International Journal of Research Studies in Education
2024 Volume 13 Number 3, 77-86

Chinese middle school student's interest and attitude in mathematics

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Received: 5 January 2024 **Revised**: 1 February 2024 **Accepted**: 10 February 2024
Available Online: 2 March 2024 **DOI**: 10.5861/ijrse.2024.24607

ISSN: 2243-7703
Online ISSN: 2243-7711

OPEN ACCESS

Abstract

Interest is the best teacher for everyone. Learning interest will directly affect students' attitude towards learning, which is an important factor to promote students to think actively and improve their learning efficiency. Junior high school mathematics as a strong logical subject, its complexity and abstractness, is easy to make students feel bored, so the teaching should cultivate students' interest in learning. The paper determined the interaction and influence between interest and attitude and analyzed the important role of cultivating students' interest in mathematics in junior high school. The influence of students' interest in and attitude towards mathematics learning has always been a common problem. Hence, this study assessed, through a survey questionnaire, the interests and attitudes of Chinese students to help them learn mathematics better. Overall, the findings suggest that students' attitudes towards math interests and mathematics were generally positive.

Keywords: mathematics learning, attitude, interest, Chinese students

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1. Introduction

Mathematics is a field of knowledge used to train humans in logical thinking and systematization in solving problems and making decisions. The essence of mathematics is to promote meaningful and challenging learning, which is one of the areas of education emphasized by the Chinese Ministry of Education in developing human capital. Therefore, the Ministry of Education regards mathematics as one of the course subjects that each student must learn in the school education stage. Moreover, mathematics is required in education and is also widely used. However, students remain weak in math (Rylands & Coady, 2009). According to previous research, there are many factors affecting these problems, including the interest in learning mathematics, attitude, learning habits, motivation, teacher teaching or lecturer, learning style, environment, and attention to mathematics learning and other factors.

Interest is one of the relevant factors in middle school education. Many students may consistently fall behind standards in math, lose interest in math, and eventually give up learning math. If students are not interested in mathematics, they will pay less attention to the subject. According to the literature, students who fail to perform well in school mathematics exams do so because some basic skills in mathematics are weak, and as a result, their interest in mathematics decreases (Barkatsas, 2012). Several studies had been conducted in different countries to determine the factors that could influence the students' performance in mathematics. Of all the factors that could be studied, students' attitudes towards mathematics had been consistently studied because much research found a positive relationship between attitudes and students' performance (Hemmings, et al. 2018; Heinze, et al. 2005). Generally, the positive perceptions of students in learning mathematics could help develop a positive attitude towards the subject, which will, in turn, lead to better performance. In contrast, the negative perceptions of students towards the subject will also contribute to their low performance in the subject (Fitrianti & Riyana, 2020).

On the other hand, attitudinal factor is another factor that affects students' performance in mathematics in junior secondary education. In a study conducted by (Azina & Halimah, 2012), they found that students' attitudes have a significant positive effect on students' performance in mathematics. Abu and Eu (2017) in their study stated that students' attitudes towards mathematics are very important. If students have an indifferent attitude towards the subject of mathematics, it will indirectly affect their performance. The questionnaire survey and the analysis of related data are used to understand students' interest and attitude towards mathematics to find out the specific reasons for the decline in interest. By analyzing the causes of the problem from the students themselves, their families, and their schools, the study explored new teaching methods, including those that place more emphasis on exploratory learning, practical application, and the development of mathematical thinking, in order to increase students' interest.

At the same time, it strengthens students' use of mathematics in real life, applies what they have learned to their lives, and changes their attitudes toward learning mathematics. Through these studies, the root causes of the problems were better understood, and evidence-based recommendations can be provided to improve Chinese students' interest and attitudes in learning mathematics. This also helped to build a more comprehensive, balanced, and beneficial education system and provide teachers with practical guidelines for teaching and learning to develop better mathematical literacy and interest among students. Therefore, the researcher conducted this study to assess the interest and attitude of middle school students towards learning. The researcher endeavored to determine the students' mental activities in the process of learning mathematics. In this way, the vision of the school to provide quality education with a more holistic approach can be realized without compromising the academic performance of the students. Further, the motivation of students to learn mathematics is fundamentally enhanced without compromising other aspects of their development.

1.1 Objectives of the study

This study assessed the interests and attitudes of junior high school students in mathematics in a public state in Anshan City, China, and used them as the basis for a mathematics achievement improvement program. Specifically, it described the profile of the respondents in terms of sex and grade level; determined the middle school students' interest in learning mathematics, including study habits in mathematics, self-confidence of the respondents in mathematics, and value of mathematics; identified student attitudes demonstrated in math learning including Mathematics academic self-concept, enjoyment of Mathematics, and perceived value of mathematics; tested the difference of responses on the interest and attitude of the students in mathematics class when they are grouped according profile; tested the significant relationship between interest in Mathematics Learning and attitude in Mathematics Learning; and proposed a plan of action on the basis of the findings of the study.

2. Methods

The study was conducted as a descriptive quantitative survey design using questionnaire, which was the most suitable approach to gather accurate information of a population (Woo et al., 2017). According to literature, the purpose of the descriptive review is to obtain a measure or description of the condition or characteristics of the population (Yokoe *et* al., 2017). The respondents of the study were randomly selected 300 students suggested by the Raosoft calculator from the first through third year of a junior high school located in Anshan City, China. This study utilized the "Questionnaire Star" platform to distribute electronic questionnaires via the Internet. The questionnaires were mainly distributed to the students of Huanghuadian Middle School in Xiuyan Manchu Autonomous County. Under the guidance of the statistics adviser of the LPU graduate school, this study distributed 320 questionnaires and recovered 300, Valid questionnaires, with a recovery rate of 93.75%.

The researchers used standardized questionnaires and were adapted from different researches. The questionnaire was divided into three parts, The first section introduces the gender and grade of the middle school students. The questionnaire was adapted from the research article entitled Attitudes, Study Habits, and Academic Performance of Junior High School Students in Mathematics by Capuno R (2019). The questionnaire consists of two items on student attributes. The questionnaire has been repeatedly applied and validated and has been found to have good reliability. Part 2 was about the middle school students' interest in learning mathematics and it was adapted from Student interest and engagement in mathematics after the first year of secondary education by Ryan, (2022). The scale has 22 items and consists of three dimensions, study habits, self-confidence, and value of Mathematics. Part 3 was about Student Attitudes demonstrated in math learning and it was adapted from association of interest, attitude and learning habits in mathematics learning towards enhancing students' achievement by Hashim, et al. (2021). The 20 items represent the three subscales of Academic Self-Concept, Enjoyment, and Perceived Value.

Data analysis indicated that among the seven (7) items for the interest factor listed, there were five (5) items which recorded mean score with high level and two (2) other items recorded mean score for medium level. Among the five (5) items that have recorded a min score for the high level, item 4 has recorded a mean score of 4.66 which is the highest level of the mean. This item shows that the respondents were satisfied when they can answer Mathematics questions properly. The means score for all items of the interest factor is 3.95 (SD=0.85), at a high level. It indicates that students are showing their interest in Mathematics learning.

The usual index for evaluating reliability is the Cronbach's alpha coefficient developed for Likert scales. The higher the coefficient, the higher the degree of internal consistency, and thus the better the reliability of the scale. The Reliability Results show the composite Cronbach alpha of study habits in mathematics，self-confidence of the respondents in mathematics，value of mathematics as perceived by the respondents，mathematics academic self-concept，enjoyment of mathematics and perceived value of mathematics. The value of the reliability coefficients ranges from 0 to 1.0 and the alpha values of the six dimensions were 0.883, 0.962 ,

0.940,0.857,0.959,0.966 and 0.726 respectively. The Cronbach alpha of Study Habits in Mathematics was greater than 0.8, which indicates that the scale is good. In terms of self-confidence of the respondents in mathematics, value of mathematics as perceived by the respondents, mathematics academic self-concept and enjoyment of mathematics, the result was greater than 0.9, and all marked excellent. The Cronbach alpha of Perceived Value of Mathematics was greater than 0.7, which indicates that the scale is acceptable. Accordingly, it indicates that the questionnaire has good internal consistency and is suitable for research analysis.

The researcher created a standardized questionnaire that was easy for middle school students to answer. The questionnaire was submitted to the research consultant for comments and forwarded to the statistician for reliability testing to check suitability for the study. After obtaining approval, the researcher started distributing and collecting the questionnaire. Firstly, communication with all classroom teachers in the secondary school was carried out first, and full communication with students of all grades was carried out through the parents' WeChat group, explaining the purpose and significance of the study, and requesting their support to mobilize the cooperation of students of all grades to fill out the questionnaires conscientiously. Secondly, with the help of Questionnaire Star platform, the researchers created the questionnaire and generated web links to fill in the questionnaire. In order to test the reliability and validity of the questionnaire, the authors first sent 30 questionnaires, and the results showed that the reliability and validity of the questionnaire was qualified. Then, a large-scale questionnaire was distributed to selected grades in the form of a WeChat. Finally, using the data collection function of Questionnaire Star platform, all the data were exported in the form of EXCEL sheet and checked to ensure the accuracy.

To ensure the validity of the questionnaire, the researcher screened it according to the following principles. First, the time to complete a valid questionnaire was set at no less than 100 seconds. If the completion time was less than the valid response time, the completed questionnaire would be determined to be invalid. Secondly, if a respondent completed the questionnaire more than once, the first questionnaire was valid and subsequent questionnaires were invalid. Finally, 300 valid questionnaires were collected and analyzed for the study. The data from the survey were analyzed using quantitative methods. Descriptive statistics, such as mean and percentage, was used to delineate how students view the subject of mathematics, the perception of their interest and attitude in mathematics, and a deep inquiry of the relationship between the two. The result of Shapiro-Wilk Test revealed that p-values of six major variables were less than 0.05 which meant that the data set was not normally distributed. Therefore, Mann-Whitney U test for two groups and Kruskal Wallis test for the three groups were used as part of the non- parametric tests to determine the significant differences. Likewise, Spearman rho was used to test the significant relationship between study habits in mathematics, self-confidence of the respondents in mathematics as perceived by the respondents, mathematics academic self-concept, enjoyment of mathematics and perceived value of mathematics. The following Likert Scale was used in assessing the variables: 3.50-4.00-Strongly Agree; 2.50-3.49-Agree; 1.50-2.49-Disagree; and 1.00-1.49- Strongly Disagree. In addition, all data were treated using a statistical software known as SPSS version 26 to further interpret the result of the study using an alpha level of 0.05.

The ethical considerations of this research were centered on three basic ethical principles: respect for participants, beneficence or welfare of the participant, and justice. Informed consent was also a key component of the process. Moreover, operationalizing the research process occurred within the norms and mores of established ethical codes in academia. Once the research report was finalized, respondents and other stakeholders were free to access it. Throughout the research process, respect and dignity were maintained for the autonomy of the participant, and for the basic rights of each individual. Informed consent from the research participants was obtained, noting the limitations of this process. Meanwhile, the researcher also required that the use of the scale must solicit the consent of the author.

3. Results and discussion

Table 1 shows the distribution of the respondents, 300 of whom were from the same school, including both

male and female students. The table shows the sex and grade level of the respondents. As for the age of the respondents, most of them belonged to the age of 13 years in the first grade, 14 years in the second grade and 15 years in the third grade.

Table 1

Percentage Distribution of the Respondents Profile

Sex	Frequency	Percentage %
Male	155	51.7
Female	145	48.3
Grade		
Junior one	100	33.3
Junior two	100	33.3
Junior three	100	33.3

The above data show that there are now more male students in junior high schools in China, probably because the school is located in a township and the parents of the students have a preference for male children, but the problem is not very serious. The difference in gender between men and women is also related to the education of the students' parents. By 2030, the proportion of China's urban population will continue to rise, while the proportion of male population will slowly decline. In the future, China's demographic structure will accelerate (Ke et al. 2023)), while the ratio of male to female students will continue to change. Overall, the respondents were distributed across all characteristics, and the sample was characteristic and representative, which was in line with the survey conception of this paper's study and can make the survey research structure somewhat generalized.

Table 2

Summary Table on Students' Interest in Learning Mathematics

Indicators	Weighted Mean	Verbal Interpretation	Rank
Study Habits	3.18	Agree	3
Self-confidence	3.23	Agree	2
Value of Mathematics	3.28	Agree	1
Composite Mean	3.23	Agree	

Table 2 illustrates respondents ' Interest in Learning Mathematics, with a composite mean of 3.23, indicating that students agree with the above indicators. The mean of items is distributed between 3.18 and 3.28, while the overall mean lies between the means of the three items. Among the items presented, value of Mathematics received the highest weighted average score of 3.28 while Self-confidence received the second rank with a weighted average score of 3.23. Finally, the lowest weighted mean score was given to Study Habits.

There may be several reasons why students focus on the value of mathematics. Mathematics is a fundamental subject that is important not only in academic studies but also plays a vital role in real life. Mathematical knowledge can help students in logical reasoning and problem solving and improve their ability to solve real-life problems. Mathematics is a language that helps students to better express and communicate ideas. The accurate use of mathematical terms and symbols enables students to express themselves more precisely and to better understand and explain complex phenomena and concepts. It also develops students' logical thinking and analytical skills. Learning mathematics involves thinking processes such as abstraction, reasoning, and deduction, which develop students' logical thinking and analytical skills, and cultivate their logical thinking habits. Mathematics is the foundation of other subjects. Many disciplines, such as physics, chemistry, economics and others, rely on the basic concepts and methods of mathematics. With a good foundation in mathematics, it will be easier for students to understand and apply relevant mathematical knowledge in other subjects. Mathematics has a role in intellectual development and learning mathematics requires a lot of thinking activities, which can exercise students' intelligence and thinking ability, and improve their learning and problem-solving ability. At the same time, mathematics can also stimulate students' creativity and innovative thinking.

Students care about the importance of self-efficacy in math because it has a profound effect on their learning and development. Self-confidence in mathematics has a significant impact on students' academic performance. Some studies have shown that students with low self-efficacy in mathematics may feel confused and frustrated in solving mathematical problems, which may limit their learning and performance. On the contrary, students with self-confidence are more inclined to be motivated to learn mathematics and are more likely to achieve good grades. Self-confidence in mathematics also has an impact on students' attitudes towards learning. The level of students' self-confidence may affect their attitudes and interest in learning mathematics. Students with self-efficacy are more likely to be motivated to participate in math learning activities, to be willing to face challenges, and to try to solve problems. In contrast, students who lack self-confidence may be resistant to learning mathematics and are more likely to give up or avoid mathematics-related tasks. Self-confidence in mathematics is also closely related to students' mental health. Lack of self-efficacy may lead to increased anxiety, stress, and negative self-esteem among students. This psychological stress may affect students' learning outcomes and self-development. On the contrary, students with self-efficacy in mathematics are more likely to have a positive psychological state, reduce learning stress, and be more willing to take on challenges and try out new mathematical concepts. Self-confidence in mathematics may also have an impact on students' career choices. Students with self-confidence in mathematics are more likely to choose math-related career paths in fields such as math, science, and engineering. Conversely, students who lack self-efficacy in math may avoid math-related careers, thus limiting their future career development and opportunities.

There may be several reasons why students value the development of math study habits. Students understand that Mathematics as a basic subject has an important impact on their future academic development. They realize that the development of mathematics study habits can help them better master mathematics knowledge and lay a solid foundation for further study. Students understand that good math study habits can improve their learning effectiveness. By cultivating good study habits, they can understand and apply mathematical knowledge more effectively and improve their problem-solving and mathematical thinking skills. Learning mathematics requires greater patience and perseverance. By developing math study habits, students can develop their self-discipline and perseverance and learn to face difficulties and challenges. Mathematics is a subject closely related to reality, and good math study habits can develop students' ability to analyze and solve practical problems. By attaching importance to the cultivation of math study habits, students can better apply their mathematical knowledge to solve problems in real life. To cultivate students' attention to math learning habits, schools and teachers can take different measures. Schools can provide good mathematics learning resources and facilities, such as mathematics libraries and mathematics laboratories, to create a good learning environment for students. Teachers can stimulate students' interest in mathematics through rich and varied teaching techniques and demonstrations. They feel the fun and application of math in learning. Teachers can guide students to develop good study habits, including making study plans, reserving time for math practice and review every day, and thinking independently about problems. Through regular feedback and supervision, students are helped to develop the qualities of persistence and self-discipline. Mathematics learning can be carried out through cooperative learning. Students are encouraged to cooperate, communicate and discuss with each other to develop their teamwork and communication skills. This not only helps students learn from each other, but also increases their interest in and attention to math learning.

Table 3

Summary Table on Student Attitudes demonstrated in Mathematics Learning

Indicators	Weighted Mean	Verbal Interpretation	Rank
Academic self-concept	3.28	Agree	1
Enjoyment	3.26	Agree	2
Perceived Value	3.25	Agree	3
Composite Mean	3.26	Agree	

Legend: 3.50 – 4.00 = Strongly Agree; 2.50 – 3.49 = Agree; 1.50 – 2.49 = Disagree; 1.00 - 1.49 = Strongly Disagree

Table 3 presents a summary table on Student Attitudes demonstrated in Mathematics Learning .The composite mean is 3.26, which means that students agree with the above indicators. Of these three items,

academic self-concept scored the highest, with a weighted mean of 3.28; perceived value scored the lowest, with a weighted mean of 3.25; and enjoyment scored in the middle, with a weighted mean of 3.26. Students' academic self-concept in mathematics refers to students' perceptions of their abilities and values in mathematics. It involves students' evaluation of their level of confidence in learning mathematics, their recognition of their mathematical abilities, and their interest and motivation in learning mathematics Mathematical enjoyment refers to the pleasure and satisfaction that students experience in the process of learning mathematics and solving problems. It includes feelings of curiosity about mathematical problems, pleasure in solving problems, and enjoyment of mathematical reasoning and exploration.

Sense of mathematical value is students' perception and evaluation of the meaning and importance of mathematical learning. It includes considerations of the perceived usefulness of mathematical knowledge and skills for solving real-world problems, the perceived importance of mathematical learning for personal development and future careers, and the assessment of the value of connecting and integrating mathematical learning with other disciplines. These three dimensions are interrelated and together influence student learning and achievement in mathematics. Academic self-concept is critical to mathematics learning because students' self-perceptions directly affect their performance and effort in mathematics learning. If students have a positive academic self-concept, they will believe that they are capable of learning mathematics and will be more willing to invest time and effort in learning mathematics, leading to better performance.

Math enjoyment, on the other hand, promotes students' motivation and enthusiasm for learning. If students can experience enjoyment and a sense of achievement in mathematics learning, they will be more active in participating in learning activities and maintain a sustained interest in mathematics, thus improving their motivation and the quality of mathematics learning. A sense of value in mathematics, on the other hand, promotes students' attention and commitment to mathematics learning. If students recognize the importance of mathematical knowledge and skills for their future development and careers, they will be more motivated to learn mathematics and realize that mathematics learning is about acquiring a wider range of knowledge and skills to cope with future challenges and demands. Therefore, it is a very important task to develop students' positive academic self-concept and to enhance their enjoyment of mathematics and their sense of mathematical value. Teachers can facilitate students' development in these three areas by providing positive feedback and encouragement, creating interesting and challenging learning environments for students, and demonstrating the application and importance of mathematical knowledge and skills to real-world problems. At the same time, students themselves can develop a positive mindset and try to find fun and meaning in their mathematics learning to enhance their own mathematics learning.

Table 4

Difference of Responses on students' interest in learning mathematics When Grouped According to Profile

Sex	F-value	p-value	Interpretation
Study Habits	0.738	0.391	Not Significant
Self-confidence	0.137	0.712	Not Significant
Value of Mathematics	0.026	0.873	Not Significant
Grade			
Study Habits	5.801	0.003	Significant
Self-confidence	6.912	0.001	Significant
Value of Mathematics	6.295	0.002	Significant

Legend: Significant at p-value < 0.05

Table displays the comparison of responses on students' interest in learning mathematics when grouped according to profile. It was observed that there was significant difference when grouped according to grade since the computed p-values were less than the alpha level. This means that the responses vary statistically and based on the post hoc test conducted, it was found out that junior one has better assessment than others. This result shows that first year students have a higher interest in learning mathematics compared to students in other grades. This may be due to the fact that first year students are fresher and more curious as well as more motivated and enthusiastic to learn mathematics. This may be related to the fact that they have just entered secondary school

and are beginning to be exposed to more advanced mathematical knowledge and skills. However, this result is only an observation that first year students are higher in their interest in learning mathematics and does not mean that students in other grades are not interested in learning mathematics. This is because the influence of other factors can also be considered, such as the size of the sample, differences in social background, and so on. In addition, this result also reminds that teachers may need to pay attention to students' interest in learning mathematics in other grades in order to understand their needs and challenges and take appropriate measures to stimulate their interest and motivation.

In summary, based on the data in the table and the results of the post hoc test, first-year students rated their interest in learning math better than students in other grades. However, teachers need to pay attention to the limitations of the results and further study the influence of other factors on students' interest in learning mathematics.

Table 5

Difference of responses on student attitudes demonstrated in mathematics learning when according to profile

Sex	F-value	p-value	Interpretation
Academic self-concept	0.005	0.941	Not Significant
Enjoyment	0.162	0.688	Not Significant
Perceived Value	0.000	0.986	Not Significant
Grade			
Academic self-concept	3.745	0.025	Significant
Enjoyment	6.675	0.001	Significant
Perceived Value	4.710	0.010	Significant

Legend: Significant at p-value < 0.05

The table illustrates the comparison of responses on student attitudes demonstrated in Mathematics learning when grouped according to profile. It was observed that there was significant difference when grouped according to grade since the computed p-values were less than the alpha level. This means that the responses vary statistically and based on the post hoc test conducted, it was found out that junior one has better assessment than others. Based on the information provided, it was shown that group comparisons were made on the attitudes displayed by the students in learning mathematics and significant differences were found when grouped by grade. This implies that there is a statistical difference in the responses of the students and based on the post hoc test conducted, it was found that the first-year students were rated better than the other students.

This result suggests that first year students show more positive and active attitudes towards learning mathematics compared to students in other grades. They may be more eager to learn mathematics, hold more positive attitudes and conceptions about mathematics learning, and are willing to actively participate in mathematics learning activities. This may be related to the fact that first year students have just started their secondary school learning stage and they are enthusiastic and motivated about new subjects and new challenges. However, it is to be noted that this result is only an observation that first year students are better in terms of their attitudes towards mathematics learning, it does not mean that students in other grades do not have positive attitudes. This is because the influence of other factors may also be considered, such as the size of the sample, the quality of teaching and learning, and family background. In addition, this result also reminds teachers to pay attention to students' attitudes towards learning mathematics in other grades to understand the challenges and problems they may face and take appropriate measures to improve their attitudes and motivation.

In conclusion, according to the data in the table and the results of the post hoc test, the first-year students showed a better evaluation of their attitudes towards mathematics learning than the other grades. However, teachers need to be aware of the limitations of the results and further investigate the effects of other factors on students' attitudes towards mathematics learning.

Table 6

Relationship between students' interest in learning mathematics and student attitudes demonstrated

Study Habits	r-value	p-value	Interpretation
Academic self-concept	.775**	0.000	Highly Significant
Enjoyment	.756**	0.000	Highly Significant
Perceived Value	.751**	0.000	Highly Significant
Self-confidence			
Academic self-concept	.783**	0.000	Highly Significant
Enjoyment	.813**	0.000	Highly Significant
Perceived Value	.745**	0.000	Highly Significant
Value of Mathematics			
Academic self-concept	.729**	0.000	Highly Significant
Enjoyment	.791**	0.000	Highly Significant
Perceived Value	.806**	0.000	Highly Significant

Legend: Significant at p-value < 0.01

Table presents the association between students' interest in learning Mathematics and Student Attitudes demonstrated in Mathematics Learning. The computed r-values indicate a strong direct correlation, and the resulted p-values were all less than the alpha level. This means that there was significant relationship exists and implies that the more positive the interest, the better are the students' attitude in mathematics learning. Specifically, students are more likely to have a higher interest in learning mathematics when they show a more positive attitude towards learning mathematics. Conversely, students who lacked interest in math learning were likely to exhibit more negative attitudes. This result is important for educators and educational policy makers because they indicate that fostering students' interest in mathematics learning is an important strategy in improving their attitudes toward mathematics learning. When students are interested in learning mathematics, they are more likely to display positive attitudes, engage in mathematics learning, and achieve better results. Therefore, teachers can use teaching strategies that stimulate students' interest in math, such as introducing practical applications, exploratory learning, and providing interesting problems and challenges. Meanwhile, through positive affirmation and recognition, teachers can develop students' self-confidence and positive attitudes towards learning mathematics.

4. Conclusions and recommendations

Majority of the respondents are male, with equal number of junior one to junior three students. At the junior high school level, students' interest in mathematics is generally higher and they were eager to explore and learn new knowledge. Middle school students' attitudes toward learning mathematics are more positive particularly on academic self-concept. Gender differences are also an important factor affecting students' interest in and attitudes toward mathematics. Boys usually show higher interest and positive attitudes in mathematics, while girls may have relatively lower interest and attitudes in mathematics. There is a significant correlation between the two individual variables, indicating that the higher the interest shown by the students in mathematics, the better the students' attitudes towards mathematics.

School policymakers may help teachers adapt instructional strategies and curriculum design to promote the development of students' interest in learning about mathematics. Teachers may strive to enhance students' motivation and interest in learning. They may also encourage students to participate in interesting mathematical activities, provide diversified learning resources and teaching methods, and improve the teaching and learning environment. Chinese junior high school students may need to strengthen their own understanding of the importance of mathematics and improve their positive attitudes towards a good willingness to learn mathematics. Future researchers may examine other variables related to mathematics learning which could include the relationship between mathematics anxiety and mathematics learning, mathematics knowledge memory and memory strategies, mathematics thinking patterns, the relationship between mathematics and emotion, and many other aspects that need to be further explored and analyzed.

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