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Investigation and Analysis of Mathematics Application Ability of Student of Senior One[1]

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Students' mathematics application ability is a hot spot which mathematics education pays attention. So, I have carried on the test of mathematics application and the questionnaire survey to student of Senior One of the two middle schools. Through the test and the investigation, I discover that the level of the students' mathematics application ability is not high. To the simple application question, the difference of the male and the female is not big, but to the difficult application question, the male and the female has the remarkable difference. The students' lack of flexible and the original cognition monitoring ability in mathematics application process are afraid of studying mathematics application since childhood and lack of the training of this aspect. They thought mathematics foundation and reading understood ability is the key of mathematics application. Through analysis result of investigation, this paper proposed the way to raise mathematics application ability of students.

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1. BACKGROUND

20th century there is a large development in mathematics, at the same time the rapid development of the computer and the information technology causes the development of the applied mathematics and mathematics application. Mathematics already permeates into each discipline domain and daily life of people. Raising mathematical application ability has become the focal point which mathematics education pays attention to

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commonly.

The new curriculum reforming emphasizes applied mathematics that has been the prominent position. It is common recognition to strengthen the teaching of applied mathematics and the studying applied mathematics to mathematical education. It is also request that socialization and popular of mathematics But it is not satisfied to the actual situation now. Students are at a loss feel helpless to some actual problems that appear to the social life frequently and do not have consciousness of applied mathematics by side matter. We reflect our goal of mathematics education, why do we study mathematics? So it is urgently need to change the situation that student study mathematics, but could not apply mathematics. The key of raising the student mathematics application ability is to know the present situation of the students' mathematics application ability.

2. INVESTIGATION PROCESS AND METHOD

2.1. Investigations objects and method

I investigate students of two high schools' two classes of Senior One mainly by test, questionnaire and interview separately. The two high schools are the South West Normal University Affiliated high school and Jian-Shan high school. The number of one class is 60, 16 are female, 44 are male, the other class is 65, 33 are female, 32 are male. It takes 40 minutes to test and it is 5 minutes to make the questionnaire surveys of 21 items. Finally I interview five students from each class.

2.2. The selection of test

The test is worked by Mrs. Ban Chunhong, which has used to test students of the Tianjin experiment middle school. The test is seen appendix.

2.3. Questionnaire survey

The questionnaire is worked by me. The goal of questionnaire survey mainly is to know the motive, the method and the knowledge of the students to study mathematics application.

2.4. Mark of the test

The test is graded by four score way the students' behavior and displaying are divided into four ranks. The highest-level is 4 and the lowest is 1.

The rank	behavior performance describes
4	Outstandingly ---- complete very much well
3	skilled grasps ----- the most part complete well
2	reluctantly qualified ----- partially complete
1	not to be satisfying ----- has not nearly completed

2.5. Result statistics of the test

		First item	Second item	Third item
Southwest Normal U. Affiliated H. S.	Sixty students' average score	3.85	3.88	2.28
	Sixty students' score standard deviation	0.36	0.41	0.94
	Sixteen female's average score	4	3.94	2
	Sixteen female's score standard deviation	0	0.25	0.75
	Fourty-four male's average score	3.8	3.86	2.39
	Fourty-four male's score standard deviation	0.4	0.46	1.02
Jian-Shan H. S.	Sixty-five students' average score	3.6	3.74	2
	Sixty-five students' score standard deviation	0.7	0.57	0.86
	Thirty-three female's average score	3.7	3.79	1.9
	Thirty-three female's score standard deviation	0.53	0.42	0.766
	Thirty-two male's average score	3.5	3.69	2.19
	Thirty-two male's score standard deviation	0.824	0.69	0.93

	Students' number	Total score	The third item right		The total score exceed 11	
			number	proportion	number	proportion
Southwest Normal U. Affiliated H. S.	60	12	8 (only one female)	13%	14	23%
Jian-Shan H. S.	65	12	4 (no female)	6%	13	20%

3. RESULT ANALYSIS

3.1. The level of students' application mathematics ability is not high

Although it attaches more importance to mathematics application than before, the teaching of word problems has certainly efficient, but the level of students' mathematics application ability is not high. It may be seen from the table that the score of the first and the second item are higher, there are a large of students of full mark, and the standard deviation of the two items score is smaller. This is because the first and the second items is similar to the common word problems, the condition of item is clear, no more no less, the primitive problem are easy to turn into mathematical problem.

From the table it is also may seen, the score of the third item is very low. The number of full mark of the third item is 8 and 4 respectively. The proportion of taking whole amount is 13% and 6% respectively. This is because the third item has many variable and the variable relations are quite complex, the process of the primitive problem to turn into mathematical problem is complex, which causes the student understand difficulty. It shows that the student application ability is not strong and their original cognition level is lower. From the paper of the test, the train of thought of students' problem solving is quite unitary and rigid.

3.2. Differences of male and female

From two middle schools tables it shows that score of the first and the second item to female students approximately is higher than to male students, standard deviation of scores of female students is lower than male students'. It shows mathematics application ability is not deference to the simple application item for the female and the male. The female students' whole application ability quite is balanced. But the difficult third item is not such, the score of the male students obviously is higher than the female students'. There are 12 students of full mark, but only one female student. So we think the application ability of the male and the female students is the remarkable difference to difficult mathematics application, the ability of the male students is stronger than the female students', this is the same with the actual situation. In whole, the standard deviation of score of female students is lower than male students'. It shows the female students' score is quite stable, no stronger no poorer, but the male students' variance is quite big, the stronger mathematics application ability is the male students, the weaker is also the male students.

3.3. Differences of mathematics foundations

The South West Normal University Affiliated high school is a key high school in the Chongqing, the students' entering score is higher and the students' foundation quite is good. Jian-Shan high school is a key high school in Beibei, the students' entering score is lower than the South West Normal University Affiliated high school. In my interview of students, I know they do not train specially mathematics application and mathematics modeling in both high schools and it takes little time to train. Comparing the score of the two schools, the score of The South West Normal University Affiliated high school is higher than Jian-Shan high school. It shows that mathematics basic knowledge is very important for mathematical application ability.

Simultaneously the difference mathematics foundation has difference thought of solving problems of the creativity and the flexibility. When solving third item, The students who have good mathematics foundation agile and has used very many methods, except to use the algebra method to solve, but also to use table method, figures method and so on. They deepen understanding of the item by use of number and shape. From the answer process, it shows the students of good mathematics foundation have strong ability of meta-cognition monitoring.

3.4. Result analyses of questionnaire surveys

Through the questionnaire survey, we know most of students are afraid of word problems since childhood and are lack of the training in the aspect. 70% students think that mathematics application is very much significant, but 60% students do not like it, 72% students think the word problems of the textbook at the present not too is difficult, 90% students think it is very big help to students of having good mathematics foundation to study application mathematics. Only 40% students occasionally have a look the reference of mathematics application (nearly not to look at mathematics magazine, periodical); for 85%students, it takes little time in mathematics application and students also do not like summarizing and summary; The self-study ability of 75%students is not strong independently. Only 40% students have good cooperation relations in mathematics application.

For student to study mathematics application, the main barrier is: the reading ability is not strong; the ability of transforms the natural language into mathematical linguistics is poor, mathematics foundation not too is good, the computation ability is worse, students lacks the practical life background, the psychological quality is bad.

4. HOW TO RAISE MATHEMATICS APPLICATION ABILITY OF STUDENTS

4.1. Raise student's mathematics application consciousness

Professor Wang Shangzhi once pointed out three points: First, in mathematics teaching and instructing to the student to study mathematics, it should be attached importance to introduce mathematics knowledge background; Second, students should learn to descript the world mathematics phenomenon by utilizing the mathematical linguistics. Third, when mathematics teaching and the outside class activity, teachers should encourage and support the student. When facing the actual problem, they can attempt to seek solving the question strategy initiatively by mathematics angle to use the knowledge and the method of studying.

4.2. Improve the interest of the students' mathematics application

Long-term and massive "the excessive assignments tactic" "takes an exam the test" "the difficult problem and trick question," make the student lose the interest of studying mathematics. Because of busy, they don't take into consideration mathematics the application; of course they are far from the interest of mathematics application. The interest is the power of studying and the fountainhead, so in mathematics application teaching, teachers should give some simple life examples of easy understanding, from the shallow to the deep, and let the students own pose the question from the study process, let the student know that mathematics come from the life and the life dependence mathematics, we live in the world of full mathematics. The class mathematics knowledge should be extend to the practical life, for example, the paying expenses problem of taxi and the interest problem and so on, the questions have stronger interest and they are easy for students to accept.

4.3. Strengthen training the ability of mathematics application

In mathematics application, the mathematics basic knowledge is very importance. But the most of students who have solid basic mathematics knowledge also frequently fall into in the difficult position when building mathematical model, and are unable to apply mathematics knowledge in the practice. Therefore, it is especially important to raise mathematics application ability. To raise students' mathematics application ability, it must strengthen understanding and the training of mathematics application

From the questionnaire survey and interview, we know the students who have been trained mathematics application and solving word problems are higher than these who

have not trained in solving thought and method. The students have a quick mind and flexible and don't be influence of fixed thought in mathematics application.

4.3.1. In mathematics teaching, strengthen training the ability of mathematics application

According to the data statistics, word problems' proportion is 9.4% in the mathematics textbooks of junior middle school nine years compulsory education which are published by people education publishing. Such proportion obviously is somewhat low. Teacher may rearrange the word problems of the textbooks into the actual problem or the opening items, or let student themselves rearrange the word problems and inquires. Teachers should look for some practical application questions and rich course content to strengthen the training in the teaching.

For example, in concept teaching of quadratic equation with one unknown, the common "the ladder question" from the life can guide the student to carry on the discussion and to obtain the model of quadratic equation with one unknown and approximate solution.

The topic is: A length is 10 m ladder slanting on the wall, the ladder top is apart from the ground the vertical range is 8 m. if the ladder goes against glides down 1 m, then (1) Guessed the bottom end also will skid 1 m? (2) Build the equation which distance of the bottom skids is away from satisfies. (3) Can you attempt to obtain the approximate solution? The bottom skid distance compared to 1 m long, or is shorter than 1 m? Exchanges your idea with the other students?

4.3.2. Strengthen mathematics application training in students' extracurricular

To students' extracurricular activity, it takes the method that students own pose problem and seek to solve problem. The teachers transfer everybody interest and train the doing ability and application ability of students. For instance, the teachers propose the question of pays expenses of taxi, the students may associate the handset to pay expenses, the water and electricity to pay expenses and so on. Through the students' different explanation and analyzing, let the students understand deeply the problem.

4.3.3. Organize the students to attend mathematics knowledge application competition

Mathematics knowledge application competition is not the goal, but it can train students' psychological quality through the competition and raise students' comprehensive quality and the cooperation spirit. In the competition process, it raises

students' mathematics application ability.

4.4. Strengthen students' outside reading

In the periodical "Middle-school student Mathematics" and "Mathematics Notification," there are many middle-school students' mathematics application question and mathematics modeling question. Students may often read the articles on mathematics application and mathematics modeling. It is helpful to open students' thought and expand students' knowledge. After reading, students must collect, arrange and classify, so it can help students to get a deeper understanding and remembering.

5. SUMMARIZE

Above conclusion only is the conclusion to two high schools abilities test, the questionnaire survey and interview obtains. It has the certain representation, simultaneously also has the certain limitation. The conclusion has the certain reference value.

REFERENCES

Wang, Shangzhi & Kong, Qiping (2002): Raises Student's Application Consciousness is the Mathematics Curriculum Profitable Target. *Mathematics Education Journal*

Ban Chunhong: a high student mathematics modelling ability test investigation. Also available http://www.21maths.com/sxjm/zxsjm/jmlw/200307/294.html

APPENDIX: THE TEST QUESTION

1. Two men buy grain twice in the same grain shop (twice price is different). The first bought 100 kilograms of the grain each time; the second bought the grain with 100 Yuan each time. If stipulating, whose average unit price purchasing the grain twice is low, whose purchasing way is worthwhile. Please judge the purchasing way of two men and give reasons.
2. One family (father, mother and children) wants to go to some place for tour. The first travel agency says: "If father buys one ticket, other persons can enjoy the preferential treatment of the half-price ticket"; the second travel agency says: "Family's travel can be regarded as the group ticket, the discount is 2/3." If the original price of these two travel agencies is the same, for different child in the family, calculate the charges (give formula) of two travel agencies separately and discuss which travel agency is more preferential.
3. There are two clothing factories to produce the same kind of clothing. The first factory produces 900 sets of clothes every month, the proportion of time of producing the jackets and the trousers is 2 : 1. The second factory produces1200 sets of clothes every month, the proportion of time of producing the jackets and the trousers is 3 : 2. If two factories cooperate, please arrange producing scheme to make the output exceed sum of production capacity of two factories former, how many suits of clothes are produced every month.