APPLYING SEQUENTIAL ANALYSIS TO TEACHING METHODS: CASE STUDY OF A CSL CLASSROOM

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Abstract

Sequential analysis tests the statistical significance of the sequential relationship between acts. This method of analysis has been widely used in pedagogical scholarship; however, it has not yet been applied to the study of language teaching. This study uses sequential analysis to examine the different instructional methods among nine instructors of Chinese as a Second Language (CSL). The analysis uses “The Coding Chart for Observing the Methodologies Used in CSL Classrooms” to determine what instructional methods are used to teach different areas such as vocabulary and grammar. The sequential analysis reveals differences in the instructional behaviors of instructors according to their levels of seniority. Results of this study show the benefit of applying sequential analysis to the study of language teaching.

Keywords: Chinese as a Second Language, CSL, Instructional Method, Sequential Analysis, Language Learning

Introduction

Previous research has shown how sequential analysis can be used to verify whether a sequential correlation between two or more behaviors is statistically significant, and this method has been widely used in teaching-related research (Hou, 2010; Hou, Chang, & Sun, 2008, 2009; Matsumoto, 2011). However, this method has not yet been applied to studies of language teaching and learning, especially in the context of Chinese as a Second Language (CSL).

Previous research on CSL has provided a picture of current teaching and learning practices. Using a secondary analysis method, Hou, Chang, and Sun (2009) discussed studies of CSL from the past 20 years. The sources of the materials they analyzed included periodicals, theses, and publications about CSL in Taiwan, China, the U.S., and other regions. Findings indicated that most of the CSL materials used in classrooms were designed by the instructors. Moreover, most of the studies they reviewed were short-term classroom-based research studies conducted on a case-by-case basis. This type of research is important because it studies the variety of instructional methods teachers employ, and the case study approach remains central in this literature (Hsin & Chang, 2009). For example, H.Y., Chen, and Liu (2008) studied CSL online real-time courses, but they only discussed teaching in smaller classes. Yin (2001) presented an approach for designing CSL courses, but the approach is only applied to individual cases. Compared with research on the teaching of other languages, long-term empirical
studies of CSL are relatively scarce (Wheeler & McLeod, 2002; Zhu, 2006). Moreover, most studies of CSL focus on the practice of teaching, such as Bourgerie (2003), Leaver, Ehrman, and Lekic (2004), Lam et al. (2004), and Zhuang, Zhang, Wu, and Wu (2007). Other researchers have focused on specific instructional methods. For example, Xie (2001, 2007) introduces several digital CSL sources for instructors, Yin (2001) proposes the principles behind the design of CSL courses, and Luo (2002) proposes a CSL instructional source. This literature has provided a wealth of resources for CSL teaching practices; however, there is a lack of systematic research that compares these instructional methods (Chien, 2008; Peng, 2009). Previous research on the teaching and learning processes in CSL classrooms has primarily employed questionnaires or other empirical methods, but the teacher-student interactions remain unanalyzed (Hsin & Chang, 2009).

In addition, research has shown that a teacher’s number of years of experience (seniority) may influence both the style and results of teaching (Mao & Tang, 2007; Yu, 2007). According to studies by Westerman (1991), Sung (2008, 2010), Huberman (1993), Yuan and Chang (2000), and Kanno and Stuart (2011), comparing the performances of novice and expert teachers allows all teachers to better understand the differences and improve their teaching abilities.

With increasing international trade and cultural exchanges, countries throughout the world are encouraging Chinese language learning, and some of these countries have even officially characterized Chinese as an important second language (Chang, 2006). This increased demand for CSL has made efforts to improve CSL materials as well as research on methods and techniques of teaching CSL even more important. Empirical studies have important pedagogical implications because they often facilitate the design of innovative teaching methods, and more empirical studies on CSL are needed.

This article reports on findings from a longitudinal study that used in-class observations to examine CSL teaching methods. The study was conducted from 2009 to 2010. During this time, we visited the Mandarin Training Center, the largest and most well-known CSL institution in Taiwan, and observed nine “audio-visual Chinese” courses (totaling 9 teachers and 73 students). Class sessions were videotaped which allowed us to collect complete data on how each instructor taught his or her course.

The “audio-visual Chinese” course is currently the most complete and widely practiced CSL program for adults in Taiwan. The course curriculum includes nine volumes of varying levels of difficulty. Each volume is complete with textbooks, teacher manuals, student assignments, and MP3 supplementary CDs. The curriculum is designed for foreigners whose native language is not Mandarin. The goal is to develop students’ basic pronunciation, syntax, and vocabulary, thus enabling them to use the language on a daily basis. All new words and phrases in the textbooks are spelled with Mandarin phonetic symbols, Hanyu pinyin, and Tongyong pinyin to help readers recognize new items. The assignment booklet complements the courseware by providing opportunities to practice the strokes, pronunciation, and shape of new words. The booklet also helps students practice constructing, paraphrasing, and translating sentences so they can improve their Chinese language abilities and understand their own learning performance.

During the beginning stages of the project, we reviewed past research on language-learning classroom observations and performed an initial viewing of the videotaped data. The Delphi method was used to determine the validity of our findings, and results yielded “The Coding Chart for Observing the Methodologies Used in CSL Classrooms” (Chang, Hou, Chang, Sung, & Yu, 2011). The coding system consists of four categories with 18 instructional methods and 59 sub-items. For example, Category 1 is “Vocabulary” and includes 6 instructional methods and 25 sub-items; Category 2 is “Grammar and sentence types” and includes 3 instructional methods and 9 sub-items; Category 3 is “Textbook and dialogue” and consists of 5 instructional methods and 13 sub-items; and Category 4 is “Other” and includes 4 instructional methods and 12 sub-items. A simplified version of the coding scheme is shown in Appendix A. This coding scheme represents the diversity of CSL teaching methods and can serve as a reference for future researchers and/or educators. For example, this coding scheme provides a fuller understanding of how each CSL instructional method was utilized by teachers, and can help determine the effectiveness of various CSL instructional behaviors.

In addition to the coding scheme that was used to calculate how often each instructional method was used by the nine CSL instructors, we also performed a sequential analysis to further examine the use of these instructional methods. The primary research
questions for this study were as follows: 1) How often are the different instructional methods utilized by the CSL instructors? and 2) What is the difference in the distribution of methods among CSL instructors according to their different levels of experience?

Research method

Participants

The participants were nine CSL teachers from the National Taiwan Normal University Mandarin Training Center, the largest and most well-known CSL center in Taiwan, in addition to the 73 students enrolled in these courses. Basic information for these teachers is shown in Table 1.

Table 1 near here

Research tools

This study used “The Coding Chart for Observing the Methodologies Used in CSL Classrooms” to code the instructional behaviors of the nine teachers, as captured in the videotaped data. The data set represents complete recordings of class meetings of the audio-visual Chinese course for each of the nine instructors. We recorded six classes for each instructor. In the course of the six classes, each instructor taught one lesson from the class textbook.

After coding, we conducted a sequential analysis to examine the sequential relationships among instructional methods. For example, we determined whether a teacher’s use of a certain instructional method was followed by the use of another instructional method, and whether this sequential relationship was significant. We conducted a sequential analysis to calculate and determine the significance matrix in order to visualize each category of behavioral patterns. Following Bakeman and Gottman (1997), the calculation procedures were as follows. First, we determined the “frequency transition matrix,” which represents how many times a transition between certain instructional methods has occurred within a teaching process. Given the frequency transition matrix, we then determined the sequential transition conditional probability matrix. Taking the sequential frequency matrix into account, we then determined the expected-value matrix. We then used these findings to calculate the adjusted residual table where a Z-score greater than +1.96 indicates a significant sequence (p<0.05). Finally, we prepared a sequential transition table to illustrate the significant sequences, where each node represents a type of instructional method and the arrowhead represents the sequence.

Research procedures

For the coding procedure, we utilized an inter-rater reliability test in which two or more coders were asked to categorize the same content to determine the similarities between their results. A high level of consistency in inter-rater categorization indicates a greater level of consistency in their content analysis, and vice versa (Lunz, Stahl, & Wright, 1994). We also invited three researchers who specialize in CSL to participate in the coding process. We first conducted a coding training program in which we transcribed content verbatim into texts. To elaborate, the three researchers watched the class videos and then recorded and typed individual sentences and words spoken by the teacher and students in class. We then viewed the transcripts with these researchers and discussed the coding scheme to ensure coding consistency.

The inter-rater reliability analysis (with three coders) yielded a kappa value of 0.95, indicating that our study is reliable. The follow-up coder then used “The Coding Chart for Observing the Methodologies Used in CSL Classrooms” to code the transcripts. The method of analysis is shown in Table 2. After we read about each instructional method, the methods that were utilized by the nine teachers were coded and recorded in the column on the right.

Table 2 near here

After the transcripts from the nine classes were coded, we were then able to determine the frequency of each instructional method used by each teacher.

Results

After the coding process described above was completed, we determined the frequency of each sub-item of the instructional methods utilized by the nine teachers for the four categories of “vocabulary,” “grammar and sentence types,” “textbook and dialogue,” and “other.” Appendix B presents an example of the instructional methods that were utilized by Teacher B, who has six years of experience and is responsible for teaching the first volume of CSL.

In addition, we determined the three types of instructional methods that were most often used by the nine teachers according to teachers’ seniority
levels and the CSL volumes. For the “vocabulary” category, findings revealed that the most frequently used method regardless of seniority or CSL volume was “teacher-student dialogue.” For the “grammar and sentence types” category, all of the teachers primarily relied on the method of “explaining the application,” with the exception of Teacher A. For the “textbook and dialogue” category, all of the teachers primarily relied on “reading from the textbook,” with the exceptions of Teachers C and H. All of the teachers also primarily relied on “discussing the textbook and asking questions,” with the exceptions of Teachers A and G. Finally, with regard to the “other” category, all of the teachers primarily relied on “discussing the content of oral presentations.” These results are presented in Table 3 below.

Table 3 near here

Our second research objective was to determine how much each instructional method was used according to the teachers’ varying seniority levels and the different difficulty levels they were teaching. On the basis of their seniority, Teachers A, D, and G were categorized as low-experience teachers; Teachers B, E, and H were categorized as medium-experience teachers; and Teachers C, F, and I were categorized as high-experience teachers. Table 4 lists the frequencies with which these teachers used the different instructional methods for the four categories of “vocabulary,” “grammar and sentence types,” “textbook and dialogue,” and “other.”

Table 4 near here

Sequential analysis

As stated previously, the purpose of this study is to determine whether there is a difference in terms of how CSL teachers use the different instructional methods according to their different seniority levels and course difficulty levels. The frequency transition matrix and multiple stages of calculation yielded a table of residuals. Table 5 is an example of the residuals for the low-experience teachers. In the table, a Z-score greater than +1.96 indicates that a sequence is significant (p < 0.05).

Table 5 near here

Table 5 indicates that the instructional methods used by the CSL teachers for all the seniority levels are significant. Next, these significant sequences were used to create a sequential transition table. Each node of the table represents a type of instructional method and the arrow represents the sequence. Figures 1, 2, and 3 present the transition table by showing the frequencies of the instructional methods used by the low-experience, medium-experience, and high-experience teachers.

Figure 1 near here

Figure 2 near here

Figure 3 near here

Discussion

Using the “Coding Chart for Observing the Methodologies Used in CSL Classrooms,” we coded the methods that were adopted and thus were able to determine how often each instructional method was used by the CSL teachers. The results are described in this section.

Instructional methods used by the CSL instructors

The most common sub-method that was adopted by the nine instructors in teaching vocabulary was “teacher-student dialogue,” and this finding is consistent with Zhang (2004), Zhang (2007), Fu (2009), Liao (2011), and Mustafa and Lal (2011). These studies show that “teacher-student dialogues” are extremely helpful for students as they try to understand the meanings of new words and their appropriate contexts. These dialogues help students fully internalize the material through repeated practice. However, it is important that teachers design appropriate practice sessions or tasks for students to practice new words and phrases to ensure that students fully grasp how to use these new words rather than simply reading them.

Zhang (2007) claims that vocabulary learning is a crucial component of language learning because it helps learners to effectively express their opinions and communicate with others. In our study, we observed that after the students learned a certain number of new words, the teachers would often conduct teacher-student dialogues using different activities. For example, the teacher may guide the students to actively engage in conversations with the teacher or fellow students. In the process of teacher-student dialogue, the instructor is able to both teach and correct student mistakes but also act as a facilitator and training partner.
Zhang (2007) proposed several styles of teacher-student dialogue that facilitate vocabulary learning:

1. Speaking after listening: For the words and phrases with which students are already familiar, teachers could use games in which a student is asked to explain the meaning of a word and then other students could explain which words would be appropriate for a certain context. These games provide practice opportunities for students whose strengths are either listening or speaking.

2. Speaking after reading: Pictures help students visualize new concepts, and having pictures with matching phrases helps students to gain a clearer understanding of these new phrases.

3. Speaking after writing: To assist students who have completed introductory lessons in developing their ability to produce a passage, teachers could select new words during vocabulary lessons and ask students to use these words to produce a longer passage. In this activity, teachers would ask students to write down their passages and read them aloud.

4. Facilitate speaking with speaking: Vocabulary can be read aloud by either teachers or students. It is recommended that students read the majority of the vocabulary aloud so that their mistakes can be detected and corrected by other students. However, a teacher’s participation in this process would also encourage students to speak. The teacher can initiate the speaking process; however, he or she must exercise caution with the use of words and phrases in the textbook before asking students to read the material aloud. Students would perceive this activity as a fun communication game, feeling more relaxed and they might try to imitate the teacher’s speaking style.

The most common sub-method used to teach grammar and sentence types was “explaining the application.” Interestingly, this finding is not consistent with previous research. Lei (2010) argues that the method of “explaining the application” still places the teacher at the center of the classroom, and focuses only on teaching grammar at the expense of other aspects of the language system. According to Tosun (2006) and Gocer (2010), even if students have sufficient knowledge of grammar and sentence types, they are often unaware of when to apply this knowledge. Therefore, teachers should focus more on helping students apply this knowledge in actual situations and avoid providing only theoretical explanations.

For the “textbook and dialogue” category, this study found that the most common sub-methods used by the teachers were “reading the textbook aloud” and “discussing the textbook and asking questions.” This finding is consistent with previous research. Liu (2009) observed that instructors often teach material from textbooks by explaining the textbook material and encouraging students to share their experiences, guiding students to read the text sentence by sentence, and having students read the text aloud together or by taking turns. These methods were similar to the method of “reading from the text” observed in our study.

The other most common methods in this category were “oral presentation” and “discussing the content of oral presentations.” Wu (2010) argues that oral presentations help students improve their listening comprehension and speaking skills. In another study, Wei (2007) showed that an “oral presentation” is a comprehensive learning activity that involves multiple skills. On the surface, a presentation appears to be a speaking activity; however, students must engage in a series of learning activities in order to deliver speeches successfully. For example, a student may need to read the material first, think critically about this material, and incorporate their own experience and perspectives, produce their ideas in writing, and rehearse the material before finally giving the presentation in class. Therefore, the preparation process improves comprehension, learning vocabulary and phrases, and developing critical and creative thinking skills.

The different instructional methods according to teachers’ level of experience

Findings reveal that, for the “vocabulary” category, the instructional method used most often by all instructors, regardless of seniority levels, was “implementing oral practice.” However, the low-experience teachers never used the method of “designing take-home assignments.” For the category of “grammar and sentence types,” the most common method that all teachers in this study employed was “implementing oral practice.” Differences in seniority level was found to effect teaching practices for the category of “textbook and dialogue.” For the low- and medium-experience teachers, the most common method was “implementing oral practice.” On the other hand, for the high-experience teachers,
the most common method was “exploring the content of the textbook.” Meanwhile, the medium-experience teachers never implemented the strategy of “preview and review.” For the “other” category, although all teachers used the method of “writing and publishing articles,” the low-experience teachers used this method with less frequency (63) than the medium-experience teachers (282) and the high-experience teachers (250). (Note that the numbers in parentheses are the number of observations.) In addition, the low-experience teachers did not adopt the method of “providing extra-curricular material and engaging in activities.”

The sequential analysis reveals that most of the methods that were adopted by all nine teachers were found to be significant. The “preview and review strategy” that the high-experience teachers used when teaching “vocabulary” and “textbook and dialogue” was significantly correlated. Figure 3 shows that the instruction methods adopted by high-experience teachers to teach “vocabulary” were correlated with the sequential analysis of the instructional methods adopted to teach “textbook and dialogue,” such as 1a–>3e and 1e–>4b. Further, when the medium-experience and high-experience teachers taught “vocabulary,” the instructional methods display more correlation than the methods used by the low-experience teachers. For example, in Figure 3, 1a, 1b, 1c, 1d, and 1f demonstrate a strong correlation.

For the “grammar and sentence types” category, the method of “analyzing grammar and sentence types” used by the low-experience teachers overlapped with the methods used for the “vocabulary” and “other” categories. This relationship is shown in Figure 1 where 2b–>1a, 2c–>4a. The medium-experience teachers did not employ cross-category methods when teaching “grammar and sentence types.” In contrast, the high-experience teachers utilized methods from both the categories of “vocabulary” and “textbook and dialogue,” as shown in Figure 3 where 2b–>1e, 2b–>3a.

For the “textbook and dialogue” category, the use of cross-category methods differs among the low-experience, medium-experience, and high-experience teachers, as shown in Figures 1, 2, and 3. When teaching “textbook and dialogue,” the low-experience teachers demonstrated only 3e–>2b and did not demonstrate a great degree of cross-category spillover. On the other hand, when the medium-experience teachers taught “textbook and dialogue,” they borrowed numerous instructional methods from the “other” category, as more d–>4c, 3b–>4b transitions were observed. When the high-experience teachers taught “textbook and dialogue,” they frequently combined the instructional methods that were used for “vocabulary” and “grammar and sentence types,” as demonstrated in 3e–>1a, 3a–>4b.

For the “other” category, the medium-experience teachers demonstrated the highest cross-category use of instructional methods, as shown in Figure 2 where 4b–>3b, 4c–>3d.

The results of this study support findings from previous research on differences between expert and novice teachers. Tang, Han, and Tong (2010) showed that high-experience teachers tend to inform their students of the agenda for each class meeting and use methods that are effective and help students of various backgrounds and levels absorb the material. Hogan, Rabinowitz, and Craven (2003) noted that when planning a course, low-experience teachers tend to focus on short-term goals, whereas high-experience teachers focus on both short-term and long-term goals and demonstrate flexibility by using various instructional methods. Further analysis of the behavioral frequency transition table indicates that for the categories of “vocabulary,” “grammar and sentence types,” “textbook and dialogue,” and “other,” low-experience teachers tend to use category-specific methods rather than cross-category methods. On the other hand, there is more variation in the instructional methods used by high-experience teachers because they use both category-specific and cross-category methods. This finding is consistent with other studies that have found that high-experience teachers demonstrate more diverse and flexible use of instructional methods.

After the coding and sequential analyses were completed, the final step of the analysis was to interview the nine teachers and discuss their behavioral patterns with them. When the respondents were asked why certain methods were used less frequently, most of them explained that this limited use was probably a result of classroom logistical limitations. For example, some classrooms had insufficient space for certain educational resources. Some classrooms did not have projectors or computers and were not suitable for multimedia-assisted teaching. The teachers occasionally needed to keep pace with the syllabus timetable and thus had to limit the time allotted for student interaction. All nine teachers agreed with the coded results and
confirmed that the most frequently used method was correlated with speaking and discussing. Since CSL is a linguistic course, the teachers’ greatest concern was whether the learners were able to apply what they had learned in class to practical situations.

Conclusion and Suggestions

This study examined videotaped classroom data in order to determine teaching behaviors and student-teacher interaction in CSL classrooms. We performed a coding analysis and a sequential analysis to determine the kinds of methods CSL teachers used in the classroom, the relationships among those methods, and whether the factors of seniority or level of class difficulty affected what method a teacher used. The coding analysis provided an overall picture of what instructional methods were used by the CSL teachers in teaching vocabulary, grammar and sentence types, textbook and dialogue, and other areas. The analysis and results also determined differences in the instructional methods used according to the teachers’ different levels of experience or seniority. One important finding is that the high-experience teachers used more category-specific and cross-category methods compared with the low-experience and medium-experience teachers.

Some limitations of our study can be addressed in future research. In our study, we analyzed only the instructional methods of teachers and did not discuss the characteristics of the teacher-student interaction observed in the classrooms. While all of the respondents agreed that the most popular method was “implementing oral practice,” teachers with varying seniority and course difficulty levels engage in both academic and also non-academic dialogues with students. For example, O’Connor and Fish (1998) observed that experienced teachers establish rules and determine motivations in anticipation of what could occur in the classroom, evaluate students, provide feedback, and adjust their lessons on the basis of student performance. In contrast, teachers with less experience focus more on oral practice and adjust their lessons on the basis of the oral performance and needs of students. Thus, these classes are often controlled by the students. Future research could focus on these aspects in order to determine whether the same pattern also applies to CSL teachers. In addition, more research is needed to determine the relationship between various instructional methods and teacher-student interaction.

In this study, the instructional behaviors of the teachers were videotaped and analyzed. The interviews allowed the teachers to explain why they used certain methods; however, the question of how each method shapes student learning and affects performance requires further clarification and discussion. For example, in a study on ESL, Liu (2005) shows that in-class teaching methods create fewer opportunities for oral practice as a result of time and space limitations, and programs that combine face-to-face and virtual course material could provide a solution. We also found that the most popular method among all teachers for the “other” category was “writing and publishing articles.” Lee (2008) points out that students’ in-class writing and publishing pieces are often not retained for other students to view. However, digital technology could allow students to retain their material, and teachers and researchers would also be able to collect relevant data for analysis in order to better understand and correct learner errors in writing.

During the follow-up interviews, all nine respondents expressed their struggles to keep pace with the syllabus every semester and their subsequent need to reduce the time spent in class on discussion and interaction. One possible solution for this problem is to incorporate new technologies into the classroom. For example, Yilmaz (2011) showed how online synchronous systems provide opportunities for language practice that is similar in class teaching methods create

References


Table 1. Basic information for the participating teachers.

<table>
<thead>
<tr>
<th>Teacher’s number</th>
<th>Volume of textbook used</th>
<th>Years of experience (seniority)</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
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<td>1</td>
<td>2</td>
<td>Female</td>
</tr>
<tr>
<td>B</td>
<td>1</td>
<td>6</td>
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</tr>
<tr>
<td>C</td>
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</tr>
<tr>
<td>D</td>
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</tr>
<tr>
<td>E</td>
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<td>5</td>
<td>Male</td>
</tr>
<tr>
<td>H</td>
<td>5</td>
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</tr>
<tr>
<td>I</td>
<td>5</td>
<td>37</td>
<td>Female</td>
</tr>
</tbody>
</table>

Table 2. Examples of coding.

Transcript (emotions are shown in parentheses; elliptical marks indicate a pause) | Code
--- | ---
Teacher: (raises and lowers the right hand and looks at the class) Any questions? | 4-b-4
A, B: (looks at the test) | 
Teacher: (looks at Student G) Thank you. (Walks up to Student A and looks at his/her book) | 1-a-7
A: (looks at the test) I am confused, what is the difference between “值钱” (zhí qián) and “值得” (zhí dé)? | 
Teacher: (gives a hand gesture for money and puts his/her hands down) “值钱” refers to money; for example, you can say that a painting is a thousand years old, and it is therefore “值得”. | 
A: (looks at the teacher) | 
Teacher: (looks at Student A) | 
A: (nods) Oh! | 
Teacher: (looks at Student A and waves his/her hand upward) And “值得” means… You see something or do something that you think is worth it or good for you. | 1-a-2
Teacher: (flips the test over, writes “气候” (qì hòu) with his/her right hand on the whiteboard, and uses his/her left hand to point at the desk) OK! If there are no more questions, please put your test on the desk. (writes on the whiteboard) | 
A: (looks at the test) Um... I have a question. | 
Teacher: (Replaces the cap on the whiteboard marker and turns around) Go ahead. | 
(looks at the test) |
<table>
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<tr>
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<th>Instructional method Sub-item 1</th>
<th>Instructional method Sub-item 2</th>
<th>Instructional method Sub-item 3</th>
<th>Instructional method Sub-item 4</th>
<th>Instructional method Sub-item 5</th>
<th>Instructional method Sub-item 6</th>
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<tr>
<td>A</td>
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<td>1-c-1</td>
<td>2-a-2</td>
<td>2-c-3</td>
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<td>4-b-1</td>
<td>4-a-2</td>
</tr>
</tbody>
</table>

Category: Instructional method
Vocabulary: Teacher-student dialogue
Grammar and sentence types: Reading, Understanding, and making sentences
Textbook and dialogue: Whiteboard
Other: Repeating and making connections to previously learned material

- reviewing and making connections to previously learned material
- teacher-student dialogue
- reading new sentence types or sentence examples
- explaining applications
- the practice of sentence making
- reading from the textbook (69 times, 69%)
- pronunciation correction (8 times, 8%)
- practicing dialogues in the textbook (8 times, 8%)
- writing and announcing articles and dialogues (15 times, 79%)
- discussing test results (1 times, 5%)
- discussing the content of oral reports (137 times, 53%)
- discussing the content of oral reports (24 times, 36%)
- discussing the content of oral reports (29 times, 28%)
- discussing the content of oral reports (3 times, 16%)
- discussing the content of oral reports (1 times, 5%)
- discussing the content of oral reports (43 times, 16%)
- discussing the content of oral reports (6 times, 9%)
- discussing the content of oral reports (20 times,
<table>
<thead>
<tr>
<th></th>
<th>1-c-4 Teacher-student dialogue (152 times, 39%)</th>
<th>1-a-2 Whiteboard (123 times, 32%)</th>
<th>1-c-1 Reading new sentence types or sentence examples (45 times, 12%)</th>
<th>2-b-1 Explaining applications (128 times, 42%)</th>
<th>2-c-2 Reading sentence examples or modifying sentences (91 times, 30%)</th>
<th>1-c-1 Whiteboard (41 times, 13%)</th>
<th>3-b-3 Taking turns reading from the text (52 times, 46%)</th>
<th>3-c-1 Text-related discussions and questions (34 times, 30%)</th>
<th>3-b-1 Reading from the textbook (11 times, 10%)</th>
<th>4-a-1 Writing and announcing articles and dialogues (8 times, 53%)</th>
<th>4-a-2 Oral presentation (5 times, 33%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>1-c-4 Teacher-student dialogue (152 times, 39%)</td>
<td>1-a-2 Whiteboard (123 times, 32%)</td>
<td>1-c-1 Reading new sentence types or sentence examples (45 times, 12%)</td>
<td>2-b-1 Explaining applications (128 times, 42%)</td>
<td>2-c-2 Reading sentence examples or modifying sentences (91 times, 30%)</td>
<td>1-c-1 Whiteboard (41 times, 13%)</td>
<td>3-b-3 Taking turns reading from the text (52 times, 46%)</td>
<td>3-c-1 Text-related discussions and questions (34 times, 30%)</td>
<td>3-b-1 Reading from the textbook (11 times, 10%)</td>
<td>4-a-1 Writing and announcing articles and dialogues (8 times, 53%)</td>
<td>4-a-2 Oral presentation (5 times, 33%)</td>
</tr>
<tr>
<td>F</td>
<td>1-c-4 Teacher-student dialogue (216 times, 20%)</td>
<td>1-b-6 Interpreting vocabulary (188 times, 18%)</td>
<td>1-a-7 Body language (103 times, 10%)</td>
<td>2-c-2 Explaining applications (115 times, 24%)</td>
<td>2-c-1 Repeating or leading in reading (71 times, 15%)</td>
<td>2-c-1 Reading from the textbook (39 times, 30%)</td>
<td>3-b-2 Pronunciation correction (20 times, 16%)</td>
<td>4-a-3 Discussing the content of oral reports (67 times, 45%)</td>
<td>4-a-2 Oral presentation (62 times, 42%)</td>
<td>4-b-4 Discussing test results (9 times, 6%)</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>1-c-4 Teacher-student dialogue (264 times, 24%)</td>
<td>1-a-2 Whiteboard (221 times, 20%)</td>
<td>1-a-7 Body language (135 times, 12%)</td>
<td>2-c-1 Repeating or leading in reading (158 times, 44%)</td>
<td>2-c-1 Explaining applications (100 times, 28%)</td>
<td>3-b-1 Reading from the textbook (49 times, 50%)</td>
<td>3-b-2 Pronunciation correction (37 times, 38%)</td>
<td>3-c-4 Combining vocabulary with grammar and sentence types (4 times, 4%)</td>
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<td>0</td>
<td>0</td>
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<tr>
<td>H</td>
<td>1-c-4 Teacher-student dialogue (269 times, 51%)</td>
<td>1-c-1 Reading new sentence types or sentence examples (73 times, 8%)</td>
<td>1-a-2 Whiteboard (43 times, 8%)</td>
<td>2-b-1 Explaining applications (34 times, 41%)</td>
<td>2-c-2 Reading sentence examples or modifying sentences (18 times, 22%)</td>
<td>2-c-3 The practice of sentence making (10 times, 12%)</td>
<td>3-c-1 Text-related discussions and questions (44 times, 20%)</td>
<td>3-b-2 Pronunciation correction (38 times, 18%)</td>
<td>3-c-4 Combining vocabulary with grammar and sentence types (19 times, 9%)</td>
<td>4-b-4 Discussing the test results (15 times, 25%)</td>
<td>4-a-2 Oral presentation (15 times, 25%)</td>
</tr>
</tbody>
</table>
Table 3. Comparison chart of the most frequently employed instructional sub-items.
Table 4. List of instructional methods that were utilized by teachers with different seniority levels.

<table>
<thead>
<tr>
<th>Faculty member category</th>
<th>Frequency and proportion of utilized instructional methods</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Method 1a</td>
</tr>
<tr>
<td>Novice</td>
<td>Frequency</td>
</tr>
<tr>
<td></td>
<td>Proportion</td>
</tr>
<tr>
<td>General</td>
<td>Frequency</td>
</tr>
<tr>
<td></td>
<td>Proportion</td>
</tr>
<tr>
<td>Expert</td>
<td>Frequency</td>
</tr>
<tr>
<td></td>
<td>Proportion</td>
</tr>
</tbody>
</table>

Table 5. Example of the residuals of the low experience teachers

<table>
<thead>
<tr>
<th>Z</th>
<th>1a</th>
<th>1b</th>
<th>1c</th>
<th>1d</th>
<th>1f</th>
<th>2a</th>
<th>2b</th>
<th>2c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>6.08*</td>
<td>11.29*</td>
<td>5.73*</td>
<td>0.93</td>
<td>-3.94</td>
<td>-2.12</td>
<td>-4.23</td>
<td>-6.16</td>
</tr>
<tr>
<td>1b</td>
<td>5.51*</td>
<td>11.77*</td>
<td>4.87*</td>
<td>4.06*</td>
<td>-1.89</td>
<td>-2.53</td>
<td>-5.17</td>
<td>-6.34</td>
</tr>
<tr>
<td>1c</td>
<td>7.42*</td>
<td>2.99*</td>
<td>33.24*</td>
<td>-2.09</td>
<td>-7.62</td>
<td>-5.1</td>
<td>-10.64</td>
<td>-13.77</td>
</tr>
<tr>
<td>1d</td>
<td>2.07*</td>
<td>-0.45</td>
<td>-0.36</td>
<td>28.67*</td>
<td>-3.04</td>
<td>-2.37</td>
<td>-3.85</td>
<td>-6.24</td>
</tr>
<tr>
<td>1f</td>
<td>-3.93</td>
<td>0.28</td>
<td>-8.86</td>
<td>-3.33</td>
<td>51.45*</td>
<td>-2.44</td>
<td>-4.51</td>
<td>-6.43</td>
</tr>
<tr>
<td>2a</td>
<td>-2.56</td>
<td>-2.94</td>
<td>-5.62</td>
<td>-2.38</td>
<td>-2.45</td>
<td>0.63</td>
<td>16.67*</td>
<td>6.52*</td>
</tr>
<tr>
<td>2b</td>
<td>-3.73</td>
<td>-4.53</td>
<td>-10.11</td>
<td>-4.39</td>
<td>-4.52</td>
<td>13.91*</td>
<td>20.27*</td>
<td>11.3*</td>
</tr>
<tr>
<td>2c</td>
<td>-5.96</td>
<td>-6.52</td>
<td>13.99</td>
<td>-6.24</td>
<td>-6.43</td>
<td>5.36*</td>
<td>12.05*</td>
<td>37.29*</td>
</tr>
</tbody>
</table>

Figure 1. Novice teachers’ methods
Behavioral frequency transition table.

Figure 2. General teachers’ methods

Behavioral frequency transition table.

Figure 3. Expert teachers’ methods

Behavioral frequency transition table.