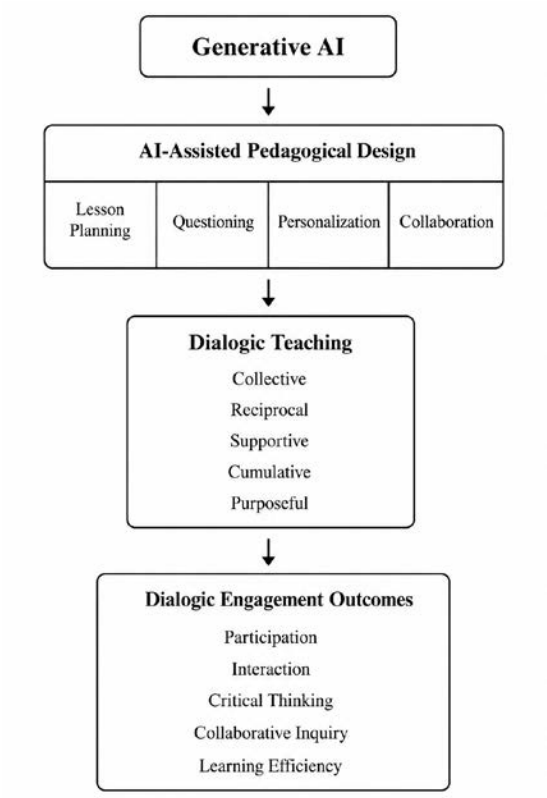


*Figure 3. GenAI-Enhanced Classroom Dialogue Framework*

This framework indicates that GenAI does not directly influence student learning outcomes. Instead, it first enhances teachers' pedagogical design capacity through AI-assisted instructional design, which in turn activates four key teaching mechanisms: curriculum design, questioning design, personalized support, and collaborative learning.

These mechanisms jointly shape classroom dialogic practices and correspond to Alexander's (2008) five principles of dialogic teaching (Collective, Reciprocal, Supportive, Cumulative, Purposeful). Ultimately, dialogic teaching practices further promote multiple dimensions of student learning outcomes, including participation, interaction, critical thinking, collaborative inquiry, and learning efficiency. Therefore, this study argues that the core value of GenAI in higher education classrooms is not to replace teachers, but to enhance teachers' instructional design capacity, thereby indirectly facilitating the generation of high-quality classroom dialogue.

Drawing on the theoretical perspective of dialogic teaching (Alexander, 2008; Mercer et al., 2019), this study examines how Generative Artificial Intelligence (GenAI) reshapes the structure of teaching interactions and learning processes in Chinese higher education classrooms. Unlike traditional research that conceptualizes AI as a tool for instruction or an efficiency-enhancing technology (Holmes et al., 2019; Kasneci et al., 2023), this study positions GenAI as a "structural mediator" of classroom dialogue and proposes a GenAI-Enhanced Classroom Dialogue Framework. This section discusses the findings at three theoretical levels and further explores implications for teacher professional development.

## GenAI as a Structural Mediator of Dialogic Teaching

The primary theoretical contribution of this study lies in redefining the functional positioning of generative AI in classroom teaching. Existing literature typically frames AI as a content-generation tool or learning support technology (Dwivedi et al., 2023; Kasneci et al., 2023). However, the empirical findings of this study demonstrate that GenAI is deeply embedded in instructional design and classroom interaction processes, functioning as a "pedagogical cognitive mediator" that directly influences the structure, rhythm, and depth of classroom dialogue.

This interpretation is supported by multiple empirical findings. First, quantitative results show that after the introduction of GenAI, classroom participation significantly increased (+22.2%, $p < 0.001$), the number of contributions per class rose significantly (+2.1, $p < 0.001$), and the proportion of higher-order cognitive responses increased from 31% to 46%. This indicates that GenAI does not merely increase interaction frequency but enhances the cognitive quality structure of interaction.

Second, classroom observations further reveal a systematic transformation in teachers' questioning patterns, shifting from factual Q&A to multi-level cognitive sequences (Knowledge → Reflection), indicating a substantial restructuring of dialogic architecture. Based on these findings, this study argues that GenAI expands teachers' cognitive boundaries through three pathways:

- Question generation capacity
- Anticipatory pedagogical reasoning in classroom interaction
- Dialogic structuring capability

Importantly, GenAI does not replace teacher judgment but expands the teacher's "design space," enabling the construction of more complex dialogic structures at lower cognitive cost. Therefore, this study proposes a revision of the traditional teaching model:

- Traditional model: Teacher → Dialogue → Learning
- Revised model: Teacher → GenAI → Dialogue → Learning

This shift suggests that GenAI is no longer an external tool but an embedded structural generative mechanism within classroom teaching, fundamentally reshaping how classroom dialogue is produced.

## Four Pedagogical Mechanisms of AI-Enhanced Classroom Dialogue

Based on the integrated analysis of qualitative and quantitative data, this study identifies four core mechanisms through which GenAI supports classroom dialogue, mapped onto Alexander's (2008) five principles of dialogic teaching.

### Mechanism 1: AI-Assisted Lesson Design → Purposeful Dialogue

Teachers widely use GenAI for case generation, question prediction, and activity structuring, shifting classroom teaching from experience-driven to structure-driven design. This transformation enhances goal alignment and cognitive focus in classroom dialogue.

Observations show that AI-assisted classes involve fewer factual exchanges and more explanation, evaluation, and reflection, consistent with the significant increase in higher-order responses (+15%). This mechanism strengthens Alexander's principle of

Purposefulness, where dialogue becomes a structured cognitive pathway rather than spontaneous interaction.

**Mechanism 2: AI-Supported Question Design → Reciprocal & Cumulative Dialogue**
GenAI plays a key role in generating "questioning sequences," transforming classroom interaction from isolated Q&A into structured progressive dialogue. Interviews indicate that AI expands single questions into multi-layered sequences, extending discussion chains.

This mechanism is supported by quantitative findings showing increased student contributions (+2.1) and a higher proportion of student-led interaction (+13%). It strengthens:

- Reciprocity (increased interaction frequency and response diversity)
- Cumulativeness (knowledge construction through continuous dialogue)

More importantly, it transforms the temporal structure of classroom dialogue from linear Q&A into a cyclic generative cognitive process.

**Mechanism 3: AI-Driven Personalized Support → Supportive Dialogue**
GenAI-enabled personalized feedback significantly reduces students' speaking anxiety and increases participation among low-engagement students. This is consistent with subgroup findings, where low-engagement students' learning engagement increased from 2.91 to 3.05, while medium-engagement students declined (-0.11), indicating a redistribution effect.

This mechanism strengthens the Supportive principle by lowering participation barriers through cognitive scaffolding, thereby reshaping the psychological accessibility of classroom dialogue.

**Mechanism 4: AI-Facilitated Collaboration → Collective Dialogue**
In group learning contexts, GenAI serves as a shared cognitive tool, providing structured starting points for knowledge construction. Classroom observations show more structured group discussions, clearer task division, and more frequent use of AI-generated content as discussion anchors.

This mechanism extends the Collective principle. In GenAI-supported environments, collectivity is not only about co-participation but also about sharing an intelligent cognitive system as the basis for interaction, forming a socio-technical mode of collaboration.

**Extending Dialogic Teaching Theory in the Age of GenAI**
This study further extends Alexander's model of dialogic teaching. In the original framework, dialogic teaching can be simplified as:Teacher → Dialogue → Learning, assuming that teachers are the sole designers of classroom dialogue.

The key finding of this study is that this structure is fundamentally reconfigured in the presence of GenAI: Teacher → GenAI → Dialogue → Learning. This transformation has three theoretical implications. First, GenAI becomes a generative mediator of classroom dialogue, participating in the pre-structuring of interaction and reducing dependence on individual teacher capacity. Second, the mechanism of dialogue generation shifts from

teacher-centered design to human–AI co-design, expanding the reach and scalability of dialogic teaching. Third, Alexander's five principles (Collective, Reciprocal, Supportive, Cumulative, Purposeful) are reinterpreted as operational logics of a human-AI co-constructed system rather than pedagogical norms alone.

Accordingly, the GenAI-Enhanced Classroom Dialogue Framework demonstrates that GenAI does not directly affect learning outcomes. Instead, it reshapes classroom dialogue as a mediating mechanism, which in turn influences student participation, critical thinking, and collaborative ability. This finding moves beyond the dominant "technology-outcome" paradigm and emphasizes a "technology–dialogue structure–learning outcome" mediation pathway.

**Implications for Teacher Professional Development**

The findings suggest that effective use of GenAI depends not only on the technology itself but also on teachers' digital pedagogical competence. Therefore, teacher professional development should shift from traditional ICT training toward systematic cultivation of AI-enhanced teaching competencies. Specifically, four key dimensions are proposed:

1. **Prompt design literacy**: the ability to use prompts to generate high-quality instructional materials, including questions, cases, and learning tasks.
2. **AI pedagogical literacy**: understanding how to embed AI within instructional structures rather than using it merely as an auxiliary tool.
3. **AI ethics awareness**: identifying and managing issues such as data privacy, academic integrity, and student dependency.
4. **Dialogic facilitation competence**: maintaining depth, openness, and criticality in classroom dialogue when AI is present, rather than allowing AI to weaken student thinking processes.

Therefore, future teacher training systems should move from "technology use training" to "human–AI co-design capacity building" to support sustainable and responsible integration of GenAI in classrooms.

## Conclusion

Grounded in dialogic teaching theory, this study uses mixed-method evidence from two Chinese universities to systematically examine how Generative Artificial Intelligence (GenAI) reshapes classroom dialogue mechanisms and influences teaching processes and student engagement. The study proposes and validates a GenAI-Enhanced Classroom Dialogue Framework, demonstrating that GenAI does not directly affect learning outcomes. Instead, it operates through embedding itself in instructional design processes, forming a human-AI co-generative pathway: Teacher → GenAI → Dialogue → Learning.

Specifically, GenAI enhances classroom dialogue through four core mechanisms: instructional design optimization, questioning structure reconstruction, personalized learning support, and collaborative learning facilitation. These mechanisms collectively improve classroom participation, interaction frequency, and higher-order cognitive responses, and partially improve the distribution of learning engagement.

The theoretical contribution of this study lies in redefining GenAI from a "teaching tool" to a "structural mediator of classroom dialogue" and extending Alexander's (2008)

framework toward a human-AI co-constructed dialogic model. Practically, the study offers actionable pathways for integrating GenAI in higher education, emphasizing that the key lies not in the technology itself, but in how it is used to reconstruct high-quality classroom dialogue structures. However, the study is limited by its sample scope and cross-sectional design. Future research could further examine the robustness and long-term effects of this framework in cross-disciplinary and longitudinal contexts, deepening understanding of AI-driven pedagogical transformation mechanisms.

## References


Alexander, R. J. (2008). *Towards dialogic teaching: Rethinking classroom talk* (4th ed.). Dialogos.

Asterhan, C. S. C., Clarke, S., & Resnick, L. B. (Eds.). (2015). *Socializing intelligence through academic talk and dialogue*. Casemate Group.

Benyahia, A. (2025). Artificial intelligence in teacher education: Investigating pre-service teachers' attitudes, practices, and perspectives. *Journal of Studies in Language, Culture and Society*, 8(4), 106–122.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2023). Chatting and cheating? Ensuring academic integrity in the era of ChatGPT. *Innovations in Education and Teaching International*, *61*(2), 228–239. https://doi.org/10.1080/14703297.2023.2190148

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.

Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications.

Cui, R., & Teo, P. (2021). Dialogic education for classroom teaching: A critical review. *Language and Education*, *35*(3), 187–203. https://doi.org/10.1080/09500782.2020.1837859

Dwivedi, Y. K., Kshetri, N., Hughes, L., Slade, E. L., Jeyaraj, A., Kar, A. K., Baabdullah, A. M., Koohang, A., Raghavan, V., Ahuja, M., Albanna, H., Albashrawi, M., Al-Busaidi, A. S., Balakrishnan, J., Barlette, Y., Basu, S., Bose, I., Brooks, L., Buhalis, D., … Wright, R. (2023). "So what if ChatGPT wrote it?" Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy. *International Journal of Information Management, 71*, Article 102642. https://doi.org/10.1016/j.ijinfomgt.2023.102642

Field, A. (2018). *Discovering statistics using IBM SPSS Statistics* (5th ed.). SAGE Publications.

Firer, E., Slakmon, B., Dishon, G., & Schwarz, B. B. (2021). Quality of dialogue and emotion regulation in contentious discussions in higher education. *Learning, Culture and Social Interaction, 30,* 100535. https://doi.org/10.1016/j.lcsi.2021.100535

Flick, U. (2023). *An introduction to qualitative research* (7th ed.). SAGE Publications.

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeiffer, F., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences, 103*, 102274. https://doi.org/10.1016/j.lindif.2023.102274

Luckin, R., & Cukurova, M. (2019). Designing educational technologies in the age of AI: A learning sciences perspective. *British Journal of Educational Technology, 50*(6), 2824–2838. https://doi.org/10.1111/bjet.12861

McMurry, D. L. (2025). *Teachers' pedagogical beliefs and perceived benefits and challenges of AI educational technology: A qualitative study* (Publication No. 32279634) [Doctoral dissertation, Keiser University]. ProQuest Dissertations & Theses.

Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). Jossey-Bass.

Mercer, N., Wegerif, R., & Major, L. (2019). *The Routledge international handbook of research on dialogic education*. Routledge.

Ng, D. T. K., Leung, J. K. L., Chu, S. K. W., & Qiao, M. S. (2021). AI literacy: Definition, teaching, evaluation and ethical issues. *Proceedings of the Association for Information Science and Technology, 58*(1), 504–509. https://doi.org/10.1002/pra2.487

OECD. 2019. "OECD AI Principles Overview." Retrieved 22 May 2026 (https://oecd.ai/en/ai-principles)

Sallam, M. (2023). ChatGPT utility in healthcare education, research, and practice: Systematic review on the promising perspectives and valid concerns. *Healthcare, 11*(6), 887. https://doi.org/10.3390/healthcare11060887

Tashakkori, A., & Teddlie, C. (2010). *SAGE handbook of mixed methods in social & behavioral research* (2nd ed.). SAGE Publications.

Tlili, A., Shehata, B., Adarkwah, M. A., Bozkurt, A., Hickey, D. T., Huang, R., Agyemang, B., & McGreal, R. (2023). What if the devil is my guardian angel? ChatGPT as a case study of using chatbots in education. *Smart Learning Environments, 10*(1), 15. https://doi.org/10.1186/s40561-023-00237-x

UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO Publishing.

Yin, R. K. (2018). *Case study research and applications: Design and methods* (6th ed.). SAGE Publications.

Zawacki-Richter, O., et al. (2024). [Title not verified]. [Publication information not verified].