

# The Reform and Practice of Middle School Mathematics Classroom Teaching under the Background of First-class Specialty Construction in Colleges and Universities

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**Abstract:** The teaching content organization of middle school mathematics is based on the cultivation of students' mathematical core quality and mathematical thinking. The construction of "double first-class" in colleges and universities emphasizes the optimization and adjustment of professional structure, which requires colleges and compulsory education to cultivate professional talents in the new era with new ideas, new models and new methods. Mathematics is a basic science, closely related to other disciplines. To discuss and think about the reform and practice of middle school mathematics curriculum teaching is to deepen the educational reform and cultivate the needs of comprehensive talents who can observe the world with mathematical vision, think about the world with mathematical thinking and express the world with mathematical language.

**Keywords:** Middle school mathematics; First-class professional construction; Micro lesson; Reform

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## 1. Introduction

Our country is in the key stage to enter into the powerful educational system from the great power in education, and in the stage of development of deepening educational reform. In 2015, The State Council put forward a proposal to speed up the construction of world-class universities and disciplines, specifying specific tasks and requirements for the construction of "double first-class" universities. In 2016, the Ministry of Education further emphasized the requirements of optimizing and adjusting the structure of higher education majors and the structure of personnel training types. In 2019, the Ministry of Education also put forward Several Opinions on Comprehensively Improving the Quality of Higher Education, requiring universities to dynamically adjust the structure and mechanism of disciplines and specialties, implement the autonomy of discipline and specialty construction in universities, and optimize the allocation of resources independently. We will follow the path of independent and distinctive development. Disciplines and majors are the core of colleges and universities, the basis for training talents, serving the society and academic research, the key to deepening educational reform and developing educational undertakings, and the main breakthrough of "double first-class" construction of colleges and universities. From the emphasis and requirements of social development needs and policies, it can be seen that discipline construction is of self-evident importance to colleges and universities, and first-class specialty construction is the basic need for colleges and universities to realize the goal of educating students in the whole course, the whole process and the all-round way. Mathematics education in middle school is the primary stage of cultivating students' logical thinking, which is the important foundation of higher mathematics education and other subjects. The 2022 edition of Mathematics Curriculum Standards for Compulsory Education clearly puts forward new standards for mathematics curriculum to train students to observe the world with mathematical vision, think about the world with mathematical thinking, and express the world with mathematical language <sup>[1]</sup>. In this context, it is very necessary and significant to explore new ideas, new models and new methods of middle school mathematics

classroom teaching, implement new curriculum standards and deepen curriculum reform.

## **2. Middle school mathematics curriculum pain points and difficulties**

### **2.1 Middle school mathematics curriculum pay attention to the examination**

Middle school mathematics curriculum to test as the teaching goal. In the middle school stage, the teaching pace is relatively slow, teaching content is relatively basic. Teachers have enough time to explain and analyze various knowledge points. With the help of exercises, they can explain mathematical knowledge points clearly and thoroughly. For students, listening carefully in class, combined with a large number of exercises, can deepen the understanding and memory of knowledge points, through repeated practice, can master the method of solving specific questions. In addition, teachers adopt the method of phased testing and examination to test students' mastery of knowledge points, find out their weak links, and finally consolidate targeted, so as to achieve the purpose of teaching. Although the test-oriented teaching method can effectively and quickly improve students' academic performance and learning effect, this teaching mode takes the teacher as the main body, and students, as passive receivers of knowledge, can only learn according to the path set by the teacher, which is not conducive to students' subjective initiative and stifle their desire to explore and seek knowledge in mathematics<sup>[2]</sup>. As time goes by, students will lose interest in math and have an aversion to it, and rely heavily on teachers in math learning.

### **2.2 Equal emphasis is placed on explicit and implicit knowledge**

For students, math knowledge is very abstract. From the bottom logic analysis, in fact, because of the explicit and implicit knowledge of mathematics. Explicit knowledge of mathematics refers to explicit knowledge points that can be expressed and demonstrated in some form, such as formulas, theorems, laws, etc. Tacit knowledge, however, refers to the knowledge points that cannot be demonstrated in detail. It is a non-fixed form of knowledge that can only be understood and cannot be expressed. It only exists in teachers' teaching experience, students' learning experience and logical thinking. For example, in the chapter "Direct Relation of Variables" in the second volume of the seventh grade textbook, when teaching the knowledge point of "Representing relation of variables with images", coordinate axes, independent variables and dependent variables are all explicit knowledge points, which students can understand and master through memory and learning. However, when it comes to marking function relations with images of coordinate axes, Many students fail to understand the functional relationships represented by the specific images in the axes. This is due to the abstractness of mathematical knowledge, and the more important reason is that it is a tacit knowledge point to find out the way of functional relations, which is difficult for junior high school students who have not formed mathematical thinking to understand. This also verifies the correctness of the new curriculum standard to train students' mathematical thinking and logical thinking.

### **2.3 The connection with higher mathematics**

Unlike middle school mathematics, which focuses on exams, advanced mathematics focuses more on ability. When it comes to the university learning stage, the teaching content and teaching methods of mathematics classroom have been greatly changed<sup>[3]</sup>. First of all, the teaching method of the teacher is no longer detailed, but only gives an overview of the content. Instead, the teacher plays a guiding role and pays attention to the students' self-learning ability and initiative. In addition, advanced mathematics has stronger classroom teaching practice ability and is more closely connected with other subjects. For example, linear algebra and other knowledge points of advanced mathematics are directly related to numerical analysis and other knowledge points of computer science. Advanced mathematics pays more attention to the cultivation of students' mathematical thinking and logical thinking, and emphasizes the provision of students' comprehensive learning ability. Although middle school mathematics and higher mathematics are related in form and content, how to achieve effective connection is a problem that middle school mathematics teachers need to consider.

## **3. Some thoughts on middle school mathematics classroom reform**

### **3.1 In-depth exploration of teaching materials**

Mathematics textbook is a study guide written on the basis of curriculum standards. It is very important to guide and reference, and it is a program for teachers' classroom teaching and students' learning. The mathematics textbook fully takes into account the age characteristics and stage mental and physical conditions of students. The content is arranged step by step with moderate difficulty, which conforms to the cognitive ability of middle school students and helps to improve their logical thinking ability. Therefore, for mathematics teachers, textbooks have a lot of exploitable value. In the classroom, mathematics teachers should fully use the guiding role of the textbook, dig the value of the textbook, and apply it to the teaching design. Reasonable use of teaching materials, can avoid

course design deviated direction, can make up for the teaching content. In addition, the textbook also provides a large number of targeted and comprehensive exercises, which also provides a useful reference for teachers' teaching and learning. Fully exploring the teaching value of textbooks can not only realize the purpose of exam-oriented education, but also effectively avoid the drawbacks of exam-oriented education. Students are the learning subjects of the textbook. Encouraging students to learn independently, stimulating students' interest in learning, fitting the content and background of the textbook, can combine the explicit knowledge and tacit knowledge in the textbook to the greatest extent, which is of great benefit to the cultivation of students' mathematical thinking.

### 3.2 Innovative teaching methods

Middle school mathematics teaching is the key environment of basic education. Because of the abstract characteristics of mathematics curriculum, the teaching mode of "imparting and explaining" obviously cannot solve the problem of separating knowledge from practice. The traditional teaching method has its advantages, especially the obvious test-taking effect, but it is not conducive to the cultivation of students' autonomous learning ability, exploration and innovation ability and problem-solving ability, and is not conducive to the cultivation of students' mathematical thinking. Therefore, in the course design process, teachers should pay attention to the traditional teaching methods to retain and improve, while making the classroom become the starting point of innovation. Teachers provide students with opportunities for knowledge construction and method accumulation, organize cooperative learning, share learning results and process experience, explore new knowledge, experience and practice of new methods, optimize and restructure methods, reduce students' information processing load, accurately understand the correlation and matching of knowledge under the new curriculum concept, and promote the formation of innovative thinking with skills and methods. Develop and sublimate students' innovative thinking.

### 3.3 Integrate micro-course technology into course design

With the development and improvement of information technology and computer technology, it brings new ideas and new ways for the reform of curriculum teaching and classroom design. Multimedia technology, big data technology and various software technology have injected new vitality into traditional classroom teaching. Micro-class is a unique product of the Internet information age, and it is a kind of multimedia teaching method proved effective in the course of teaching practice. From the definition, micro-class refers to the use of multimedia technology and Internet technology, based on curriculum standards and actual teaching conditions, combined with students' psychological characteristics and cognitive rules, to present and display learning content to students, so that students can master learning content more easily and efficiently. Micro classes are usually presented in the form of small videos, which are short, concise, vivid, interesting and targeted. Micro-course can be compatible with various learning resources of various subjects, and the teaching content presented is easy to be understood and absorbed by students. At the same time, micro-class can also break the limitation of time and space. By using the Internet and various terminal devices, knowledge can be imparted to learning without difference, making the teaching of course content more targeted and effective, and helping to cultivate students' independent self-examination ability and self-learning ability.

## Summary

Under the background of the construction of first-class majors in colleges and universities, the reform and innovation of middle school mathematics classroom teaching is the need of deepening education reform, combining teaching theory with practice, and cultivating talents to meet the needs of social development in the new era. This paper analyzes the pain points of middle school mathematics curriculum, such as the emphasis on examination, the combination of explicit knowledge and tacit knowledge, and the difficulty of connecting with higher mathematics, thinking and discussing the concrete measures of middle school mathematics classroom reform, so as to provide reference for middle school mathematics teachers.

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