

# The Teaching Strategy Exploration and Practice Approach of Integrating Moral Education into Higher Mathematics Based on Information Technology

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**Abstract.** With the goal of inspiring students' inner drive, this paper Starts from exploring the breadth and depth of higher mathematics courses. Then the selection principles of ideological and political elements, the practice approach of integrating moral education into higher mathematics, the method of class organization based on information technology, the guarantee of classroom teaching are discussed which is guided by virtue and cultivating people. The study shows that it can arouse emotional resonance and effectively promote students' understanding, improvement, expansion and application of knowledge in the way of integrating moral education into higher mathematics.

**Keywords:** higher mathematics, information technology, moral education

## 1 Introduction

As a basic course for all majors in universities, higher mathematics is not only the main course for cultivating students' mathematical accomplishment and improving students' consciousness of innovation, but also an important basis for learning other courses. It has unique advantages to combine with moral education. The higher mathematics itself contains abundant moral education resources, and has a unique value guiding function in the moral education <sup>[1]</sup>. As teachers, we should make full use of modern teaching methods, renew teaching ideas and make contributions to cultivating modern talents with mathematical thinking ability and moral integrity.

## 2 Research At Home And Abroad

In December 2016, General Secretary Xi Jinping stressed that "Moral education should be taken as the key link, ideological and political work should be carried out throughout the whole process of education, so as to achieve the goal of all-round education and meet the needs of students' growth and development."<sup>[2]</sup> Moral education is not only the requirement of all courses but also an important element of educational innovation in the new era. To fulfill the fundamental task of moral cultivation, innovation in concept and practice are all important.

In June 2020, the guiding outline of ideological and political construction of curriculum in colleges and universities point out that we need to combine knowledge, perfecting personality with the cultivation of the quality and ability. In addition to the innovative thinking abilities and

practical ability are very important. We should pay more attention to improving the personality of students, the ability to analyze and solve problems, which not only explains the necessity of integrating moral education into classroom teaching, but also points out the direction for universities to carry out moral education.

Xu Teli argued that "Teaching is not only to impart knowledge, but also to educate people."<sup>[3]</sup>. Yang Jing from the department of mathematics at Tsinghua University stressed the importance of explaining the motivation and background of concepts, so that students can not only feel the "cold beauty" of mathematical concepts, but also experience the "hot thinking". Han Lijia, a professor at the College of Mathematics and Physics of North China Electric Power University, advocated paying attention to the depth and breadth of knowledge, presenting the complete history of mathematics to students, in order to enhance students' national pride.

In a word, the process of teaching is bound to educate people. It is as important as education people. Therefore, It has become a hot issue in higher education that how to dig lively and effective political education resources and proper educational elements in higher mathematics, how to combine the knowledge of higher mathematics with moral education, how to turn boring classroom into interesting, how to influence students' life in the process of teaching.

### **3 Significance And Value**

The fundamental goal of moral education is that all courses should return to education itself. Advanced mathematics is open to freshmen. Most of these students are the only child of their families, so they lack of the ability to face difficulties and think independently, it is difficult to find the motivation to learn for them, their insights about life can be changed. At the present stage, teachers should pay more attention to knowledge, but neglect moral education. In the process of learning, most students have strong psychological dependence and prefer the traditional "indoctrination" teaching method, but lack of initiative and creativity. They often nod off, which is not conducive to the shaping of independent personality. However, advanced mathematics has the great influence and wide coverage, which is an important channel to carry out "curriculum ideological and political" teaching. Therefore, timely integration of "curriculum thinking and politics" into higher mathematics can play an important role in the way of thinking, moral quality and scientific accomplishment of students.

In this paper, the new mode of "moral education" into the classroom teaching is explored by studying the cases of moral education in higher mathematics, so as to improve the quality of classroom teaching, and strengthen moral education, which plays a crucial role in stimulating students' patriotic enthusiasm, inspiring national pride and self-confidence.

### **4 The Goal Of Integrating Higher Mathematics Into Moral Education**

Give full play to the main role of moral education in colleges and universities. "Course education" goal is not to change the professional course system of knowledge, nor to education teaching mode on higher mathematics course, but in the moral education as an opportunity to refine contained in the higher mathematics course of truth, in the form of "moistens everything silently", in the process of teaching permeate the ideas of the ideal faith level essence.

Secondly, the effective integration of moral education and intellectual education should be realized [5]. The ideological and political elements of higher mathematics curriculum should be deeply explored, and the educational work should be permeated into the teaching while imparting knowledge, so as to highlight patriotism education and promote national pride. With the dream of a strong army to lead students to realize their self-value, effectively improve students' humanistic quality and moral quality.

Renew the education idea, strengthen student's problem consciousness, stimulate student's potential; Optimize the teaching content, on the one hand, explore the depth of the curriculum, on the other hand, expand the breadth of the curriculum; Innovating teaching methods, emphasizing the process of exploring problems, learning knowledge and cultivating ability in the process from knowledge discovery to solution.

## 5 Technical Route, Implementation Method And Effect Of Integrating Moral Education Into Higher Mathematics

### 5.1 Selection principle (Fig.1)

The higher mathematics itself has the unique advantage of organic integration with "moral education" in the fundamental task of going in the same direction with higher mathematics, which contains interesting moral education resources. When selecting ideological and political materials and cases, we should grasp the following principles: It looks comfortable, sounds interesting, tastes delicious and more than anything, it must be effective.

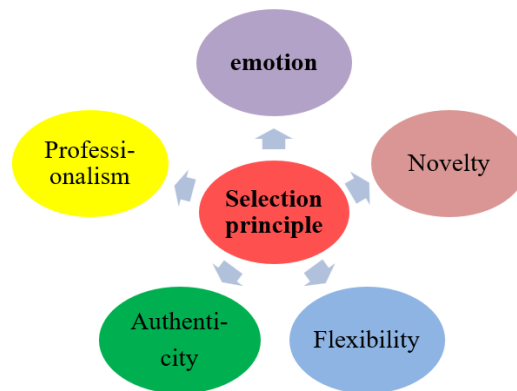


Fig.1. Selection principle

**Emotion:** moral education elements should infect students. Teachers should be strict with herself, understand the students, take care for students, and communicate with students heart-to-heart.

**Novelty:** The ideological and political elements and cases should keep up with the cutting-edge fields and adapt to the development of students, keep up with hot topics, cutting-edge fields, and the students' thinking. They should be suitable for the actual problems that students are interested and comfort to the characteristics of students' thinking.

**Flexibility:** The higher mathematics itself contains abundant moral education resources. To achieve the purpose of education, the basic knowledge must be blended with ideological and political elements.

And unchangeable methods, course ideas and language will inevitably make classroom teaching rigid, lack of vitality. Therefore, in the process of teaching, we should start from multiple channels, multiple dimensions and adopt a variety of teaching methods to enhance students' practical ability and improve their awareness of active thinking, so as to achieve the purpose of improving effect in class.

**Authenticity:** The selection of ideological and political content of the course should be combined with professional knowledge and national development, actual situation of the society and students' thinking, which should not be divorced from reality and professional knowledge.

**Professionalism:** If the knowledge in higher mathematics is compared to soup, course politics is like salt. If the salt in soup is too little, it will be tasteless, but too much will distract the host. On the basis of guaranteeing the integrity of professional curriculum system,

we should combine the characteristics of professional curriculum to carry out curriculum ideological and political thinking. It is necessary to add ideological and political elements in the course at the right time and follow the principle of being appropriate, effective, so that students can be educated unconsciously. It is absolutely forbidden to carry out ideological and political thoughts in the course for the sake of ideological and political thoughts in the course, which not only fails to achieve the purpose of education, but will cause antipathy of students.

## **5.2 Integration path**

Higher mathematics itself has the advantage of organic integration with moral education. As teachers, they should consciously analyze the nature and characteristics of the course, collect practical teaching cases with novel ideas by digging ideological and political elements in higher mathematics, and apply them to practical teaching.

### **5.2.1 The conscientious attitude of teachers is the perfect embodiment of moral education.**

A good teacher should constantly improve his scientific research level, scientific and humanistic qualities. Strive to be an excellent teacher, who seriously prepare every lesson, every teaching plan, carefully designed every blackboard, love education, love life, care about every students<sup>[4]</sup>, instill positive energy in order to influence students.

### **5.2.2 Explore ideological and political education elements from the cultivation of students' one-day life system.**

Students are required to abide by classroom regulations, listen to lectures carefully and take notes in class, participate actively in class, regulate students' behavior and habits of listening to lectures and learning, urge students to respect the efforts of others, and cultivate the spirit of teamwork and mutual help.

Completing homework independently is an important way to test students' ability to understand and apply the knowledge they have learned. Students are required to complete assignments on time and independently. Strengthen the sense of integrity, innovation, improve the ability of independent learning, enhance learning inquisitive. More than that, the importance of integrity should be stressed.

### **5.2.3 Tell the students stories around us. In the development of calculus theory, most mathematicians have tenacious perseverance and rigorous academic attitude.**

Jacobi is the most diligent scholar in the history of mathematics, Gauss is remembered as the “Prince of mathematics”, They all have made great contributions in the history of mathematics. Cultivate students' indomitable research spirit with mathematician's unremittingly and unyielding spirit of struggle. Teachers should lead students to discover the truth from the stories and feel the true meaning of life by reproducing the history of discipline, explaining the stories of scientists, and sharing the personal experiences and feelings of teachers, so as to motivate students.

### **5.2.4 Improve students' ideological level and cultivate students' thinking ability by reading famous quotes.**

Quotes by famous people are the eternal wealth of mankind, which contains rich philosophy and profound connotation. Hua Luogeng who is Chinese mathematician points out that " Figures appear lack of ocular and specific impression without graphs while the graphs can't be researched deeply without figures." which explained the importance of the Methodology of number-shape combination. The definition of limit is introduced by using Li Bai's poem, and the combination of mathematics knowledge and poetry is conducive to creating beautiful teaching scenes. During the course of teaching activities, It is necessary to mobilize students' learning enthusiasm and improve the classroom teaching interest by quoting concise and graceful, intelligent and thought-provoking famous sayings, so as to cultivate students' sentiment, improve students' humanistic quality and the teaching effect.

### **5.2.5 Learn how to do things in the process of mathematical discovery.**

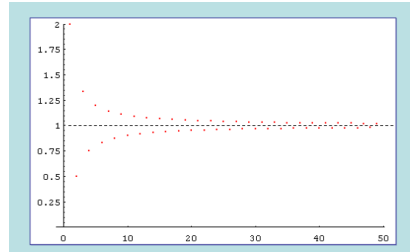
The discovery of mathematical problems is a difficult but challenging process. Through the explanation of the idea of micro element method in higher mathematics, tell students that no matter how complex things are combined by simple things. Teachers should encourage students that do not have fear of difficulties, to be good at analyzing problems, decomposition problems whether in life or learning problems.

For obscure mathematical concepts, you can get inspired by MATLAB. Limit problems is a very important concept in higher mathematics, which is also difficult for beginners. For example, With regard to

$$\lim_{n \rightarrow \infty} \left( 1 + \frac{(-1)^{n-1}}{n} \right) \quad (1)$$

MATLAB can be used to program and draw its image (Fig.2) to make hard things simple, which is conducive to students' mastery of the concept of limit. In addition, MATLAB can also be used to simplify complex derivation and quadrature operations. Tell students that a person's power is limited and the way to solve the problem is unlimited. When encountering problems, we should be good at thinking and try to maximize the limited power. Limit is a very important concept in higher mathematics [6], but it is also difficult for beginners. For example, MATLAB can be used to program and draw its image (Fig.3) to simplify complexity, which is conducive to students' mastery of the concept of limit. In addition, MATLAB can also be used to simplify complex derivation and quadrature operations. Tell the students that although a person's power is limited,

but the way to solve the problem is unlimited. When encountering problems, we should be good at thinking and try to maximize the limited power.



**Fig.2** The graph of formula(1)

**5.2.6 Improve students' scientific thinking methods and innovation ability through the use of reverse thinking and analogical innovation method.**

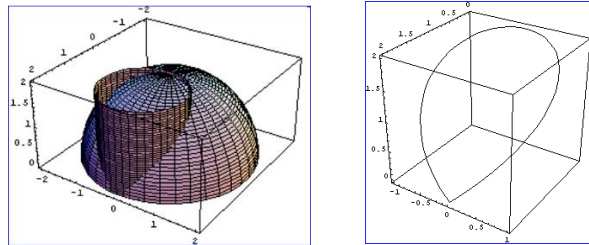
The innovation consciousness of asking questions, thinking hard and facing difficulties is the source power of the development of mathematics. In class, teachers should be good at inspiring students' scientific thinking, stimulating students' thirst for knowledge, guiding them to explore new ways to solve problems and cultivating students' scientific innovation ability.

**5.2.7 Train students' ability to apply theory to practice with the ultimate goal of solving practical problems.**

Mathematics is the basic means of practice in all walks of life. A few students don't know how to apply what they have learned at work. Therefore, for knowledge points, research and design some application cases based on the reality of students, which provide necessary knowledge reserves for students to work better and faster, so as to achieve the purpose of their major. Introducing mathematical software such as MATLAB in the class, emphasizing the importance of analyzing and dealing with problems by using mathematical software. About the intersection line of

$$\begin{cases} z = \sqrt{a^2 - x^2 - y^2} \\ (x - \frac{a}{2})^2 + y^2 = \frac{a^2}{4} \end{cases} \quad (2)$$

Students only know it represent the intersection line of the spherical surface and the cylindrical surface., but some students lack the spatial imagination ability, The two surfaces and their intersection lines can be displayed in front of them by drawing its graph in MATLAB (Fig.3 ), which not only improves students' learning interest, but also improves their mathematical thinking ability.



**Fig. 3.** The graph of formula(2)

**5.2.8** In mathematics class, students should be trained to have scientific and rigorous dialectical thinking and master the skill to analyze every problem on a case-by-case basis by means of explaining the philosophical dialectical thoughts such as the unity of opposites and the unity of opposites and quantitative and qualitative changes contained in higher mathematics.

**5.2.9 Experience the beauty of mathematics.**

In addition to simple symbols, simple and unique language, and boring formulas, mathematics also contains cold beauty -- harmonious and unified structure, symmetrical and abstract form, fantastic and amazing beauty. While learning mathematics, students should be led to travel in the sea of beauty, which is not only conducive to improving students' interest in learning, but also conducive to improve aesthetic awareness, stimulate their own potential and improve their own quality<sup>[1]</sup>. On the one hand, It can give people beautiful visual enjoyment by applying mathematical elements in our life. For example, the Golden Gate Bridge in the United States (Fig.4), Jefferson Memorial Arch (Fig.5), which use the structure of catenary; Furthermore, The designs of icon of Phoenix TV and the "China Knot" pedestrian bridge on the Mexi Lake, are all inspired by the Mobius strip which is unilateral surface.



**Fig. 4.**The Golden Gate Bridge



**Fig. 5.** Jefferson Memorial Arch

**6 Innovate Teaching Methods, Improve Teaching Means And Optimize Assessment Methods.**

Advanced mathematics has a wide range of applications in practical life. With the development of science and technology, the passive indoctrination mode in the traditional teaching mode has shown many disadvantages. In order to give play to the subjective initiative of students, new and better teaching methods must be sought. The difficult and important points should be previewed before class, explained in detail in class, and collect cases after class in the way of group discussion to turn difficult into easy.

Explore new teaching methods in the process of teaching, such as case method of teaching, situational representation teaching method<sup>[7]</sup>. For the purpose of innovation, it is a good way to integrate ideological and political elements into the classroom teaching which are contained in the mathematical thought, mathematical culture, mathematical history, mathematical theorem derivation.

In terms of teaching means, traditional classroom teaching methods can be improved with modern technological means such as rain classroom, wisdom classroom and flipped classroom by making full use of new resources, new technical means and network resources, so as to put the basic principles of being a man, the indomitable and positive national spirit, the sense of responsibility and mission present in front of the students vividly and highlighting the important value leading role of curriculum ideology.

In terms of the evaluation mode, the diversified assessment methods should be emphasized, which should not only examine the basic knowledge of higher mathematics, but also pay attention to the students' learning attitude, mathematical thinking, innovation ability and the ability to comprehensively use mathematical knowledge to solve military problems. Students' learning attitude and learning process will be stressed. The test score will be divided into two parts: formative assessment results in the process of students' learning and the closed-book exam results at last. The formative assessment includes homework completion, unit test scores, the mid-term exam achievement, the length and quality of online learning, etc, in order to strengthen the effect of ideological and political education by guiding the students to understand the truth that piecemeal accumulation of daily life is more important.

## **7 Problems And Solutions Of Integrating Moral Education Into Higher Mathematics**

### **7.1 Insufficient**

**7.1.1** Some teachers are not psychologically aware of the importance and necessity of integrating moral education into curriculum teaching; Their understanding and grasp of curriculum moral education are not enough.

**7.1.2** The incentive policy, operation mechanism and condition guarantee of moral education construction lack both research and practice; The cultural atmosphere of moral education needs to be further constructed.

**7.1.3** It is not easy to grasp the degree of integrating moral education into higher mathematics. It has no effect if there are few elements of moral education in the curriculum; But it will dilute the teaching of professional courses if there are too many elements, Which not only does not play a role in educating people, but will affect the classroom teaching effect.

### **7.2 Improve methods**

**7.2.1** Improve the teacher development system and teachers' ability to implement curriculum thinking and politics; Revise the teaching syllabus in order to emphasize the importance of curriculum thinking and politics; Help teachers to accept moral education psychologically; Teaching reform is regarded as one of the important indicators of teaching process evaluation.



**7.2.2** Establish a complete incentive policy for teaching reform, encourage teachers to carry out teaching reform, and give strong support to teachers who participate in teaching reform.

**7.2.3** Carry out collective lesson preparation and discuss the moral education of the course which will improve its effectiveness and vividness.

## 8 Conclusion

Teachers are the backbone force of teaching and talent cultivation in the college. As a teacher, they should adhere to the teaching concept of moral education and have a sense of identity with moral education. So they must strengthen their own ideological and political work, strengthen moral awareness, cultivate mathematical cultural literacy, and learn to dig the ideological and political elements hidden in various knowledge points, which will shape students' political thoughts and values in an all-round way.

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