

Investigation and Analysis on the Current Situation of the Thought of Numeral-form Combination in Senior High School

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Abstract: As a bridge between number and form, the thought of numeral-form combination plays an indispensable role in senior high school mathematics teaching. In order to improve the high school students' thinking level of the combination of number and shape, this paper uses the questionnaire to investigate the high school students. From four dimensions to understand the students' understanding of the combination of number and figure. Using spss26.0 to analyze the data of the questionnaire results, we get the research results and conclusions: high school students can realize the importance of the thought of combining number with shape, but their consciousness and abilities of using the thought to solve problems are not strong. The students' mastery of the thought of combining number with shape is related to their learning habits and teachers' teaching approaches. In view of the problems found, this paper puts forward suggestions for both students and teachers: students should pay attention to the concept of theorem and the thought of combining number with shape behind it. Teachers should lay stress on infiltrating the numeral-form combination thought in daily teaching activities.

1 Introduction

Mathematics is a science to study the relationship between quantity and space form. The idea of combination of number and shape combines the two independent contents of set and algebra. It can directly solve the algebraic problems, accurately prove the geometric problems, and deepen the students' specific understanding of the relationship between space and quantity, which is very beneficial to the cultivation of high school students' mathematical thinking. As a basic and important mathematical thinking method, the thought of combination of number and shape has played a huge role in problem-solving teaching in recent decades, and also greatly promoted the development of problem-solving teaching, especially in solving problems such as college entrance examination and mathematical competition, which shows its unique charm and is favored by the majority of teachers and students.

Since 1940, European educators began to take the British education reform as the starting point, and then the education reform in Germany and France gradually spread throughout Europe. Alex Porter pointed out that the British algebra teaching attaches great importance to the combination of number and figure, at the same time emphasizes understanding and practical application [1]. Jinyi Yan pointed out that the idea of combination of number and shape is widely used and indispensable in the process of learning mathematics. In the study of equations and inequalities, analytic geometry and other aspects, we should correctly classify and summarize [2]. According to the survey of high school in Iran by feereshteh zeynivandnezhad, information technology helps students learn mathematical concepts and methods through graphical and numerical visualization [3]. Park Rae Seong of H Middle School in the south of Gyeonggi do, South Korea, pointed out the necessity of using digital tools to improve students' thinking of combining number with shape and mathematics performance [4].

There are still many problems in the teaching of combination of number and shape, which need to be improved fundamentally. This paper puts forward how to infiltrate the thought of combination

of number and shape in high school mathematics teaching. It is very beneficial to improve the teaching ability of the combination of number and shape. It can promote teachers to apply theory to practical teaching. Change the old and unscientific teaching method about the combination of number and shape.

2 Research Method

2.1 Research Design

In order to investigate the current situation of high school students' thought of combination of number and form. In this paper, according to the actual situation of the students, we compiled a questionnaire on the thought of combination of number and form, a total of 26 questions, using Likert's five point scoring method. The questionnaire investigates the four dimensions of high school students' number shape combination thought: Students' understanding of the number shape combination thought, students' application of the number shape combination thought in solving problems, teachers' teaching methods of the number shape combination thought in class, and the role of modern information technology in the number shape combination thought. From Tables 1 and 2, the Cronbach α coefficient of the questionnaire is 0.834, the kmo value is 0.787, and the significance of Bartlett test is 0.000, which has good reliability and validity.

Table 1. Reliability statistics

Cronbach's Alpha	N of Items
0.834	26

Table 2. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.787
Bartlett's Test of Sphericity	Approx. Chi-Square	458.561
	df	120
	Sig.	0.000

2.2 Research Objects

The thought of combination of number and form is an important mathematical thought throughout the primary and secondary schools in recent years. Senior one is in the transition period of junior high school and senior high school, and the amount of knowledge and difficulty are greatly improved. Good mathematical thought helps senior one students quickly adapt to the learning life of senior high school. This questionnaire selects senior one students from a middle school in Weifang City as the survey object, and randomly selects two parallel classes for the survey. Anonymous survey is adopted in the questionnaire survey. A total of 100 questionnaires are issued and 92 are recovered. The author sorted out the returned questionnaires and eliminated the invalid ones. Finally, there were 89 valid ones, and the effective rate was 89%.

3 Research Results

3.1 Analysis of the Students' Understanding towards the Thought of Numeral-form Combination

It is not comprehensive for students to know whether to apply the idea of combination of number and shape in mathematics knowledge of different chapters. There are many chapters in senior high school mathematics textbooks permeated with the idea of combination of number and shape. The vast majority of senior high school students can skillfully use the idea of combination of number and shape in the chapters of function and geometry. More than half of the students can combine

number and shape in the chapters of set. Less than 30% of the students can associate the idea of combination of number and shape in the chapters of equation and inequality.

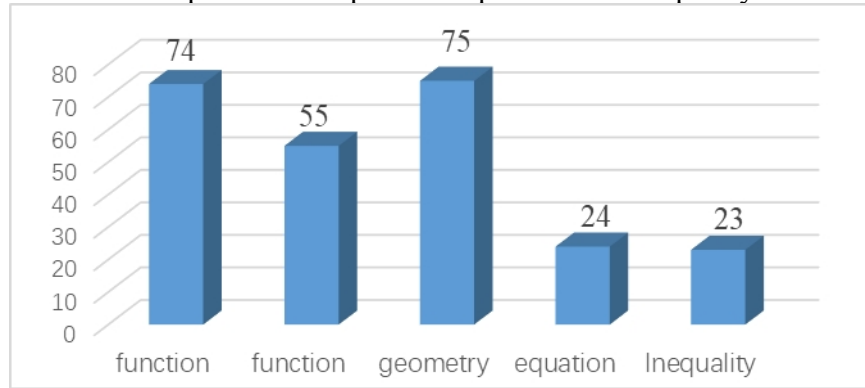


Figure 1. The distribution of the thought of combining number with shape in senior high school mathematics chapters

3.2 Analysis on the Application of the Thought of Numeral-form Combination in Solving Problems

The average number of questions is 2.32. It shows that the vast majority of students show less initiative to explore a variety of problem-solving methods when doing math problems. From Figure 2, more than half of the students show that they like to solve more than one problem, but often only one solution can be found. And there are about 30% of the students think that finding a solution is enough, do not need to waste time to explore other solutions.

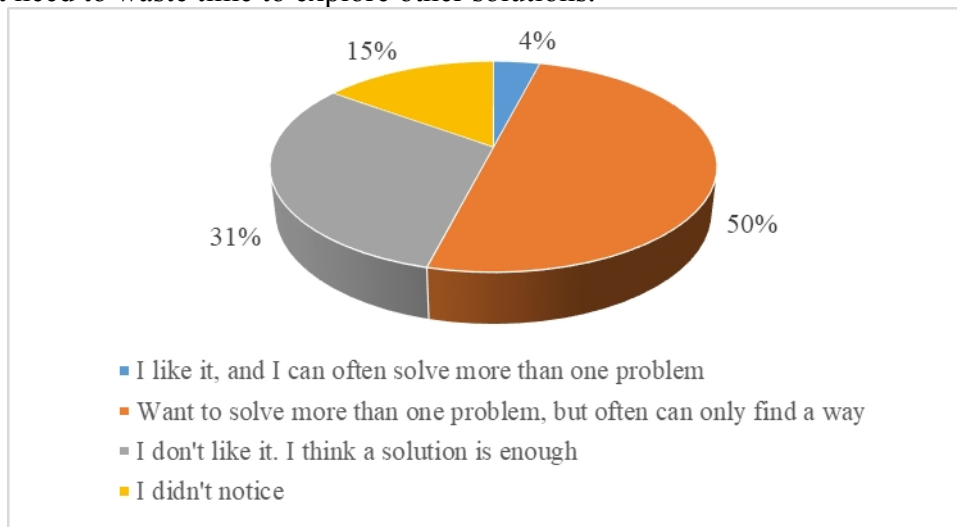


Figure 2. The distribution of students' liking for multiple solutions to a problem

3.3 Analysis on the Teaching Approach of the Thought of Numeral-form Combination in Class

Whether teachers intend to infiltrate the thought of combination of number and shape in mathematics teaching has an important influence on enhancing students' thought of combination of number and shape. About 70% of the students said that teachers always or often mentioned the combination of number and shape, and thought that the combination of number and shape could help their understanding of knowledge when teaching. Less than 30% of the students thought that the combination of number and shape did not help their understanding of knowledge. Half of the students interviewed said that teachers mainly use the idea of combining number with shape to explain problems in exercise class. In order to take into account the teaching progress in the new class, they often pass this idea by without in-depth analysis and discussion. Only when explaining

exercises can they really introduce the effect of the idea of combining number with shape on problems, so that students can only understand the idea of combining number with shape superficially.

3.4 Analysis on the Function of Modern Information Technology in the Thought of Numeral-form Combination

Students generally believe that Geometer's Sketchpad and other auxiliary teaching software is of great help to improve the thought of combination of number and shape. And they hope that teachers can use modern information technology such as multimedia in the course containing the thought of combination of number and shape [5]. However, in the actual teaching activities, more than 60% of the students reported that teachers rarely use Geometer's Sketchpad or other multimedia to assist in explaining the combination of figure and figure. A small number of students said that only in the open class, teachers will use multimedia display, and other teaching is mainly based on blackboard.

4 Conclusion

4.1 The Application of the Thought of Numeral-form Combination in High School Mathematics

Senior One students generally can better understand the basic meaning of the combination of number and shape, and realize the importance of the combination of number and shape in senior high school mathematics learning. But for the difference between mathematical thinking and mathematical methods often cannot be answered accurately, the understanding of the combination of number and figure is not comprehensive enough, also did not cause students to pay enough attention to the combination of number and figure.

The infiltration effect of teachers in the classroom is relatively general, which is subject to the influence of classroom teaching time, energy and other aspects. In the process of classroom teaching, the application of the thought of combination of number and shape is strict, and the application process of the thought of combination of number and shape is concise and clear, and the composition is standard and accurate. In the new teaching, it is difficult to introduce the thought of combination of number and figure, and it is more likely to be reflected in the explanation of the topic in the exercise class.

4.2 Factors Influencing the Application of the Thought of Numeral-form Combination in Senior High School Mathematics

The students' own factors affect the mastery of the thought of mathematical combination of number and shape. Senior One students are lack of good habit of solving problems when they are doing problems about the combination of number and shape. They are not good at drawing auxiliary diagrams quickly and accurately with ruler when they are drawing. They can't reflect and organize in time and review frequently after solving problems. Students are not strong in learning autonomy, eager to solve more than one problem, and do not have the ability to match it. These inert behaviors seem to improve the efficiency of doing questions, but it is not conducive to the cultivation of students' thought of combining number with shape.

In the process of teaching, the infiltration of the thought of the combination of numbers and shapes is the main source of the students' learning of the combination of numbers and shapes. The teacher's grasp of the examination site and the understanding of the thinking method greatly affect the teaching effect. The flexible use of modern information technology shows the students the application of the combination of number and shape in knowledge with efficient and clear images and animation [6]. After understanding the history and development of mathematics culture behind the thought, students can better understand and master the thought.

5 Suggestions

5.1 Suggestions for Students

(1) We should pay attention to the concept of formula and theorem and the thought of combination of number and shape. First of all, students' understanding of the concept is the direct factor affecting the mastery of the thought of combination of number and shape. Only by clearly understanding the concept can we distinguish number and shape and combine them [7]. When using the idea of combination of number and shape, we can see the answer directly in the image, so as to reduce unnecessary calculation.

(2) Strengthen the drawing ability. It's very helpful to draw auxiliary images for the application of the idea of combining number with figure, but students are very casual and perfunctory in drawing. Therefore, students should pay attention to the drawing standard when using the idea of combination of number and shape, and draw accurately with the help of ruler. More attention should be paid to the parts specially explained by the teacher in class. When you draw your own pictures after class, you should think about the difference between the pictures demonstrated by the teacher and find the real connection between numbers and shapes.

5.2 Enlightenment to Teachers' Teaching

(1) Strengthen the application of information technology. The teacher must have strong drawing ability, and the on-site drawing should be standardized and accurate. With the rapid development of information technology, multimedia can display the drawing of images intuitively and vividly, and enable students to have a deeper understanding of the combination of number and figure. Multimedia assisted teaching can enable students to better understand and master mathematical knowledge [8].

(2) Strengthen the teaching consciousness of the thought of combining number with shape. In the process of preparing lessons, teachers must firmly grasp the teaching materials, conduct in-depth discussion, and make clear the teaching objectives of this lesson, so as to be good at teaching [9]. According to the actual situation of students, we should carefully design the teaching process, from easy to difficult, strengthen the formation of corresponding strategies and the successful experience of strategies, find the entry point of number and shape, or the bridge to communicate them, and widely identify them. The classroom is the main battlefield of mathematics teaching. We should make full use of the classroom time to sublimate the mathematics thought, bring the thought of combining number with shape into the mathematics learning goal, design the corresponding links, and implement the complete application of the thought of combining number with shape [10].

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