A Study on the Cognitive Levels and Spatial Distribution of Classroom Questioning in Senior High School English Listening and Speaking Classes

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Abstract: To investigate the existing problems of classroom questioning in senior high school English listening and speaking classes, optimize the quality of classroom questioning, promote students' thinking development, and enhance classroom interaction equity, this study takes a high-quality senior high school English listening and speaking class as a case study. Using a classroom questioning observation scale and a seating distribution chart, it conducts a quantitative analysis of 43 effective questioning samples from four dimensions: question design, student response, teacher feedback, and spatial distribution. The findings reveal that the cognitive structure of classroom questioning is imbalanced, with a high proportion of lower-order questions and a lack of open-ended questions; student response patterns are rigid, with low levels of cooperative participation; teacher feedback lacks peer evaluation and error correction, resulting in insufficient response strategies that promote deeper thinking; and the spatial distribution of classroom questioning is uneven, showing a clear seating-based interaction bias. Based on the above results, this paper proposes the following five improvements: optimize the cognitive level of questions, increase the proportion of open-ended questions, diversify students' ways of answering, improve teachers' feedback strategies, and balance the spatial distribution of classroom questioning. The above changes aim to change the type of questions, stimulate students' thinking, reduce the disparity in participation among seated students, and provide support for the improvement of teaching methods for listening and speaking.

Keywords: High school EFL; Classroom Questioning; Cognitive Levels; Teacher-Student Interaction; Spatial Distribution

1. Introduction

Senior high school English listening and speaking instruction is a key foundation for fostering students' thinking quality. Its immediacy, interactivity, and contextual nature give it unique advantages in cultivating students' rapid response, logical expression, and critical thinking. Since thinking quality should be developed across all stages of listening and speaking instruction, classroom questioning becomes the central link that drives students' thinking engagement. It activates thinking by encouraging students to articulate their thoughts, reason through problems, and engage in meaningful dialogue [1], and its quality profoundly influences the depth of students' thinking and their cognitive levels.

However, existing research indicates that teachers find it difficult to pose questions that focus on or expand students' thinking in actual classroom practice [2]. Their questioning tends to concentrate on front-row or high-achieving students, and teachers are inclined to position themselves at the center front of the classroom, resulting in an uneven distribution of verbal interaction between teachers and students [3,4].

Therefore, conducting an in-depth analysis of teachers' questioning behavior in senior high school English listening and speaking classes from the two dimensions of cognitive levels and spatial distribution holds significant research value and practical implications.

2. Research Design

To address the research purpose outlined above, this section describes the research sample, instruments, and data collection and analysis procedures.

2.1 Research Sample

The study selected a prize-winning exemplary lesson from the 19th National Senior High School English Teacher Teaching Skills Demonstration and Lesson Exchange Activity as

the research sample. The lesson type was listening and speaking, delivered to 52 second-year senior high school students with a duration of 42 minutes.

2.2 Research Instruments

The study mainly employed a classroom questioning observation scale and a classroom seating distribution chart for data collection.

The classroom questioning observation scale was developed based on Bloom's Revised Taxonomy of Cognitive Objectives [5], Flanders' classroom interaction analysis system [6], and the IRF (Initiation-Response-Feedback) discourse structure [7]. A coding system was constructed from four dimensions: question type, cognitive level, student response, and teacher feedback. Specifically, student responses referred to Wang [8] and Cheng [9] to distinguish the modes and manifestations of responses; teacher feedback followed Black & Wiliam's [10] formative assessment strategies to record teachers' feedback behaviors. The classroom seating distribution chart was used to analyze the spatial distribution characteristics of questioning. By drawing a classroom seating map and marking the seat positions targeted by each question in real time, the abstract coverage of classroom questioning was transformed into visual spatial data. Accordingly, the study recorded the student seat targeted by each question from both vertical and horizontal dimensions and counted the frequency of questions in each area.

2.3 Data Collection and Analysis

Based on the complete classroom video recording, this study took each classroom question as the unit of analysis and coded them one by one according to the four dimensions of the observation scale, yielding 43 valid questioning samples. During the coding process, the seating distribution chart was used to record the seat of the student targeted by each question and to classify them vertically (front, middle, back rows) and horizontally (left, middle, right columns). Descriptive statistical methods were applied to analyze the data. The frequency and percentage of questions at each cognitive level were calculated, along with the total and per-capita frequency of questions in each seating area. Additionally, frequency statistics were generated for question design, student response modes, teacher feedback, and the spatial distribution of classroom questioning.

3. Results Analysis

Based on the coded data obtained from the classroom questioning observation scale and the seating distribution chart, an analysis of classroom questioning characteristics was carried out across four dimensions: question design (including question type and cognitive level), student response, teacher feedback, and spatial distribution.

3.1 Question Design Characteristics

Two dimensions are used to examine classroom questioning: question design and cognitive level. The first shows whether a question is open or closed, while the second indicates how deeply a question expects students to think.

3.1.1 Question type characteristics

The type of classroom questions directly affects students' level of thinking engagement and the quality of their language output. As shown in Figure 1, 34 of the 43 valid questioning samples were closed-ended (79%), while 9 were open-ended (21%). Closed-ended questions made up the majority, and open-ended questions accounted for a relatively small share.

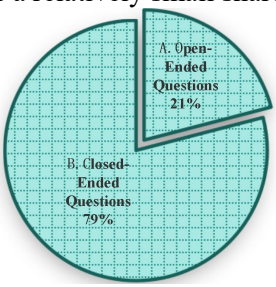

Figure 1. Distribution of Question Types in Classroom Questioning

In this case, closed-ended questions were used primarily to retrieve information, check understanding and keep the class on track. With clear answers that call for a single response, they helped the teacher quickly gauge students' understanding while maintaining a steady classroom pace. Open-ended questions mostly appeared during follow-up questioning, requiring students to express personal opinions, analyze reasons, or make judgments. However, open-ended questions accounted for only 21%, leaving students relatively limited opportunities for opinion expression and in-depth analysis. Considering the characteristics of the listening and speaking lesson type, the listening comprehension stage naturally requires a substantial number of closed-ended questions to

extract factual information, which has a certain degree of rationality. Nevertheless, the insufficient presence of open-ended questions may lead to students' language output remaining at the factual level, making it difficult to cultivate higher-order thinking skills.

3.1.2 Cognitive level characteristics

According to Bloom's Revised Taxonomy of Cognitive Objectives, cognitive levels can be divided into lower-order thinking (remember, understand, apply) and higher-order thinking (analyze, evaluate, create). Their distribution reflects the depth of cognitive activity in the classroom. The statistical results are presented in Table 1.

Table 1. Distribution of Cognitive Levels in Classroom Questioning

Cognitive Level	Remember	Understand	Apply	Analyze	Evaluate	Create	Total
Frequency (n)	13	17	2	10	0	1	43
Percentage (%)	30%	40%	5%	23%	0%	2%	100%
Lower vs. Higher	75%			25%			100%

From an overall perspective, lower-order thinking questions accounted for 75%, while higher-order thinking questions accounted for only 25%, with the former being three times that of the latter, indicating that classroom questioning was dominated by lower-order cognition. Among lower-order questions, remembering and understanding together accounted for 70%, indicating a heavy reliance on factual recall and simple comprehension. Application questions, however, made up only 5%—a serious gap at the transition from lower-order to higher-order thinking. Students therefore lacked practice in knowledge transfer and preliminary application. Among higher-order questions, analyzing accounted for 23%, showing that the teacher attempted to guide students toward analysis and generalization. But evaluating was absent (0%), and creating appeared only once. Students thus received insufficient training in information integration, creative expression, and critical evaluation, making it difficult for them to move beyond understanding and analyzing to synthesizing, creating, and critical evaluating.

3.2 Student Response Characteristics

Two core dimensions are used to analyze student response characteristics: response mode and response attitude. The first concerns the way students participate in classroom interaction; the second concerns how willingly and actively they engage. Figures 2 and 3 present the statistical results.

Individual responses (58%) and choral responses (35%) were the main forms of student response in this case, together accounting for 93%. Group responses (2%) and self-response (5%) accounted for relatively low proportions, reflecting insufficient opportunities for student cooperation and interaction. Moreover, due to the short thinking time allocated to some questions, students failed to respond in time, and the teacher answered on their behalf.

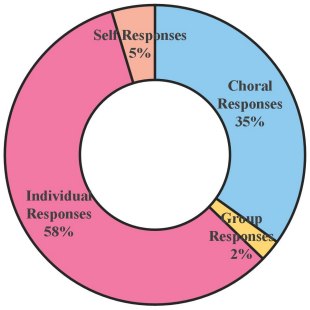

Figure 2. Distribution of Student Response Modes

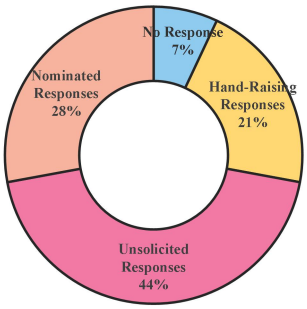

Figure 3. Distribution of Student Response Attitudes

Unsolicited responses (44%) and nominated responses (28%) dominated, while hand-raising responses (21%) and no response (7%) accounted for relatively low proportions. This indicates a lively classroom atmosphere, but students' awareness of actively seeking the floor was weak, and some questions may have exceeded their immediate comprehension abilities.

Overall, student responses in this lesson were characterized by "equal emphasis on individual and choral responses, with a predominance of unsolicited responses." Group cooperative learning was lacking, and students had limited opportunities for independent expression and deep collaboration.

3.3 Teacher Feedback Characteristics

Teacher feedback reflects teachers' response strategies and the depth of interaction following student answers. The statistical results are presented in Figure 4.

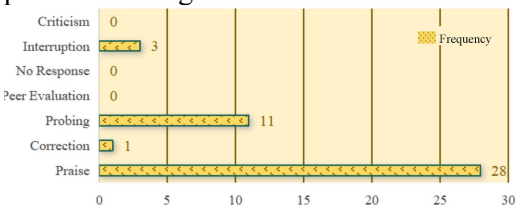

Figure 4. Distribution of Teacher Feedback Types

The data show that teacher feedback was mostly positive. Praise and encouragement were seen throughout the lesson, keeping students engaged and willing to speak. This created a positive atmosphere for interaction. Beyond simple affirmation, the teacher used probing questions to push students to explain their views, add details, and think more clearly. These strategies helped deepen students' thinking. When students encountered difficulties in responding, the teacher either answered on their behalf or turned to other students to maintain the pace of the lesson. However, in terms of feedback types that promote students' deep reflection and meta-cognitive engagement—such as error correction and refinement, as well as peer evaluation—the performance in this lesson was relatively lacking. This, to some extent, limited students' active examination of their own response quality and the collision of ideas among peers.

3.4 Spatial Distribution Characteristics

Using a seating distribution chart (Table 2), this study conducted horizontal and vertical statistical analyses of the student seats targeted by 43 effective classroom questions, measuring the degree of participation in each area by the per-capita frequency of questioning. The statistics were based on the number of response instances (i.e., person-times). Specifically, there were 25 individual responses (25 person-times) and one group response (3 person-times), totaling 28 person-times. The seat location of the student(s) responding was recorded for each response instance. By developing a classroom seating map and marking the seats targeted by each question in real time (using the symbol "." to represent a student), the study transformed the abstract coverage of classroom questions into intuitive visual spatial data, thereby providing a reliable basis for subsequent analysis of classroom interaction fairness.

Table 2. Classroom Seating Distribution Map

Screen									
Black-board			.						.
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Note: "×" indicates an unoccupied seat (the last row has only four students).

To clearly observe the interaction between the teacher and students, the side of the classroom where the teacher stands (i.e., the blackboard side) is designated as the front of the classroom, with students seated facing the blackboard. The arrangement of the seats is 8 rows of 6 students, and the last row has 4 students. The two kinds of seats are horizontally and vertically divided. The three horizontal zones are the front row (rows 1-3), middle row (rows 4-6) and back row (rows 7-9). The three vertical zones are the left section (the two columns next to the screen), the middle section (the two central columns) and the right section (the two columns near the audience side). The statistical results are presented in Table 3 and 4.

Table 3. Classroom Questioning Frequency by Horizontal Area

Area	Front Rows	Middle Rows	Back Rows	Total
Frequency of Questions	23	2	3	28
Number of Students	18	18	16	52
Per-Capita Frequency of Questions	1.28	0.11	0.19	0.54

From the perspective of horizontal distribution, the per-capita frequency of questioning in the front rows (1.28) was approximately 6 to 12 times that of the middle rows (0.11) and the back rows (0.19). Teacher questioning was highly concentrated on students in the front rows, while students in the middle and back rows had significantly fewer opportunities to participate.

Table 4. Classroom Questioning Frequency by Vertical Area

Area	Left Section	Middle Section	Right Section	Total
Frequency of Questions	5	13	10	28
Number of Students	18	18	16	52
Per-Capita Frequency of Questions	0.28	0.72	0.63	0.54

From the perspective of vertical distribution, the per-capita frequency of questioning in the middle section (0.72) and the right section (0.63) was relatively close, while that in the left section (0.28) was significantly lower. This reflects the teacher's habitual preference in classroom positioning or visual attention, as the left section may lie at the edge of the teacher's visual field, resulting in students in that area being called on significantly less often than those in the central and right sections of the classroom.

Overall, classroom questioning in this case exhibited an uneven distribution pattern characterized by "denser questioning at the front and sparser at the back, and more on the right and less on the left." Students in the front row had many more chances to answer questions than those in the middle and back rows, and the participation of students in the left section was also significantly lower than that in the middle and right sections. An unequal distribution may lead some students to believe that their study results are average; thus, there will be a loss of enthusiasm for class participation among those students and an expansion of participation inequality among students from various areas.

4. Pedagogical Suggestions

Based on the empirical analysis of classroom questioning in senior high school English listening and speaking classes, pedagogical suggestions are put forward in this section. According to the analysis, the following problems have been identified: questions are often not cognitively demanding enough and lack openness; teacher feedback tends to be superficial; questioning is unevenly distributed among the students in the class; and students show little cooperation. The above suggestions are based on the nature of listening and speaking instruction and the requirements for core competencies education.

4.1 Optimize Cognitive Levels of Questions to Promote Cognitive Advancement

Teachers need to revise their questions in listening and speaking classes based on Bloom's Revised Taxonomy of Cognitive Objectives, as there are many low-order questions. The first problem is that there are not enough application questions, and thus scaffolding should be added to help students apply what they have learned. In addition, the proportion of evaluation and creation questions should also be raised. Therefore, students learn to consider and reconstruct the listening materials themselves, and they can form a chain of questions that progresses from lower-order to higher-order thinking. In this way, the questions asked in class can be used to guide students' thinking and help improve the quality of their thinking.

4.2 Vary Question Types to Enhance Speaking and Listening

In the stage of listening comprehension, a small number of closed-ended questions are still necessary to check for basic understanding. Teachers can also add some leading open-ended questions to allow students to speak freely and think more deeply. Increase the proportion of open-ended questions to give students chances to express their thoughts and reasons freely. Probing questions can be used to make more open-ended dialogue after a closed-ended answer. Thus, students will be motivated to put forward their own opinions and engage in reason; at the same time, they can draw on the text and their own experiences.

4.3 Diversify Response Modes to Ensure Full and Deep Participation

Senior high school students have some specific cognitive traits; therefore, teachers need to adjust the organization of student answers accordingly. Rather than using many choral responses or random individual names, teachers can also have students work together in pairs or groups. The structure is simple; therefore, there is less need for complex language and it is easier to arrange their thoughts. In the group work, a division of labour can be used to assign different roles, and the responsibility for speaking among the group members should be rotated to prevent some students from being too talkative. Through different interaction forms, more students will participate. Simple teacher-student interactions can evolve into all sorts of forms of communication, such as teacher-student talk, student-student exchange and group-group interaction. Therefore, students at all levels will be more motivated to participate. They are more active, have richer language, and think more deeply. Listening and speaking activities then move beyond simple fact-checking to be more communicative.

4.4 Improve Feedback Strategies to Deepen Classroom Thinking Dialogue

Teachers are to use praise to give students some encouraging words. Instead of broad remarks or answers to certain questions, they need to be more specific and based on reason. Another good way is peer evaluation. It can make students add to, question, and discuss the ideas with others; thus, collective thinking is formed. When students give wrong answers, teachers can give indirect correction to lead them to self-correction. This way can make students more confident and think independently. Give students more time to think, and then have them elaborate on or improve their answers. Through timely correction and reasonable questioning, students can learn to cooperate with others to build the idea independently.

4.5 Balance Spatial Distribution to Achieve Classroom Interaction Fairness

Teachers should pay more attention to the problem of spatial inequality in the classroom. Questioning often has a pattern: it is dense at the beginning and sparse at the end, and more frequent on the right side than the left. To break this pattern, teachers should ask more questions of the students in the middle and back rows, as well as those at the edges. At that time, teachers can move around more freely, stop in the middle and rear areas to widen the scope of vision, and reduce blind spots caused by being in the same spot. They should also change typical position and not always stand on the same side of the podium. Scan the entire class evenly and spread the questions among all the seating areas to distribute who gets to answer. Through special arrangements, the problem of a participation gap due to seating will be alleviated, and all students will be given an equal chance to participate in class activities.

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