On the Eighth Grade Mathematics Achievement and Its Effect Factors-Based on Seven Areas Study

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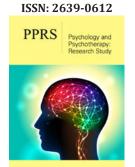
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Background

Lots of international achievement assessments program, such as PISA, TIMSS, try to evaluate mathematics quality. PISA [1,2] focuses on students problem solving in real life, while TIMSS [3] spends an effort on testing students mathematics achievement based on the curriculum standard .This study tries to design mathematics test and questionnaire which are based on the compulsory education mathematics curriculum standard (2011 Edition) (which is called The Standard for convenience) to examine students' performance and figure out the factors influencing their achievement. Therefore, The research questions are: what is the proportion of students meeting the requirements of The Standard? What are the factors influencing students' math achievement?

Sample and Framework

170748 eighth grade students who are from seven regions---three in the East , three in the middle and one in the West --- took the test and questionnaire survey. Based on The Standard, the test was designed in two parts [4]: mathematics content and mathematics competency. The mathematics content includes three areas: number and algebra, shape and space, statistics and probability. The mathematics competencies consist of 4 components: knowing, understanding, grasping and application. Before doing the finial assessment, three steps have been taken---- six students' interview, 30 students' test and 300 students' test. In the end, we have got the final three test booklet A\B\S . There are 20 questions in the questionnaire, including Teaching Methods(TM), Teaching Representation (TR), Mathematics Representation (MR) and Thinking Tendency (TT). The Cranach α reliability of the questionnaire was 0.925.

Findings

Students' performance from seven regions

Overall, about 92.4% students meet the requirements of the Standard . The mean proportion for students in level A, B, C, D are 34%, 33%, 26%, 7% respectively. Students performed steadily but distinctively in the three areas. To be more specific, students had an obvious better performance in shape and space than in the other two areas, based on the higher excellent rate---34.7%. On the contrary, with the lower excellent rate and pass rate, students' knowledge of statistics and probability needs to be improved.

The results of questionnaire

Five Likert scales was used in the questionnaire, and the mean score is 3.21, 3.24, 3.06 and 2.71 for TM, TR, MR and TT. Meanwhile, we also did regression analyses between the four components and students' score respectively to find out their relationships. The results are listed in Table 1. Based on the statistics, we find that teaching representation has more contribution to students' score compared to the other three factors. Meanwhile, mathematics representation and teaching methods have positive impact, while thinking tendency shows a negative influence on students' performance, which means that students will react negatively in the exams if the teacher has his preference and tendency when thinking and teaching.

Table1: Regression a. dependent variable: Standard score all.

Model	Non Standard Coefficient		Standard Coefficient	t	Sig.
	B	Standard Error	Trial Version		
(constant)	376.945	1.293		291.446	0
TM	17.113	0.44	0.133	38.883	0
TR	27.259	0.54	0.149	50.444	0
MR	11.624	0.505	0.097	23.002	0
TT	-2.647	0.504	-0.022	-5.25	0

Conclusion

Firstly, eight grade students achieve the high score, and their pass rate is 92.4%. However, their level of application is lower than the level of knowing, understanding, and grasping. Secondly, students' achievements varied among different regions but the most obvious difference is in the students from the top level. Finally, among all the four components in questionnaire survey, teaching representation have the great impact on students' performance, teaching methods and mathematics representation are the second while thinking tendency has a negative effect on students' performance. This study tries to find out the difference between students' achievements in various areas (number and algebra, shape and space, statistics and probability) and regions (three in the East, three in the Middle, and three in the West), as well as the factors which cause the difference. Meanwhile, development of tools in test booklet and the influencing factor in the questionnaire need to be explored in depth.

In terms of the significance of this research, it is not only a large-scale but very representative one on Chinese Mathematics achievements. On one hand, it tested 170,748 Grade 8 students in mainland; On the other hand, the regions where the students were selected from are widely located around China, including the East, the Middle, and the West. Therefore, the collected data should be very reasonable and scientific. From this perspectives, it is difficult for other researches to compare with this one. With regard to the scientific perspective of the research, we firstly used questionnaires to explore the factors which influence students' mathematics achievements. After finding out the factors, we applied quantitative methods to figure out the specific relationships between factors and students' achievements, making the relationships clearer and concrete.

References

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