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Investigation and Research of Middle School Mathematics Education

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***Abstract* – Let the mathematics culture enter the middle school mathematics teaching and the students experience the mathematics culture while learning mathematics. Help them master the way and spirit of mathematics, so as to realize the education function of the mathematics culture and improve the comprehensive quality of the students, and truly realize the mathematics that benefits for life. That is the problem current mathematics culture education must focus on .Through the investigation, we find that there are some problems in the current mathematics culture education, and the corresponding solutions are: to strengthen the teachers' mathematics culture literacy; to make full use of the mathematics culture and pay attention to the teaching of mathematics thought and method; to properly carry out the second classroom activities of mathematics culture.**

***Keywords* – Mathematics Culture, Mathematical Thinking Method, Cultural Value.**

I. Introduction

"Compulsory Education Mathematics Curriculum Standards (2011 edition)" proposed that "Mathematics is an important part of human culture"; Mathematics culture, as an integral part of teaching materials, should be permeated in the whole teaching material". The basic idea of the course is "everyone can get good mathematics education, different people get different development in mathematics": Curriculum resources development and utilization suggest that schools should make full use of the history of mathematics and the classic stories of mathematicians, as well as the links between mathematics and other disciplines, to broaden students' horizons. In the basic idea of the curriculum proposed in the Standards for Mathematics Curriculum (Experiments) of General Senior High School, it is clearly put forward that mathematics teaching should "embody the cultural value of mathematics.": It advocates increasing the teaching of mathematical culture and even setting up selected lectures on mathematical history so that students can feel the important role of mathematics in the development of human civilization while learning mathematics. Cultivate students' rational spirit of mathematics and enjoy the beauty of mathematics. [1] However, the current educational teaching emphasizes the screening and selection function of examinations too much, therefore, most of the teaching resources are "serving for examinations" rather than for the development of students: The teacher's own teaching concept also tend to be biased towards the concept of exam-oriented education. They often hold an opinion that mathematics and culture education is only superficially lively, and it is actually a waste of time; In terms of teachers' mathematical and cultural literacy, many teachers mistakenly believe that mathematics culture education is to tell mathematics stories or introduce mathematics history. This misunderstanding has made the practice of mathematics culture education too one-sided [2]. As Wenbin Xu mentioned in his article "On Mathematics Learning from the Perspective of Mathematics Culture".

II. Survey on the Current Situation of Mathematics Culture Education in Middle Schools

A. *Implementation of the Investigation*

During the internship, a questionnaire survey was conducted in Yanji middle school. We randomly selected students of different grades from a middle school in Yanji City. The sample size was 160. A total of 160 questionnaires were distributed and 160 were recovered, with a recovery rate of 100%.; 148 valid questionnaires, the effective rate was 92.5%. The questionnaire for teachers was issued 60, covering different levels of mathematics teachers at different levels. 57 Samples were recovered with a recovery rate of 95%; 54 valid questionnaires with an effective rate of 94.7%.。

B. *Survey data processing and Analysis*

1）The teacher part

The questionnaire design of teachers' understanding of mathematics culture education is divided into two parts, the basic situation and the questionnaire part. The questionnaire part mainly carries on the problem design from the internal and external factors: the internal factors mainly refer to the teacher's teaching philosophy and mathematical cultural literacy; the external factors mainly refer to the teaching environment and teaching materials.

From the statistical results of the basic situation, it can be known that more than 90% of the mathematics teachers who participated in the survey are undergraduate and bachelor degree or above; In terms of professional titles, more than 80% have first-level and senior professional titles; in terms of teaching time, more than 80% of teachers have more than 10 years of teaching experience. From the above data, it can be said that the ability, quality and experience of teachers are superior. In the field investigation, it was learned that almost all mathematics teachers could actively participated in teaching and research activities. This fact shows that Yanji City's middle school mathematics teaching research activities have been carried out quite effectively, which is conducive to improving the quality of mathematics teaching.

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Graphics (1) Part of the teacher's teaching idea (%)

title \Option (%)	meaning of conforming	Very consistent	More	general very consistent
Understanding mathematics culture	11.11	33.33	22.22	33.34
understand the new curriculum requirement for mathematicculture.	12.96	42.59	22.22	22.23
Mathematical culture learning should be added in teaching	79.63	14.81	5.56	0.00
Mathematical culture helps mathematics teaching	46.30	33.33	12.96	7.4
Mathematics culture can arouse students' enthusiasm.	50.00	31.48	12.96	5.56
Mathematics culture has a positive impact on students' emotional attitude and values	37.04	46.30	16.67	0.00
Enrich classroom with mathematical culture	42.59	33.33	16.67	7.84
Improving teaching skills with mathematical culture	37.04	46.30	9.26	0.00
Inform students exactly how to use mathematical thinking.	48.15	25.93	0.00	0.00
Infiltrating mathematics history, mathematics thought, etc.	50.00	24.07	14.81	0.00

The statistical results of the questionnaire section are shown in Figure 1. According to the questions in Sections 1-6 of the questionnaire, most of the current teachers are no strangers to the concept of mathematical culture, viewing mathematics as a discipline no more, but as a culture. Although there are still a small number of mathematics teachers with old teaching concepts, the requirements for mathematics culture and new curriculum standards on mathematics culture are not thoroughly understood, however, more than 90% of teachers believe that mathematics teaching should reflect the cultural value of mathematics, and should add the part of mathematics culture teaching. Therefore, it can be seen that the mathematical culture has penetrated into the teaching concept of front-line mathematics teachers. According to the 7-9 questions in the questionnaire, it can be found that about 80% of the teachers believe that the teaching of mathematics culture is conducive to the actual teaching activities, and it has a certain promotion effect on the enthusiasm of students, which is also beneficial for students to form a positive outlook on life and values through learning mathematics and can have a positive effect on the purpose of "teaching mathematics to educate people". Analysis of the results of 10-13 questions, most of the mathematics teachers are interested in mathematics culture and mathematics culture education, and are willing to practice in teaching, but some teachers are not very interested in this.

2) The student part

Questionnaires for junior high school students' u 28.38 understanding of mathematics and culture education mainly includes three aspects: students' perceptions and feelings on mathematics; students' perceptions and feelings about current mathematics teaching; students' understand--ing of mathematics culture.

Graphics (2) Students' perceptions and feelings about mathematics.

title \Option (%)	very agree	agree	Unclear	Disagree
Do you like math class?	31.76	47.97	14.86	5.41
Is it stressful to learn mathematics in all subjects?	30.41	22.97	26.35	20.27
I can finish my math homework on my own initiatively.	78.38	11.49	6.08	4.05
Mathematics can exercise people's willpower	45.27	34.46	10.14	10.14
Do mathematics thinking have any influence on you ?	60.14	25.00	10.14	4.73
title \Option (%)	Hobby	study	Unclear	text
What is the purpose of your mathematics	28.38	50.00	14.19	7.43
What is the driving force of learning mathematics	24.32	39.86	20.95	14.86

According to the data in Table 2, about 80% of students have a high degree of love for mathematics, and only 5.41% of students do not like mathematics. This shows that students are more interested in mathematics, and this attitude is beneficial to students. Mathematical learning. Most of the students have a positive attitude about mathematics learning. Only 14.19% of the students are studying mathematics for the exam. In terms of learning motivation, 20.95% of the students are in a state of ignorance in mathematics learning, and 14.86% of the students are motivated just by exams. That shows that some students have not realized the true value of mathematics, do not know what mathematics is, and why they study mathematics. About the idea that mathematics can exercise people's will quality, 80% of the students or so support this, only 10.14% of the students disapprove of this view; About 85% of the students think that the mathematical ideas involved in the process of learning mathematics have a certain degree of influence on themselves, only 4.73% of the students think that the impact is not great. This phenomenon indicates that some students have realized that learning mathematics is not only limited to the study of knowledge, but also to the inner thoughts, thinking and perceptions. During the process of learning mathematics at ordinary times, about 20% of students feel that the pressure of learning mathematics is quite large, even stressed out.

Graphics (3) students' views and feelings on Mathematics Teaching

title \Option (%)	Strongly agree	Quite agree	general	Not quite agree
The teacher talks more about math problems and	62.84	18.24	16.89	2.03

stories on everyday life				
Can math stories help you improve your interest in learning?	54.73	20.27	12.84	12.16
The math teacher will teach you the reading materials in the textbook.	9.32	21.62	23.65	12.16
Do you often read the reading materials in the text book?	37.84	8.78	40.54	12.84

As seen in Table 3 above, most of the students agree that the teacher introduces some math problems and math stories in life in the classroom, and these contents can also help students improve their interest and enthusiasm in learning mathematics. About the reading materials on the mathematics culture part of the textbooks, for some reasons, it is difficult for teachers to do it all during the classroom teaching. While the self-study of students after the class is not very satisfactory, and even 12.84% of the students are completely passive. Only when the teacher make them homework can they be completed; while about the extracurricular mathematics readings, only 14.19% of the students can read them regularly. This shows that the main way for students to come into contact with mathematics culture is the explanation and introduction of teachers in the classroom, just limited to textbooks.

Graphics (4) Students' understanding of mathematics culture

title \Option (%)	Very Understand	understand	general	blurry
Do you understand mathematics culture?	10.14	15.54	18.92	54.40
Do you think mathematics is widely used	38.51	18.9 2	9.46	33.11
Do you know some anecdotes or stories of mathematician	6.08	33.11	27.70	33.11
Do you know some extracurricular mathematics questions, nature, theorems, etc?	4.73	10.81	28.38	56.19

Table 4 shows that students are no strangers to mathematics culture. About 44% of students have different levels of understanding of mathematics culture, 35.81% of students do not know enough about mathematics culture,; Nearly 70 % of students have some understanding of the deeds of some mathematicians, but when it comes to well-known mathematics questions, nature and other content outside the classroom, they know little. More than 50% of the students do not know much about it, or even understand it. This shows that although students have some understanding of mathematics culture, they do not have an in-depth understanding, and there is still a lack of knowledge in mathematics and culture. Regarding the application of mathematics in real life, 38.51% of the students think that the application of mathematics is very extensive, but 31.08% of the students think that the application of mathematics is not much,. This shows that a large number of students pay more attention to solving problems in the process of actually learning mathematics, and mathematics has some missing parts in practical life. Students will think that mathematics is a subject with no practical value. This will have a negative impact on students on the enthusiasm and motivation of learning mathematics.

III. Strategies for Infiltrating Mathematics Culture in Teaching

A. *Strengthening teachers' Mathematical and Cultural Literacy*

First, teachers should have a correct understanding of mathematics culture. According to the requirements of the curriculum standards, mathematics teaching should be based on textbooks. On the basis of mastering certain basic knowledge and basic skills, it is also necessary to closely contact the reality and cultivate students' problem-solving skills, practical ability, and innovative ability. In the teaching activities, students can work together to overcome difficulties, strive to explore, and have a certain develop--ment in spiritual quality. Second, teachers must strive to improve their mathematical and cultural literacy. The fundamental task of teachers is to teach and educate people. [3] If you want to train qualified and outstanding students, teachers must constantly improve their overall quality and let themselves keep up with the times. This is also the basic professional accomplishment that teachers should possess. The improvement of teachers' mathematical and cultural literacy is a task that requires long-term persistence, continuous learning, and continuous improvement. The difficulty of mathematics culture is more difficult than that of mathematics majors, and the requirements for teachers are higher. [4] On the one hand, teachers must increase their knowledge of mathematics and cultural knowledge, learn more, see more, study more, explore more, fully understand the development process of mathematics, feel the beauty of mathematics in this process, discover the beauty of mathematics, and deeply understand mathematics, grasp the essence of the way of mathematics. On the other hand, teachers must understand the mathematics culture profoundly, comprehensively and systematically, and can apply the mathematics culture to practice and apply it to teaching. Teachers should combine the teaching materials, comprehensively consider the actual situation of students, make full use of mathematics culture for teaching design, and ensure the effect of mathematics culture in teaching. [5]

B. *B Make full use of Mathematics Culture and pay attention to the teaching of Mathematical Thinking methods*

Together with other disciplines, mathematics shoulders the mission of cultivating students' comprehensive qualities. For students, the purpose of learning mathematics is not limited to learning mathematics knowledge and skills. It is also necessary to feel the charm of mathematics and learn mathematics from the process of learning. Teachers should learn the method of thinking, the spirit of mathematics, and enhance their own humanistic qualities under the influence of mathematics culture. [6] Teachers should use

mathematics culture as the carrier to complete the teaching design and carry out classroom teaching activities. While infiltrating mathematics knowledge and medium-based skills, they should pay attention to the teaching of mathematics thinking methods, so that students can achieve the desired teaching effects under the influence of mathematics culture. It is also necessary to make rational use of the mathematical culture to guide students' emotional attitudes and values correctly, so that different children can achieve different degrees of development while learning mathematics. Pay attention to the development of students' outlook on life, world outlook, values and personal cultivation.

C. *C Properly carry out the Second Classroom activities of Mathematics Culture*

The study of mathematics is not limited to the classroom, but the learning method of mathematics culture should be more diverse. Teachers should look at the long-term development of students, so that students can improve their overall quality through mathematics. Therefore, in addition to regular mathematics classes, teachers should create a more open learning environment for students and provide a wider range of learning resources so that students can develop in a comprehensive and harmonious manner through a variety of learning activities. The second classroom is a relative term to the regular classroom teaching. The teaching content of the second classroom is not limited to the teaching materials, there is no examination pressure, the forms are various, time is active, and the space is wide. It is an indispensable part of quality education [7]. Using the second classroom, such as mathematics history knowledge contest, mathematics composition and other forms, which is a good way to supplement and assistant mathematics culture and helps deepen students' understanding of mathematics culture, strengthen students' understanding of mathematics thinking methods, and exercise students' thinking, cultivate students' ability to find problems and solve problems in life, improve students' understanding of mathematics, give full play to the educational value of mathematics culture, and truly makes it possible to educate people through teaching.

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Therefore, how to let the mathematics culture truly enter the middle school mathematics teaching, let the students experience the mathematics culture while learning mathematics, master the way the mathematics go, learn the mathematics spirit, thus realize the educational function of mathematics culture, and enhance the comprehensive quality of the students. How to make mathematical learning benefit students for a lifetime is a problem that must be studied in current mathematics and cultural education.

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