

# Students' opinions on different types of mathematics tasks

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## 1. Introduction

In 2004 and 2011, students from Shanghai got the highest scores in the PISA tests. Almost every people think mathematics education in China is very successful, but many scholars say although our students can get highest marks, their interest and confidence level is lower than many other countries. Many Chinese teachers think students who are too confident in learning mathematics may fail in test, so they always pay too much attention to students' performance in standard tests and ignore their emotional feelings. In the recent years both researchers and curriculum designers have begun to realize the importance of improving students' confidence and interests.

The Dutch mathematician Freudenthal said mathematics came from reality and could be used in reality (Zhou & Zhang, 2008). But in traditional mathematics lessons, our students have few chances to use mathematics out of schools. They always find it difficult to deal with the problems in real contexts. After 2001, the Chinese mathematics curriculum syllabus required teachers to help students know how to use mathematics knowledge and methods in their daily life.

In this article, I asked Chinese students in grade 10 whether they are confident in mathematics learning and whether mathematics is important in their daily life.

## 2. Literature review

### 2.1 *Students' opinions on mathematics learning*

Belief is regarded as one of the most important factors that affect students' learning achievement. How mathematics belief affects our students' learning process is one of the foci of research during the past years. But what is mathematics belief? Some scholars for example, Lester, Garofalo and Kroll thought mathematics belief constitutes the subjective knowledge about oneself, mathematics and mathematical problem solving etc (Jin, 2010). In China, Professor Li Shiqi also proposed his own opinion. He said mathematics belief is basic and overall views about mathematics (Li & Wu, 2011). From these definitions we can find mathematics belief is stable and it cannot be changed easily. Mathematics belief contains many different aspects such as views of mathematics, mathematics learning and teaching (Underhill, 1988; Mcleod, 1992; Kloosterman et al., 1996; Kang, 2011; Jin, 2010; Op't Eynde et al., 2006; Wang et al., 1993; Tang, 2007). Based on the research questions in this article, I only focus on two subareas included in mathematics belief: 1) mathematics confidence, which is contained in views of mathematics learners; 2) mathematics values, which is contained in views of mathematics.

Many researchers used questionnaires to find how mathematics confidence affects individuals' learning behavior. Most of them think one of the important problems in mathematics education is how to improve students' confidence level (Kyriacou, 2005). Although after 2001, the Chinese mathematics curriculum syllabus required all the mathematics teachers to pay attention to improve students' confidence (Ministry of

Chinese Education, 2011), many researchers still found that in China and other Asian countries, children almost never showed confidence in learning mathematics (Chen & Zimmerman, 2007).

Maybe influenced by traditional culture, some Chinese teachers say that if students felt too confident in learning, they would not spend more time on studying and examinations (Leung, 2014). As one of the internal motivations, confidence could affect children's performance in mathematics activities. So many researchers think mathematics confidence is very important for students but how does it affect their learning behavior? Are those who feel more confident in learning able to get higher marks? Some researchers like Lucock (Middleton & Spanias, 1999) found boys who got higher scores in examinations did not show more confidence than those who got lower scores. In the TIMSS test (Chen, 2014), researchers found that students from Chinese Hongkong and Singapore did not show higher confidence level, although they got higher marks than their Western counterparts. Whether students' self-confidence will be able to influence their mathematics achievement is unknown.

From the literature, lots of mathematics educators try to find the relationship between students' self-confidence and their mathematics learning results. But different studies have different conclusions. Although there are so many different research findings, one of the important things, which almost every Chinese researcher agrees with, is that in China, mathematics teachers often ignore students' confidence and other emotional feelings. This kind of phenomenon shows our mathematics education is not very successful, although our students can get the highest scores in many international research programs.

### *2.2 Students' opinions on mathematics value*

Many Chinese students often think mathematics is useless in their life. One of the reasons is that in our mathematics textbooks it is difficult to find any questions or problems with real situations. Every day, our students do the same exercises many times. From these exercises, students cannot see any relationship between school mathematics and their daily life. Some students even said, "In their life, they use mathematics only when they come to buy foods, clothes and other things. Why should they learn mathematics like trigonometric function?"

With the development of society, mathematics becomes more and more important in our life. After 2000, Chinese educators became focused on the roles mathematics plays in students' daily life. But our mathematics textbook is still too abstract and we often emphasize on rigorous structures and imparting knowledge. Our teachers pay almost no attention to mathematics application (Zhang, 2001) and many students felt mathematics just came from another world, which was far from their real life (Attard, 2013). Although our traditional mathematics education proposed three basic abilities: operation, logical reasoning and space imagination, it does not mean we could forget to cultivate our students' mathematics application abilities (Zhang et al, 2009).

Western countries, such as the USA, attach great importance to cultivating their students' mathematics application consciousness (Zhao, 2007). In other countries like Australia (Attard, 2013), students know the important roles mathematics plays in society and they are also required to use mathematics knowledge in their life. From the data in

International test programs like TIMSS, we can find that more Western students think mathematics is very useful in their life as compared to Asian students (Wang, 2009).

Since 2000, Chinese educators became concerned about the importance of letting students know the value of mathematics. Some scholars proposed that we should add more real problems into our textbooks in order to cultivate students' mathematics application abilities. But there have been no studies that looked at students' opinions on these real problems. In this paper, we asked students about their views on real problems and pure mathematics problems and try to find the differences between them.

### 3. Research design

#### 3.1 Research questions

In this paper, there are two main research questions: (1) What kind of mathematics problems does a student solve with confidence, pure mathematics problems or contextualized ones? (2) What kind of mathematics problems does a student think is more important in daily life, pure mathematics problems or contextualized ones?

#### 3.2 Samples

There were 205 Grade 10 students in Shanghai that took part in this survey, 73 boys and 132 girls. All these students finished their first year mathematics learning tasks in senior high school before they joined in our research.

#### 3.3 Methods

First, all of the participants were asked to finish one mathematics test that contained two parts, one is a set of contextualized problems and the other, pure mathematics problems which came from their textbooks. I chose two problems in the PISA test as one part of my own research, and in order to compare different problem types, I also chose two problems from our mathematics textbooks. These two parts of mathematics problems contain the same mathematics knowledge. After finishing these problems, these students answered a questionnaire that asked about their opinion on these two types of mathematics problems. These questions come from the students' questionnaire in PISA and TIMSS. It includes 5 items on the mathematics values and 3 items on mathematics confidence. The first 5 items are multiple-choice and each one has 4 choices: strongly agree, agree, disagree and strongly disagree. Another 3 items are open-end questions.

### 4. Results

From literature, mathematics confidence is very important. In this article, 205 senior high school students in Shanghai participated in our survey. Their confidence towards mathematics is shown in Table 1.

*Table 1. The percentage of students' mathematics confidence*

	Mathematics Confidence				
	Very High Confidence	High Confidence	Middle Confidence	Low Confidence	Very Low Confidence
Number	23	81	80	14	7
Percentage	11.2%	39.5%	39%	6.8%	3.4%

From Table 1, we can see about half of the students fall under “Very High Confidence” and “High Confidence.” It means they are confident in learning mathematics. Only about 10.2% of these students said they were not confident with mathematics. Other students fall under “Middle confidence.” From their answers of other questions, we found that these students did not feel confident in learning mathematics.

In our country, few researchers investigate how different problem types affect students learning. In this paper, students were asked to choose which type of mathematics problems they solved with confidence, pure mathematics problems or contextualized ones? Table 2 shows how many students said they were confident in solving these problems.

*Table 2. The percentage of students' mathematics confidence toward different tasks*

	Type of mathematics			
	Contextualized problems	Pure mathematics problems	All of them	None of them
Number	52	130	20	3
Percentage	25.4%	63.4%	9.8%	1.5%

From these data we can find most of the participants were more confident when they solved pure mathematics problems. Only 25.4% of the students chose contextualized problems. Also about 9.8% students were confident with all the problems.

With developments in society, mathematics becomes more and more important. More jobs need mathematics knowledge than many years ago. Thus in our study, we also asked students about their views on these different mathematics problems. Based on TIMSS and PISA tests, we used five dimensions to investigate our participants' views on these problems.

*Table 3. Students' views on these different mathematics problems*

Question	Percentage			
	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Contextualized problems are more important in solving real problems	26.3%	57.6%	14.1%	2%
2. Contextualized problems are more useful in finding jobs	19%	36.6%	41.5%	3%
3. Contextualized problems are more important in learning other subjects	19%	50.2%	27.8	2.9
4. Contextualized problems are more useful in standard tests	11.2%	32.2%	49.8%	6.8%
5. Contextualized problems are more important in thinking training	20.1%	56.9%	21.1%	1.9%

From Table 3, different students have different views on these problems. We can see more students think that contextualized problems are more important. About 83% of the students chose “Agree” or “Strongly agree.” Only 2% chose “Strongly disagree.”

Different students have different views on the role mathematics plays in finding jobs in the future. About 41.5% of the students disagree that mathematics is very important for them to find good jobs, while about 36.6% of them agreed that contextualized problems were more useful and 19% chose “Strongly agree.”

In school, many subjects will use mathematics knowledge such as physics and chemistry. From the data, we know about half of the students (50.2%) agree that contextualized problems can help them learn other subjects well. Also 19% chose “Strongly agree” on this question and 27.8% thought pure mathematics problems are more useful.

The Standards test is very important for students, especially in China. It can help students and their parents know how well they learn mathematics. From Table 3, we find only one-third of the students think contextualized problems are useful in their examinations and other tests.

Our fifth question is “Compare these problems, do you agree contextualized problems are more useful in thinking training?” More than half of the students think contextualized problems are more important in thinking training. About 56.86% chose “Agree” and 20.1% chose “Strongly agree.” While only 21.08% of those chose “Disagree.”

## **5. Discussion**

The conclusions of this study are as follows:

### **(1) Students are more confident with pure mathematics problems**

From our data, more than half (63.4%) of the participants are more confident with pure mathematics problems while only 25.4% are more confident with contextualized problems. In the Chinese mathematics class, students spent more time on solving questions in their textbooks or exercise books because of the many mathematics standards tests they have to take. This is the reason why our students are more familiar with these kinds of questions and also why many of them are more confident. With these exercises, students find these questions easy to deal with.

### **(2) Contextualized problems are more useful for our students**

Mathematics is very important in our daily life, but due to our teaching methods, our students have few chances to use mathematics knowledge in their life. This is why many Chinese students think mathematics is not only boring and difficult but also far from their life. In this paper we showed them two kinds of mathematics problems. More students think contextualized problems were more useful in their life compared to the problems in our textbooks, for example, in careers, learning other subjects, daily life and thinking training. But students also say that, in Standards tests, contextualized problems are not very useful to them. Since 2000, the Chinese national mathematics curriculum syllabus began to put emphasis on mathematics values. Letting students know the important roles mathematics plays in our life is an important goal for our teachers. But from our data, the problems in our textbooks cannot help the teachers finish this teaching goal while contextualized problems from the PISA test and real life can help students know the mathematics values.

There is no doubt that many pure mathematics problems can help students master mathematics knowledge. But too many exercises also make mathematics boring and abstract. And if a student does not get good marks in one of the examinations, he would think mathematics is difficult for him and would lose his confidence in learning. Because of examination pressures, teachers have to assign many similar exercises, even let students recite some useful formulas. Many students said in our survey that given the chance they would not choose to learn mathematics. Other students professed they did not like mathematics. This is a problem that needs to be addressed. It has also become one of the research interests in many countries. The future mathematics education in China could be better if we add more real problems in the mathematics textbooks like in other countries, such as the USA and other European countries.

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