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An investigation and study of the mathematical computational skills of grade one junior students

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Abstract: *Mathematical computation skills are very important in middle school mathematics. Middle school mathematical computation involves many basic mathematical concepts and skills, including four rules of calculation, fraction calculation, algebraic calculation, geometric calculation and so on. The author conducted a survey and research on the mathematical computation ability of junior high school students in two middle schools in Binzhou City, A and B, and came to the following conclusions: the average score of junior high school students' mathematical computation ability is high although there are certain deficiencies; there is a significant difference between students' mathematical computation ability in the dimension of school level difference, and there is no significant difference between them in the dimension of gender; the factors of computational attitudes and mathematical computation habits have an influence on students' mathematical computation competence. Therefore, it is necessary to improve students' mathematical computation ability in the first year of school. Educators and parents should pay attention to students' learning attitudes and mathematical learning environment, and adopt effective teaching methods and measures to improve students' mathematical computation ability.*

Keywords: *numeracy; research study; first year mathematics*

1. Formulation of the problem

Mathematical computation ability is one of the basic and core competencies of mathematical learning, which is of great significance to students' mathematical development. The Compulsory Education Curriculum Standard (2022 Edition) points out that the mathematics curriculum cultivates students' mathematical thinking, and mathematical computation ability is one of the main manifestations of mathematical thinking in the compulsory education stage; secondly, cultivating students' computation ability can also promote the development of their logical thinking, laying a foundation for students to solve some complex problem scenarios in the future.[1] Finally, mathematical computation accounts for a relatively large proportion of first-year mathematics learning. Taking the Humanistic Teaching Edition as an example, computation involves rational numbers, addition and subtraction of integers, and solving equations, accounting for about 62.5% of the total. However, in recent years, some studies have shown that first-year students have deficiencies in mathematical computation, which may have a negative impact on their subsequent mathematical learning[3] . Therefore, understanding first-year students' mathematical computation ability and its influencing factors is of great significance for educational practice and teaching improvement.

2. Study design

2.1. Subjects of study

In this study, two parallel classes of students were selected as research subjects in the first grade of each of two middle schools in Binzhou City, Shandong Province, respectively, in which school A is a municipal school and school B is a township middle school, and a total of four classes were selected and 200 questionnaires were distributed[2] The total number of questionnaires distributed was 200. 200 valid questionnaires were recovered, with an effective recovery rate of 100%. There were 100 students in School A, 52 boys and 48 girls, and 100 students in School B, 50 boys and 50 girls.

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2.2. Research methodology

On the basis of a large collection of literature related to the mathematical computational ability of first-year students, students were surveyed with the compiled Questionnaire on the Mathematical Computing Ability of First-Year Students, and then the obtained data were statistically analyzed using SPSS22.0 software.

2.3. Research tools

The questionnaire of this study was prepared on the basis of the questionnaire on the mathematical arithmetic ability of the first year students with reference to Tang Xin's[4] . It consists of 4 dimensions (computational motivation, computational self-perception, computational attitude, and computational habits) with a total of 12 questions, including 3 questions on computational motivation, 3 questions on computational self-perception, 4 questions on computational attitude, and 2 questions on computational habits. The questions were scored on a five-point Likert scale: students scored 5 points if they answered "very much in line", 4 points if they answered "in line", and 3 points if they answered "not sure", "Does not meet" scores 2 points, "very inconsistent" scores 1 point, i.e., the higher the degree of compliance, the higher the score, the better the students' ability to calculate. The total score of the questionnaire is 60. The questionnaire was analyzed for reliability by SPSS22.0, and according to Table 1, the reliability coefficient was 0.977, which was between 0.75 and 0.9, indicating that the overall reliability of the questionnaire was good. Applying KMO and Bartlett's test, the results were obtained as shown in Table 2, the value of KMO is 0.952, which is greater than 0.7, and the significance value of Bartlett's test is 0.000, which is less than 0.01, which indicates that the questionnaire's structural validity is good, and it can be used as an effective tool for investigating the situation of mathematical computation ability of first-year students.

Table 1: Reliability statistics

Cronbach'sAlpha	item count (of a consignment etc)
.977	12

Table 2: KMO and Bartlett's test

The Kaiser-Meyer-Olkin metric for sampling adequacy.		.952
Bartlett's test of sphericity	approximate chi-square (math.)	3693.777
	df	66
	Sig.	.000

3. Study design

3.1. General Status of Mathematical Computing Skills of First Year Students

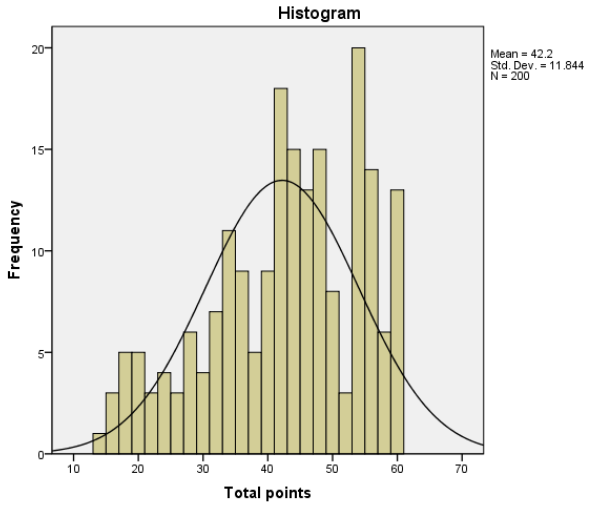

Figure 1: Histogram of the distribution of math computational skills scores of first-year students

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The math computational ability scores of first year students are shown below. The effective sample is 200 and the mean is 42.2.As can be seen from Figure 1, the math computational ability scores of the first year students are approximately normally distributed, most of the students' scores are located in the middle and upper levels, some of the students' scores are low due to the lack of motivation to learn, and some of the students' computational ability scores are higher due to the influence of various aspects.

3.2. Differences between mathematical computing skills and school level

A t-test was conducted on the scores of all students according to school level, and the results are shown in Table 3. The mean value of the scores of School A was 44.25, and the mean value of the scores of School B was 40.15. p=0.014, which is less than 0.05. That is, there is a significant difference between the mathematical computation ability of the first year students in the dimension of school, and School A is significantly better than School B. The results of the t-test are shown in Table 3. This is usually inextricably linked to the student population and the quality of teachers. Municipal schools are significantly better than township schools in terms of both student population and the level of the teaching staff, which may be an important reason for the gap in first-year students' mathematical computation ability in the school dimension.

Table 3: t-test for school-level differences in math computation skills of first-year students

students	N	average value	(statistics) standard deviation	Standard error of the mean	t	Sig.
1	100	44.25	11.990	1.199		
2	100	40.15	11.389	1.139	2.479	.014

3.3. Differences between math computation skills and gender

A t-test was conducted on the scores of all students according to gender and the results are shown in Table 4. The mean value of the scores of male students was 42.69 and the mean value of the scores of female students was 41.69. p=0.555 which is greater than 0.05. i.e. there is no significant difference between the mathematical computation skills of the first year students in the dimension of gender.

Table 4: t-test for gender differences in math computation skills of first year students

	distinguishing between the sexes	N	average value	(statistics) standard deviation	Standard error of the mean	t	Sig.
totals	male	102	42.69	11.626	1.151		
	daughter	98	41.69	12.105	1.223	.591	.555

3.4. The correlation between attitudes toward mathematical computation as well as computational habits and computational ability

Table 5: Correlation between attitudes toward mathematical computation as well as computational habits and computational skills

			7-12t	totals
Kendall's tau_b	7-12t	correlation coefficient	1.000	.918**
		Sig. (bilateral)	.	.000
		N	200	200
	totals	correlation coefficient	.918**	1.000
		Sig. (bilateral)	.000	.
		N	200	200
Spearman's rho	7-12t	correlation coefficient	1.000	.983**
		Sig. (bilateral)	.	.000
		N	200	200
	totals	correlation coefficient	.983**	1.000
		Sig. (bilateral)	.000	.
		N	200	200

**. The correlation is significant at a confidence level (two-test) of 0.01.

The correlation analysis of mathematical computation attitude as well as computation habit and computation ability is shown in Table 5 by Kendall's and Spearman correlation analysis. The results show

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that the correlation between computational attitude, computational habits and mathematical computational ability is significant, with correlation coefficients of $r=0.918, p<0.01$; $r=0.983, p<0.01$, respectively, which is in line with our daily cognition.

Clearly, having a positive attitude toward computing and good computing habits usually promotes better engagement of individuals in computing assignments, which leads to improved efficiency and accuracy in computing[5] .

4. Conclusions and recommendations

4.1. Conclusion

The following conclusions were drawn from a survey and study of the mathematical computational skills of first year students in two schools, A and B, in Binzhou City:

(1) First-year students scored high on average in math computation, although there were some deficiencies;

(2) There is a significant difference in students' mathematical arithmetic skills on the dimension of school level differences and no significant difference on the dimension of gender;

(3) Factors such as attitude towards computation and mathematical computation habits have an impact on students' ability to perform mathematical computation, and in general, a positive attitude towards computation and good computation habits improve the quality of computation[6] .

4.2. Recommendations

In response to the above inquiry, this paper will give suggestions to improve students' computational ability from three aspects: teaching basic knowledge, mathematics learning environment, and computational attitude and computational habit:

(1) Strengthening the teaching of fundamentals. Establishing a solid foundation is crucial to improving numeracy. Teachers should therefore ensure that students master and understand basic computational concepts and skills, such as the four operations, fractions, decimals and percentages. In addition, students can be provided with a large number of calculation practice problems to consolidate their calculation skills through repeated practice.

(2) Create a positive learning atmosphere. In daily teaching, teachers should pay attention to encouraging students, appreciating their efforts, and providing a positive learning atmosphere so that they can discover the joy of learning and thus achieve the realm of joyful learning. For example, math games and competitions can be used to stimulate students' interest and motivation, so that they can improve their calculation speed and accuracy in competition[7] .

(3) Developing good calculation habits and a positive attitude towards calculation. Good calculation habits and attitudes are crucial. In daily teaching, this can be achieved by training students to calculate step by step, to check results repeatedly, to pay attention to the checking of results, and to reduce their reliance on calculators.

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