

# Turning “mistake” into “treasure” -- Dealing with and thinking about students’ generative mistakes in mathematics classroom

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**Abstract:** Students will make some mistakes in the learning process of mathematics class, how to deal with these mistakes tests the wisdom of teachers. If it is not handled properly, it will often cause mistakes in education; If it can be effectively captured and used by teachers, it may become a valuable teaching resource and play its unique teaching value. This paper expounds the problem of making mistakes in mathematics learning become valuable teaching resources from three aspects: what kind of mistakes can become teaching resources, what teaching values are contained in mistakes and the strategies to make mistakes become valuable teaching resources. It provides useful references for teachers to deal with students’ generative mistakes in classroom teaching.

**Key words:** Error; Teaching resources; Strategies

Students will inevitably make some mistakes in math class, which not only accords with students’ cognitive law, but also reflects good classroom ecology. How to reasonably deal with the errors generated by students in real time, excavate their effective value, and make them become a valuable teaching resource, requires teachers to have certain ability to distinguish and transform errors.

## I. What kind of mistakes can become teaching resources

Students in the learning process may appear a lot of mistakes, causing these mistakes are also a lot of reasons, may be the student foundation is not solid, may not understand the question, may be inattentive, may also be caused by carelessness. Is it true that all the mistakes made by students in the learning process have their teaching value and can be used as teaching resources? What kind of mistakes can be valuable teaching resources? The author believes that mistakes that can be converted into teaching resources meet at least one of the following conditions.

1. contains a certain element of rationality

The result obtained by the students is wrong, but the solution process contains some reasonable factors, and these reasonable factors will trigger thinking and bring inspiration, then the mining of these reasonable elements can produce valuable teaching effects.

For example, students solve the following problem: with 100 yuan to buy three items priced at 36 yuan, 23 yuan and 45 yuan, is the money enough? Some students calculate immediately, and some students do not calculate, his reason is: 36 as 30, 23 as 20, 45 as 40, combined is 90, is enough. There are reasonable components in such mistakes, which need to be further explored, and the ideas can be shown and improved to get a reasonable estimation method.

2. It can help students clarify knowledge points

Some mistakes in the learning process, if it will be “amplified”, the whole class reflection, discussion, will help students to clarify what they have learned, develop critical thinking, in understanding “wrong” why “wrong” at the same time, about the “right” why “right” will know more thoroughly.

For example, when learning decimal addition, how much is the result of calculating  $2.45+4.55$ ? Some students calculate the result as: 6.100, it is very obvious that this result is wrong, the student did not fill the tenth place to the one place, but squeezed into the first part of the decimal part, such a mistake made the whole class to discuss and reflect on the reason for the error, students will have a deeper understanding of the calculation of decimal addition.

3. It will be helpful to the follow-up study

Some mistakes, if the teacher skillfully make use of them, may produce new learning content or knowledge growth points on the basis of solving the mistakes.

For example, when the score of teaching 10 is matched, the number game is played. The teacher gives 9 and the student gives 1. When it is the turn of a child, the teacher gives a 4 and the student gives a 5. It is obvious that the student has made a mistake. Taking this mistake as an example, the teacher asked the student how many more times 4 and 5 would be enough for 10, so that he could use the error of the two method to lead to the three method.

## II. What teaching value is implied in the error

In teaching, if teachers can deal with students’ mistakes reasonably and effectively, they can dig out the valuable teaching value in the mistakes. The main reason why it is valuable is that this kind of teaching resource has the characteristics of authenticity, timely generation and reflexivity. To be specific, reasonable use of students’ mistakes can play the following roles.

1. Make use of mistakes to stimulate students’ interest in inquiry

The mistakes in students’ learning process come from students, which is a kind of real-time generated material and has a certain intimacy in itself. When students collide with their peers’ thoughts or basic facts, it is natural for them to have a desire to explore.

For example, when teaching engineering application problems, show an example question: “There are 60 tons of vegetables to be

shipped to Hangzhou Asian Games Village, transport alone, car A can be finished in 10 hours, car B can be finished in 15 hours, how long does it take for the two cars to transport together?" Student column formula:  $60 \div (60 \div 10 + 60 \div 15) = 6$  (hours). The teacher asked, "If the vegetables become 120 tons, what is the time?" Most students think it is 12 hours. The teacher asked the students to do the math and found that the time was still six hours. The teacher asked, "If the quantity of vegetables is 30 tons, 90 tons, and 300 tons, what is the time?" The students calculated and found that the answer was still 6 hours. The student naturally asks, "Why does the amount of vegetables vary but the time stays the same?" The teacher leads the students to explore the reasons. The students took the initiative to explore and began to learn new knowledge.

## 2. Make good use of mistakes to cultivate students' innovative thinking

Innovative thinking refers to a way of thinking that is not limited by personal experience and general thinking, and uses relatively new and original methods to solve problems. Mistakes in the learning process sometimes contain students' creation, which requires teachers' timely discrimination and wisdom to deal with, dig out the bright points of thinking in the mistakes, refine and share.

For example, teaching "simplification ratio", show the exercises:

$$\frac{4}{5} : \frac{4}{7} \quad \frac{2}{5} : \frac{3}{10} \quad \frac{3}{5} : 0.375$$

One student wrote the answer to the first question 5:7. Obviously this answer is wrong, but there is something to be found in the student's thinking. The teacher asked the students to share their ideas. The students thought that since the numerator is the same, the ratio of the two denominators is the result of simplification. After analyzing the whole class, the students improved their ideas and found that the ratio of two fractions with the same numerator could be written as the ratio after the denominators were switched. If the denominator is the same, then directly write the numerator as the ratio and then simplify. The above change is based on the basic properties of ratios, and the other two problems can be quickly judged in this way. The students found something valuable in a wrong result, creatively found different solutions, broadened their understanding of the problem, and effectively improved their thinking.

## 3. Using mistakes to improve students' ability to judge and argue

mistakes in the learning process are fresh materials for discrimination and discussion, which can allow students to communicate and collide with different thinking, so as to further improve their own thinking. In the process of reading and understanding others and reflecting on themselves, students will continuously improve their critical and critical ability and form good thinking habits.

For example, in the "divisor is a decimal division practice class", the students encountered such a problem, with 30 yuan to buy each 2.7 yuan pen, the most can buy a few, how much money? The students' column formula is  $30 \div 2.7$ , but most of the students' use of the vertical formula to make the result is wrong, the quotient is 11, the remainder is 3. In view of this situation, the teacher showed the students' practice on the screen and asked the class to think quietly for one minute to judge whether the result was correct. After some time, many students found that the result was wrong. The teacher asked, "How did you find the error?" The students found two ways to tell when they were wrong:

(1) The divisor is 2.7, the remainder is 3, the remainder is larger than the divisor, and 3 can have 1 2.7 in it, so it is wrong.

(2)  $30 - 11 \times 2.7 = 0.3$ , the remainder should be 0.3, indicating that the remainder 3 is wrong.

Then the teacher led the students to conduct analysis, and converted  $30 \div 2.7$  into  $300 \div 27$  through the quotient invariant property when listing the vertical formula, and the remainder obtained at this time was also expanded by 10 times, so the correct remainder should be restored to 0.3.

As teachers, we should firmly believe that students have certain critical thinking ability. As long as students are given sufficient opportunities and time to think, their critical and reflective ability will become stronger and stronger.

### III. The strategy of turning mistakes into valuable teaching resources

The mistakes in the learning process contain valuable teaching value, so how to deal with these mistakes reasonably and effectively, and make them play their due role, becomes the key step whether the mistakes can become valuable teaching resources. Here are some effective ways to do so.

#### 1. Group discussion method

Some mistakes can arouse students' interest in inquiry. For such mistakes, teachers can organize students to have a group discussion and make use of the collision of students' thinking to explore the problem effectively.

For example, in the teaching of "average", presented a student to the group as a unit of oral calculation competition on the number of questions of the statistical table, the number of some groups is different, let the students to select a group of students for the class of god calculation group. Some students proposed to calculate the total number of pairs of questions to evaluate the winning group. The teacher asked the students to discuss this idea in a group of four. The activities were as follows: 1. Is this method OK? Why? 2. If you can't, what better way do you judge? The students had a heated discussion. In their report, they rejected the former evaluation method and gave reasons. It was further proposed that a number should be calculated to reflect the overall level of the group, and the average should be calculated. In this kind of class, students are more interested and have a high enthusiasm to participate.

#### 2. Ask questions about the method to the end

Some mistakes can stimulate students' sense of inquiry and cultivate their innovative thinking. In the face of such mistakes, teachers

need students to fully expose their own thinking process in order to find out the innovative elements in it. Therefore, teachers can ask the students to tell them all about their thinking.

For example, there is such a problem in the teaching of applied problems: the Asian Games Village to carry out grass greening, 3 workers can plant 90 square meters of lawn in 2 hours, there is a working group of 9 workers, how many square meters of lawn can be planted in 8 hours? Most of the students answer the question according to the idea of solving the unified application problem, the formula is  $90 \div 3 \div 2 \times 9 \times 8 = 1080$  square meters. There are also students' method is  $90 \div 3 \times 8 \times (9 \div 3) = 720$  square meters, after showing the algorithm, many students said they did not understand, the teacher asked: "What do you think?" The student said: "I think according to the multiple relationship." The teacher continued, "In terms of multiples? Can you explain it in detail?" The student said, "The number of workers in the work group is  $(9 \div 3)$  times that in the previous condition, and the first two steps represent the area that three workers would clean in 8 hours." The other students found out where he was wrong and revised the calculation to  $90 \div 2 \times 8 \times (9 \div 3)$ . Under the inspiration and influence of the student, other students were no longer limited to the conventional ideas and rethought them from different angles, listing different solutions such as  $90 \div 3 \times 9 \times (8 \div 2)$ ,  $90 \times (9 \div 3) \times (8 \div 2)$  and so on.

### 3. The method of reflection with blank space

Some mistakes can be clarified by students through their own thinking, when such mistakes occur, teachers should not judge immediately, should be patient to wait, let the class in a state of calm thinking, create space and time for all students to reflect on the reasons for their own insight into the wrong, so as to improve the ability of criticism.

For example, in the lesson of "Factors and multiples", the teacher first asked, how many rectangles can three identical small squares be placed into? S: One. Teacher: How about four squares? S: Two kinds. Teacher: How about 12 squares? Student: Three. The teacher continued to ask: Then, is it true that the more squares given, the more rectangles can be laid out? Many students responded loudly: Yes. The teacher repeated the question again, and still many students agreed. At this moment, the teacher said nothing and looked at the students. The whole class became quiet. The students naturally reflected on the question just now. After silence for a while, many students raised their hands and said that such a conclusion was wrong and explained the reasons. In this way, when students make mistakes, they can leave a cold silence in the class and give students sufficient space for reflection, which is conducive to improving students' argumentation ability.

Students' mistakes in the learning process are a kind of generative resources that need urgent attention in the primary school mathematics classroom, and teachers need to treat them with the perspective of development. Although there is no specific model to pursue, teachers need to use their own good consciousness, teaching wisdom and teaching ability to deal with this kind of teaching resources reasonably, so that this kind of resources can really become valuable wealth conducive to the improvement of students' literacy.

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