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Dialogue and interaction: Characteristics of classroom questioning by university teachers and their influencing factors

Ziyuan Guan¹, Shaoli Feng², Chao Wang³*

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Abstract:

Classroom questioning is an integral component of effective teaching. While existing research has predominantly focused on the K-12 education sector, this practice has received considerably less attention in the context of university teaching. This study investigates the characteristics of classroom questioning and the factors influencing it by conducting observations and interviews with nine university teachers at a Chinese university. The findings reveal that the majority of questions posed by teachers are factual and academic. The questioning approach typically follows a logical progression of knowledge, with students being randomly selected, and is delivered in an emotionally neutral tone. In terms of student responses, there is a notable lack of interaction, with factual answers being the most common and direct feedback serving as the primary form of response. The study identifies three key factors influencing effective classroom questioning: school management, student characteristics, and teacher practices. To optimize teaching effectiveness, this study recommends that universities provide systematic and scientifically grounded training for teachers, encourage the use of targeted questioning strategies, and enhance teachers' ability to reflect on their instructional practices.

1. Introduction

In the pursuit of establishing a robust higher education system in China, the government has enacted a series of significant documents aimed at enhancing the quality of teaching within higher education. Notable among these are the Several Opinions of the Ministry of Education on Comprehensively Improving the Quality of Higher Education (2012), the Opinions of the Ministry of Education on Deepening the Reform of Undergraduate Education and Teaching and Comprehensively Improving the Quality of Talent Training (2019), and the Outline of the Plan for Building a Strong Education Country (2024-2035) (2025). Collectively, these documents underscore the paramount importance of teaching quality, positioning it as a critical issue in contemporary higher education.

Questioning serves not only as a vital pedagogical tool within the classroom but also as an effective strategy for enhancing teaching quality. As a fundamental aspect of teaching, classroom questioning involves educators posing a series of inquiries related to the curriculum, aligned with specific teaching objectives. This process encourages students to engage deeply with the material, stimulating their critical thinking and facilitating the achievement of educational goals (Xu & Zhao, 1997; Ghafar & Hazaymeh, 2024). Thoughtfully crafted questions can render the structure of classroom instruction more coherent and actively involve all students in the learning process (Dös et al., 2016). The proficiency of teachers in questioning techniques is closely linked to the overall effectiveness of classroom teaching, necessitating that educators master and implement effective questioning strategies.

However, within the Chinese context, existing research has predominantly concentrated on K-12 education (Yu & Cao, 2019; Ma & Liu, 2013). In the realm of higher education, classroom questioning practices reveal several deficiencies, including a tendency towards a limited variety of questioning



*Corresponding author.

E-mail address: 903781190@qq.com (Z. Guan); 1935794521@qq.com (S. Feng); chaow66@connect.hku.hk (C. Wang).

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¹School of Education, City University of Macau. Macau 999078, SAR, China

²Feng Shaoli. Shanghai Youzhile Education Technology Co., Ltd. 201100, Shanghai, China

³Faculty of Education, The University of Hong Kong, Hong Kong 999077, SAR, China.

techniques (Long, 2017) and insufficient interaction, resulting in minimal intellectual exchange between teachers and students (Guan & Feng, 2017). Consequently, there exists a considerable opportunity for research to explore how university educators perceive their own questioning practices in daily teaching and how they can effectively employ classroom questioning strategies.

To address these concerns, this study is guided by the following research questions:

RQ1: What are the characteristics of classroom questioning employed by university teachers?

RQ2: What are the influential factors of the questioning behaviors of university educators?

2. Literature review

Classroom questioning is a widely employed pedagogical technique that significantly influences students' engagement, fosters critical thinking skills, and enhances interaction between teachers and students (Shi & Cui, 2009; Davoudi & Sadeghi, 2015). With the increasing emphasis on effective teaching methodologies, the impact of classroom questioning—specifically effective questioning—has garnered considerable attention within the academic community. Research in this area primarily explores the definition, strategies, evaluation criteria, and various factors affecting effective classroom questioning.

Definitions of effective classroom questioning vary among researchers, reflecting different perspectives and starting points. However, a comprehensive analysis of the literature reveals three core components of effective questioning (Ghafar & Hazaymeh, 2024). Firstly, it emphasizes the importance of teachers' questioning skills. Effective classroom questioning entails that educators apply scientific pedagogical principles, teaching strategies, and aesthetic considerations tailored to the specific content being taught. This approach aims for effective design, clear articulation, timely intervention, and thoughtful phrasing. Secondly, following the reform of basic education, the focus of effective classroom questioning has shifted from solely teachers' questioning skills to the development of students' cognitive abilities (Shi & Cui, 2009). It is now recognized that effective questioning enables students to actively engage in learning and make tangible progress through their responses, thereby fostering their thinking processes (Ghafar & Hazaymeh, 2024). Lastly, as educational philosophies and teaching paradigms evolve, the interplay between teachers and students has emerged as a critical aspect of effective classroom questioning. This perspective posits that effective questioning involves teachers thoughtfully crafting questions and creating conducive environments that encourage students to think critically, pose their questions, and engage in dialogue, ultimately leading to the attainment of desired educational outcomes (Feng, 2011).

Most research on effective classroom questioning strategies tends to be broad and comprehensive. It can be categorized into three key areas. First, teachers' questioning skills: educators should focus on crafting questions with artistic flair, ensuring a variety of questioning methods and linguistic diversity.

Effective questions need to be deep, broad, and probing (Ghafar & Hazaymeh, 2024). Second, the development of students' thinking: questions should be inclusive and stratified, allowing for reasonable distribution that maximizes student autonomy. Adequate waiting time should be provided, enabling students to reflect deeply (Dös et al., 2016). Third, teacher-student interaction: educators must prioritize reasoning, offering effective feedback and motivational reinforcement to enhance engagement (Wangru, 2016).

The criteria for evaluating effective classroom questioning primarily stem from two perspectives: teachers' questioning skills and the development of students' thinking (Shanmugavelu et al., 2020). Teachers' questioning skills are assessed through dimensions such as the purpose and process of questioning, as well as the types and levels of questions posed. In contrast, from the perspective of students' cognitive growth, effective questions should encapsulate underlying philosophical ideas that ignite students' interest and encourage deeper contemplation. Evaluation criteria serve as the foundation for measuring questioning effectiveness. Recently, with the rise of dialogic teaching, these criteria have evolved to emphasize the interaction between teachers and students, focusing on aspects such as student participation and the nature of communication.

Several key factors might influence the effectiveness of classroom questioning. First, students' cognitive development, emotional responses, and engagement levels are crucial determinants (Yang, 2009; Alhayyan, 2023). Second, teachers' questioning skills, emotional responsiveness, feedback styles, reflective practices, and professional development significantly impact questioning effectiveness (Hou, 2009; Dös et al., 2016). Additionally, situational factors such as the context and difficulty of questions, along with the overall classroom environment, play a direct role in shaping the quality of questioning (Lu, 2005; Shanmugavelu et al., 2020). External supports, such as institutional resources and mentorship from experienced educators, also contribute to fostering effective classroom questioning. These factors interact dynamically to collectively influence the overall effectiveness of classroom questioning (Shen &Yuan, 2013). Moreover, research on effective classroom questioning has gradually transitioned from an initial focus on teachers' questioning skills to encompass the development of students' thinking and the nature of teacher-student dialogues. There is now a growing emphasis on dialogue as a critical component of effective questioning.

Existing studies predominantly address strategies and influencing factors of questioning within K-12 education, with limited exploration in the context of higher education. Differences may exist between instructional interactions in university classrooms and K-12 teaching processes, encompassing aspects such as class size and technology integration levels (Yan et al., 2024), depth of knowledge (Jiang & Li, 2023), and teacher-student power dynamics (Li & Zhu, 2023). In particular, the unique challenges faced by university educators regarding classroom questioning, the cognitive needs of students, and the specific strategies for implementing effective questioning have yet to be thoroughly examined (Yan et al., 2024; Li, 2023). Thus, investigating the current state of classroom questioning by university teachers, the influencing

factors, and methods for conducting effective questioning is of considerable theoretical and practical significance. This research could not only bridge existing gaps in the literature but also provide valuable empirical insights and guidance for enhancing the quality of teaching in higher education classrooms.

3. Theoretical framework

Etymologically, "dialogue" is related to "dialectic." Socrates, the ancient Greek philosopher, facilitated understanding through dialogue, engaging in a question-and-answer format with his students. This teaching method, often referred to as "midwifery," emphasizes the role of dialogue in learning. His student, Plato, adopted this approach, using it for academic discourse. Similarly, The Analects of Confucius, a foundational text of Confucianism, is written in a dialogue format, reflecting Confucius's belief in the importance of conversational teaching.

The theory of dialogue is central to Bakhtin's philosophy, where he views dialogue as a relational process. Language, as a vital means of communication, cannot exist in isolation; it requires specific dialogic contexts. Human existence is defined and highlighted within relationships with others. In this sense, dialogue is not merely a tool for maintaining relationships; it embodies the relationship itself and represents the essence of humanity. Intersubjective dialogue signifies an equal status among participants, where consciousness and thought are both free and equitable. Importantly, dialogue transcends formal question-and-answer exchanges; not every conversation qualifies as a genuine dialogue. Bakhtin asserts that individuals enter dialogue as complete voices, contributing not only their thoughts but their entire selves, including their destinies (Dong, 1992). Thus, the value of dialogue should not be assessed solely by its structure but by its intrinsic qualities. The quality of dialogue encompasses mutual communication, integration, understanding, and enhancement among participants, grounded in principles of democracy, equality, and cooperation (Dong, 1992).

In an atmosphere of equality, democracy, respect, and trust, dialogue-based teaching fosters knowledge creation and meaningful learning through mutual interactions among teachers, students, and texts, thereby promoting collective growth (Wells & Arauz, 2006). Whenever there is a spiritual exchange and response, regardless of form, it can be considered dialogue. Effective questioning serves as the cornerstone of dialogue teaching (Feng, 2011). In this context, classroom interactions initiated by teachers' questions and students' responses represent a common pedagogical approach. Dialogue encompasses two levels of meaning: formal and substantive. Formal dialogue pertains to everyday communicative exchanges, often purposeless and mediated through speech. In contrast, substantive dialogue signifies a deeper spiritual connection, leading to cognitive resonance, thought synchronization, and emotional alignment between participants (Li &Wu, 2012). These theoretical insights provide a foundational framework for data collection and analysis in this study.

4. Methodology

In this study, data were collected using classroom observation and interviews to examine the characteristics and influencing factors of effective classroom questioning by university teachers. Participants were purposively selected to ensure representation across disciplines (humanities, STEM), academic ranks (professor to lecturer), and teaching experience (5-20 years). Eventually, nine instructors from a university were included as participants voluntarily, representing three types of areas: liberal arts, engineering majors and science, including eight subjects: mechanics of materials, machine building, digital electronics, marketing, introduction to communication, college English, chemistry and discrete math. Within each discipline, the participants comprised professors, associate professors, and lecturers, each with varying job titles. Basic information about the research subjects is presented in Table 1.

Table 1. Shows the basic information about teachers.

CodeZ	Job title	Subject
Q	Professor	Mechanics of materials
A	Associate professor	Machine building
Y	Instructor	Digital electronics
X	Professor	Marketing
F	Associate professor	Introduction to Communication
L	Instructor	College English
W	Professor	Chemistry
Z	Associate professor	Chemistry
D	Instructor	Discrete math

To address RQ1: "What are the characteristics of classroom questioning by university teachers?", this study utilized classroom observation as a data collection method. Observations were conducted in an undergraduate class at a university in China, involving nine teachers who were each observed across six lessons, totaling 54 lessons. The courses encompassed a range of disciplines, including engineering, with examples such as "Mechanics of Materials," "Introduction to Environmental Protection," and "Seismic Design of Buildings"; science courses like College Physics, Principles of Compilation, and Probability Theory and Mathematical Statistics; and humanities and social sciences, including College English, Finance, and Sociology. The classroom observation focused on the content, manner, and responses to questions, as detailed in Table 2. The content of questions primarily refers to their Types of questions, while the manner encompasses aspects such as tone, sequence, pause patterns, and answer selection methods. Responses to questions pertain to the nature of classroom interactive form, the types of student response, and the teacher's evaluation of student's answers.

To answer RQ2: "What factors influence the classroom questioning behavior of university teachers?", this study employed semi-structured interviews for data collection. Each teacher was interviewed for approximately 45 minutes to

Table 2. Main contents of classroom observatio.

Dimension	Components	Codes	
Content	Types of question	 Factual academic questions (with definitive answers) Opinion questions (with no definite answers) Non-academic questions (personal, procedural, disciplinary, etc.) 	
Way	Tone of the question	 Be challenging or encouraging Not emotional Checking 	
	Sequence of questioning	 Ask questions in a logical order of knowledge Ask questions according to the actual course of the class Ask questions out of order 	
	Pause patterns	 Ask questions, pause, and ask students to answer Ask questions, invite students to answer, without pause Invite students to answer and ask questions without pause 	
	Answer selection methods	Answering the Question 1. Before asking the question, name the student who answered the question 2. After the question, name the students who raised their hands to answer the question 3. After asking questions, point to students who did not raise their hands to answer the question 4. After asking questions, students answer randomly	
	Interactive form	1.Teacher-student interaction2. Student-student interaction3. No interaction	
Answer	Types of student's response	 Thinking type (must be reasoned through to reach a conclusion or elaborate explanation) Fact-based (finding answers from memory) Other types 	
	Teacher's evaluation of student's answers	Giving Feedback 1. Give feedback directly 2. Give prompts and ask students to dig deeper 3. Ask other students to give comments	

1 hour following the course observations, with interviews conducted either in person or by telephone. The interview questions primarily explored the teachers' experiences in designing classroom questions, their understanding of effective questioning, and the factors influencing their questioning behavior.

For data analysis, the study utilized content topic analysis as outlined by Hsieh & Shannon (2005). During the organization stage, each interview transcript was coded by two researchers, and the research team subsequently summarized the findings. Any discrepancies in coding were discussed among team members to ensure consistency, resulting in a unified coding approach that enhanced the reliability of the analysis.

5. Results

5.1 Characteristics of classroom questioning by university teachers

In the 54 observed lessons, teachers posed a total of 133 questions, averaging about 2.5 questions per lesson. Among these, 31 questions were from engineering majors, 39 from science, and 63 from liberal arts, indicating significant differences among the disciplines.

5.1.1 Content of questions

Regarding the content of the questions, of the 133 questions raised, 67 were factual academic questions, accounting for 50.3%, while 45 were viewpoint academic questions and 21 were non-academic questions, representing 33.9% and 15.8% respectively. This indicates that factual academic questions were the most prevalent type among those asked.

5.1.2 Way of asking questions

In terms of the ways of asking questions, the tone varied: 59 questions (44.4%) were posed in a challenging or encouraging tone, 73 (54.9%) were delivered in a non-emotional tone, and one question (0.7%) was asked in a checking tone. The order in which questions were asked also varied: 74 questions (55.6%) followed a logical flow of knowledge, 36 (27.1%) adhered to the actual course of the class, and 23 (17.3%) were posed out of order. Regarding pause modes, 66 questions (49.6%) involved the teacher pausing for student responses, 50 questions (37.6%) were asked without pauses for answers, and 17 (12.8%) involved no pauses at all. When selecting respondents, 13.5% of questions called on specific students beforehand, 15.8% were directed at students who raised their hands, 24.1% were answered by students who did not raise

their hands, and 46.6% were answered randomly.

5.1.3 Logical answers to questions

For logical answers to questions, reasoning refers to the teacher's response to student answers. Among the interactions, 8 questions (6.0%) involved teacher-student interaction, 51 questions (38.3%) prompted interaction without direct engagement, 3 questions (2.3%) involved students interacting with each other, and 71 questions (53.4%) had no interaction. Many student answers were fact-based (52.7%), while answers that required critical thinking constituted 38.3%, and other types accounted for 9%. In terms of feedback, 61.7% of teachers provided direct comments on student answers, while only 32.3% offered hints to encourage deeper thinking; 6.0% of teachers did not provide feedback, and there were instances of peer comments among students.

5.2 Influencing factors of effective classroom questioning by university teachers

The influencing factors on effective classroom questioning by university teachers, as analyzed from interview content, can be categorized into three main aspects: school management, teachers, and students. Specific dimensions include teacher training within school management, teachers' teaching skills and concepts, and students' knowledge bases and learning attitudes. These factors significantly impact the effectiveness of classroom questioning, as illustrated in Table 3, which presents the results of the thematic analysis.

5.2.1 School management

Teacher training. The content and methods of teacher training significantly influence their beliefs and skills regarding classroom questioning. Teacher Y noted, "We have received systematic training, which is greatly beneficial for asking questions effectively in class. However, over time, we teachers also need to learn from practice, as what you learn from books is always limited." Teacher F emphasized the effectiveness of mentorship, stating, "An experienced professor mentored me for a year, and during that period, my teaching skills improved the most; I gained a lot."

Class schedule. Time constraints often force teachers to reduce the time allocated for student reflection in order to complete the syllabus, leading them to provide answers directly. Teacher W expressed concern, saying, "I think the class time is too short. With classes meeting only twice a week, there's no time left for questioning if the content isn't finished."

Student Size. The expansion of higher education has increased student numbers, which can limit the potential for classroom dialogue. Teacher L explained, "Effective interaction between teachers and students may be limited by class size; it's difficult to implement if the number is large or if the course schedule is tight."

5.2.2 Teachers

Teaching Skills. Research shows that a teacher's ability to organize the classroom and reflect on their teaching practices promotes effective questioning. Teachers with strong organi-

zational skills tend to ask more flexible questions. Teacher Y highlighted, "Questions should stimulate students' interest or promote their thinking; they should be asked in a way that engages as many students as possible and gives them credit and encouragement." Furthermore, Teacher L emphasized the importance of reflection, stating, "Reflecting after class is essential. Many teaching problems can be identified, and optimizing teaching through reflection can rapidly improve our teaching abilities."

Teaching Concept. Teachers with traditional teaching philosophies often become the sole questioners in the classroom. In contrast, those who embrace a dialogue-based approach allow students to become active participants. Teacher Y described this ideal, saying, "Students can express their opinions, provide feedback, and ask questions. I believe this state of interaction is much better."

Peer Communication. Communication among peers is crucial for teacher development. Teacher F explained, "I attend other teachers' classes and expert feedback sessions every semester. By observing each other and discussing feedback, my teaching level improves imperceptibly."

5.2.3 Students knowledge base and learning Attitudes

A student's knowledge base is a crucial factor in determining the depth of their classroom responses. Teacher Q highlighted the challenges of effective questioning, stating, "Our students have a weaker foundation and lower learning ability. Therefore, they require continuous encouragement and motivation; we cannot set expectations too high for them."

Additionally, the survey revealed that students with strong learning motivation are more likely to take initiative, fostering effective classroom questioning. Teacher F noted that students' attitudes significantly influence their interactions with teachers, saying, "Many students simply don't want to respond to the teacher; their lack of motivation makes interaction difficult."

6. Discussion and Conclusion

This study, conducted at a university in China, analyzes the effectiveness of classroom questioning by university teachers. Through classroom observations, it was found that the majority of questions posed by teachers were primarily factual academic inquiries. More than half of the teachers asked questions in a non-emotional manner, often following a logical sequence of knowledge. Teachers frequently called on students to answer directly, often selecting them at random. Feedback on student responses predominantly consisted of direct comments, with most student answers being fact-based. Additionally, interactions among students were minimal, with only one-third of classes featuring student-to-student engagement, and more than half showing no interaction whatsoever.

Questioning is a crucial yet often neglected aspect of university teaching. When teachers' questions lack stimulation and creativity, focusing solely on textbook knowledge, they fail to foster critical thinking or cultivate innovative talents (Lu, 2010; Davoudi & Sadeghi, 2015). The prevalence of neutral-toned questions (54.9%) reflects institutional norms prioritizing content delivery over affective engagement, con-

Influencing Factors	Indicators	Number of people mentioned	Ratio
	Teacher training	8	89%
School administration	Class schedule	1	11%
	Student scale	1	11%
	Teaching skills	9	100%
Teachan	Teaching concept	9	100%
Teachers	Teaching attitude	4	44%
	Peer communication	2	22%
G. 1 .	Knowledge base	5	56%
Students	Learning attitude	5	56%

Table 3. Influencing factors of effective classroom questioning by college teachers.

tradicting the 'whole-self' dialogue (Li & Zhu, 2023). This situation has persisted in college teaching for a long time, where factual questions dominate, leading to limited student participation and minimal teacher-student interaction (Guo, 2002; Dös et al., 2016). The essence of teaching should be viewed as "dialogue"—a process of interaction between teachers and students mediated by teaching resources, rather than a mere object-subject relationship. Effective teaching involves mutual engagement, allowing for true "teaching and learning" to occur and fostering a genuine "learning community" (Dös et al., 2016). Without meaningful exchanges of ideas, students' initiative and agency in their learning diminish (Ghafar & Hazaymeh, 2024).

The research further identifies three aspects that influence effective classroom questioning: school management, students, and teachers. Similar factors have been noted in K-12 education research (Ghafar & Hazaymeh, 2024; Shanmugavelu et al., 2020). While teachers acknowledged issues related to school management and student attitudes, they also recognized their own shortcomings, such as the lack of "dialogue" in teaching and the difficulty in creating a collaborative learning atmosphere. Although self-reflection and practice are critical for professional growth, many teachers tend to relax their efforts after an initial adaptation period.

Based on these findings, this study offers several targeted recommendations. First, universities should implement systematic and scientific training for teachers, emphasizing educational theory while also facilitating mentorship from experienced teachers. Second, teachers should be encouraged to ask targeted questions that consider individual student differences, rather than relying on random selection. Third, enhancing teachers' reflective practices is crucial; engaging in peer dialogue and critically reviewing teaching activities can foster a habit of reflection.

The main limitation of this study is the homogeneity of the sample, as it relies on classroom observations and interview data from a single university, which may limit the applicability of the findings to higher education contexts in other regions or countries. Future research should consider broadening the sample to include universities from diverse regions and institutional types to validate the findings in wider

contexts. Additionally, while the study focuses on teachers' questioning practices, it does not provide a detailed analysis of students' active involvement in the questioning process and their feedback mechanisms, potentially leading to an incomplete understanding of classroom interactions. Exploring students' roles and responses in classroom questioning can provide insights into how they perceive teachers' questioning strategies and their overall engagement. Furthermore, disciplinary differences were analyzed only superficially; future work should employ mixed methods to explore disciplinespecific dialogic strategies. Finally, although interview data reflect teachers' subjective views, they may be influenced by social expectation bias, which could affect the accuracy of their representations of classroom dynamics. Future work could include multimodal data such as videos, voice, and tone generated during classroom teaching to analyze the interactive patterns. Importantly, Investigating effective teacher training implementation and its impact on questioning abilities, alongside the supportive roles of school management and cultural environment, can contribute to a more comprehensive understanding of questioning effectiveness in university classrooms, ultimately enhancing the quality of teaching.

Conflict of interest

The author declares no conflict of interest.

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