

# Paying Attention to Students and Promoting Students' Mathematics Understanding

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Promoting students' mathematics understanding is an important research theme in mathematics education. According to general theories of learning, mathematics understanding is close to active learning or significant learning. Thus, if a teacher wants to promote his/her students' mathematics understanding, he/she should pay attention to the students so that the students' thinking is in active situation. In the first part of this paper, some mathematics teachers' ideas about paying attention to their students in Chinese high school are given by questionnaire and interview. In the second part of this paper, we give some teaching episodes about how experienced mathematics teachers promote their students' mathematics understanding based on paying attention on them.

*Keywords:* mathematics understanding; questionnaire, interview, classroom observation, instruction strategy

*ZDM Classification:* C34, C44

*MSC2000 Classification:* 97C30, 97D40

## 1. INTRODUCTION

One of the most widely accepted ideas within the mathematics education community

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is the idea that students should understand mathematics. The goal of many research and implementation efforts in mathematics education has been to promote learning with understanding. But achieving the goal has been like searching for the Holy Grail (Hiebert & Carpenter, 1992) That is to say, promoting students' mathematics understanding is an important research theme in mathematics education.

Many general theories of learning include the notion of understanding and there is a common viewpoint in these theories, that is, learning could not be occurred unless learning is active or significant. For example, Piaget (1975) regarded learning as an active process that all knowledge has to be constructed by the individual. Therefore, a learner should think about questions actively. Bruner thought learning included three simultaneous processes: acquisition, transformation and evaluation. Thus, a learner should not be a passive accepted learner, but should be an active learner (Bruner, 1963). One of Ausubel's idea is "significant learning" (Ausubel, 1968). He thought learning with understanding was significant learning. Rogers (1983) noticed significant learning not only involving fact learning but also involving a learner's behavior, attitude and personality. Learning is a process into which a learner put his/her heart. Based on these theories of learning, mathematics understanding is close to active learning or significant learning. Thus, a teacher should pay attention to his/her students, care about his/her students and make their thinking be in active situation so that they feel their learning is interesting and significant.

The purpose of this paper is twofold. We intend first to describe the situation about mathematics teachers paying attention to their students. We will then draw illustrative examples from actual mathematics classrooms how experienced mathematics teachers promote their students mathematics understanding based on paying attention to their students.

## 2. PAYING ATTENTION TO STUDENTS

In this section, we will give mathematics teachers' some ideas about paying attention to their students (*cf.* Huang, 2005; F. Tang, Guo & J. Tang, 2005; Li & Yu, 2005).

### **Method**

The method involves questionnaire and interview. First of all, we have investigated in a class of grade students' who come from high schools. According to this, we modified our questionnaire and then we have chosen mathematics teachers in Jiangsu Province and Guangxi Province. 179 questionnaire sheets were sent out and 109 were returned and valid. The basic information of the subjects in this investigation is as follows.

**Table1.** The basic information of the subjects (109) in this investigation

Province		Jiangsu	Guangxi	Total
Sex	Male	28	40	68
	Female	11	30	41
Years of teaching	1–5 years	8	18	26
	6–10 years	10	18	28
	11–20 years	14	17	31
	More than 20 years	7	17	24
Academic credential	Below college level	1	1	2
	College level	6	18	24
	University level	32	47	79
	Graduate School level	0	4	4

At the same time, we have interviewed some mathematics teachers in these schools so that we can understand their ideas better.

Based on the theories of learning that we mention above, there are 13 questions in this questionnaire. Each teacher makes marks according to his/her opinion about every question. The content consists of four aspects: mathematics teachers' ideas about teaching precondition (Questions 1–3), mathematics teachers' ideas about their students' learning situation (Questions 4–8), mathematics teachers' ideas about teaching tact (Questions 9–11) and mathematics teachers' ideas about using modern information technology and traditional teaching aid (Question 12–13).

The Alpha for this questionnaire is 0.821. All data in this research are processed using "SPSS13.0 for windows."

## Result

### (1) Mathematics teachers' idea about teaching precondition

61.5% mathematics teachers think that a harmonization relationship between a teacher and his/her students has a high influence on mathematics teaching. 60.6% mathematics teachers think that respecting his/her students has a high influence on mathematics teaching. Through individual interview, we get the message that most mathematics teachers agree that a harmonization teaching environment is important in mathematics teaching. Thus, teachers should respect their students.

**Table 2.** Questions in this questionnaire and the corresponding percentages (unit: %)

Questions	Each question has an influence on mathematics teaching		
	A: Low	B: Some what high	C: High
1. Mathematics teacher should create a harmonization relationship between he/she and his/her students.	3.7	34.9	61.5
2. Mathematics teacher should respect his/her students.	3.7	35.8	60.6
3. Mathematics teacher should leave sufficient time and space for his/her students' learning.	6.4	39.4	54.1
4. Mathematics teacher should know his/her students' previous knowledge and experience.	5.5	49.5	45.0
5. Mathematics teacher should know his/her students' preparing situation before they begin to study mathematics.	11.9	54.1	33.9
6. Mathematics teacher should know his/her students' thinking situation when they are studying mathematics.	3.7	53.2	43.1
7. Mathematics teacher should know his/her students' summarizing situation after they study mathematics.	3.7	49.5	46.8
8. Mathematics teacher should analyze the reason why some mistakes are made in his/her students' mathematics learning.	1.8	33.9	64.2
9. Mathematics teacher should respond to his/her students' answer and adjust teaching plan based on corresponding information.	4.6	37.6	57.8
10. Mathematics teacher should put forward mathematics learning questions according to his/her students' learning situation.	6.4	45.9	47.7
11. Mathematics teacher should deal with pre-planned teaching objective and generative teaching objective.	13.8	52.3	33.9
12. Mathematics teacher should use modern information Technology.	11.9	62.4	25.7
13. Mathematics teacher should use traditional teaching aid.	5.5	55.0	39.4

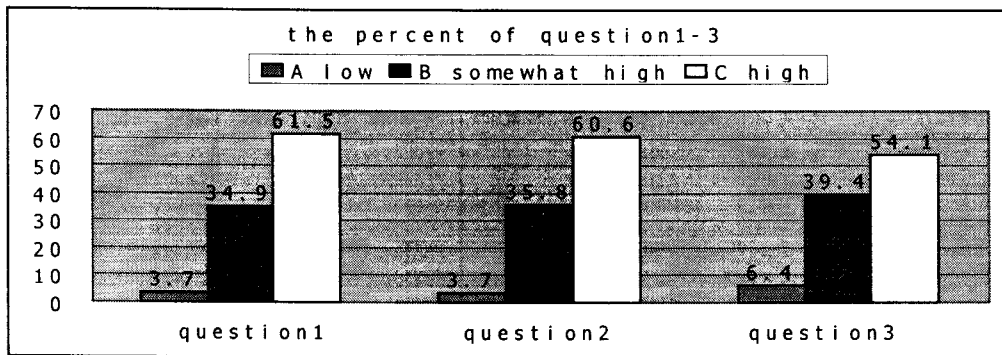


Figure 1. The percent of Questions 1–3

They say some mathematics teachers do not respect their students in mathematics teaching, such as requiring their students to obey them without considering the students' feeling and their ideas, answering their students' questions with inarguable tone and so on. All these teaching behaviors make the students dislike such teachers and revolt such teachers. Actually, the origin of many problems in teaching lies in this bad relationship between teachers and students.

54.1% mathematics teachers think leaving sufficient time and space for their students' learning has a high influence on mathematics teaching. However, 6.4% mathematics teachers do not regard that leaving sufficient time and space for their students' learning is important in mathematics teaching. As mentioned above, even if a teacher has very good basic teaching technique, it does not instead of students themselves thinking. If a teacher does not leave sufficient time and space for his/her students' learning in mathematics teaching, students have no time and space to think about mathematics questions and have to memorize mathematics knowledge mechanically. Thus, they seem to know some mathematics facts, theorems and formulae.

They also seem to solve some mathematics questions. But, when they meet new mathematics questions that mathematics teacher does not tell them in mathematics teaching, they do not know how to analyze mathematics questions and how to solve mathematics questions. This is the reason why some students say they can understand what his mathematics teacher says in mathematics teaching, but they could not solve mathematics questions by themselves. In fact, these students do not understand mathematics knowledge really, their learning are rote learning. Therefore, mathematics teachers must leave sufficient time and space for their students' learning in mathematics teaching if they want students have deep mathematics understanding.

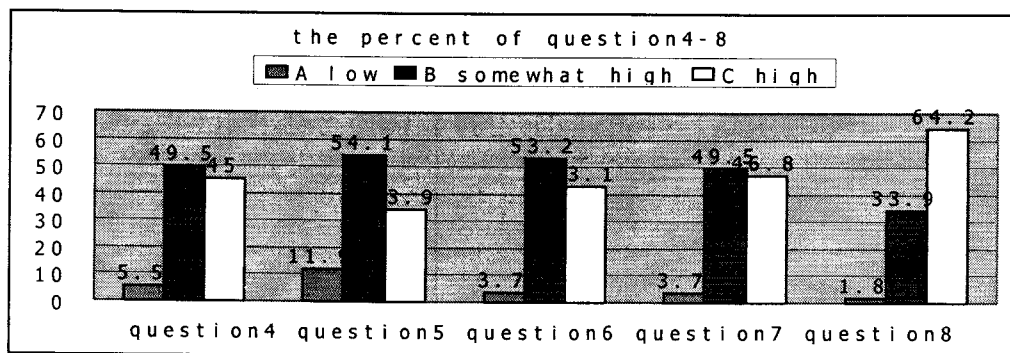
(2) *Mathematics teachers' ideas about their students' learning situation*

Figure 2. The percent of Questions 4–8

45.0% mathematics teachers think knowing their students' previous knowledge and experience has a high influence on mathematics teaching. The datum shows that some mathematics teachers do not attach importance to their students' previous knowledge and experience. Students enter their classroom with some previous knowledge and experience. Mathematics teachers should understand their previous knowledge and experience; otherwise teachers can not promote students' mathematics understanding.

Only 33.9% mathematics teachers think knowing their students' preparing situation before they begin to study mathematics has a high influence on mathematics teaching. Because the relationship between this aspect and knowing students' previous knowledge and experience is close, this datum also shows that mathematics teachers should know their students' previous knowledge and experience before mathematics teaching.

43.1% mathematics teachers think knowing their students' thinking situation when they are studying mathematics has a high influence on mathematics teaching. This datum shows that some mathematics teachers only pay attention to their teaching but not pay attention to their students' learning. Through individual interview, we find that these mathematics teachers think accomplishing lesson plans timely is important. As to students' learning, they think it is students themselves things. But these mathematics teachers seem to forget a teacher's role is to help his/her students learn mathematics. If a teacher is only to accomplish lesson plans, where is his role in mathematics teaching?

46.8% mathematics teachers think knowing students' summarizing situation after they study mathematics has a high influence on mathematics teaching. Compare this datum with the two above data, we find that mathematics teachers regard knowing their students' summarizing situation is more important than knowing their students' preparing situation and knowing their students' thinking situation.

In general, before a Chinese mathematics lesson is finished, mathematics teachers often spend several minutes on summarizing the teaching content which the students have learned in this lesson in order to help students retrospect corresponding mathematics knowledge. This is a good teaching activity to promote students' mathematics understanding. But this summary is often made by mathematics teacher. Mathematics teacher seldom let his/her students to summarize corresponding mathematics knowledge by themselves. So, it reduces the abundant meaning of the teaching behavior.

64.2% mathematics teachers think analyzing the reason why some mistakes are made in students' mathematics learning has a high influence on mathematics teaching. However, there are 1.8% mathematics teachers take no notice of the reason of their students' mistakes in mathematics learning. In individual interview, many teachers say it is important to analyze the reason why some mistakes are made in students' mathematics learning because these mistakes are actually the reflection of the students' thinking about questions. So, analyzing these mistakes is an important way of knowing what the students know and what students do not know.

### (3) Mathematics teachers' ideas about teaching tact

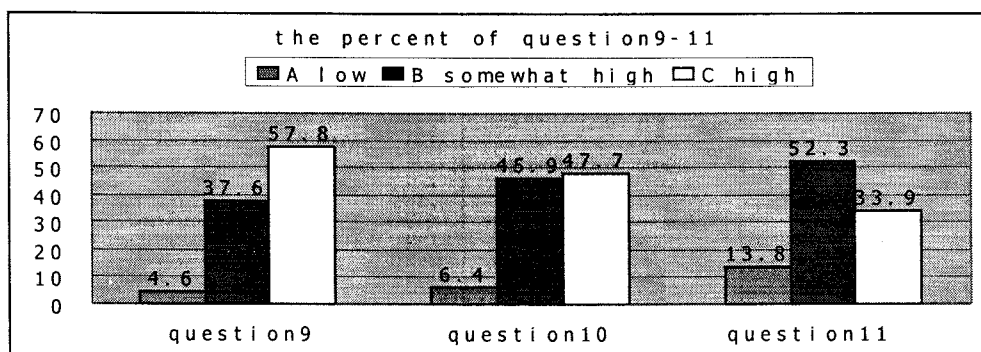


Figure 3. The percent of Questions 9–11

57.8% mathematics teachers think responding to students' answer and adjusting the teaching plan based on corresponding information has a high influence on mathematics teaching. 47.7% mathematics teachers think putting forward mathematics learning questions according to their students' learning situation has a high influence on mathematics teaching. However, only 33.9% mathematics teachers think dealing with preplanned teaching objective and generative teaching objective has a high influence on mathematics teaching.

This datum seems to contradict the two above data. Through individual interview, we know that most teachers agree that mathematics teaching needs lesson plans and lesson

plans should also be adjusted in actual lesson in classroom if mathematics teachers want to promote their students' mathematics understanding. But many teachers do not know how to deal with preplanned teaching objective and generative teaching objective. For example, how to deal with the situation when students put forward some questions beyond lesson plans? How to meet the different learning requests about different students? Just such these questions influence many mathematics teachers' correlated idea. These mathematics teachers say they want to get professional help about how to deal with preplanned teaching objective and generative teaching objective.

*(4) Mathematics teachers' ideas about using modern information technology and traditional teaching aid*

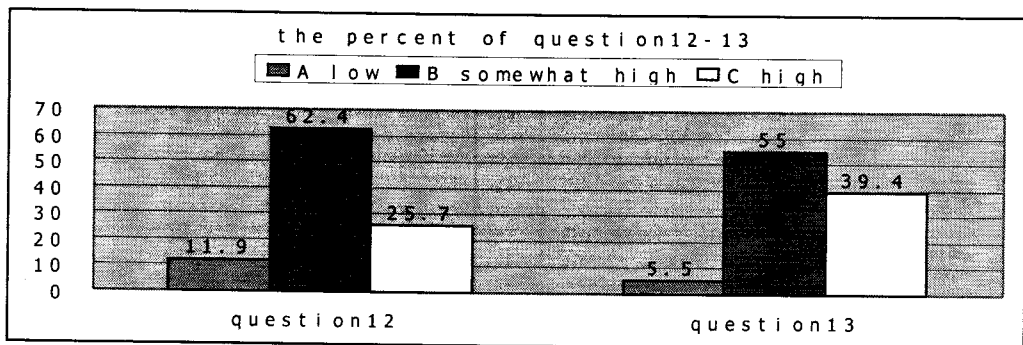


Figure 4. The percent of Questions 12–13

25.7% mathematics teachers think using modern information technology has a high influence on mathematics teaching. Along with society progress, modern information technology is gradually popularized in mathematics teaching. Through individual interview, we get the message that many schools still lack of these aspects condition, such as only have little classroom with computer, many teachers are incapable of using computer. At the same time, 11.9% mathematics teachers think using modern information technology has a low influence on mathematics teaching. These mathematics teachers are still used to teach with chalks and rulers. The datum shows that some mathematics teachers' ideas of using modern information technology should be changed.

39.4% mathematics teachers think using the traditional teaching aid has a high influence on mathematics teaching. The datum is little higher than the above datum about using modern information technology in mathematics teaching. Many mathematics teachers regard they have better ability in using the traditional teaching aid than using modern information technology. Thus, we should research further how to improve the ability of using modern information technology.



### 3. STUDENTS' MATHEMATICS UNDERSTANDING

In this section, we will discuss how experienced teachers promote students' mathematics understanding based on the above four aspects about mathematics teachers paying attention to students.

#### Method

The method is classroom observation. We have been into mathematics classroom to observe how experienced teachers promote students' mathematics understanding based on the above four aspects about mathematics teachers paying attention to students from the March of 2005 to the December of 2006. Audio recordings of the verbal contributions of the students and teachers were made, records of the ongoing student activities were kept, and the written work of all students was available.

#### Background

For the sake of simplicity within this paper, we have selected teacher Mr. Weng. He is 38 years old and has 16 years of teaching. His academic credential is university-level. Every year, his class has better mathematics achievement than other classes. For example, in last final examination, his class's average mathematics score is the highest in the same grade. At the same time, other teachers say students in Mr. Weng's class could think about questions flexibly.

This is a lesson about "The graph of function  $y = A \sin(\omega x + \varphi)$  ( $A > 0, \omega > 0$ )," where students are required to understand the process how to draw the graph of  $y = A \sin(\omega x + \varphi)$  ( $A > 0, \omega > 0$ ) using "the way of five points" (WFP)<sup>1</sup> and how the graph changes when  $A, \omega, \varphi$  changes respectively. Before this lesson, students have learned the graph and the nature of sine function and cosine function, including how to draw their simple graph in terms of WFP.

*(1) The teacher creates a harmonious environment between his and his students*

**Teaching Episode 1:** There were two minutes before the lesson was begun. Mr. Weng smiled to come into the classroom, and then stood besides a student's desk. He saw some words were written on the title page of the student's textbook, that is, if we want to get better outcomes, we must do our best. Mr. Weng read these words and smiled, other

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<sup>1</sup> The means of WFP (the way of five points) is that when we draw the function graph, we should get those points that denote the trend of this graph, such as the highest point, the lowest points and zero points.

students smiled too. Meanwhile, the ring rang and the lesson was begun.

Just as we say in the first part, in general, teachers obtain some knowledge before students and teachers hold more knowledge than students. However, teachers and students are equality in personality. Each student is an independent individual. Teachers must respect students' individual ways of perceiving, acting and organizing. Otherwise, students may be revolt such teacher and exclude such teacher. Thus, their education behaviors do not have any influence on the students because they do not accept teachers' education information actually.

From the teaching Episode 1, we could see Mr. Weng understood the meaning of those words that the student wrote on the title page of his textbook and agreed with his viewpoints. That is to say, the role of a teacher in mathematics teaching is to help the students learn mathematics. If students want to understand mathematics deeply, they must be relied on their effort, such as thinking about mathematics by themselves. Mr. Weng intended other students to understand this meaning about mathematics learning, and read the words aloud to all students. Furthermore, this behavior made the relationship between his and his students was harmonious. In this harmonious environment, Mr. Weng began to introduce the topic that the students were going to learn, and the students were willing to listen to what their teacher said.

*(2) The teacher poses questions based on his students' answer*

### **Teaching Episode 2:**

**T (Mr. Weng):** We have learned the graph of sine function and cosine function in terms of WFP. Now, there is a question: How to get these five points?

(Mr. Weng posed question about the substance of WFP.<sup>2</sup>)

**Student One:**  $0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$ .

**T:** Good! But why we get these five points?

(The Student' answer was not wrong. Mr. Weng praised him, but did not end up the question. He wanted to know if the students knew the reason why they got these five points.)

**Student One:** Because their function value could be figured out.

(This time, the student's answer was still right, but the answer did not fit the substance of WFP. That is to say, he did not grasp the substance of WFP.)

**T:** But we also figure out the function value when  $x = \frac{\pi}{4}$ .

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<sup>2</sup> This part is the author's analysis. The following corresponding part is the same.

(Students laughed, the teacher smiled too. Obviously, Mr. Weng's question caused students' thinking:

Why we do not get the point when  $x = \frac{\pi}{4}$ , although we can figure out the function value when  $x = \frac{\pi}{4}$ ?)

**T:** We get these five points,

$$(0, 0), \left(\frac{\pi}{2}, 1\right), (\pi, 0), \left(\frac{3\pi}{2}, -1\right), (2\pi, 0),$$

not because their function value could be figured out, don't we? The function value of other points could also be figured out. Now, what is the specialty of these five points?

(Mr. Weng clarified the question further so that students could understand WFP deeply.)

**Student Two:** These five points are the highest point, the lowest point and zero points.

How to get points is very important when we draw function graph. We should get those points that could decide the tendency of graph. Although the answer of the student one was not wrong, his explain that the function value could figure out is not the substance of WFP. Mr. Weng did not tell directly the student that his answer was wrong and gave correct result, but posed a question in order to make students think about corresponding knowledge that students have learned. So, this question plays an important role in promoting students mathematics understanding. Thus, students could understand how to get points to draw the graph of function  $y = A \sin(\omega x + \varphi)$  ( $A > 0, \omega > 0$ ), that is, get

$$\omega x + \varphi = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi, \text{ but not get } x = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi.$$

(3) *The teacher pays attention to his students' previous knowledge and experience*

**Teaching Episode 3:** When Mr. Weng and students were discussing how the change of  $A$  influenced the graph of function  $y = A \sin x$  ( $x \in \mathbb{R}$ ,  $A > 0$  and  $A \neq 1$ ), Mr. Weng showed the graph of function

$$y = 2 \sin x \quad \text{and} \quad y = \frac{1}{2} \sin x$$

in a period  $[0, 2\pi]$  through GSP (Geometer's Sketchpad). Then, Mr. Weng asked students to explore their relationships between the three function graphs in a period.

**T:** Look at these graphs, please think about the relationships between these graphs of

$$y = 2\sin x, y = \frac{1}{2}\sin x, \text{ and } y = \sin x.$$

Notice, we only put them in a period  $[0, 2\pi]$ .

(Mr. Weng posed a learning task.)

**Student Three:** The graph of  $y = 2\sin x$  could be got if we stretched the graph of  $y = \sin x$ .

**T:** How to stretch?

(The student described the relationships between the three graphs in terms of his life language. Mr. Weng wanted the student to express mathematics questions in detail.)

**Student Three:** Stretch it up above x axis and stretch it down underneath x axis.

**T:** That it to say, stretch it vertically, and how about  $y = \frac{1}{2}\sin x$ ?

(The student still used his life language to describe the question. Mr. Weng generalized the student's answer, and posed another learning task.)

**Student Three:** It could be got if we compressed  $y = \sin x$ .

**T:** How to compress?

(Mr. Weng still wanted the student to express mathematics question in detail.)

**Student Three:** …… (He does not speak about it.)

**T:** What you said is very visual. But how do they change from quantity viewpoint? How do these points change?

(Faced the second learning task, the student felt the expression was similar to the expression about the first learning task. He did not know how to express accurately. So, the teacher enlightened him to think about the question from quantity viewpoint.)

**Student Three:** Expand one time<sup>3</sup>.

**T:** However, a point has horizontal coordinate and vertical coordinate. We should think about how its coordinate change.

(The student began to express the question from quantity viewpoint, but the express still was lack of precise. Then, the teacher enlightened him further.)

**Student Three:** Its horizontal coordinate remain unchangeable, and its vertical coordinate expand one time.

**T:** That it to say, if we get a point in the graph of  $y = \sin x$ , the horizontal coordinate of

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<sup>3</sup> The actual lesson record is so.

the corresponding point in the graph of

$$y = \frac{1}{2} \sin x$$

is unchangeable, and its vertical coordinate is

$$\frac{1}{2}$$

time as bigger as the vertical coordinate of the point in the graph of  $y = \sin x$ . Similarly, the horizontal coordinate of the corresponding point in the graph of  $y = \sin x$  is unchangeable, and its vertical coordinate is two times as bigger as the vertical coordinate of the point in the graph in the graph of  $y = \sin x$ . So, its vertical change causes the change of function value.

(Mr. Weng generalized the student's answer)

In fact, describing mathematics questions in terms of students' life language is valuable mathematics learning. On the other hand, mathematics questions also need to be described in terms of students' mathematics language. Mr. Weng affirmed the student's expression in terms of life language. Then, aiming at the student not describe mathematics question in terms of mathematics language, he gave some explanation. Thus, under the teacher's enlightenment, the students understood mathematics questions step by step. The process that the students experienced was as follows:

“Stretch it up above x axis and stretch it down underneath x axis”

⇒ “Stretch it vertically”

⇒ “Expand one time”

⇒ “Its horizontal coordinate remain unchangeable, and its vertical coordinate expand one time”

⇒ “The change of function value”.

From this Teaching Episode, we could see that Mr. Weng knew his students' past knowledge, experiences and their thinking style by listening to their answers. He led the students to describe mathematics questions from their familiar life language to mathematics language. In this process, the students strengthen mathematics understanding. Actually, mathematics teaching is the teaching about mathematics language. If students could not express mathematics questions using mathematics language, they could not understand mathematics knowledge deeply. So, the process of forming mathematics language is the process of mathematics understanding. Paying attention to students' mathematics language can help students understand mathematics.

*(4) The teacher should use modern information technology appropriately*

As we all know, modern information technology is a useful learning tool. But if teachers did not use modern information technology appropriately, it may be block students' learning. For example, students do not see clearly some learning information because the information is showed too quickly. Thus, Students have no time to think about related questions. Furthermore, if only showing some information through modern information technology and not letting students themselves to calculate and draw could not cultivate students' learning ability. So, mathematics teachers should use modern information technology appropriately in order to strengthen students' mathematics understanding.

In teaching Episode 3, teacher Weng did not use GPS to draw the graph of

$$y = \sin x, y = 2\sin x \text{ and } y = \frac{1}{2}\sin x \text{ in a period.}$$

Mr. Weng circulated through the class as the students explored the problems. After several minutes, he observed that the students had finished their drawing and had explored the differences between these three graphs, then, he gathered the class to go over the problems together. Because the students had experienced the process of drawing these function graph, they had deep mathematics understanding when the teacher showed the differences between the three function graphs in terms of GPS. All students uttered "oh" to indicate their understanding.

#### 4. DISCUSSION

The results show that a good mathematics teacher should not only think about how he/she teaches but also think about how his/her students learn. So, a teacher should pay attention to his/her students if he wants to promote students' mathematics understanding. There are some reasons. First, if a teacher listens to his/her students' reply, students feel that they are respected by their teacher. Second, the students' reply reflects their currently knowledge and experience, reflects their currently learning difficulty, reflects their thinking style and reflects their currently learning attitude. For example, when a teacher pays attention to his/her students, he/she would find whether the students are interested in mathematics learning, whether the students are willing to answer the teacher's questions and whether the students posed questions by themselves. All the information pertains to the activities of the students. Thus, it could help the teacher to promote the students' mathematics understanding.

##### **(1) Creating a harmonious environment**

Noticeable, creating a harmonious environment is a necessary condition of promoting

students mathematics understanding. Only in this harmonious environment, teachers and students could cooperate and communicate with one another and the students think about mathematics questions boldly and exhibit their viewpoints. Therefore, the teacher can get the message about students' learning from students' talking and adjust teaching plan and teaching strategy based on the information. Otherwise, students are lazy to think about questions, they do not answer the teacher's questions and do not pose questions by themselves. They only accept the teacher's teaching information passively. The teacher has to answer the questions that he poses in the teaching. He/She could not obtain an honorable feeling from students, and he/she is not willing to teach and does not put his/her heart wholly into teaching. If so, how can the teacher obtain students' learning information? How can students have better mathematics understanding? Therefore, teachers should care about their students: an expression in his/her eyes, a smile in his/her face and a conversation with his/her students can influence the students deeply. Actually, we can feel this harmonious environment between Mr. Weng and his students everywhere.

### **(2) A teacher should know clearly the substance of mathematics knowledge.**

A teacher not only can explain the procedure of solving problems but also the reason for the procedure, and can analyze not only whether the result is right or wrong but also why the result is right or wrong.

In the Teaching Episode 2, as Mr. Weng understood the substance of WFP, he could pose the question that evoked students' thinking. In the Teaching Episode 3, as Mr. Weng understood how mathematics language came from life language, he could lead his students to express mathematics questions from their life language to mathematics language.

Actually, the main reasons that some mathematics teachers do not pay attention to their students are these teachers themselves have not an in-depth mathematics understanding. These mathematics teachers could not discover some errors behind the students' superficial mathematics understanding. Obviously, these mathematics teachers could not promote the students' mathematics understanding. Therefore, a teacher should know clearly the substance of mathematics knowledge if he/she wants to promote students' mathematics understanding.

### **(3) A teacher should insist on the heuristics instruction idea**

The heuristics instruction idea is the tradition instruction idea in China. Confucian raised the idea thousands years ago. Confucian regarded that a teacher did not enlighten students how to think about questions until students was in the situation when they want to understand but not to understand after they thought about questions actively, and a

teacher did not lead students how to express until students wanted to say but not to know how to say. Otherwise, a teacher's instruction could not cause students' active thinking. Under the heuristics instruction idea, mathematics teacher's role is to help students to think about mathematics questions, not to tell students some mathematics facts. Before a mathematics teacher teaches, he/she always has a teaching objective and a teaching plan. However, in actual lesson in classroom, mathematics teaching relies more on students' learning status, but not on teaching plan. Students' replies influence mathematics teacher's teaching plan and teaching strategy. The teacher must adjust his teaching plan and teaching strategy based on students' learning status so that students have deep mathematics understanding.

Accordingly, mathematics teacher should provide sufficient time for students thinking about mathematics questions, encourage students to enter into classroom discuss including analyzing, understanding and evaluating their own or other students views. Meanwhile, mathematics teacher should supplement some information and help students overcome difficulties in mathematics learning.

But in our classroom observation, we find there is a phenomenon in mathematics classroom that most mathematics teachers do not pay attention to students themselves posing questions; no matter the teacher is an experienced teacher or a novice teacher. We must notice highly this phenomenon. How to encourage students posing questions by themselves is left for further research to clarify.

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