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A Literature Review of the Effective Teaching of Mathematics in Junior High School Since the New Curriculum Reform

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Abstract: Mathematics, as a basic subject, has an imperceptible influence on other subjects. With the development of the new curriculum reform, the effective teaching research of mathematics in junior high school has been paid attention to by experts, scholars and teachers. In this paper, from the quantitative and qualitative dimensions, the CNKI database as the main data source, the new curriculum reform of junior high school mathematics teaching since the research is systematically combed. To analyze the research results, find out the lack of research, explore the research trends, in order to provide reference for the future development of effective mathematics teaching research.

Keywords: New Curriculum Reform; Junior Middle School Mathematics; Effective Teaching; Summary.

1. Introduction

The new round of curriculum reform of basic education is the main way to deepen the educational reform at the national level and promote the quality-oriented education in an all-round way. As an important standard to measure the effect of mathematics teaching, effective teaching has been paid much attention in the "New curriculum reform". This paper attempts to systematize the research on the effective mathematics teaching in our country since the new curriculum reform, and further unscramble the current situation, existing problems and developing trend of the effective mathematics teaching research, so as to provide reference for the follow-up research.

2. Data Source and Quantitative Analysis

2.1. Data Sources

Taking the "China Knowledge Network" database as the data source, we conducted three searches. The first time, 30958 articles were retrieved with the keyword of "Effective teaching" The second time with "Effective teaching" and "Junior High School Mathematics" as the key words to retrieve a total of 729 articles; For the third time, "Effective teaching" and "Junior high school mathematics" as the key words, and the full text includes "New curriculum reform" for advanced literature search (including journal papers, Master Thesis, conference papers, yearbook, etc.) , in order to guarantee the scientific and accuracy of literature collection, 256 articles were obtained by manual deletion within the scope of literature retrieval. On the basis of this, using Excel and CITESPACE software, from the quantitative point of view of the "Effective teaching of mathematics in junior high school" research field of literature presentation form, year distribution, journal source distribution, and high-frequency keywords, and so on, mapping. Based on this, this paper analyzes the concept and teaching strategy of "Effective teaching of mathematics" from a qualitative point of view, in order to see through the shortcomings of current research and the trend of future research.

2.2. Quantitative Analysis

2.2.1. Literature Distribution

Based on the results of the second literature search, a total of 729 articles were obtained, including 698 journal articles, 11 master's theses and 20 conference papers. From 2015 to 2019, there were 377 papers, accounting for 51.7% of the total, with a decreasing trend in the last three years. The 256 papers retrieved from the third literature search were analyzed, the journals are mainly related to curriculum and teaching, such as new curriculum, exam weekly, literature and science navigation, Mathematics Learning and research, mathematics, physics and chemistry learning, mathematics world, etc.

2.2.2. Research Focus Analysis Based on Keyword Co-occurrence

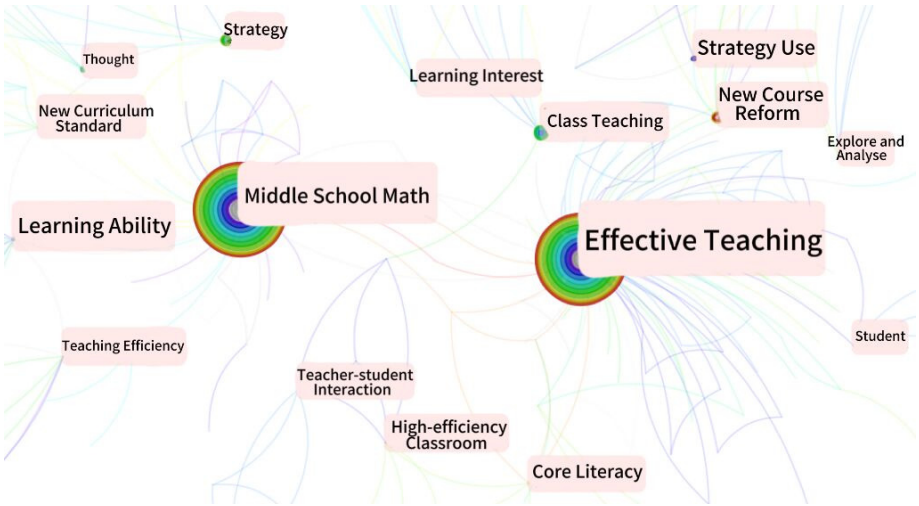
Table 1. High-frequency Key Words in the Research Field of Effective Mathematics Teaching in Junior High School Since the New Curriculum Reform (Top 20)

Ranking	Frequency	Keywords	Ranking	Frequency	Keywords
1	245	Junior High Math	11	7	The new curriculum standard
2	226	Effective teaching	12	6	Teaching methods
3	27	Classroom teaching	13	6	Explore
4	24	New Curriculum	14	6	Core literacy
5	19	Strategy	15	5	Efficient classroom
6	9	Ability to learn	16	4	Interest in learning
7	9	Classes	17	4	Analysis
8	9	Think	18	4	Ask questions in class
9	8	The role of strategy	19	4	Teaching effectiveness
10	8	Teaching strategies	20	3	Recitation

CITESPACE software was used to analyze the key words of 256 retrieved articles, and to calculate the frequency and the relationship between key words, get THE TOP 20 keywords (Table 1) and the link between the keywords (Table 2).

Combining tables 1 and 2, with minor adjustments to the distribution of research hotspots, it is not difficult to see, the effective teaching of "Classroom teaching", "Strategy", "Learning ability" and so on are the topics that scholars in this field pay close attention to at present.

Table 2. The Co-occurrence of Key Words in Effective Teaching Research of Mathematics in Junior High School Since the New Curriculum Reform



3. A Review of Research at Home and Abroad

The sprouting of research on effective teaching in China can be traced back to the spring and Autumn period and the Warring States period, it is the requirement of effective teaching for teachers and students. In the book of Rites of learning, it is mentioned that "The good scholar gets twice the contribution from the teacher, the bad scholar gets twice the contribution from the teacher", "The good questioner gets half the contribution from the teacher", "The good questioner gets half the contribution from the teacher", "The good questioner gets half the contribution from the teacher", "The good questioner gets half the contribution from the teacher", "The good questioner gets half the contribution from the teacher", "The good questioner gets half the contribution from the teacher", "The bad questioner gets half the contribution from the teacher", improve the efficiency of teaching and learning through correct methods. Domestic research on "Effective teaching" began in the 1980s, this paper mainly discusses the new curriculum reform since the junior high school mathematics effective teaching research. Socrates' midwifery in Ancient Greece, Plato emphasized to reveal the contradiction through the way of question and answer, so as to draw out the students' inner knowledge and seek the truth, which is the embryonic form of effective teaching research in foreign countries, according to his teaching theory, "Effective teaching" is to make students develop in intelligence, physical strength, moral character, sense of laughter and so on. In recent years, the research focus of effective teaching in foreign countries has changed from the study of teachers' personal characteristics and classroom teaching behavior to the study of factors affecting effective teaching, then it tries to extend the research perspective to explore ways and strategies to improve teaching. Since the research topics at home and abroad are basically the same, this paper will be from the following four aspects of the domestic and foreign literature on the parallel.

3.1. The Definition of Effective Teaching

3.1.1. The Definition of Effective Teaching in China

Chen Houde's effective teaching (2000) is the first monograph on effective teaching in China. On the basis of this, domestic research defines the concept of effective teaching from the following four angles, the first angle is to define the composition of effective teaching, such as "Effective teaching theory" edited by Gao Shenying and Liu Liangfang (2004), which points out that effective teaching is research learning, recessive learning and experiential learning. The second perspective is to define the process of effective teaching and describe how effective teaching is constructed in the classroom, as the scholar Wen-sen Yu (2012) pointed out: "Effective teaching is based on curriculum standards, teachers and students in accordance with the Basic Law of teaching activities, and strive to use the least time, energy and material costs, to achieve the best classroom effect, to produce the best classroom benefits, so as to achieve the set classroom goals, to achieve social and personal needs for the value of education and planned activities." The third is from the effective teaching effect to define, for example, Wang Guangming (2005) put forward four connotations of mathematics teaching effect, namely "Efficiency consciousness", "Good mathematics cognitive structure", "Rational spirit" and "Mathematics learning ability". The fourth is mainly defined from the meaning of effective teaching, for example, the scholars Cheng Hong and Zhang Tianbao (2002) hold that "Effective teaching activities require teachers to use the least time, energy and material cost to achieve the most ideal classroom effect according to the general law of classroom teaching." They also give the significance of effective classroom teaching in three aspects: effect, efficiency and benefit. Other scholars define effective teaching from different theoretical bases, including the theoretical basis of economics, pedagogy, psychology and philosophy, the implications of effective teaching are rich.

3.1.2. The Definition of Effective Teaching in Foreign Countries

Foreign scholars define the concept of effective teaching mainly in the following three orientations: first, the goal orientation. The main viewpoints of the scholars, such as Stephen Keith (2005), are as follows: (1) it is called effective teaching to motivate students' enthusiasm and make them actively participate in intellectual learning; Effective teaching is to stimulate the desire for learning, to form critical thinking and the sense of teamwork, to master the ability to solve problems, and to form the attitude of lifelong learning. Second, skills orientation. Academics such as JM Broder & J. J. Dorfiman (1994) believes that teachers' teaching skills and the complexity of teaching are two aspects that define effective teaching, which they consider to be socially challenging work, there is a high intellectual requirement for educators, who can accomplish this by means of a series of progressive, accessible and developable teaching skills. Third, achievement orientation. Since the 1980s, and especially since 2000, the U.S. Congress has required states to make improving students' academic performance a top priority in teaching and learning, and to make every child develop as much as possible, reduce the proportion of underachievers. In the UK, standards for improving students' maths performance through effective maths teaching have been high on the national agenda, making it possible to include more V. Scholars such as Koshy (1999) Link Students' academic achievement to effective teaching.

3.1.3. The Definition of the Concept of Effective Mathematics Teaching in China

Domestic research defines the concept of effective teaching of mathematics from the following four angles, the first is from the conditions of effective teaching of mathematics to define, such as Wu Hairong (2002) expressed that effective classroom teaching needs to have effective classroom effect, efficient completion of classroom goals, good classroom income three conditions. The second is defined from the point of view of describing the process of effective teaching of mathematics. For example, Li Chunguang (2007) thinks that teachers should use the most appropriate teaching method in mathematics classroom teaching according to the general law of classroom learning activities, aiming to achieve the pre-set classroom goals and promote students' development with the least time, energy and material cost, scholar Chen Chao (2020) defines effective teaching in mathematics classrooms in junior high schools as: teachers should base on the concept of effective teaching, in order to achieve the teaching goal of junior high school mathematics curriculum, we try to choose effective teaching strategies and scientific teaching methods to help students learn effectively, so that teachers and students can get their own growth of classroom activities. The third approach is to define the characteristics of effective mathematics teaching, for example, Wang Guangming (2005) put forward two characteristics of high-efficiency teaching of mathematics: paying attention to the training of students' thinking quality and improving their understanding ability, and strengthening students' ability to construct the knowledge they have learned. The fourth view points out the nature of effective mathematics teaching, Hong Yanhua (2015) pointed out that effective mathematics classroom teaching should have “Real”, “New”, “Live” three words.

3.2. The Influencing Factors of Effective Teaching

3.2.1. Factors Affecting Effective Teaching in China

Domestic research on the factors affecting effective teaching generally proceeds from the following four angles. The first one is to analyze it from the angle of different subjects, in the book contemporary educational psychology edited by Chen Qi and Liu Rude (2007) , for example, from the perspective of teachers, it is proposed that effective teachers should have three basic characteristics, wu Hairong and Zhu Dequan (2002) put forward that the development of students is the only criterion to measure the effective teaching from the angle of students' subject, zhang Hao (2015) analyzes the factors that influence the effective teaching of mathematics in junior middle school from both teachers and students under the background of the new curriculum reform. The second is to explore the factors influencing effective teaching from the perspective of concept. Professor ye Lan puts forward effective teaching values: paying attention to classroom teaching, reproducing the production and development of knowledge, diversifying teaching methods, focus on the mobilization of classroom atmosphere, so that the classroom full of vitality, with such values to promote effective teaching. The third point of view is from the perspective of the educational system of pedagogy, such as Deng Kai (2005) proposed five factors that affect the effectiveness of classroom teaching in primary and secondary schools: effective students, effective teachers, effective content, effective environment, effective media can be summed up as educators, educators, and intermediaries. The fourth viewpoint analyzes the factors of effective teaching from the angle of psychology, for example, Chen Mo (2005) uses the research method of Case Study and questionnaire, it is concluded that the attribution of teaching behavior of high-efficiency and low-efficiency mathematics teachers lies in five aspects: effort, professional knowledge, student factors, course difficulty, opportunity and accidental factors.

3.2.2. The Influential Factors of Effective Teaching in Foreign Countries

3.2.2.1. Teachers' Influence on Effective Teaching

Gary D. Borich (2002) concluded in effective teaching methods that 10 types of teacher behavior are significantly associated with students' excellent academic performance, and put forward five characteristics of effective teaching: diverse teaching methods, clear teaching ideas, students actively cooperate, guide students to invest, high learning efficiency. Psychologist Raymond B. The Cartel’s survey summarized 10 remarkable characteristics of excellent young teachers and excellent mature teachers, the words found to describe the qualities of a good teacher are: intelligence, open-mindedness, personality and will, sense of humor, compassion and wit. Ryan D. sums up three main variables that affect effective teaching: enthusiasm, understanding and indifference, ruthlessness; They are stimulating, imaginative, and monotonous, and conformist. The closer you get to the positive end of the scale, the higher the score, and the more effective the teaching. These studies suggest that teachers are important to the achievement of effective teaching.

3.2.2.2. Student’s Influence on Effective Teaching

Western countries in the late 20th century on the effectiveness of classroom teaching to expand the scope of research, the object of study from teachers to students, focusing on training students' self-learning ability, from

paying attention to the mastery of students' knowledge to the improvement of students' ability, we should pay more attention to the application of the knowledge in real life, and improve students' practical ability and social practice ability. Hurst believes that effective teaching should have the following characteristics: 1 student master subject knowledge in class, and through other ways to learn other relevant knowledge; Students want to learn and learn on their own. Gagne (1965) in the "Conditions of learning," the content of student learning and teaching progress on the basis of students' psychological foundation, improve the efficiency of classroom teaching. What's more, Bruner argues that what students learn is not something they are forced to give, but something they think about, discover, and incorporate into their cognitive structure. Ausubel divided learning into discovery learning and acceptance learning, rote learning and meaningful learning, and he advocated that students should carry out meaningful discovery learning, in the original cognitive structure and new knowledge between the establishment of non-artificial, substantive links to promote the effectiveness of teaching. These studies have shown that students in the main role in effective teaching, need to give full play to the subjective initiative of students, mathematics in junior high school, such as hands-on, brain, heart-to-heart exploration of the classroom is even more so.

3.2.2.3. Effective Teaching of Environmental Impact

The study of teaching environment and teaching effectiveness in foreign countries mainly focuses on the class size. Most scholars think that small class teaching is helpful to improve the overall effective teaching. Rogers believes that effective teaching should pay attention to classroom atmosphere and material environment, good classroom atmosphere is conducive to students' all-round development, good material environment and teaching equipment is conducive to students' practical ability. In the 1960s, Stanford University came up with Microteaching, a systematic approach to using modern teaching techniques to train students and in-service teachers in teaching skills, small-class communication improves the effectiveness of teaching. John D. Bransford (2013) believes that the fundamental guarantee of effective learning is to build a learning community, the use of multimedia composite technology to facilitate communication between teachers and students, multimedia to facilitate students to practice, feedback and improve, improve teaching efficiency. The environment, as an intermediary in the educational system, also has a certain impact on the realization of effective teaching.

3.3. The Evaluation Criteria of Effective Teaching

3.3.1. The Evaluation Criteria for Effective Teaching in China

Effective teaching in China mainly from teachers, students, teaching itself three dimensions of the establishment of evaluation standards. The first one is constructed from the teacher's point of view. For example, Lu Weiyuan (2002), in his book "Effective teaching outline", used the quantitative evaluation method to study the effective teaching for the first time, this paper analyzes the influence of the types of teachers, teaching methods and courses on the effective teaching in the university classroom, and then formulates the index system of the effective teaching evaluation in the university, developed a framework of classroom effectiveness criteria for teachers. The second kind constructs the evaluation standard from the student dimension, Yu Wen-sen (2008) revolves around the student to propose the study effective evaluation standard: the study time, the study effect, the study feeling; Teachers' effective teaching should overcome ineffective or inefficient teaching and improve effective teaching. The third way is to construct evaluation criteria for effective teaching from the perspective of teaching itself, according to Zhang Hao (2015) , there are four evaluation standards of effective teaching in junior middle school mathematics classroom under the background of new curriculum reform: the effectiveness of teaching content, the effectiveness of teaching process, the effectiveness of teaching effect, and the effectiveness of learning interest, and explained the small standards under each big standard.

3.3.2. The Evaluation Criteria of Effective Teaching in Foreign Countries

The research on evaluation criteria of effective teaching in foreign countries has gone through three stages with the change of time. The second stage is the quality research period of excellent teachers from the early 1930s to the late 1960s. The evaluation criteria of effective teaching are built around the characteristics of good teachers, it is believed that classroom teaching is effective for teachers with certain characteristics or excellent qualities, and this kind of research corresponds the quality of good teachers with the teaching effect, but pays little attention to the relationship between the two.

In the second stage, from the early 1970s to the end of 1980s, the research direction of this stage has changed into the research and analysis of students' learning effects of teacher's classroom behavior, at this point, the evaluation standard is in the classroom teaching, the teacher's behavior for the growth and development of students to promote the significance, then the teacher's behavior is effective. In the study of learners' learning behavior, teachers' education can change learners' learning, but it cannot determine students' learning or replace their learning. The teacher's teaching behavior must pass through the learner's cognition, the adoption, the cooperation and the interaction, and displays the effective learning behavior through the learner, then its effect will be reflected, effective learning behavior becomes the evaluation criterion of effective teaching.

The third stage is the comprehensive research stage, since the early 1990s, the research attention has been broadened to classroom teaching practice activities, the research in this stage emphasizes the communication and mutual help between students and teachers, and emphasizes the control of teaching and learning strategies. Some scholars think that the factors influencing effective teaching are curriculum setting, teaching facilities and environment, strategy and art, teacher-student communication, learning style and learning atmosphere, etc.

3.4. Strategies for Implementing Effective Teaching

3.4.1. Effective Teaching Strategies in China

There are three perspectives on the implementation of effective teaching strategies, the first is the combination of theory and practice, such as Chen Chao (2020) proposed to improve the effective teaching of mathematics review class in junior high school, first of all, seek the guidance of theory, it includes Bruner's discovery learning, Piaget's constructivism, Babansky's optimization of educational process, and Theo Hug's micro-learning, the second is how to use theory and

practice at the practical level. The second is from the perspective of different subjects, but also the most used perspective, such as Zhang Hao (2015) proposed the new curriculum reform background to improve the effective teaching of mathematics in junior high school classroom strategy, from the two aspects of educators and learners put forward specific strategies, educators include educational managers and front-line teachers, the paper puts forward five strategies for students: correct attitude, establish confidence, cultivate interest, find means and use brain health, and Xu Zhilan (2005) aims at the characteristics of mathematics teaching, this paper sums up the characteristics that mathematics teachers should have in effective teaching, probes into the effective teaching behaviors of mathematics teachers and puts forward effective teaching strategies. The third is to divide the curriculum into different time periods, for example, Chen XI (2020) proposed eight specific strategies from three dimensions: teachers' effective pre-class preparation strategies, teachers' effective teaching process strategies, teachers' after-class reflection and learning method guidance strategies.

3.4.2. The Implementation Strategy of Effective Teaching in Foreign Countries

Researchers abroad have explored the issue from three different perspectives. First, from the perspective of teaching process, Stewart and others think that effective teaching strategies are: lesson preparation, class, evaluation. Second, to explore the flow of classroom instruction, Rosenshine & Stevens combined their own research findings, through further practical research the following strategies have been obtained: review, learning new knowledge, practice, feedback, review. Third, from the perspective of the organization of classroom activities, Killen R combined with the study of classroom practice activities, the strategies are: teaching, discussion, group work, cooperative learning, problem-solving, inquiry learning, role-playing, case analysis and writing. In addition, Babansky, a famous educator of the former Soviet Union, put forward the principle of teaching optimization in order to improve teaching efficiency. He believes that the principle of teaching optimization must be based on the principles of teaching and the laws of teaching. It is a purposeful and conscious arrangement of the teaching process by the teacher, making full use of various conditions to make the teaching process go smoothly."

4. Comments

Effective teaching research is arousing more and more responses in the field of teaching theory and practice. On the theoretical level, it plays a role in popularizing the "New thinking" in teaching, guiding the reform of Basic Education courses and further advancing the direction, thus enriching the theoretical research on effective teaching, at the same time, the research has put forward many problems existing in the mathematics classroom teaching in junior middle school, which arouse the thinking of experts, teachers, parents and students, the related research provides reference for the junior middle school mathematics teachers to change the inefficient classroom teaching, helps the teachers set up the effective teaching idea, creates the effective learning environment for the students, improves the junior middle school mathematics classroom teaching efficiency. For the research of teacher professional development, the research results of effective teaching are also helpful to the research and practice of teacher professional development and teacher training model. However, due to the actual situation of mathematics classroom in junior middle schools in different places, students' knowledge mastery and teachers' ability level are different, scholars often base on different research perspectives and research methods, the level of analysis of the problem is also different, so there are still some deficiencies in the study, mainly in the following aspects.

4.1. The Concept of Effective Teaching is Vague

There is no consensus on the definition of the concept of effective teaching in the academic community, and there are still doubts about it. There is no clear concept of effective teaching, which leads scholars to go astray in the research. The following definition is too narrow or too broad, which will affect the reliability and validity of the whole study.

4.2. The Content of The Study was Uneven

In terms of the contents of the studies, there is an unbalanced distribution. There are many difficult problems in effective teaching, such as the theoretical basis of effective teaching, the main factors affecting effective teaching and how to influence it, therefore, the research results obtained in these aspects are relatively scarce. To a certain extent, reflecting the overall level of research is not very high, talking about "Should", "Necessary" these practices, importance, significance of many articles, there are few articles on "Why", such as internal logic and reason, and there are also few articles on summary.

4.3. The Study Method is Simple

At present, the research on the effective teaching of mathematics in junior middle school can be divided into two kinds. One kind mainly relies on the method of literature research, which leads some scholars to rely too much on the existing experience at home and abroad, only in reference to some literature, the effective teaching of mathematics in junior high school on the basis of the problems of theoretical countermeasures, but the lack of actual survey data support, floating on the surface. The other kind of research focuses on the quantitative research, some scholars rely on the survey results, which is not only lack of scientific theoretical basis, but also difficult to ensure the reliability and validity of the survey process, and lack of a reasonable interpretation of the data. In general, there are few comprehensive studies that combine qualitative analysis with quantitative methods.

4.4. The Research Results are of Weak Pertinence

The practice of effective teaching research is not targeted. Effective teaching, as a special teaching reform research, begins with teaching problems in reality, therefore, the value and development of effective teaching research depends on its effectiveness in solving practical teaching problems. The current effective teaching research seems to be more and more separated from concrete thinking and effective exploration in solving practical problems, more and more keen on the logical derivation of theoretical knowledge and abstract research goals, theory for the theory, and specific measures for the discipline is not strong, general.

5. The Future Outlook

5.1. Comprehensive Research

In the research of effective teaching of mathematics in junior middle school, we should combine qualitative analysis with quantitative research, we should not only base on the subjective judgment of certain mathematics subject, but also take the objective facts as the basis and have the theoretical foundation, also need to have the data that actual investigation gets to carry on the support, just have more convincing, just have scientific sex. Research that combines theoretical responses with actual research should be carried out in depth.

5.2. Research Should be Conducted from Multiple Perspectives

Students, as the main body of classroom teaching activities, have the deepest feeling of teachers' teaching. In the effective teaching and research of mathematics in junior high school, we should break through the limitation of experts' inherent visual angle and take students as the main body, instead of asking students to do anything, but it really reflects the "People-oriented" "Learning theory teaching" of modern education philosophy, focusing on the actual learning of students to carry out effective teaching.

5.3. Put Forward an Operable Plan

Research results can not only be shown as empirical results, to come up with a practical operational program. In order to build an effective classroom of mathematics teaching in junior high school, we should not only stay in the exploration of theory, but also base on the practice of junior high school, based on the theoretical guidance to develop a set of practical and effective teaching strategies, the specific strategies should be simple, simple and easy to implement, avoid abstract and complex, with guidance.

The core of the new curriculum reform is curriculum implementation, and the basic way of curriculum implementation is classroom teaching. Improving the effectiveness of mathematics teaching in junior high school is the key to ensure the smooth progress of curriculum reform. In order to realize effective teaching, it is not a matter of a short time, and it needs the joint efforts of educational administration, teachers and students to overcome their own shortcomings, so as to ensure the smooth implementation of the new curriculum reform, to achieve the desired results and train qualified personnel for the socialist modernization drive.

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