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Analyze the Three Factors That Influence the Mathematics Performance of Junior Middle School Students

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Abstract

In the ordinary junior middle school, students learning motivation, learning attitude, and learning strategy on the basis of the questionnaire survey to the following conclusions: mathematics learning attitude, learning motivation, learning strategies for junior middle school students has a great influence on mathematics performance. The paper puts forward some measures to improve the mathematics performance of junior high school students.

1. The Research Background

Attaching importance to the cultivation of non-intellectual factors is the characteristic of modern education. Since the 1990s, we have explored the factors that affect students' mathematics performance, so as to help students to carry out effective mathematics learning and improve their math scores, which has become a research topic in mathematics education. In this context, the relationship among mathematical learning motivation, learning attitude and learning strategy and mathematical achievement has gradually become a hot topic in current research and has made some research achievements. [1]

The motivation of mathematical learning refers to the motivation to motivate and promote students to study mathematics and to achieve a certain goal of mathematics learning activities. Stimulating students' learning motivation should focus on both cognitive factors and emotional factors while stimulating students with external incentives.

Mathematics learning attitude is specific to mathematics learning attitude and is held by the student to study mathematics evaluation combined with the inherent tendency to reflect, that is, the fond of mathematics showed by students where they interested in, etc., affect the subject of mathematics to make love or alienated behavior choice. It specifically includes three components: cognitive level, emotional experience and behavioral tendency.

Mathematics learning strategies refer to a variety of programs that are intentionally and consciously adopted by students in order to improve the effectiveness and efficiency of math learning, including some specific methods of directly involved in information processing, as well as some cognitive methods to play a better role in some means of promoting the learning process of mathematics.

Throughout the literature, many studies are single factor or two factor studies, this paper will take math learning motivation, learning attitude and learning strategy three factors

together to explore their influence on the mathematics achievement of junior middle school students, so as to provide certain theoretical guidance for junior middle school mathematics teachers to improve their teaching, correctly guide the student to study and to develop students' potential and improve the junior high school students' mathematics achievement.

2. The Research Methods

2.1. The Research Object

There are three grades in NO. 23 junior high school in Heze city. We choose a normal class in each grade in the school, the effective testee were: 50 in grade one, 52 in grade two, and 50 in grade three.

2.2. Research Tools

(1) Learning motivation, learning attitude, learning strategy measurement questionnaire

Reference Peng Chaoying "learning strategy" and Tao Deqing "theory and the study of learning attitude" of the relevant part [2], combining Lai Changgui professor "test for the method of study of middle school students" scale and Zang Xianghong, Wang Xiaoyang "mathematics learning attitude measurement questionnaire", Cheng Ying "middle school students' mathematics learning motivation questionnaire", developed "the mathematics learning attitude, learning motivation, learning strategies questionnaire. The questionnaire is divided into three parts: mathematical learning motivation measurement questionnaire, mathematical learning attitude measurement questionnaire and mathematical learning strategy measurement questionnaire, which have 60 topics.

(2) Mathematical performance index

The math score of the end of the first semester of the 2016-2017 year is an indicator of personal mathematics performance. Total score is 100.

2.3. The Research Process

(1) Preparation of learning motivation, learning attitude, learning strategy measurement questionnaire

Learning motivation scale, a total of 16 items, total of 64 points. Learning motivation is divided into internal motivation and external motivation, and the internal motivation has four dimensions: curiosity, learning beliefs, values, the study tries to bring the pleasure of success; Extrinsic motivation consists

of two dimensions: the acquisition of praise and respect from others, and the promotion of employment.

The learning attitude scale was 19 questions, with a total score of 76. Learning attitude, there are seven dimensions: the understanding of the significance of mathematics learning, emotional experience, intellectual curiosity in learning, learning initiative performance, Knowledge of math scores, overcoming the difficulties of behavior, the behavior of the anti-jamming performance.

The learning strategy scale including 25 topics, total scores of 100 points. Learning strategies are divided into three dimensions: cognitive method, metacognition, resource management. Cognitive approach includes seven dimensions: retelling and memory, finish machining strategy, organization, preparation, taking notes, review, examination strategy; Metacognition includes three dimensions: planning strategy, monitoring strategy and self-adjustment strategy; Resource management includes time management strategy, learning environment management strategy, effort management strategy, and seeking support strategy and has 4 dimensions.

(2) Data collection

In each of the first and second and third grades, a teaching class is selected to carry out mathematical motivation, learning attitude and learning strategy measurement. With the help of the head teacher, the student's ideological work is done, stressing that the measurement has no effect on the students and demands that the students answer truthfully. The measurements were completed in 40 minutes.

(3) Analyzing measuring data

The collected questionnaires were collected, and the invalid questionnaires were excluded (1.97% of the total questionnaires), and the effective questionnaires were obtained in 149, including 50 in the first grade, 50 in the second grade and 49 in the third grade. In this experiment, spss20.0 statistical software was used for data recording and statistical analysis, and the main statistical methods were: correlation analysis, t-test and regression analysis. [3]

3. Research Results

3.1. Basic Situation of Mathematical Learning Motivation, Learning Attitude and Learning Strategy and Math Scores

(1) Basic situation of students use mathematical learning motivation, learning attitude and learning strategies. See table 1.

Table 1. Basic information of students' mathematical learning motivation, learning attitude and learning strategy.

Variable			Mean	Standard deviation	The average score of each question
Learning motivation	Intrinsic motivation	curiosity	6.04	1.89	3.02
		Learning beliefs	5.23	1.07	2.62
		values	4.78	2.56	1.59
	External motivation	Trying to be successful in your studies bring about the fun	6.06	1.98	2.02
		Getting compliments and respect from others	10.97	1.07	2.74
	Promotion and employment	4.97	1.66	2.48	

Variable		Mean	Standard deviation	The average score of each question
Learning attitude	Understanding of the purpose and significance of mathematical learning	4.49	1.41	2.24
	The emotional experience of learning	7.68	1.953	1.92
	Intellectual curiosity	6.33	1.820	2.11
	Learn initiative performance	10.06	2.491	2.51
	Knowledge of math scores	4.16	1.124	2.08
	The act of overcoming difficulties	4.54	1.289	2.27
	The behavior of anti-interference	3.08	0.907	1.54
The cognitive approach	Retelling and memory	8.69	1.349	2.89
	Finishing strategy	3.81	1.421	1.90
	Organizational strategy	3.37	1.195	1.68
	Preview	4.76	1.477	2.38
	Take notes	5.85	1.559	2.92
	Review	4.70	1.349	2.35
	Exam strategy	2.54	1.010	2.54
Learning strategy	Planning strategy	4.17	1.244	2.08
	Monitoring strategy	2.36	0.976	2.36
	Self-regulating strategy	1.52	0.801	1.52
	Time management strategy	2.00	0.879	2.00
Resource management	Learning environmental management strategy	5.35	1.688	2.67
	Effort management strategy	5.81	1.341	2.91
	Seek support strategy	3.76	1.152	1.88

(2) Analysis of mean and standard deviation of mathematics learning motivation, learning attitude, learning strategy and math scores. See table 2.

Table 2. Average and standard deviation of mathematical learning motivation, learning attitude, learning strategy, math scores.

Variable	The highest score	The lowest score	Mean	Standard deviation
Learning motivation	60	18	38.05	8.46
Learning attitude	72	34	40.34	7.83
Learning strategy	80	25	58.69	8.90
Math scores	96	36	56.67	19.68

The above two tables can be seen: the average score of the subjects was 38.05, the highest in curiosity and the lowest in values.

In the case of mathematics, the average score of the subjects was 40.34, which was a great difference from the highest score of 72 (out of 76), and the students generally scored lower. Of the seven subjects that constitute the study attitude of mathematics, the highest score was the performance of learning initiative, and the lowest was the behavior of anti-interference.

The average score of the subjects studied was 58.69. In each strategy of mathematics learning, Effort management strategy score was highest and the self-regulation strategy scored the

lowest.

The average score of the subjects was 56.67, not 60, and the standard deviation was 19.68. It shows that the polarization of academic achievement is serious.

3.2. The Influence of Mathematical Learning Motivation, Learning Attitude and Learning Strategy on Mathematics Achievement

(1) Predict mathematics performance from learning motivation, learning attitude and learning strategy. See table 3.

Table 3. Use regression analysis to predict the mathematics performance from learning motivation, learning attitude and learning strategy. (N=149).

Variables	R2	Adj. R2	R	F	b	t	P	Sr2
Overall model	0.524	0.512	0.724	23.487*				
Learning motivation					0.337*	3.356	0.000	0.13
Learning attitude					0.408	3.723	0.000	0.14
Learning strategy					0.506	5.432	0.000	0.23

*p<0.01

Table 3 shows how to predict the mathematics performance learning with multiple regression analysis from learning motivation, learning attitude and learning strategy. [4] The overall regression model to predict mathematics performance using learning motivation, learning attitude and learning strategy was statistically significant, $F = 23.487$, $p < 0.01$. For

this overall model, $R = 0.724$, $R^2 = 0.524$. In other words, when learning motivation, learning attitude and learning strategy are used as predictors, approximately 52.4% of the variance in mathematics performance could be explained.

Learning motivation was significantly predictive of mathematics performance when learning attitude and learning

strategy were statistically controlled: $t = 3.356, p=0.000$. The positive slope for learning motivation as a predictor of mathematics performance was 0.337 indicating that there was approximately a one-third of a point increase in mathematics performance for every increase of one in learning motivation. The correlation to determine the amount of variance in mathematics performance uniquely predictable from learning motivation was $sr^2 = 0.13$ meaning that learning motivation accounted for approximately 13% of the variance in learning motivation when learning attitude and learning strategy were statistically controlled.

Similarly, when learning motivation and learning strategy were statistically controlled, learning attitude significantly affected math scores, $t = 3.723, p=0.000$. When learning motivation and learning attitude were statistically controlled, learning strategies also significantly affected math scores.

(2) The correlation between the components of mathematical learning motivation and the achievement of mathematics. See table 4.

Table 4. Correlation between the components of mathematical learning motivation and the achievement of mathematics.

Variable	Math scores	
	r	p
curiosity	0.498**	0.000
Learning beliefs	0.389**	0.000
values	0.213**	0.000
Trying to be successful in your studies bring about the fun	0.462**	0.000
Getting compliments and respect from others	0.458**	0.000
Promotion and employment	0.346**	0.000

By table 4, curiosity, learning beliefs, values, striving for the pleasure of success in learning, gaining others' praise and respect, entering a higher school or Entrance employment are moderate positive correlation to the math scores. curiosity, trying to be successful in your studies bring about the fun, and earn others' praise and respect are higher correlation with academic performance Compared with learning beliefs, values, Promotion and employment.

(3) The correlation between the components of mathematics learning attitude and the scores of mathematics is shown in table 5.

Table 5. Correlation between the components of mathematics learning attitude and the performance of mathematics.

Variable	Math scores	
	r	p
Understanding of the purpose and significance of mathematical learning	0.236**	0.002
The emotional experience of learning	0.423**	0.00
Intellectual curiosity	0.421**	0.00
Learn initiative performance	0.556**	0.00
Knowledge of math scores	0.417**	0.00
The act of overcoming difficulties	0.430**	0.00
The behavior of anti-interference	0.421**	0.00

Table 5 shows that the emotional experience of a learning, intellectual curiosity, performance of learning initiative, knowledge of academic performance, to overcome the difficulties of behavior, the behavior of the anti-interference show moderate positive correlation to math scores; The understanding of the purpose and significance of mathematical learning is generally related to math scores.

(4) The influence of each component of mathematical learning strategy on mathematics performance is shown in table 6

Table 6. Correlation between the components of mathematics learning strategy and the performance of mathematics.

Variable	Math scores	
	r	p
Retelling and memory	0.067**	0.324
Finishing strategy	0.46**7	0.00
Organizational strategy	0.387**	0.00
Preview	0.372**	0.00
Take notes	0.256**	0.001
Review	0.466**	0.00
Exam strategy	-0.032	0.609
Planning strategy	0.532**	0.00
Monitoring strategy	0.311**	0.00
Self-regulating strategy	0.340**	0.00
Time management strategy	0.316**	0.00
Learning environmental management strategy	0.195*	0.014
Effort management strategy	0.297**	0.00
Seek support strategy	0.397**	0.00

From table 6 we find: planning strategy, finishing strategy, and review show moderate positive correlation to math scores, and organizational strategy, Preview, taking notes, monitoring, self-adjusting strategy, time management strategy, effort management strategy, seek support strategy are related to academic degree generally, and retelling and memory, test strategy and Learning environmental management strategy are not related to learning results.

3.3. The Difference of the Students' Learning Motivation, the Learning Attitude and the Learning Strategy Was Compared Between Excellent Group and Underachievement Group.

Making the student's average scores plus or minus one standard deviation as a standard, the student's result is divided into excellent group and underachievement group. Excellent group students have 28 people that their math scores are greater than + S. Some students' Math scores are Less than - S, these students belong to underachievement group, 25 people. The two groups of students were compared in mathematics learning motivation, learning attitude and learning strategy, and the average difference between the two groups was tested, as shown in table 7.

Table 7. Differences in learning motivation, learning attitude and learning strategies among different groups.

Variable	Learning motivation		Learning attitude		Learning strategy	
	Mean	Standard deviation	Mean	Standard deviation	Mean	Standard deviation
excellent group (28 people)	49.01	8.579	50.56	8.32	66.89	9.067
underachievement group (25 people)	36.04	7.234	37.60	7.031	51.35	5.99
T	0.532		0.552		6.873	
p	0.000		0.000		0.000	

It can be seen from table 7 that there are significant differences between excellent group and the underachievement group ($p < 0.0001$).

4. Conclusion

(1) Learning motivation, learning attitude and learning strategy have a great impact on the mathematics achievement of junior high school students.

(2) At present, the learning motivation, learning attitude and learning strategy of ordinary junior high school students are low, which should arouse our attention.

(3) The lack of learning motivation, learning attitude and learning strategy are one of the important reasons for the differentiation of mathematics achievement.

Therefore, in the mathematics teaching of ordinary junior middle school, it is imperative for students to have a systematic and effective learning motivation, learning attitude and learning strategy of education.

5. Proposal

By analyzing various factors that influence students' learning, teachers should take active and effective measures to improve students' mathematics learning level and develop students' potential for learning mathematics. [5][6]

(1) The teaching activity of mathematics teacher is a prerequisite for students to learn mathematics well.

In the course of mathematics teaching, teachers' daily teaching activities and their own personalities have an extremely important influence on the students' mind. Mathematics teacher's proper teaching method plays a positive role to cultivate students' interest in learning mathematics. In the study of education psychology, learning interest is explained: study interest is the emotional expression of students' cognitive needs, it is a kind of cognitive tendency with strong color that based on past knowledge and experience. Especially in the pleasant experience, learning interest is a certain kind of sense of the tendency that willing to be positive and lasting to contact, If students are interested in the subject of mathematics, they will take the initiative and enjoy the spirit of learning. It is also an effective driving force to promote students to learn.[7]

(2) Teachers' caring, love and encouragement can enhance students' confidence in mathematics.

Teaching behavior is the process of the interaction between teachers and students, which cannot be carried out normally on one side. Only teaching and learning cooperate with each other the best teaching effect can be played. If students' mathematics result is not ideal, the teacher should not attack

them, criticize them too much, and should give them more concern and care. Students need to be understood and accepted, even if teachers give a little bit of concern and encouragement to them, it is likely to produce a great motivation for them. So, mathematics teachers should inspire students who have difficulties on study to overcome. Even if students have a little progress, teachers should give them encouragement and praise, so that they can experience the fun of learning mathematics from the heart and enhance the self-confidence on learning math.

(3) We can carry out the mathematics learning contest in a moderate way to cultivate students' enthusiasm for learning, and stimulate students' thirst for knowledge.

Competition can motivate a person's morale, especially the outstanding person who can gain a sense of achievement in the competition. Therefore, it is helpful to cultivate students' confidence and determination on overcoming difficulties in the process of learning mathematics. But at the same time, there are some negative effects, for example, students prone to generate the feelings of pride and discouragement as the result of the competition. Teachers should guide students correctly after the competition, and encourage students to achieve self-transcendence.[8]

(4) Mathematics teachers should be good at discovering and training mathematical talents in teaching process.

There are some students who have quick thinking and unique ways to solve problems, and have perseverance in the face of learning difficulties, the mathematics teacher should arouse enough attention and focus on cultivation for such students.[9]

(5) Accurate learning method, good study habits.

It include planning, pre-class self-study, focus on class, timely review, finishing homework independently, solving difficult problems, system summary and extracurricular study. Making a plan that makes the purpose of study clear and time arrangement reasonable. It is an intrinsic motivation for students to actively learn and overcome difficulties. Before class, self-study is the basis for students to get better learning results, it not only can cultivate self-study ability, but also can improve the interest of learning new courses, and master the learning initiative. Class is the key to understanding and mastering basic knowledge, basic skills and basic methods. The students who have taught themselves before class are more attentive to their lectures. They know where to look and where to study, what place should be carved, where the place can be passed, the worthy notes are written down rather than all copy that may attend to gain one thing and lose another. Timely review is one of the most important aspects of the efficient learning. Through repeated readings, consult the relevant information, understanding of the basic concept of

knowledge and memory can be strengthened that combine the new knowledge with the old knowledge. Independent homework is a process for students to think independently, analyze problems and solve problems flexibly, and further deepen their understanding of new knowledge and mastery of new skills, which is a test of the students' will perseverance. Solving difficult problems refers to the process that solutions unimpeded by enlightening the students' ideas when exposed to mistakes of knowledge understanding in the process of completing the work independently, or making up for the missing solutions when miss the answer because of blocked thoughts. The system summary is an important link in the students' ability to grasp knowledge and develop knowledge through positive thinking. Extracurricular learning includes reading extracurricular books and newspapers, taking part in discipline competitions and lectures, visiting senior students or communicating with teachers. Extra-curricular study is the complement and continuation of the study in the class.

(6) Step by step to prevent impatience.

Because of the younger age and limited experience, a number of junior middle school students are easily irritable. Some students are greedy for swallowing study, some students want to rely on a few days "sprint" overnight and some students are complacent with a little success, or feel frustrated at setbacks. In view of these circumstances, teachers should let students know learning is a long-term process of consolidating old knowledge and the accumulation of finding new knowledge. One important reason for many excellent students achieved good scores is that their basic skill is solid, and their reading, writing and arithmetic skills proficiency have achieved the automation or half automation.

(7) Study the characteristics of the subject and find the best learning method.

Mathematics is characterized by a high degree of abstraction, logical rigor and wide applicability, and high ability requirements. Learning mathematics must pay attention to "live". It is impossible to read only without practices, and it either doesn't work if you keep your head down to practices without summaries. Students should be able to drill in the textbook knowledge and also be able to jump out, combining with their own characteristics to find the best way for themselves to learn. It is the learning process of "thin to thick" and "thick to thin" advocated by Mr. Hua Luogeng.

(8) Strengthen the guidance, resolve the differentiation point.

For the place where mathematics is easy to differentiate, teachers should take many repetitions to strengthen the counseling, open seminar, guide the reading of reference books, let students discuss a debate for a mistake, fully display their thinking process, and improve their appreciation ability through the variant practice that in order to achieve the purpose of mastering and using knowledge.[10]

To sum up, mathematics learning is a complex dynamic process. Society, parents and school should shoulder their own responsibility to guide students to form correct learning motivation, learning attitude, learning strategies to improve the all-round development of students, thus improve the math

scores.

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Mathematics education psychology

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