A Comparative Study of the Teaching Language of a Novice Teacher and an Expert Teacher in Algebra Instruction

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The effectiveness of mathematics classroom teaching is directly affected by the teaching language. Comparing the teaching language of a novice teacher in algebra instruction with an expert teacher from the perspective of pragmatics, it comes to a conclusion that: both teachers attach great importance to the use of the teaching language, with the proportion of the teaching language time more than 50%; the novice teacher uses the affirmative language frequently, twice as often as the expert teacher; the declarative language the novice teacher uses in the exploration is mostly to repeat students' answer, which takes up a short time; the novice teacher uses the teaching language too much in the consolidation, which causes fewer opportunities for students to think. Then we get the following revelations: streamline the teaching language and control the time of the teaching language reasonably; make good use of the affirmative language to provide students hints and necessary time for thinking; avoid simple restatement of the student's answer and use the declarative language ingeniously to improve the feedback quality; use the teaching language appropriately to help students accumulate basic experience in mathematics activities.

Keywords: the teaching language, mathematics classroom, pragmatics, a comparative study.
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I. INTRODUCTION

At present, the use of the teaching language has become one of the basic characteristics to identify the primary teaching behaviors in efficient mathematics classroom (Yang &

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Wang, 2011). The quantity and quality of the teaching language directly influence the efficiency of mathematics classroom teaching, and have great significance for students' mathematics learning. Mathematics teachers are required to use the teaching language reasonably to inspire students to explore the new knowledge. In fact, there are still problems in mathematics teaching such as single type of the teaching language. Therefore, based on the goal of improving the teachers' ability to use the teaching language, it is particularly necessary to study the teaching language.

Obviously, there are differences between the novice and expert teachers in the use of the teaching language. Compared with the novice teachers, the expert teachers are more competent in using the teaching language properly to ensure efficient classroom teaching. But the question is: *What are the differences between the novice and expert mathematics teachers in the teaching language?* Actually, as a common mathematics class, the algebra teaching also puts forward high requirements for the use of the teaching language. Thus we compare the teaching language in algebra instruction between the novice and expert teachers to find the differences.

II. LITERATURE REVIEW

Generally speaking, the study of the teaching language can be included in the linguistic research. The linguistic research has roughly gone through a process from the study of the linguistic phenomena to the concern of the language users (Hu, 2018), that is, the transition from the traditional and structuralism linguistics to pragmatics. In the past, the linguistics focused on the linguistic facts, and statically analyzed the language from the perspective of the word meaning and the grammatical structure. Rather, pragmatics is a dynamic study which aims to analyze the speaker's behavioral intentions by considering the language environment and both sides of the speakers. It can be found through the classroom observation that teachers usually implement the teaching behaviors by their words, which have impacts on students. Specifically, the teaching language implies the teachers' certain behavioral intention. Therefore there is a theoretical basis for analyzing the teaching language from the perspective of pragmatics.

The teaching language is defined as a kind of symbol system used by teachers to transmit the teaching information to students in *the dictionary of education*. It is characterized by teachers' using grammatical and understandable language forms to transform their own familiar content reasonably (Gu, 1999). As can be seen, the teaching language is a medium generated in the classroom teaching process where transmission of teaching information takes place between teachers and learners. Functionally, the teaching language, a language that serves the classroom teaching, is used to complete various

teaching activities. And the teaching language can be classified into two distinct kinds. One refers to all languages that exist in the actual classroom of different forms, such as the facial language, the action language, the technical language, etc. The other refers specifically to the verbal language used by teachers in the actual classroom teaching. And the teaching language in this paper is defined as: *the verbal language used by the teacher to convey information to students and achieve various goals, which is specifically shown as each sentence the teacher said during the teaching process.*

III. RESEARCH METHODOLOGY

1. RESEARCH PROCESS

This study is mainly carried out by the method of video analysis. Firstly watch the videos of two lessons repeatedly, then classify and code the teaching language. Later, discussion will be done according to the analysis. The specific procedure is as follows:

Step 1: Take the class videos and communicate with the teachers and students to collect relevant background information.

Step 2: Record the teachers and students' behaviors and their corresponding starting and ending times according to the videos.

Step 3: Classify the teaching language from the perspective of pragmatics, then count up the quantity and the corresponding time of various teaching language in each lesson. Here the quantity of the teaching language refers to the quantity of sentences spoken by the teacher, and the time of the teaching language is measured in seconds.

To facilitate the data collection, the algebra class is divided into four teaching links as follows: leading-in, introducing the teaching theme of this lesson to students by reviewing the old knowledge, scene creating, etc.; exploration, leading students to experience the process of exploring and learning the new knowledge by discussion, cooperative learning, etc.; consolidation, applying the new knowledge through examples and class exercises; summary, summarizing and reviewing the teaching content, containing the homework assignment. In addition, the classroom statistics for each class is divided into two sessions. First, initial statistics is based on the classification of definition; then check whether the classification is reasonable or not on the basis of the initial statistics; finally, discuss with the members of the research team and teachers to decide the final classification.

2. SELECTION OF RESEARCH OBJECTS

Researchers mostly define the novice and expert teachers according to their own understanding, for which there is so far no unified definition. In this study, the novice and expert teachers are defined from the operational level, that is, the determination of selection criteria. There are two main criteria for the selection of the novice teachers: whether graduating from a normal college and the working time. The expert teachers are determined on a comprehensive consideration of the teaching time, reputation and honors, and the professional title (Lian, 2008). Referring to some relevant researches (Yan, 2009; Ye & Zheng, 2018)，the selection criteria for the novice teachers are determined as: (1) be graduated from a normal college and have participated in educational internships, (2) have been engaged in teaching work for 1-3 years; and the selection criteria for the expert teachers are determined as: (1) have won provincial and municipal teaching honors, (2) have got a senior professional title, (3) have been engaged in teaching work for more than 15 years. Thus the expert teacher-A from Hangzhou C Middle School and the novice teacher-B from Hangzhou W Middle School are selected as research objects. Teacher-A is a well-known teacher who has won provincial and municipal teaching honors, and teacher-B is a novice teacher who works hard. Both teachers who actively involved in teaching seminars are from the experimental schools of the researcher's school, where teachers and students have adapted to the teaching activities under the camera shooting.

The content of two lessons is about *linear equation in one unknown*, which is selected from the first section of the fifth chapter of the seventh grade mathematics book published by *Zhejiang Education Press*. The concept of *linear equation in one unknown*, its root and a method of finding the root that trying to substitute possible values into the equation to test whether the left and right sides of the equation equal are included in the main teaching knowledge.

3. TYPES OF TEACHING LANGUAGE

The speech act theory is the primary concern in the depth research of pragmatics. John Austin, a British philosopher in the late 1950s, realized early on that language was also an act in itself and he put forward the theory of "*doing things with words*", which means that the speaker performs various actions through his words and causes some corresponding effects (Lan, 2009). In order to study the speech acts, we should first classify the speech acts based on the speaker's intention expressed in the sentences. Searle, an American philosopher, further developed the speech act theory on the basis of Austin's theory, and classified the speech acts into declarations, statements, expressions, instructions and affections according to the speaker's intention expressed in the sentences (Lan, 2009). Hua (2003) summarized the classification of different speech acts from the point of view that is conducive to the actual language researches. And the speech acts are divided into: (1)

affirmative act (including statements, affirmations and assertions); (2) commitment act (including promises and guarantees); (3) imperative act (including requests, commands, etc.); (4) query act; (5) expressive act; (6) declarative act. Thus the teaching language of mathematics teachers can be divided into the following types (Ye, Li, & Si, 2015):

- Affirmative language (including statements, affirmations and assertions): providing facts or opinions on content or steps; expressing the teacher's own ideas; proposing the teacher's own explanation; or quoting others' opinions; stating the facts and putting existed content into the vision of both teachers and students.
- Commitment language: both teachers and students intend to do something.
- Imperative language: students are expected to fulfill teachers' wishes.
- Query language: the teacher asks students questions on teaching content and expects them to answer.
- Expressive language: the student's idea is accepted, or the teacher clarifies or appropriately expands the student's idea.
- Declarative language: the teacher praises or encourages students because of their learning behavior.

There is no doubt that the current research by Ye, Li, & Si (2015) does classify the teaching language from the perspective of pragmatic, which provides a reference for this study. As can be found by studying their classification, the definition of the affirmative language contains two meanings. One hand, the teacher explains and expresses his or her views to students. On the other hand, the teacher simply states the fact to students without giving his own opinions and explanations. Considering the teaching language in the actual classroom teaching, it is necessary to present the second meaning of the affirmative language solely. And we name it "drawing language". Meanwhile, as can be seen from Searle's theory, the expressive act contains acts of gratitude, apology, congratulations, and welcome, which expresses the speaker's feelings, and the declarative act means that the speaker makes something being so by speaking. Thus it is clear that the definitions of the expressive language and the declarative language above are reversed.

Therefore, we add "descriptive language" and revise the definition of "expressive language" and "declarative language". And the teaching language is divided into seven categories: affirmative language, descriptive language, commitment language, imperative language, query language, declarative language and expressive language, the definition can be as follows:

- Affirmative language: the teacher puts forward his own interpretation and opinion on knowledge, steps, etc., or quotes others' opinion and expresses his own ideas, such as, analyzing the exercises.
- Descriptive language: the teacher states facts or incorporates the existing content into

the vision of both teachers and students, such as reading the question or presenting some existed content to students.

- Commitment language: the teacher and students intend to do something together, such as organizing teaching activities.
- Imperative language: students are expected to complete the teacher's instructions, including requests, orders, etc., such as "Please tell me how you solve this equation." "If you can do it, please raise your hand."
- Query language: the teacher questionings students about the knowledge or problem-solving steps, and expects them to answer, such as "What are the common characteristics of these equations?"
- Declarative language: the teacher accepts, or appropriately expands or clarifies the student's idea, such as repeating the student's answer.
- Expressive language: the teacher evaluates the students' classroom behaviors through praise, encouragement, etc., such as "Well done!" "Very good!"

IV. RESULTS AND DISCUSIONS

Both teachers attach great importance to the use of the teaching language, with the proportion of the teaching language time more than 50%. As shown in Table 1, the teaching language time of teacher-A accounts for 66.36% of the total algebra teaching time, and the proportion of teacher-B is 51.43%. Both teachers think highly of using the teaching language to organize teaching activities, such as using the query language to guide students to summarize the characteristics of *linear equation in one unknown*. And teacher-student dialogue is still the main form of the algebra classroom teaching activities, as its time in both two lessons accounts for more than 65%. Also it can be seen from Table 1 that, the proportion of the students' response time is 16.21% and 14.19% respectively. We can find that two teachers' teaching language time is more than three times that of the students' response, which reflects that students spend less time answering teachers' questions in these two lessons.

Table 1. The quantity and time of the teaching language and students' response

Teacher	Teaching language			Students' response		
	Quantity	Time	Time percentage	Quantity	Time	Time percentage
A	486	1588s	66.36%	174	388s	16.21%
B	494	1435s	51.43%	199	396s	14.19%

The novice teacher uses the affirmative language frequently, twice as often as the expert teacher. As shown in Figure 1, the quantity of teacher-A's affirmative language and teacher-B's affirmative language is 41 and 82 respectively. By watching the teaching video, we can find the reason why teacher-B uses so much affirmative language. Students may have difficulties in understanding the questions, which cause stagnation of the classroom teaching, so the novice teacher uses much more affirmative language directly to clarify the background and meaning of the question to ensure the smooth and successful teaching activity. For example, when students were required to distinguish the equation, teacher-B immediately explained that we could consider from the opposite side----"it is not an equation" to determine whether it is an equation. In this case, students are lack of necessary time to deliberate the intent of the question. Thus their mathematical thinking couldn't be effectively trained and their understanding of knowledge might stay on the surface.
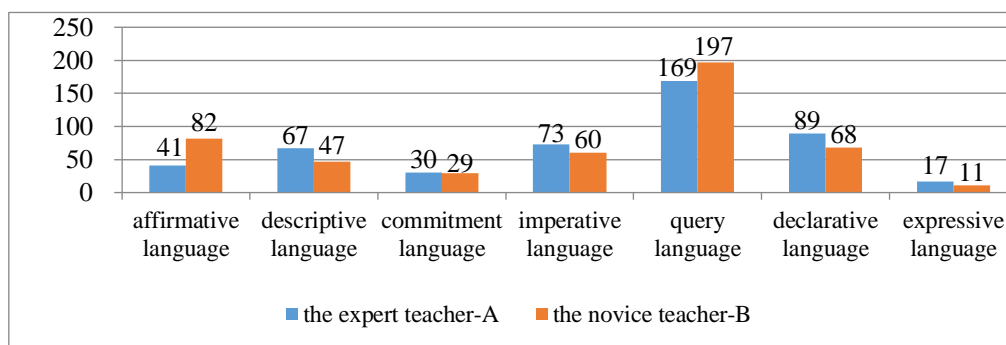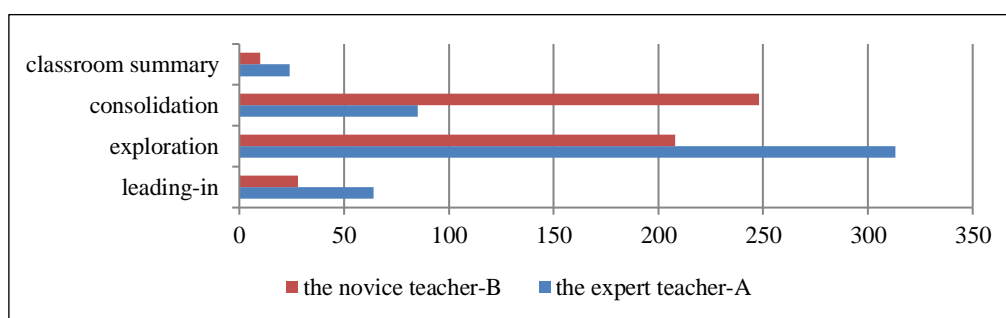

Figure 1. The quantity of two teachers' teaching language

The declarative language the novice teacher uses in the exploration is mostly to repeat students' answer, which takes up a short time. As shown in Table 2, the quantity of teacher-B's declarative language in the exploration is 28, which is about half of teacher-A's. And the time of teacher-B's declarative language is only 48 seconds, which is about one-third of teacher-A's. Comparing how these two teachers use the declarative language, it can be found that after students answered the question, teacher-B repeated the students' answer simply with the declarative language to declare whether it is correct or not, which could not effectively promote the students' deep thinking. However, teacher-A used the declarative language to give students more high-quality feedback timely and effectively or to accept the students' ideas to show encouragement and affirmation to the student, or to clarify the students' answers appropriately to deepen their understanding of knowledge. The difference between two teachers reflects that the expert teacher communicates with students more deeply and frequently on a certain issue.

Table 2. The quantity and time of the teaching language in the exploration

	The expert teacher-A		The novice teacher-B	
	Quantity	Time	Quantity	Time
Affirmative language	29	106s	36	185s
Descriptive language	47	228s	15	79s
Commitment language	17	90s	13	27s
Imperative language	47	100s	22	73s
Query language	105	349s	94	233s
Declarative language	59	145s	28	48s
Expressive language	9	30s	0	0

The novice teacher uses the teaching language too much in the consolidation, which causes fewer opportunities for students to think. As shown in Figure 2, the quantity of teacher-B's teaching language is 248 in the consolidation, accounting for 50.20% of the total number of the teaching language, which is significantly higher than 17.49% of teacher-A's. Combined with the classroom videos, it is not difficult to find that teacher-B used the teaching language to directly guide students to analyze questions and to apply the new knowledge, or to analyze the question immediately after the student answered, especially when the answer was wrong. Excessive use of the teaching language may help students temporarily learn how to apply the new knowledge to solving problems in class, but students cannot get necessary time to understand deeply, which may easily cause them being unable to solve problems alone after class.

Figure 2. The quantity of the teaching language in each teaching link

V. CONCLUSIONS

Streamline the teaching language and control the time of the teaching language reasonably. As can be found from Table 1, the teacher's teaching language occupies more than half of the algebra classroom teaching time, so students have less time to answer and think. Teaching practice shows that, excessive use of the teaching language will make the teaching effect less obvious. Only going through the proper thinking process and being under the teacher's appropriate guidance can students truly achieve the goal of having a good command of the new knowledge. Therefore, teachers should streamline the teaching language and control the teaching language time reasonably. It can ensure that students not only will not be tired of so much teaching language, but also have sufficient time to experience the knowledge derivation process, which can help them truly understand the connotation of the new knowledge.

Make good use of the affirmative language to provide students hints and necessary time for thinking. Teacher-B usually used the affirmative language to help students analyze questions directly, instead of giving them appropriate time to think after questioning them. Moreover, teacher-B used the affirmative language more significantly than teacher-A. Actually, what teacher-B did would only directly replace the students' thinking process and greatly reduce the students' thinking time. Advancing hints from teachers will lead students to only simply imitate and lack of thinking and judgment on questions (Zhang, 2018).The proper time for teachers to use the affirmative language is when students encounter some difficulties or doubts. For example, after learning the concept of *linear equation in one unknown*, teacher-A asked students what they would learn next. Teacher-A used the affirmative language to tell students to make an analogy with the process of learning equation; while teacher-B directly told the students that they were going to learn the root of *linear equation in one unknown*. The teacher-A's teaching practice helps students connect the learning of different knowledge to ensure that students' mathematics thinking is effectively exercised.

Avoid simple restatement of the student's answer and use the declarative language ingeniously to improve the feedback quality. Feedback is an important part to effectively promote teaching in mathematics classroom. When using the declarative language, teacher-B only repeated the student's answer simply, just to deepen students' impressions or attract their attentions. Conversely, teacher-A used the declarative language in an ingeniously way, such as properly explaining in a different tone on the basis of what the student said. It can not only indicate whether the teacher agrees with student's answers, but also encourages students to reflect their own answers to help them rethink the question and deepen their understanding of knowledge. For the students who do not have an idea

about the question at first, they will also get another opportunity to rethink.

Use the teaching language appropriately to help students accumulate basic experience in mathematics activities. The process of solving mathematics problems with the new knowledge is of great significance for students to acquire the new knowledge during the mathematics teaching, which places high requirements on the use of the teaching language. Instead of using the affirmative language immediately to tell students the method of solving this question after providing them classroom exercises, teacher-A gave students some time for thinking at first, and then he used the query language to stimulate students' problem consciousness and to help them understand the meaning of the question. Only when students encounter difficulties or feel confused, could teacher-A use the affirmative language to give them some hints or to guide them to analyze the problem gradually. Certainly, teacher-A also encouraged or praised students with the expressive language. Therefore, teachers should use all types of the teaching language appropriately to help students to gradually experience the activity process of "clarifying the meaning of the question - applying the new knowledge - solving the question", and accumulate basic experience of applying the new knowledge to solving mathematical problems.

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