

# Empirical Study on Senior High School Mathematics Teachers' Understanding the Situations of Students' Learning before New Class

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**Abstract** This research focused on the current state of the senior high school mathematics teachers' understanding the situations of students' learning before new class, and adopted an open-ended structure questionnaire and the method of interview to collect data. A total of 72 senior high school mathematics teachers from nine cities at Shandong Province participated in this survey. This research adopted the way of face to face to collect information. The results indicated: (1) 62.5% of the senior high school mathematics teachers usually adopted the way of oral communications (e. g., asking the class representatives of their subjects, inquiring the students face to face, and asking students in their class randomly) to understand students' learning before new class;(2) 58.33% of the senior high school mathematics teachers usually understood the situations of middle level students' learning before new class; (3) 36.11% of the senior high school mathematics teachers often understood the cases of about 5 students' learning in their class; (4) 54% of the senior high school mathematics teachers usually took about 5 minutes to understand the situations of students' learning before new class; (5) 52.78% of the senior high school mathematics teachers usually understood the situations of the students' mastering basic mathematics knowledge and students' achievements of problems solving. Therefore, the current senior high school mathematics teachers' understanding about the situations of students' learning was obviously too simple and unscientific, which should be one of the radical causes of some difficulties in the current senior high school mathematics teaching.

**Keywords:** *mathematics learning; understanding the situations of students' learning; new class; senior high school*

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## 1. Introduction

Understanding the situations of students' learning before new class referred to the activity of a teacher making use of a period of time before new class and understanding the situations of students' mastering mathematics knowledge, applying mathematics learning strategies and preparing for mathematics learning etc. in order to ensure effectiveness and pertinence of the lesson [6,7]. Understanding the situations of students' learning before new class did not only agreed with the requirements of new curriculum standards advocated currently in education, but also provided comprehensive and valuable information for teachers' preparing their classes and teaching in classes. Therefore, understanding the situations of students' learning before new class was universally attached importance to in the present senior high school mathematics teaching. Recently, not a few researchers had made quite a few suggestions in the terms of necessities of understanding students' learning situations and the specific methods and strategies for understanding. Take, for example, Li Munan [4] and Ma Ruifeng [5], who considered that only understand students' situations can a teacher teach his students as individuals

and be competent at his job. Gao Zilin [3], Gao Pei [2] and Chen Xiaobin [1] thought teachers should understand students' learning situations duly, exactly, as well as deeply. But according to our observation about current senior high school mathematics teaching, some of the senior high school mathematics teachers' works of understanding the situations of students' learning didn't play a role in serving teaching including helping students with the learning, and improving the quality of mathematics teaching etc. What caused this? Is it the incomplete understanding of teachers? Or is it the shallow understanding? To find out the reasons and improve the study on the present senior high school mathematics teachers' understanding about student' learning situations before new class, we chose some senior high school mathematics teachers from Shandong Province as the participants and conducted a survey.

## 2. Methodology

### 2.1. Participants

We recruited randomly 72 senior high school mathematics teachers as research objects from Jinan city, Qingdao city,

Yantai city, Weifang city, Zibo city, Linyi city, Liaocheng city, Dezhou city, and Jining city. Their average age was 42.125 (MD=8.486). These 72 teachers consisted of 43 female teachers (the average age was 40.388, MD=7.808) and 29 male teachers (the average age was 42.696, MD=9.588), in which there were 21 younger teachers aged under 35 years old (the average age was 28.667, MD=2.889), 32 middle-aged teachers aged between 35 years old and 50 years old (the average age was 42.185, MD=3.75), and 19 older teachers aged over 50 years old (the average age was 53.105, MD=1.186).

## 2.2. Instrument

This research was performed to know the state of the current senior high school mathematics teachers' understanding about students' learning situations before new class in details. So before the research, we formulated an open-ended structure questionnaire based on relevant literature and questionnaires, taking almost all probable issues of mathematics teachers' understanding about situations of students' learning into consideration. Our questionnaire included five open questions, and involved mainly hierarchies of students, number of students, ways of understanding the situations of students' learning, duration of understanding, and contents of understanding etc.

## 2.3. Data Collection

To obtain comprehensive information, we adopted the method of interview to collect data. We interviewed respectively all the above 72 senior high school mathematics teachers face to face, recorded what they said firstly, and organized these sound recordings into text materials afterwards. Because what we planned to find out in this research was the state of the current senior high school mathematics teachers' understanding about students' learning situations before new class, we did not interview their students.

## 2.4. Data Analysis

We encoded the text materials with qualitative analysis software nivo10 at first, and then analyzed the codes in table and calculated the frequencies and percentages of each code. All answers were obtained from these percentages and frequencies.

## 3. Results

### 3.1. Types of Students for Teachers' Understanding

As for what kinds of students whose situations of mathematics learning were understood before new class, 18.06% of the above senior high school mathematics teachers said they usually understood outstanding students' learning situations, 58.33% of the teachers said they usually understood middle level students' learning situations before new class, and less than 30% of the teachers said their understanding usually involved the situations of backward students' learning. The details of kinds of students whose situations of mathematics

learning were understood before new class were as shown in Table 1. From Table 1, it could be seen that the percentage of teachers who understood the situations of learning of both the class representatives of their subjects and the students who had slight opportunities to be admitted into leading universities was up to 54.17.

**Table 1. The details of types of students involved in understanding**

Hierarchies of students	Teachers (percentages)
Outstanding students	18.06
Middle level students	58.33
Backward students	26.39
Class representatives of specific subjects	25.00
Students who had slight opportunities to be admitted into the leading universities according to school reports	29.17
Students who had difficulties in learning but worked hard	4.17
Troubled students	2.78
Other Special students	2.78

### 3.2. The Number of Students Involved in Understanding the Situations of Learning before New Class

Regarding the number of students whose learning situations were understood before new class, some teachers said they got used to understanding about 5 students' learning situations before new class, some teachers said they usually understood about 10 students' situations, and some said they would understand the situations of four-fifths of all students in the class, and others said it all depended. The details of the number of students whose learning situations were understood before new class were as shown in Table 2. From Table 2, it could be seen that 36.11% of the teachers were accustomed to looking for about 5 students to understand learning situations and 15.28% of the teachers usually understood the situations of about 10 students' learning

**Table 2. The details of the number of students involved in understanding the situations of learning before new class**

The number of students whose learning situations were understood	Teachers (percentages)
About 5 students	36.11
About 10 students	15.28
About four-fifths of all students in the class	2.78
It all depended	2.78

### 3.3. The Ways of Understanding the Situations of Students' Learning before New Class

Regarding the ways adopted by teachers to understand students' learning situations before new class, the most of the teachers said they get used to communicating orally with their students. Besides, some teachers said they adopted the way of correcting students' work, and others showed they also adopted other ways. The details of the ways of understanding students' learning situations before new class were as shown in Table 3. From Table 3, it could be seen that about 60% of the teachers often adopted the way of talking personally to the students to understand their learning situations, more than 30% of teachers

usually adopted the way of correcting students' work, such as guided learning plans and lecture notes, and 22.22% of the teachers would adopt the way of counting and analyzing mistakes in students' problem solving by the class representatives of their subjects.

**Table 3. The ways of understanding students' learning situations before new class**

Ways	Teachers (percentages)
Oral communication (e. g., asking the class representatives of their subjects, inquiring the students personally, and asking students in their class randomly)	62.5
Correcting students' work (e. g., guided learning plan made by teachers and lecture notes)	36.11
Analyzing students' problems and mistakes in mathematics learning	22.22
Studying and analyzing students' guided learning plans	6.94
Testing students with dictating mathematics concepts, principles, and formulas, and putting questions to the students etc. before new class	5.56

### 3.4. The Duration of Understanding the Situations of Students' Learning before New Class

According to the answers of these mathematics teachers invited to our investigation, we knew the majority of the teachers usually took about 5 minutes to understand the situations of students' learning before new class, some of the teachers usually took about 10 minutes, and some took

within 3 minutes. The details of the duration of understanding situations of students' learning before new class were as shown in Table 4. From Table 4, it could be seen that more than 50% of the teachers understood the situations of students' learning about 5 minutes, 15.28% of the teachers' understanding usually lasted for about 10 minutes, and 11.11% of the teachers understood students' learning situations within 3 minutes.

**Table 4. The duration of understanding learning situations**

Duration	Within three minutes	About five minutes	About ten minutes	Unspecific
Teachers (percentages)	11.11	54.17	15.28	6.94

### 3.5. The Contents of Understanding the Situations of Students' Learning before New Class

According these teachers' answers, the contents of current senior high school mathematics teachers' understanding the situations of students' learning before new class mainly included students' mastering basic mathematics knowledge, achievements in solving problem and difficulties in making sense of ambiguous and challenging mathematics knowledge. Besides, some of the teachers referred to the situations of accomplishments of

students' work and students' preparing for new class. The details of the contents of teachers' understanding were as shown in Table 5. From Table 5, it could be seen that about 80% of the teachers mainly understood the situations of both students' mastering basic mathematics knowledge and students' difficulties in making sense of ambiguous and vague mathematics knowledge before new class, 26.39% of the teachers usually understood the situations of accomplishments of students' homework, and 18.06% of the teachers also understood the situations of students' previewing.

**Table 5. The contents of understanding the situations of students' learning before new class**

Contents of understanding	Teachers (percentages)
The situations of students' mastering basic knowledge and achievements of problems solving	52.78
Students' difficulties making sense of ambiguous, vague and challenging mathematics knowledge	30.56
The situations of accomplishments of homework	26.39
The situations of students' previewing	18.06

## 4. Results and Discussions

1. The ways adopted by the current senior high school mathematics teachers to understand the situations of students' learning before new class were too single. From previous data, it could be known that the majority of the current senior high school mathematics teachers usually understood students' learning situations through oral communications (e. g. asking the class representatives of their subjects, talking to the students face to face, and inquiring students in their class randomly). Besides, some of the teachers adopted the way of correcting students' homework. However, few of the teachers were accustomed

to understanding the situations of students' learning via consulting the homeroom teachers and putting questions to the students during the class. And generally, the students received directly responses and feedbacks from the teachers in their presence in the process of the understanding.

2. The number of students whose learning situations were understood before new class was fixed, which evidently indicated the poor representativeness of the understanding. Specifically, the most of the teachers' understanding involved within 10 students' learning situations with little representativeness. But there were not enough time for these teachers to understand the situations of all students' learning in the class virtually.

3. The timing for mathematics teachers' understanding students' learning situation was unreasonable and evidently the process of the understanding was more than hastier. Based on the previous data, durations of the understanding were generally within five minutes.

4. The kinds of students whose situations of learning were understood before new class and the contents of the understanding were irrational and unscientific. From previous data, it could be known that the current senior high school mathematics teachers' understanding the situations of students' learning before new class usually referred to the situations of both middle level and backward students' learning, and hardly referred to the situations of outstanding students' learning. The contents of understanding were mainly involved the situations of students' mastering basic mathematics knowledge, the results of problem solving, and students' difficulties and confusions in making sense of ambiguous and challenging mathematics knowledge, and hardly involved students' attitudes towards mathematics learning and students' mathematics learning strategies, such as strategies for how to preview before new class and how to listen to the teacher in class.

## 5. Conclusions and Suggestions

The overall understanding about the situations of students' learning before new class in current senior high school mathematics teaching was insufficient and incomprehensive. And the understanding played a poor role in supporting the current efficient class. Based on the investigation to the 72 mathematics teachers and the analyses above, it could be seen that the reasons were various. Too short duration of understanding, too single and limited contents of understanding, too narrow kinds of students, too small number of students, unscientific ways of understanding, simple and fixed process of understanding, etc. were all the direct causes of the current insufficient and incomprehensive understanding about the situations of students' learning. Therefore, in order to improve the function of mathematics teachers' understanding in supporting the mathematics teaching, we suggested that various ways were supposed to be adopted to understand the situations of students' learning before new class. And the number of students whose situations of learning were understood should be appropriately expanded, that was, the teachers should not only

understand the situations of both middle level and backward students' learning, but also understand the situations of outstanding students' learning. Stratified sampling could be used to choose students in the process of understanding, which would guarantee that all kinds of students, outstanding students, backward students, as well as middle level students included, whose situations of learning have opportunities to be understood. As for when to understand students' learning situations and how long the appropriate understanding, we thought contents of the new lessons, schedule of curriculum and students' prior knowledge etc. should be taken into account. Besides, the contents of mathematics teachers' understanding about the situations of students' learning should be more extensive and comprehensive. That was, the contents of teachers' understanding should involve more than students' mastering basic mathematics knowledge and students' achievements in problem solving etc. The strategies for mathematics learning and students' attitudes towards mathematics learning etc. should be paid largely attention to as well, which was helpful for students to master the mathematics methods and improve their mathematics thinking, as well as the abilities in mathematics learning. And it should be noted that the teachers need usual self-reflections and continual improvements on the ways, contents, as well as the process of understanding the situations of students' learning in their teaching practices.

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