On the Cultivation of Students' Thinking Ability in the Teaching of Mathematics Exercises in Primary Schools

Qian Zhai[1], Yifei Yang[2], Zhijun Luo[1*]

[1]School of Mathematics and Finance, Hunan University of Humanities, Science and Technology, Loudi, 417000, P. R. China

[2]Xuan Xi primary school in Xinhua County, Xinhua, Hunan, 417631, P. R. China

*Corresponding Author:
Zhijun Luo
Email: ldlzj11@163.com

Abstract: Thinking is the core of mathematics, and the cultivation of students' mathematical ability is mainly the cultivation of students' thinking ability. Exercises in mathematics teaching is an important way to deepen the understanding and mastering of knowledge, and it can not only enable students to master the knowledge, but also develop students' divergent, creative and broad thinking, which plays an important role in the development of students. This text designs several different types of exercises to improve students' thinking ability, with the corresponding examples in detail.
Keywords: Mathematics Exercises; Thinking Ability

INTRODUCTION

The so-called mathematical thinking [1] means the students, based on perceptual understanding of mathematics, who can use the basic methods of comparison, analysis, synthesis, induction and deductive thinking, to understand and master the mathematical content, or to infer and judge the specific mathematical problem, so as to obtain the nature of mathematical knowledge and understanding of the law of ability. Although mathematical thinking is not always equal to the solving of mathematics exercises, we can say that the formation is based on an understanding of the basic concepts, mathematical theorems and formulas; and the most effective way of developing such kind of thinking is to solve problems [2-3].

As an extension of classroom teaching, the exercise class is an important part of mathematics teaching, combining the teaching content carefully designed exercises, the implementation of appropriate and scientific training, so that students hold a new view or a higher position of what learned before, and it is vital to optimize the knowledge structure of students and develop the good quality of mathematical thinking and mathematical thinking ability. The practice of Mathematics Teaching shows that the basic knowledge, basic theory and method of mathematics teaching, cannot do without mathematics exercises; similarly, developing students' thinking ability and training them to master the important thinking skills also cannot do without mathematics exercises. Since the exercise class and thinking ability are so closely related, then how can we use the exercises to train students' mathematical thinking ability? The following contents will introduce several different types of exercises to improve students' thinking ability in different aspects.

EXERCISES AND THE CULTIVATION OF MATHEMATICAL THINKING ABILITY
Contrast exercises to cultivate the agility of students' thinking

In primary school, many concepts of mathematics are similar or opposite in meaning, it is not easy for students to distinguish in the process of understanding and mastering. This practice puts the similar or confusing knowledge together, making a comparative analysis of similarities and differences, which can help the students to distinguish the concept, and truly understand the concepts. Although these concepts and methods are similar, they are not all the same. They have connections and differences. Without a comparative analysis, there can not be a good mastery, which requires students to answer accurately and quickly in the comparison, thus deepening the understanding and mastery of knowledge, such as teaching the prime number and the number, odd and even, GCD and LCM concept. Because the students are confused about the difference between these concepts, the teachers design for comparison exercises on purpose. In order to let students distinguish these concepts, the exercises can be designed as follows: (1) Elect within 20 odd and even number, prime number, and point out their characteristics; (2) Find the greatest common factor and the least common multiple of 14 and 32, 7 and 21, and stress the difference of the two concepts when communicating. Such exercises can help students overcome the inertia of thinking caused by the inertia of thinking, develop students' thinking agility.

Multiple solutions to a problem, broaden their horizons, develop the divergent thinking ability
Various solutions to the same problem is contribute to the cultivation of multi angle and multi-lateral thinking, and the preferred method is helpful for students to think actively.

Example 1: A car dose 250 kilometers for 5 hours, as per this speed, then the line of 750 km, a total of how many hours? Students put forward many solutions:
(1) $750 \div (250 \div 5) + 5$;
(2) $(750 + 250) \div (250 \div 5)$;
(3) $5 \times (750 \div 250) + 5$;
(4) $5 \times (750 + 250) \div 250$

After discussion, comparison, so that students clear the best of the fourth methods. Thanks to the hands-on, multiple solutions of optimization and training, to some degree, which can be very good to attract students from multi angle observation, thinking, association, generalization and access to a variety of way of solving problem, arising student's thought waves? As a result, they not only broaden their horizons or add interest, also feel the beauty of mathematics and taste, and the student strive for further improvement, even the brick or sparks of fire in the knowledge and intelligence, and it is more likely to develop the flexibility of divergent thinking.

Ask more questions and expand the student's thinking
Expand students' thinking through a number of questions. To cite a mathematical situation, put forward several problems, there are relations between problem and problem or knowledge and knowledge. Let the students find the link between knowledge points, then there is a collision caused by thinking sparks.

Example 2: Li Lei's mother divided the watermelon into 10 pieces, and Li Lei ate 2 pieces. How much did he eat the watermelon? If the rest of the average to the father and mother, how much did father and mother eat?

This topic contains several issues, they are similar but slightly different, when finishing a problem, the students must know the knowledge. They will go on the problem based on the former knowledge, so that students not understand its simple knowledge but on the basis of extending deeper knowledge in one question, which not only consolidate the foundation but expand students' thinking.

Multi use of one method to cultivate the diversity of students thinking
Multi use of one method is to solve multiple problems in a way, it can make the students are no longer confined to a single problem, but to explore more problems. In the process, students' thinking will gradually be opened or to be more broad, and the students not passively accept the teacher's said, but with open thinking, spontaneously to look for problems and solve it.

Example 3: Xiaoming and Xiaohong are 1000 meters apart, Xiaoming walks 40 meters per minute, Xiaohong walks 60 meters per minute, and they are walking face to face, then, when will they meet?

Example 4: A and B cooperated to repair a road of 3000 meters, A can repair 120 meters per hour, B can repair 150 meters per hour, after the cooperation, when will the road be finished?

From the case 3 to the case 4, although the problem has changed into a project, the basic solving methods are still the same, are from: Distance divided Speed equals to Time, the basic formula, it is simply a change on the surface. Although this is only two simple questions, it helps students to develop thinking, making them understand knowledge and knowledge is interlinked, which can drive students think more about the links between problems in the future, rather than do only as the teacher told.

Variant practice to cultivate the exploration of students' thinking
A variety of questions are items or known and unknown swap. Flexibility of thinking for unfettered thinking and thinking mode, can adjust the direction of thinking according to the changes of objective conditions, to change the thinking path when thinking is blocked, looking for new channels and methods. In the course of teaching, it is very helpful to cultivate the flexibility of the students' thinking through target training.

Example 5: Basic questions: 32 divisors have [ ].
Variant problem: (1) 32 can be divided by[ ];

(2) [ ] is divisible by 32;

(3) [ ] is the multiples of 32.

The three variant problem transform the narrative form, but the nature of its divisors must be divisible by always in constant. When answering the question, the students can not only finish the standard narrative form of title (basic questions), but also can flexibly exclude non-essential attribute variant, and answer the questions correctly. Thus they have a more profound understanding of the concepts, and their ability of flexible use of knowledge is also cultivated.

Example 6: Basic questions: There are 90 students grade three of Shuanglin primary school, the number of the fourth grade is 6 more than the third grade, how many people were in grade three and four?

Variant problem:

(1) There are 2 classes in grade three of Shuanglin primary school, each class of 45 people, the number of the fourth grade is 6 more than the third grade, how many people were in grade three and four?

(2)There are 90 students in grade three of Shuanglin primary , the number of the third is 6 less than the forth, how many people were in grade three and four?

The variant design using this method, is often used in solving the problems in the teaching. The variant problem
(1) and (2) compared with the basic problem, although the problem remains unchanged, because of the condition transformation, which makes one-step method expand into two or three steps, so that students can understand the structural characteristics of the complex problem solving.

Set the error function, cultivating students' critical thinking

The teaching practice shows that, in the exercise teaching, there can be set wrong solutions to wrong problems or the creation of cognitive conflict, so as to stimulate students' interest in question. Under the guidance of teachers, the students are in a state of The heart desires and not, and not to talk. This situation can stimulate the students' strong eagerness to the essence of the problem and the desire of exploring knowledge, so that they can be actively involved in research, developing their critical thinking ability.

Example 7: Judgment

1) The result is two number 1 reciprocal [ ]

2) The 6meters rope is divided into 5 parts on average, each length of 1/5 m [ ]

Error: 1) [√] 2) [√]

The two problems designed by the teacher are easy to confuse the students in the past "wrong"; Through identify, analysis, discussion, comparison and discussion, the students finally find out the accurate content of the reciprocal concept and meaning of fraction, let the students who make mistakes find the error, correcting them.

Example 8: There are 840 students in Shuanglin this year, 40 more than last year, what percent dose the number of students this year than last year increase ?

[The common errors 1] （840-40） ÷840 =800÷840 ≈0.952=95.2%。

A: the number of students this year is 95.2% higher than last year.

[The common errors 2] （840-40） ÷840 =800÷840≈0.952=95.2%。 1-95.2%=4.8%。

A: the number of students this year is 4.8% higher than last year.

[positive solutions] 40÷ （840-40） = 40÷800 = 0.05 = 5%。

A: the number of students this year is 5% higher than last year.

The second error is frequent, it is for the number of students than this year to reduce a few percent". In this way, students who solve problems always think, "last year, the number of students decreased by a few percent this year," that is, the number of students this year than last year increased by a few percent". In fact, this is not equal, the reason is the same as A is more than B is to say B is less than A, however, A is more than B a few percent cannot say B is less than A a few percent. This kind of error is related to the study of the influence of the set of integers, so long as we know the truth, we will not make such mistake.

Teachers can improve students' ability of self-reflection learning by guiding students to correct mistakes. To cultivate students' ability of self - prevention, self-analysis and problem solving; to form a good mathematical critical thinking and to improve the effectiveness of learning.

SUMMARY

Exercise class is an important platform to carry out the new curriculum idea "advocate active and active exploration", "focus on improving students' mathematical thinking ability". Through the teaching of exercises, we can help students consolidate and deepen the basic knowledge, eliminate the confusion and correct the existing problems; perfect the knowledge system, and cultivate the students' ability of thinking and teaching. Math exercises are mainly the ramming double base to expand their knowledge, sum up the law, develop the skills and mathematical thinking ability; Therefore, the examples arranged should have clear learning objectives, with demonstration and level, and the number of questions should be moderate, pure and not much. No matter from which aspect in the course of the explanation, the exercise class should pay attention to the training of thinking so as to improve students' comprehensive abilities.

REFERENCES

1. Zhanghui R. Mathematical Thinking; Guangxi Education Press, 1996.
2. Peiling Q. Mathematical Thinking Methods and High School Mathematics (Second Edition); Beijing Normal University Publishing Group, 2008.
3. Yunchen S. Discuss the Cultivation of Thinking Ability in Mathematics Teaching; Classroom Teaching; May, 2008.