

**THE RESULTS OF USING THE MICRO CLASS TEACHING METHOD IN TEACHING
MATHEMATICS TO DEVELOP LEARNING ACHIEVEMENT FOR JUNIOR HIGH
SCHOOL STUDENTS IN ZIGONG LUSHENG EXPERIMENTAL SCHOOL**



YI LIANG

**A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION
PROGRAM IN CURRICULUM DEVELOPMENT
AND INSTRUCTIONAL INNOVATION
FACULTY OF TECHNICAL EDUCATION
RAJAMANGALA UNIVERSITY OF TECHNOLOGY THANYABURI
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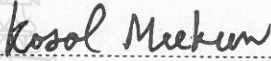
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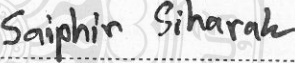
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ABSTRACT

The purposes of this research were to: 1) compare the learning achievement in the mathematics course of Secondary 3 (Grade 9) students before and after learning management by using the micro class teaching method, 2) compare the learning achievement in the mathematics course of Secondary 3 (Grade 9) students before and after learning management by using traditional methods, and 3) compare the learning achievement in the mathematics course of Secondary 3 (Grade 9) students between the group of students learning management by using the micro class teaching method and another group of students learning management by using traditional methods. The research design was a quasi-experimental research methodology.

The samples of this research were 60 Secondary 3 (Grade 9) students in the Zigong Lusheng Experimental school, China. They were divided into two classes and selected by using cluster sampling technique. The research instruments were the micro class teaching method lesson plans, traditional lesson plans, and learning achievement tests. The data were analyzed using mean, standard deviation, and t-test.

The research results revealed that: 1) the learning achievement in the mathematics course of Secondary 3 (Grade 9) students after learning management by using the micro class teaching method was significantly higher than before learning management at the .05 level, 2) the learning achievement in the mathematics course of Secondary 3 (Grade 9) students after learning management by traditional methods was significantly higher than before learning management at the .05 level, and 3) the learning achievement in the mathematics course of Secondary 3 (Grade 9) students learning management by using the micro class teaching method was significantly higher than another group of students learning management by traditional methods at the .05 level.

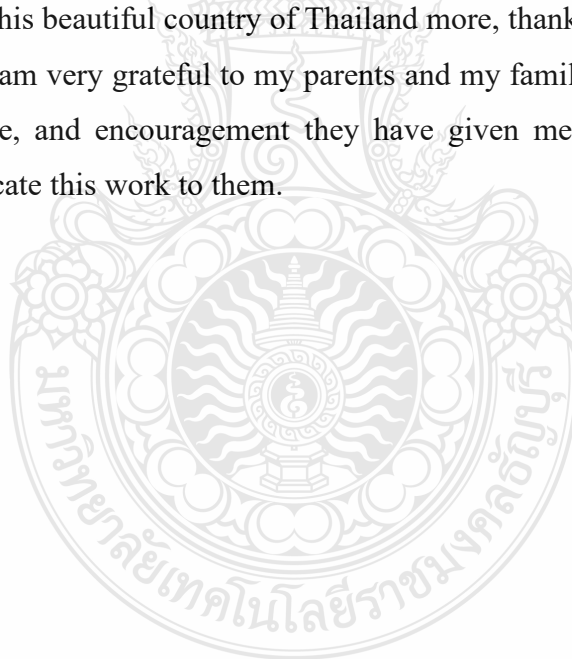
Keywords: micro-class teaching, learning achievement, mathematics

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Yi Liang

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CHAPTER 1

INTRODUCTION

1.1 Background and Importance of the Problems

In the national basic education curriculum reform outline, it was elaborated that primary and secondary school teachers needed to continuously improve their information literacy, applied information technology to all aspects of teaching, and promoted the effective integration of information technology and subject curriculum. The goal was to achieve changes in the presentation mode of teaching content, the learning mode of students, the teaching mode of teachers, and the interaction mode of teachers and students.

The reform tapped the advantages of information technology, promoted the development of students, and provided students with high-quality learning methods (Jianlin, 2019, pp.97-100). The teaching process of teachers was not simply a process of imparting knowledge and accepting knowledge. It also needed to take students as the main body, observe the needs of students from life, combine the characteristics of students' growth and development and the characteristics of the development of the times, and use new teaching methods or teaching methods to let students actively participate in the learning of mathematics classes, maximize the enthusiasm of students for learning, and tap the learning potential of students, so that every student could achieve greater development.

In the mathematics curriculum standard of full-time compulsory education, it was pointed out that the development of modern information technology had a great impact on the value, objectives, contents, and learning and teaching methods of mathematics education, and the design and implementation of mathematics curriculum should pay attention to the use of modern information technology methods (Yanfeng, 2019, p.2). The use of micro-class means was employed to design the junior high school mathematics classroom process, process the mathematical knowledge, and display it in another dynamic way. That is, the hidden knowledge was visually displayed through short videos, which reduced the difficulty of understanding the knowledge, helped students find the fun of learning mathematical knowledge, made students willing to learn and explore, and triggered students' exploration and creativity.

For the students in the targeted training school (here in after referred to as School D), their parents' education level was relatively low. Most of the students' parents' education level was below junior high school, and some hadn't even graduated from primary school. Whether before or after class, the parents couldn't provide effective homework guidance to the students, and the students couldn't complete the homework before and after class in a timely and accurate manner. This resulted in an increasing amount of knowledge that the students didn't know. The weariness of learning became more serious, directly reducing the students' interest in learning, leading to a gradual decline in academic performance (Hongli, & Guo, 2016, p.1).

The emergence and rapid development of network technology brought a great impact on the operation and lifestyle of human society, especially the rapid progress of Web 2.0 technology, which provided great convenience for people's information integration and sharing. Currently, the "micro era" represented by microblogs, WeChat, and other information media had arrived, which was both an opportunity and a challenge for the development of all walks of life. Specifically, in the field of the education industry, the rapid development of information technology in recent years had brought great impetus to the traditional teaching model. Currently, a new round of teaching mode innovation, represented by micro-courses and micro classes, gradually attracted the attention of the educational community, creating the necessary conditions for the improvement of teaching quality and efficiency under the premise of the rapid development of mobile Internet technology. Since the beginning of this century, Harvard University, Yale University, Massachusetts Institute of Technology, and other world-renowned universities in the United States had opened web-based open video courses. China was also vigorously promoting the construction of the national high-quality course network video resource system. The open sharing of educational resource systems under the network environment had become an important direction and trend in the future development of education.

However, with the progress and development of the times, the above development model of open education using classroom teaching records also had some shortcomings. For example, the video time of online open courses was relatively long, and the requirements for network bandwidth resources were relatively strict. At the same

time, too large video files also affected the upload, download, and sharing of these resources in the network environment. It was not conducive to learners' open learning anytime and anywhere. Additionally, the open online course video didn't simplify the teaching content, which led to the learners' inability to maintain high attention for a long time in the learning process. In this context, new teaching models systems such as teaching video cases, micro videos, micro classes, and micro classes emerged in the education systems at home and abroad. Currently, many domestic scholars, experts, and frontline teachers attached great importance to micro classes. With its distinctive teaching theme, highly targeted teaching content, short resource system, and highly structured and expandable advantages, the micro class created a good environment for mobile learning and hybrid learning under the network environment, which could better meet the basic needs of learners for autonomous learning at anytime and anywhere. Therefore, it had high theoretical and practical value for the relevant theoretical and practical research of micro classes.

The researcher designs and develops a micro-class resource system in the mathematics teaching system for Secondary 3 (Grade 9) students as the research object. This thesis discusses the necessity and possibility of introducing the micro class teaching mode into the mathematics teaching process for Secondary 3 (Grade 9) students. It does so by sorting out and analyzing the learning achievements in the micro-class teaching system in China and combining the author's experience in mathematics classroom teaching in elementary and intermediate schools. The aim is to study the design and development mode of mathematics micro class resources for Secondary 3 (Grade 9) students, analyze the implementation effect of the micro class in mathematics teaching activities for Secondary 3 (Grade 9) students, provide some references for the design, development, and implementation of micro class resources in domestic elementary and intermediate schools, and promote the improvement of mathematics teaching quality in elementary and intermediate schools.

1.2 Research Purposes

1.2.1 To compare the learning achievement in the mathematics course of secondary 3 students before and after learning management by using the micro class teaching method.

1.2.2 To compare the learning achievement in the mathematics course of secondary 3 students before and after learning management by using traditional methods.

1.2.3 To compare the learning achievement in the mathematics course of secondary 3 students between the group of students learning management by using the micro class teaching method and another group of students learning management by using traditional methods.

1.3 Research Hypothesis

The researchers will test the following hypothesis tests at a significance level of .05:

1.3.1 learning achievement in the mathematics course of secondary 3 students after learning by micro class teaching method is higher than before learning.

1.3.2 learning achievement in the mathematics course of secondary 3 students who learn by the traditional method is higher than before learning.

1.3.3 learning achievement in the mathematics course of secondary 3 students who learned by micro class teaching method is higher than that who learned by traditional method.

1.4 Scope of Research

1.4.1 population and samples

1.4.1.1 The population was 203 secondary 3 (grade 9) students from 5 classes in a junior high school in Zigong Lusheng Experimental School, China in the academic year 2022.

1.4.1.2 The samples were secondary 3 (grade 9) students in junior high school in Zigong Lusheng Experimental School, China in the academic year 2022. The 2 classes of 60 students were randomized by cluster sampling technique, with one group

being assigned as the experimental group and another as the control group. Each group had 30 students.

1.4.2 Variable scope

1.4.2.1 Independent variables teaching management 2 level were.

- 1) micro class teaching method
- 2) traditional method

1.4.2.2 Dependent variable was learning achievement.

1.4.3 Content scope

The first volume of the mathematics curriculum for junior high school grade three consists of four chapters:

Unit 1: rational numbers

Unit 2: addition and subtraction of integers

Unit 3: univariate quadratic equation

1.4.4 Time frame

The period of the teaching experiment was from January 2022 to February 2023.

1.5 Definition of Terms

1.5.1 The micro class teaching method refers to a kind of teaching activity that realizes a certain knowledge point, practice, question answering, or practical teaching in junior high school mathematics teaching activities by using short digital videos (2-4 videos) as a medium and combination of teaching resources. These videos are integrated into the teaching steps and introduced to students for studying and reviewing after class.

1.5.2 The traditional method refers to the primary teaching approach used in junior high school mathematics teaching activities. It's one-way instillation by teachers and passive acceptance by students. Teachers play a leading role in the teaching process, and students, as cognitive subjects, can only receive knowledge passively.

1.5.3 learning achievement refers to the unit test and final exam, mainly composed of 30 multiple-choice questions. Each multiple-choice question has 4 options,

which are used to investigate students' mastery of mathematics curriculum knowledge and require students to conduct relevant analysis, calculation, and inference.

1.5.4 Junior high school students refer to students from secondary 1 to 3 (grades 7 to 9), usually between the ages of 13 and 15, who were in the last stage of China's nine-year compulsory education.

1.6 Research Framework

This research used a quasi-experimental research design, and the framework below served as the researcher's guide in the conduct of the study.

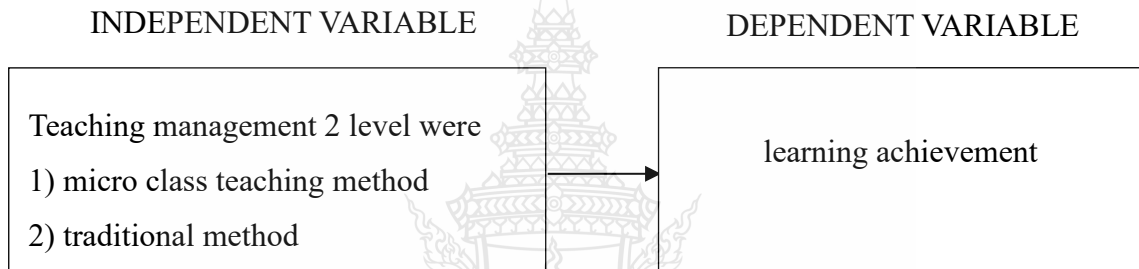


Figure 1.1 Conceptual Research Framework

1.7 Contribution to Knowledge

1.7.1 Guideline on how to manage teaching by the micro class teaching method can improve learning achievement of secondary 3 students in mathematics course learning.

1.7.2 Guideline on how to manage teaching by the micro class teaching method can improve learning achievement for the other courses.

CHAPTER 2

REVIEW OF THE LITERATURE

The researcher studied the results of using the micro-class teaching method in teaching mathematics to develop learning achievement for junior high school. The researcher focused on a review of the literature related to this research as the following:

- 2.1 Mathematics Curriculum
 - 2.1.1 Importance of mathematics curriculum
 - 2.1.2 Strands and learning standards
 - 2.1.3 Learning management guidelines
- 2.2 Micro-Class Teaching Method
 - 2.2.1 Meaning of Micro-Class Teaching Method
 - 2.2.2 Feature of Micro-Class Teaching Method
 - 2.2.3 Steps of Micro-Class Teaching Method
 - 2.2.4 Benefits of Micro-Class Teaching Method
 - 2.2.5 Disadvantages of the Micro-Class Teaching Method
- 2.3 Learning Achievement
 - 2.3.1 Definition of learning achievement.
 - 2.3.2 What is the scoring standard of learning achievement
 - 2.3.3 How to effectively improve learning achievement
- 2.4 Relevant Research
 - 2.4.1 Domestic research
 - 2.4.2 Foreign research

2.1 Mathematics Curriculum

2.1.1 Importance of mathematics curriculum

As an important compulsory course from primary school and middle school to university, mathematics was essential knowledge for human beings. Mathematics played an important role in people's daily life and production anytime and anywhere. In modern times, mathematics, as an important weapon of modernization, played a crucial and even decisive role in many important fields. By accurately and

quantitatively considering problems and gaining a fully grounded understanding of laws, mathematics became an essential foundation, not only in natural science and technical science but also in economic science, management science, and even humanities and social sciences. Without the support of mathematics, it was difficult for relevant science to make great progress. In recent years, many disciplines (especially many natural science disciplines) even showed a trend of mathematization (Lin & Yunwu, 2015, pp.127-130).

At the same time, mathematics ignored the specific forms and attributes of matter and studied the real world purely from the perspective of quantitative relations and spatial forms. It was similar to philosophy and had the characteristics of transcending specific disciplines and being universally applicable. It had to guide significance for all disciplines. Mathematical science had now formed a huge scientific system, including many branches of pure mathematics and applied mathematics, as well as many new interdisciplinary subjects. Mathematics was an important foundation of human civilization. Its emergence and development were accompanied by the process of human civilization, and it played an important role in promoting and holding a pivotal position (Shuang, 2016, p.141).

Based on the data, the researcher concluded that mathematics played a key, even decisive role in many fields as an important weapon of economic construction, an essential foundation of various sciences, and a fundamental pillar of human civilization. Mathematical technology had become a prominent symbol and an indispensable component of high technology. The influence and role of mathematics could be seen everywhere, and its importance had been recognized by an increasing number of people.

2.1.2 Strands and learning standards

In China, junior high school mathematics was implemented in accordance with the mathematics curriculum standard of nine-year compulsory education. Its purpose was to enable every student to obtain the most suitable development in the learning process through mathematics teaching. Through the teaching of junior high school mathematics, students were taught to master basic knowledge and skills and cultivate their logical thinking ability, computing ability, spatial concept, and ability to solve simple practical problems. This allowed students to gradually learn to operate correctly and reasonably, and gradually learn to observe, analyze, synthesize, abstract, and summarize.

They were able to use induction, deduction, and analogy for simple reasoning. The aim was to enable students to understand the origin and practice of mathematics, which, in turn, acted on their practice. (Xueming, 2018, p.2)

At the same time, junior high school mathematics teaching also aimed to help students improve their interest in learning mathematics and gradually cultivate students with good learning habits and realistic attitudes. It aimed to instill strong perseverance in learning and foster new ideas of independent thinking and exploration. The teaching aimed to cultivate students' ability to solve problems with mathematical knowledge. (Xinxin, 2019, p.2)

Based on the data, the researcher concluded that through the study of the mathematics curriculum in junior high school, students should recognize the close relationship between mathematics and life, clarify the significance of learning mathematics, and utilize mathematical knowledge to solve practical problems. This will enable them to gain successful experiences and establish confidence in learning mathematics effectively. Students should also realize that mathematics is an important tool for solving practical problems and understand its crucial role in promoting social progress and development (Jianli, 2014, pp.4-6). They should recognize that mathematics learning is a process that involves observation, practice, inquiry, induction, analogy, reasoning, and creativity. Furthermore, it is essential to cultivate the good thinking quality by combining independent thinking with cooperation and communication.

2.1.3 Learning management guidelines

Yu (2018, p.1) believed that the learning management guidelines of the mathematics curriculum mainly included previewing, listening in the classroom, completing homework, taking tests, correcting errors, and reviewing, etc. 1) Previewed: browsed the content of the unit to be taught by the teacher before class, and paid attention to the parts that were not understood. 2) Listened in the classroom: recited the key points while listening in class. Key points such as definitions, theorems, and formulas were memorized carefully during class. 3) Completed homework: carefully and independently completed the homework in and out of class. If unable to solve a problem immediately, it was advisable to skip it temporarily to avoid wasting time. The problem could be revisited during spare time. If still unable to solve the problem, discussions with classmates or

teachers were encouraged. Wrong questions in the work were corrected promptly, with analysis of the causes of errors and taking notes. 4) Took tests: before the test, key points within the scope of the test were organized and reviewed, with a focus on the key questions and knowledge points outlined in the teaching requirements. During the test, questions were answered carefully. Difficult or impossible questions could be set aside temporarily, and after answering all the relatively simple questions, attention could be redirected to solving the remaining problems. 5) Corrected errors: after the test, all the incorrect questions were sorted out, and the reasons for the mistakes were analyzed by comparing answers or consulting with teachers and classmates. And 6) reviewed: after learning a unit or a lesson, the key contents of the acquired knowledge were repeatedly reviewed and consolidated. The review was conducted according to the chapter titles and the structure of knowledge points.

Based on the data, the researcher concluded that mathematics is a rigorous natural science. Students should fully grasp the characteristics of the mathematics curriculum, adequately prepare during the learning process, listen attentively in class, and complete their homework on time. Furthermore, they should approach tests and exams with seriousness, carefully review and correct any incorrect answers, and engage in regular course content revision.

2.2 Micro-Class Teaching Method

2.2.1 Meaning of Micro-Class Teaching Method

"Micro Class" was originally differentiated from Micro-Lecture. Tiesheng (2011, pp.61-65) first proposed the concept of "Micro Class" around 2010 and conducted a comparative analysis of resource content, presentation methods, resource platforms, target audiences, sources of materials, production tools, production methods, basic objectives, classification, and application occasions between micro class and micro curriculum. It was also believed that micro-course was a type of micro-course resource in the network environment that could overcome time and space restrictions and support multiple learning environments by structuring compound resources, utilizing short video files as the teaching content carrier and presentation approach, and operating in the Web network environment.

Tiesheng's definition and elaboration of the concept of micro course have gained recognition from academic and educational circles, and many researchers and frontline teachers have also acknowledged it. Furthermore, some domestic scholars have defined the concept of micro-courses from different perspectives, and the main points can be summarized as follows: Jin (2015, pp.22-25) believed that the difference between micro-courses and micro-courses was not particularly distinct, and they had a close relationship. He also emphasized that micro-courses and micro-courses should not be considered separate entities. Both micro-courses and micro-courses are teaching modes that utilize online videos as the primary medium, with the video duration not exceeding 10 minutes. They have precise teaching purposes and content settings, primarily focusing on explaining single knowledge points or key and challenging aspects within the teaching process (Leroy, 2014, pp.189-201).

Jiahou (2014).believed that micro class is a teaching mode that describes a single knowledge point in teaching activities through short and concise network videos. Its core feature is the unity and networking of teaching content. The specific application environment is classroom teaching, and the audience consists of teachers and students.

Based on the data, the researcher concluded that the basic concept of a micro class can be defined as follows: A micro class is a teaching activity conducted through digital video as a medium for specific knowledge points, exercise exercises, question-answering tasks, or practical teaching within the context of teaching activities. In other words, a micro class is the seamless integration of teaching resources and teaching activities, applicable to learning activities before, during, and after class. It represents a tangible implementation of the flipped classroom concept.

2.2.2 Feature of Micro-Class Teaching Method

"Micro-Class" was a new teaching mode that emerged with the development of network technology and the advancement of teaching philosophy, and it had some similar characteristics to traditional teaching videos. The basic features of Micro-Class included short learning time, strong subject matter, flexible teaching content selection, and sharing of teaching resources, which could be summarized as short, small, concise, and humble (Yuxia, 2015, p.2): 1) Short: the teaching process was relatively short, and the duration of video resources was also relatively short. 2) Small: the teaching

content was relatively small, with a focus on selecting topics and knowledge points that were relatively single and not extensive in terms of knowledge capacity. 3) Precise: the teaching content was carefully selected, and the teaching process was wonderfully compact. And 4) Humble: the teaching process was highly interactive and could be applied to multiple teaching situations.

In the Micro-Class teaching mode, the duration of the entire teaching activity was relatively short, typically around 15 minutes, and usually not exceeding 10 minutes for Micro-Class education in primary and secondary schools (Xiuyu, 2014, pp.18-22). The topics chosen in the Micro-Class teaching mode were relatively small, and the teaching process typically covered only a single knowledge point or teaching session. The selection of topics for Micro-Class teaching followed the principle of refinement, focusing on addressing difficult and key points that appeared in teaching. Additionally, the Micro-Class teaching mode had strong interactivity and could be applied to various teaching settings such as school classroom teaching, teaching research preparation, distance network teaching, and mobile network teaching, optimizing the configuration and combination of teaching resources (Lippényi, & Gerber, 2016, pp.80-103).

Based on the data, the researcher concluded that the micro class is an information-based teaching mode and approach, with the micro video at its core, and micro courseware, micro-teaching plan, micro exercise, micro feedback, micro comment, and micro reflection as its content. It possesses the fundamental characteristics of being "short and concise". In comparison to the traditional classroom teaching mode, the micro class maximizes the benefits of information technology. The situational teaching presented through micro videos holds unmatched advantages in stimulating students' enthusiasm and learning motivation.

2.2.3 Steps of Micro-Class Teaching Method

The design and development of the micro class was a relatively complex and systematic task. Currently, the academic community had established a fixed process model for the design and development of micro-courses (Li, 2021, pp.81-83):

Step 1. Firstly, the topics and knowledge points used for micro-class teaching were analyzed based on the teaching plan's basic situation. Knowledge points with high teaching value and research significance were selected as the themes for micro-

class design. Additionally, key or challenging content from the course could also be chosen as the focus of micro-class teaching.

Step 2. Front-end analysis work: The front-end analysis work in the design and development of micro class played a crucial role in guiding the design and production of teaching resources and determining the quality of micro class resources. This work involved investigating and analyzing the learning content, assessing students' knowledge points and learning abilities to guide the subsequent design and development of mathematical micro classes.

Step 3. Elaboration of knowledge points: Micro class's essential feature was its "micro" nature, where the content, expression, and resource scale of knowledge points were relatively small, representing typical micro learning resources. After the front-end analysis and processing, the selected knowledge content and teaching plan were refined and segmented, ensuring that the knowledge points used for micro-class development were not only "micro" in nature but also self-contained and relatively complete.

Step 4. Designing micro class resource elements: Micro class resources were teaching resources directly applicable to teaching activities, encompassing complex contents and elements. This included specific teaching design, exercise design, and teaching courseware, corresponding to micro-teaching plans, micro exercises, and micro courseware in micro class resources. The design of these basic elements should closely align with specific junior high school mathematics teaching content, providing detailed guidance for the production of final video resources.

Step 5. Recording teaching videos: Based on the analysis of resource elements for junior high school mathematics micro-class teaching, teachers could record micro-class video resources. In this stage, teachers needed to select appropriate software, hardware equipment, or tools, determine the script writing platform, and establish processing methods for specific elements. During the recording of original video materials, teachers should choose a quiet environment to ensure that the video's quality met the basic requirements of junior high school mathematics micro class teaching.

Step 6. Post-editing and format processing of micro-class video resources: After completing the recording of micro-class video resources, optimization of the

original video resources was typically necessary using video processing software or tools. This stage involved tasks such as adding video commentary subtitles, reducing video noise, and editing the video. After these processes, video resources suitable for micro-class teaching could be obtained. Additionally, since the video file formats generated by recording and processing tools were often large, it was necessary to use video format conversion software to convert and output the video files into a format suitable for junior high school mathematics micro-class teaching.

Based on the data, the researcher concluded that the core links and processes involved in the design and development of micro classes mainly include the selection and establishment of teaching themes, the analysis of front-end resource content, the analysis and refinement of knowledge points, the detailed design of basic elements of micro class resources, the planning and production of micro class video resources, and the subsequent processing, editing, and application of micro class video resources.

2.2.4 Benefits of the Micro-Class Teaching Method

As a situational teaching mode, the micro class had a more prominent effect in activating the classroom atmosphere and mobilizing students' enthusiasm and interest in learning. Compared to the traditional teaching mode delivered by teachers, students had a higher level of interest in micro-class learning (Luo, 2020, pp.1-5).

Micro-class teaching provided a convenient way for students to learn independently and solve problems after class. After the introduction of the micro class teaching mode, students could learn independently by reviewing micro videos, reinforcing their knowledge from class, and finding solutions to problems that arose (Ma, 2018, pp.93-95).

The introduction of the micro class teaching mode improved the classroom teaching effect of mathematics courses in junior high schools and enhanced student learning outcomes. When teachers selected teaching content that closely aligned with students' real-life experiences, it became easier to create micro videos in a situational manner. Compared to traditional teachers' classroom teaching or PowerPoint presentations, students' attention was more focused, resulting in a more prominent and noticeable learning effect (Zequn, 2017, p.2).

Based on the data, the researcher concluded that with the rapid development of information technology, the micro class teaching mode, as a new learning resource and teaching method in recent years, meets the fundamental requirements of current quality education. Additionally, students also express a preference for introducing the micro lesson teaching mode in junior high school mathematics classroom teaching. The micro lesson can effectively enhance and stimulate students' enthusiasm and interest in learning, sustain their attention in the classroom through demonstration videos and other resources, facilitate students in quickly grasping the knowledge and skills they have learned, and contribute to the enhancement of students' overall quality and abilities.

2.2.5 Disadvantages of the Micro-Class Teaching Method

The disadvantage of the micro class was that its teaching process involved independent teaching based on knowledge points, resulting in fragmentation. As a result, it could not be compared to the systematic and comprehensive nature of a complete chapter's course content. Most scholars generally recommended micro class as an auxiliary learning method for students to consolidate knowledge points (Xiangzeng, 2014, pp.24-32).

Based on the data, the researcher concluded that compared to traditional classroom teaching, micro class exhibits the following two disadvantages. Firstly, the effectiveness of micro-class teaching relies heavily on students' level of consciousness. While micro-class teaching encourages students' active engagement in autonomous learning, students with weaker autonomous learning abilities may experience diminished learning outcomes due to excessive dependence on micro-class activities. Secondly, micro-class teaching can result in knowledge fragmentation. Although some studies argue that knowledge fragmentation is not necessarily detrimental, for students, the knowledge they need to learn is presented in the form of micro classes. Due to the time constraints of micro classes, knowledge points are inevitably broken down into smaller units. While students may achieve better mastery of individual knowledge points through micro classes, it does not guarantee their ability to independently integrate these knowledge points. In simpler terms, students may struggle to construct a comprehensive understanding of the entire subject system after mastering all the key knowledge points. This is unfavorable for students' long-term and follow-up studies.

2.3 Learning Achievement

2.3.1 Definition of learning achievement

In junior high school, the learning achievement of curriculum teaching reflected the requirements of all-round development, with emphasis on the organic integration of knowledge and skills, independent thinking, problem-solving, emotion and attitude, and the development goals of ideological enlightenment, spiritual perception, and personality shaping. This required a full consideration of the comprehensiveness of the curriculum objectives in the design process, taking into account knowledge and skills, abilities and methods, emotional attitudes, and other goals. However, classroom teaching time was limited, and goal design could not cover all objectives. Therefore, achieving harmony between the comprehensiveness of the curriculum objectives and the simplicity of the teaching objectives had become an important aspect to consider and study. In teaching practice, to achieve simplicity in teaching objectives, the focus was placed on the basic objectives and highlighted key objectives. Furthermore, classroom teaching emphasized the knowledge goal (Guohua, 2021, p.197).

Students had certain differences in intelligence, health, emotion, experience background, special ability, social adaptation, etc. In terms of respecting these differences, the most typical practice in teaching was the implementation of hierarchical teaching. By studying the teaching materials, unified teaching objectives were redesigned based on the different conditions of students at different levels, with adjustments made to increase or decrease the difficulty or requirements. Generally, low-level students could start from the basic goals and then achieve the improvement goals or even the development goals after completing them. High-level students could either start from the basic goals or directly from higher goals (Huazhong et al., 2018, p.3).

Based on the data, the researcher concluded that the primary objective of mathematics learning is to enhance students' thinking ability, cultivate their thinking quality, and stimulate their mathematical creativity. Therefore, any instruction of mathematical concepts should adhere to this overarching goal. Subsequently, for each unit and class session, a specific classroom teaching objective is formulated based on the particular topic being taught, with a deliberate focus on consciously fostering, assessing, and evaluating students' thinking abilities.

2.3.2 What is the scoring standard of learning achievement

In mathematics teaching on the third day of junior high in China, the main way to test and evaluate students' learning achievements was through staged tests, which were closed-book examinations with a total score of 120 points. According to the opinions of most educational scholars, students were usually required to achieve a passing mark of 0.6, equivalent to 72 points. If a student's test score was lower than 72 points, it fell into the unqualified range. Additionally, students scoring between 72 and 96 were evaluated as average, those scoring between 96 and 108 were evaluated as good, and those scoring between 108 and 120 were evaluated as excellent (Yanjiao, 2021, pp.71-72).

Based on the data, the researcher concluded that in China, the academic performance of the mathematics curriculum in the third year of junior high school is typically assessed through mid-term and final examinations. These examinations are conducted as closed-book tests, with a maximum score of 120 points. Additionally, students' learning achievements are classified into four grades, namely: unqualified, average, good, and excellent, based on the score range of 0.6 to 0.79, 0.8 to 0.89, and 0.9 to 1, respectively, of the total score.

2.3.3 How to effectively improve learning achievement

Mathematics learning methods underwent constant changes, but there were rules to follow after all. Among them, the "foundation" was eternal. Only by consolidating the foundation could achievements be made in future learning. Learning the basic concepts of mathematics was one of the important ways to consolidate the foundation. In the past, the basic concepts of mathematics curriculum on the third day of junior middle school in China included mathematical definitions, formulas, theorems, and more. Only by mastering the correct mathematical concepts could one understand the basic mathematical language, better comprehend the meaning of mathematics, and approach problems with mathematical thinking. This required students to understand the basic definitions in the textbook, grasp the mathematical formulas and theorems in the textbook, and comprehend the solution ideas of the examples in the textbook. By mastering the basic mathematical concepts in the past, one could draw inferences from one instance, ensure a thorough understanding of mathematical knowledge, and subsequently enhance mathematical performance (Su, 2020, pp.49-51).

Simultaneously, to improve student's learning achievements, it was also important to help them develop good homework habits. The core was to assist and cultivate students in forming the awareness of "completing independently and actively". Daily homework had to be completed on the same day, ensuring that classroom knowledge was consolidated promptly and memory efficiency was maintained. Additionally, homework had to be completed independently. Even if encountering difficulties, students were encouraged to seek help from classmates or teachers and engage in collaborative discussions. This approach deepened their impression and improved the learning effect (Chunxue & Jian, 2018, p.136).

Lastly, cultivating students' ability to summarize incorrect questions was also crucial. Many students knew how to solve problems but lacked the skill to summarize, which failed to reflect any learning effect. Therefore, it was vital to summarize after completing the exercises. By carefully summarizing, students continuously accumulated experience in solving exercises, leading to ideal results (Guoguang, 2014, p.4).

Based on the data, the researcher concluded that to enhance the learning achievements of Secondary 3 (Grade 9) students, it is crucial to assist them in establishing a solid foundation and mastering the pertinent knowledge points outlined in the textbook. Additionally, it is important to enhance students' capability and inclination to independently complete homework. Furthermore, considering the errors encountered during the learning process, fostering students' capacity for summarization and review is essential, ultimately leading to an improvement in their learning achievement.

2.4 Relevant of the Research

2.4.1 Domestic research

Rui and Wanli (2018) conducted theoretical research and provided an explanation of the basic definition, components, basic features, and types of Micro-Class in the context of networked teaching experience. They also shared the results and experiences obtained in the construction of Micro-Class resources, which offered valuable guidance and assistance for subsequent research scholars.

Xuan (2021) further clarified and researched the fundamental meaning of Micro-Class, discussing its development potential in the Internet era. They emphasized

that Micro-Class was an important driving force for the ongoing reform of domestic teaching models. Additionally, they highlighted that the rapid development of Micro-Class in recent years would trigger a new round of changes in teaching models based on digital and network technologies in China.

Wang (2021) proposed the basic meaning and conceptual definition of Micro-Class. They also presented 17 specific measures and implementation suggestions based on their own teaching practice experience in China. Numerous scholars and frontline teachers in China have conducted research and analysis on the basic theoretical system of micro-learning, including the background elements of micro-learning development, its fundamental meaning and characteristics, and its significance and impact. These contributions have provided a solid theoretical foundation for subsequent research work.

Regarding the construction of Micro-Class teaching systems and their practical application, Huiyan (2018) conducted a practical analysis and theoretical discussion on the Micro-Class resource development project for primary schools. They introduced the development of the Micro-Class construction project for primary schools in China and achieved research results. They also examined the problems and shortcomings that emerged during the practical research and proposed a highly feasible Micro-Class resource system design and development model combined with the development of information technology.

Taoran (2022) researched a college English micro-class teaching model that relied on a personalized intelligent adjustment algorithm. The study proposed visualizing the knowledge points of college English micro classes within the English teaching curriculum. After students' learning, a test stack was used to select targeted test items based on individual students' English proficiency. The test results were then utilized to customize teaching content for each student, aiming to achieve intelligent and personalized learning. By examining and analyzing the college English micro class teaching model, the study found that the micro class teaching mode, dependent on the personalized intelligent adjustment algorithm, significantly enhanced students' interest in learning English and accelerated their knowledge absorption. Furthermore, this approach

facilitated the seamless integration of the college English micro-class teaching method with traditional education.

Zirong (2019) compiled and examined relevant teaching video resources from three foreign teaching video databases, comparing and analyzing them with the domestic Micro-Class resource system. They conducted a comparative analysis and research on the design and development objectives, video teaching content, teaching characteristics, and specific case applications. Finally, they suggested that the foreign research results were useful for the design of the domestic Micro-Class resource system and emphasized the significance and promotion of foreign research results for the design and development of domestic Micro-Class resources.

Chunlin (2020) combined their experience in designing and developing Micro-Class resources in the teaching activities of application software courses. They discussed the innovation of subject teaching ideas in software development and application courses at universities in the context of the Internet era. They also proposed ways and means of applying Micro-Class in these courses.

Lijun (2019) analyzed the impact of information technology on the teaching of basic nursing courses. They proposed increasing the utilization of Micro-Class resources in the teaching work of basic nursing courses. They introduced the basic process and mode of designing and developing Micro-Class resources, as well as specific methods of combining them with the teaching mode of the dyadic classroom.

Shunyan (2014) studied the basic process of introducing the micro-class teaching mode in primary school language teaching classrooms. They proposed the fundamental process and considerations for developing Micro-Class resources in this context based on actual classroom teaching experience. These research results provided positive guidance for frontline teachers in China to carry out Micro-Class teaching activities.

Based on the research, the researcher concluded that the micro class is a novel teaching resource model that has emerged in the context of the rapid advancement of Web network technology and has been extensively developed and utilized in China. In comparison to traditional teaching methods, the micro class, with its concise attributes, can effectively emphasize the teaching theme and enhance the relevance of teaching

activities. Additionally, it can utilize various hardware terminals and network devices as teaching tools, thereby providing a more personalized learning experience and effectively reducing the cognitive load for students. This viewpoint is widely supported by many domestic scholars.

2.4.2 Foreign Research

Herry (2015) proposed the theoretical system of micro classes, but unlike China's Micro class, Leroy called it a micro lecture, which is similar to China's Micro class in form. Leroy's Micro lecture mainly includes a 60-sec lecture (60-second course), which focuses on the simplification and pertinence of the arrangement of knowledge points in the teaching unit, and initially has the basic characteristics of "micro" in the micro lecture.

Seidel (2020) designed a teaching mode called "one-minute speech", which provides teachers and students with teaching service support through highly simplified teaching content design and rich and diverse teaching resources. At the same time, the "one-minute speech" mode, can provide students with more convenient learning opportunities and methods and is not limited to offline learning. On the Web, Students can also learn independently through remote access. Usually, teaching resources will be converted into electronic video or audio, text, images, and other resource forms.

Sanl (2019) believes that the core of online teaching is to compress long-time classroom teaching into a short time, and gives specific implementation measures: according to the traditional classroom teaching mode, the key contents and core concepts of the required teaching are listed in the form of a list; For the knowledge points in the above list, prepare the introduction and summary text of the market for 15 minutes to half an hour as the context for the introduction of knowledge points; Use video recording equipment to record videos according to the teaching task plan obtained in the first two steps, and the total video duration should be controlled within 1 minute to 3 minutes; Based on the above work, the teaching task is designed with the goal of forming basic activity units for learners to read and explore; Upload the recorded teaching video file and the designed task file to the teaching management platform for learners to download. The above theoretical and methodological systems provide an important foundation for the current research work on the theory and practice of "micro Courses" in China and also provide important references and guidance for the research work of micro-courses abroad.

Ruiperez (2018) believed that Salman K used a web-based distributed teaching platform to publish teaching videos through the process of establishing and operating Khan Academy, and its content types included teaching materials and teaching plan videos, exercise videos, and examination explanations for free learning and downloading by learners around the world. At present, the number of teaching video files has exceeded 2000, covering literature, mathematics, astronomy, history, physics, biology, computers, engineering design, chemistry, and other disciplines. The length of teaching video files in Khan College is usually kept at about 10 minutes, and a series of teaching resources are formed according to the difficulty of the subject content, and corresponding practice teaching videos are configured after each teaching video resource. By adopting the development achievements of network science and technology in the network environment, the time and regional restrictions are broken through in the distributed environment, which can provide a flexible and free learning environment and resource support for learners.

Saputra (2018) believes that the ED of the YouTube teaching channel is a model of micro curriculum teaching in the current network environment. The length of teaching videos is usually kept within 20 minutes, which is characterized by conciseness, clear themes, and strong professionalism. At present, there are more than 100 relevant teaching videos of courses in its teaching channel, Ed of YouTube teaching channel has gradually added a complete caption description and a matching system for communication and Q & A in teaching videos. It also provides scholars and teachers around the world with the right to edit and upload teaching videos. It is an important virtual learning platform in the world under the network environment.

Based on the research, the researcher concluded that currently, there is no concept similar to China's Micro Class in foreign countries, although Micro Class and Micro Lessons share some similarities. However, the micro-class teaching method primarily focuses on teaching a single point of knowledge during the instructional process, providing a new teaching method that enhances student-teacher interaction and facilitates teaching and learning activities. On the other hand, the micro curriculum covers all the work contents in teaching activities, resulting in a broader application scope and higher content complexity. Consequently, the production and development of the teaching system for the micro curriculum are also more challenging.

CHAPTER 3

RESEARCH METHODOLOGY

The research on learning management through the Micro-Class teaching method to develop learning achievement for a secondary 3 student in junior high school had the following details or components:

- 3.1 Research Design
- 3.2 Population and Sample
- 3.3 Research Instrument
- 3.4 Instrument Development
- 3.5 Data Collection
- 3.6 Data Analysis
- 3.7 Statistics Used in Research

3.1 Research Design

The design of the study was quasi-experimental research in which the experimental design used the Pretest-Posttest Nonequivalent-Group Design by Best and Kahn (2003, p.178).

Table 3.1 The Pretest-Posttest Nonequivalent-Group Design

pre-test	Independent variable	post-test
T ₁	X	T ₂
T ₃	C	T ₄

Symbols Used in experimental design

- X = A learning management: The learning management through the Micro-Class teaching method
- C = A learning management: The learning management through the traditional approach
- T₁, T₃ = pre-test
- T₂, T₄ = post-test

3.2 Population and Sample

3.2.1 Population

The population was 203 secondary 3 (grade 9) students from 5 classes in a junior high school in Zigong Lusheng Experimental School, China in the academic year 2022.

3.2.2 Sample

The samples were secondary 3 students in junior high school in Zigong Lusheng Experimental School, China in the academic year 2022. The 2 classes of 60 students were randomized by cluster sampling technique, with one group being assigned as the experimental group and another as the control group. Each group had 30 students.

3.3 Research Instrument

The research instruments were classified into the types used in the experiment and the instruments used for data collection. With details as follows:

3.3.1 The learning management by using the traditional approach in mathematics curriculum for secondary 3 students in junior high school. The main content of this course was to teach the students of concept and operation of rational numbers, addition and subtraction of integers, concept, and solution of linear equation with one variable, type, and characteristics of a geometric figure, etc. The course includes the following chapters:

Unit 1: rational numbers

Unit 2: addition and subtraction of integers

Unit 3: univariate quadratic equation

3.3.2 The learning management by using the Micro-Class in mathematics curriculum for secondary 3 students in junior high school. The course content was an assessment of the learning management plan by the Micro-Class teaching method. The course includes the following chapters:

Unit 1: rational numbers

Unit 2: addition and subtraction of integers

Unit 3: univariate quadratic equation

3.3.3 Learning achievement test on the mathematics curriculum secondary 3 students in junior high school. The test was conducted according to the unit. The test paper contains 30 multiple-choice questions. Each multiple-choice question has 4 options.

3.4 Instrument Development

3.4.1 The learning management was done using the traditional method in the mathematics curriculum for junior high school grade three. The teaching contents included the following chapters: Unit 1: rational numbers; Unit 2: addition and subtraction of integers; Unit 3: univariate quadratic equation. This included the following:

3.4.1.1 Studied the mathematics curriculum for junior high school grade three, the learning management plan, and the learning activities of the traditional method.

3.4.1.2 Created the learning management plan using the traditional method. The mathematics curriculum for junior high school grade 9 was taught using the traditional classroom teaching mode.

3.4.1.3 Sent the teaching management plan with the learning management using the traditional method to the advisor to check the accuracy of the content. Asked the advisor to provide suggestions and make modifications based on the given suggestions.

3.4.1.4 The learning management plan with the learning management using the traditional method was given to three experts, including two curriculum and teaching experts and one measurement and evaluation education expert. The experts checked the correctness and applicability of the teaching management plan based on the traditional method, as well as the consistency of the learning content, learning standards, and test indicators. The results were divided into three levels: adequacy, uncertainty, and inadequacy.

3.4.1.5 The evaluation results of the learning management plan with the learning management using the traditional method, as feedback by experts, were sorted out. The scores given by the experts were analyzed to verify the rationality and correctness of the teaching management plan. The item-objective Congruence (IOC) index was set to a value greater than or equal to 0.50. The plan was improved based on

the evaluation results and expert suggestions before the trial, making it perfect. The IOC for this lesson plan was equal to 1.

3.4.1.6 The modified learning management plan with the learning management using the traditional method was tried out in the non-sample group of students, specifically the selected control class of 24 students, which was used as the comparison research object with the sample group.

3.4.2 The learning management was done using the Micro-Class method in the mathematics curriculum for secondary 3 students in junior high school. The teaching contents included the following chapters: Unit 1: rational numbers; Unit 2: addition and subtraction of integers; Unit 3: univariate quadratic equation. This included the following:

3.4.2.1 Studied the mathematics curriculum for secondary 3 students in junior high school, the learning management, and the Micro-Class teaching method.

3.4.2.2 Studied concepts, theories, and methodologies of the instructional method of Micro-Class teaching. Summarized the following concepts:

1) The learning management using the Micro-Class was discussed in the mathematics curriculum for secondary 3 students in junior high school in terms of course teaching application. The researchers collected and analyzed related literature and research papers on the teaching method of Micro-Class, studying concepts, theoretical systems, and methodologies related to Micro-Class. This included basic concepts, basic content, basic characteristics, scope of application, and relevant theories of Micro-Class.

2) The mathematics curriculum is an important basic course in primary school, junior high school, senior high school, university, and even graduate stages. The researcher analyzed the importance of the mathematics curriculum, the strands and learning standards of the mathematics curriculum, and the learning management guidelines of the mathematics curriculum.

Based on the research of relevant concepts, theories, and methodologies, the researcher designed the learning management plan using Micro-Class in the mathematics curriculum for secondary 3 students in junior high school. The steps were as follows:

Table 3.2 Learning management by using the Micro-Class techniques

Steps	Learning management by using the Micro-Class techniques
Steps 1	One of the two classes of secondary 3 students in Zigong Lusheng Experimental School (a junior high school in Zigong City, Sichuan Province, China) was selected to carry out the teaching experiment of mathematics curriculum course based on Micro-Class teaching method, and the other class was used as the control class to adopt the traditional teaching
Steps 2	The basic principle of Micro-Class was applied to the design process of Micro-Class teaching scheme
Steps 3	Design teaching content and scheme, carry out group teaching experiment, after the completion of each unit teaching task, the experimental class and control class unit test
Steps 4	The unit test scores of 60 students from two classes were collected and counted, and the effect of the Micro-Class teaching technique of the mathematics curriculum for secondary 3 students in junior high school was analyzed and compared

3.4.2.3 Created a learning management plan with learning management using the Micro-Class teaching method for the mathematics curriculum course.

3.4.2.4 The learning management using the Micro-Class teaching method was sent to the advisor to check the accuracy of the content. The advisor was asked to make suggestions and modify the content according to the suggestions given.

3.4.2.5 The learning management using the Micro-Class teaching method was handed over to three experts, including two curriculum and teaching experts, and one measurement and evaluation education expert. The experts checked the correctness and applicability of the learning management plan using instructional models of cooperative learning by the Micro-Class teaching method, as well as the consistency of the learning content, learning standards, and test indicators. The results were divided into three levels: appropriate, not sure, and inappropriate.

3.4.2.6 The evaluation results of the learning management using the Micro-Class teaching method, as provided by the experts, were sorted out, and the scores of the experts were analyzed to verify the rationality and correctness of the teaching management plan. The item-objective Congruence (IOC) index was set to be greater than or equal to 0.50. The plan was then improved based on the evaluation results and expert suggestions before the trial, making it perfect. The IOC for this lesson plan was equal to 1.

3.4.2.7 The modified learning management plan was applied to the sample group of students, which was a class of secondary 3 students in Zigong Lusheng Experimental School, consisting of a total of 24 students. This was done to verify the actual effect of the learning management through the Micro-Class techniques.

3.4.3 The learning achievement test on the mathematics curriculum for secondary 3 students in junior high school was conducted. The test was conducted according to units, and the test paper contained 30 multiple-choice questions, with each question having 4 options.

3.4.3.1 Studied the curriculum and concepts, theories of the learning achievement test, and how to create a learning achievement test.

3.4.3.2 Created the learning achievement test on the mathematics curriculum for junior high school grade three, which contained 30 multiple-choice questions. Each multiple-choice question had 4 options.

3.4.3.3 The learning achievement test was sent to the advisor to check the accuracy of the content. The advisor was asked to make suggestions and modify the content according to the suggestions given.

3.4.3.4 After creating the learning achievement test, researchers submitted it to experts for evaluation to verify the Content Validity of the structure and the consistency with the learning content. The evaluation criteria were as follows:

1: appropriate (The paper content was designed and created in accordance with the learning objectives).

0: not sure (It was not certain that the content was designed and created in accordance with the learning objectives).

-1: inappropriate (The content was not designed and created in accordance with the learning objectives.)

3.4.3.5 The evaluation scores of experts were analyzed for the learning achievement test to determine whether the content of the paper was consistent with the learning objectives. The formula IOC (Index of Item Objective Congruence) was used for analysis, and the IOC value was considered to be between 0.50 and 1.00. The IOC for this learning achievement test was equal to 1.

3.4.3.6 The content of the learning achievement test was improved according to the experts' suggestions. Then, the reliability test was conducted with secondary 3 students from Zigong Lusheng Experimental School, a junior high school in Zigong City, Sichuan Province, China, using Cronbach's alpha coefficient.

3.4.3.7 A test was administered to measure learning achievement, with a revised tryout conducted with 30 students who were not part of the sample group.

3.4.3.8 The test results from the trial were used to check the quality of the test. The discrimination index, difficulty, and value were analyzed. Items with a difficulty value between 0.20 and 0.80 and a classification power of 0.20-0.80 were selected.

3.4.3.9 Take a test to measure learning achievement 20 of the 30 items selected questions were selected to check the confidence of the test more than 0.8.

3.4.3.10 The final learning achievement test that had passed the quality check is released for subsequent teaching experiment verification and analysis.

3.5 Data Collection

The researchers collected data in the following sequence of steps:

3.5.1 Preparation steps

3.5.1.1 Contact the head of the education authority and request his assistance and cooperation in obtaining permission to collect data on the teaching experimental sample group.

3.5.1.2 Contact the administrator of Zigong Lusheng Experimental School and request his assistance and cooperation in obtaining permission to collect data on a sample group of teaching experiments.

3.5.1.3 In the experimental, 60 students were selected from secondary 3 students in Zigong Lusheng Experimental School in Sichuan, China, one group is the experimental group used the micro-class teaching method, and the control group used the traditional teaching method, two classes were explained to them so that they could understand their roles and responsibilities in the teaching experiment.

3.5.2 To collect data by following the following steps:

3.5.2.1 Through the final examination, 60 students from 2 classes of secondary 3 students of Zigong Lusheng Experimental School from Sichuan, China were pretested for the course of the mathematics curriculum.

3.5.2.2 The teaching experiment of the Micro-Class teaching method was carried out. After the experiment, the teaching achievement test was conducted, and the unit test was used for post-test

3.5.2.3 The teaching experiment of the traditional teaching method was carried out. After the experiment, the teaching achievement test was conducted, and the unit test was used for post-test.

3.5.3 Summarizes the steps

The test scores and the specified standards for comparison and check, and statistical test analysis, summary.

3.6 Data Analysis

In the data analysis, the researcher used a software program to analyze the data. The following data analysis was conducted:

3.6.1 Quality Analysis of the Tools

3.6.1.1 IOC method was used to analyze the validity of learning management plan content.

3.6.1.2 IOC method was used to analyze the validity of learning achievement. And checking reliability from the Cronbach Alpha Coefficient formula.

3.6.2 Analysis Used in hypothesis testing.

3.6.2.1 Learning achievement in the mathematics curriculum was compared between the before and after learning management by using the traditional method, using a dependent t-test.

3.6.2.2 Learning achievement in the mathematics curriculum was compared between the before and after learning management by using the Micro-Class teaching method, using a dependent t-test.

3.6.2.3 The learning achievement in the mathematics curriculum was compared between learning management by using the traditional approach and learning management by using the Micro-Class techniques, using an independent t-test.

3.7 Statistics Used in Research

3.7.1 Basic statistics

Descriptive statistics such as mean and standard deviation will be used by the researcher to primarily analyze the data gathered from the experimental units.

3.7.1.1 Mean

$$\bar{x} = \frac{\sum x}{N}$$

\bar{x} = refers to the mean

$\sum x$ = is the summation of all observations

N = is the number of observations

3.7.1.2 Standard Deviation

$$\bar{x} = \frac{\sum (x-\bar{x})^2}{n-1}$$

$x - \bar{x}$ = is the difference between the observation (score) and the mean of the distribution

$(x-\bar{x})^2$ = is the squared deviation of the scores from the mean

$n - 1$ = is the number of observations minus the 1

3.7.2 Statistics Used In quality inspection of Tools

3.7.2.1 Index of item Objective Congruence (IOC)

$$IOC = \frac{\sum R}{N}$$

IOC = is the Item Objective Congruence Index

$\sum R$ = is the summation of 1 in all raters

N = is the number of items

3.7.2.2 Reliability (CronbachAlpha Coefficient)

$$\alpha = \frac{k}{k-1} \left[1 - \frac{\sum s_i^2}{s_t^2} \right]$$

α = is the Cronbach alpha coefficient

k = is the number of items

$\sum s_i^2$ = is the sum of the variances of each item

s_t^2 = is the variance of the total column

3.7.2.3 Difficulty (Crocker and Algina, 1986)

$$P = \frac{R}{N}$$

P = Difficulty index of item

R = Number of correct answers to item

N = Number of correct answers plus number of incorrect answers to item

3.7.2.4 Discriminating power

$$B = \frac{U}{n_1} - \frac{L}{n_2}$$

B = Discriminating Index

U = Correct answer in upper group

L = Correct answer in lower group

n_1 = No. of examinee in upper

n_2 = No. of examinee in lower

3.7.3 Statistics used in hypothesis testing

The t-test for Independent Samples will be used by the researcher t

3.7.3.1 Independent t-test.

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{s_c^2 \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}}$$

3.7.3.2 Dependent t-test.

$$t = \frac{\bar{d} - \mu_d}{S_d} = \frac{\bar{d} - 0}{S_d/\sqrt{n}} = \frac{\bar{d}}{S_d/\sqrt{n}}$$



CHAPTER 4

RESEARCH RESULT

This research develops the results of using the micro class teaching method in teaching mathematics to develop learning achievement for junior high school students in Zigong Lusheng experimental school. The purposes of this research were to: 1) compare the learning achievement in the mathematics course of secondary 3 students before and after learning management by using the micro class teaching method, 2) compare the learning achievement in the mathematics course of secondary 3 students before and after learning management by using traditional methods, and 3) compare the learning achievement in the mathematics course of secondary 3 students between the group of students learning management by using the micro class teaching method and another group of students learning management by using traditional methods. The researchers analyzed the data and presented the results of the data analysis in 3 parts with details as follows:

Part 1: Comparative analysis of the learning achievement in the mathematics course of secondary 3 students before and after learning by micro class teaching method.

Part 2: Comparative analysis of the learning achievement in the mathematics course of secondary 3 students before and after learning by traditional method.

Part 3: Comparative analysis of the learning achievement in the mathematics course of secondary 3 students between students who learned by micro class teaching method and students who learned by traditional method.

Part 1: Comparative analysis of the learning achievement in the mathematics course of secondary 3 students before and after learning by micro class teaching method.

Data analysis to compare the learning achievement in the mathematics course of secondary 3 students before and after learning by micro class teaching method., using the t-test (dependent), the results of the analysis were shown in Table 4.1.

Table 4.1 Comparative analysis of the learning achievement in the mathematics course of secondary 3 students before and after learning by micro class teaching method.

learning achievement	n	\bar{X}	SD	\bar{D}	Sd	t	p
before learning	30	19.13	1.19	6.07	0.69	48.05*	.000
after learning	30	25.20	1.13				

*p< .05

Analysis of data from Table 4.1 significant differences were found in t-tests. (t=48.05, p<.05). When considering learning achievement in the mathematics course of secondary 3 students who were taught by the micro class teaching method, it was found that students had a statistically significantly higher learning achievement after learning (\bar{X} =25.20, SD=1.13) than before learning (\bar{X} =19.13, SD=1.19) at .05 level.

Part 2: Comparative analysis of the learning achievement in the mathematics course of secondary 3 students before and after learning by traditional method.

Data analysis to compare the learning achievement in the mathematics course of secondary 3 students before and after learning by the traditional method, using the dependent t-test, the results of the analysis were shown in Table 4.2.

Table 4.2 Comparative analysis of the learning achievement in the mathematics course of secondary 3 students before and after learning by the traditional method.

learning achievement	n	\bar{X}	SD	\bar{D}	Sd	t	p
before learning	30	18.73	1.14	3.93	0.91	23.75*	.000
after learning	30	22.67	1.09				

* p< .05

Analysis of data from Table 4.2 significant differences were found in t-tests. (t=23.75, p<.05). When considering the average learning achievement of secondary 3 students who were taught by the traditional method, it was found that students had a statistically significantly higher learning achievement after learning (\bar{X} =22.67, SD=1.09) than before learning (\bar{X} =18.73, SD=1.14) at .05 level.

Part 3: Comparative analysis of the learning achievement in the mathematics course of secondary 3 students between students who learned by micro class teaching method and students who learned by traditional method.

Data analysis to compare the learning achievement in the mathematics course of secondary 3 students between students who learned by micro class teaching method and students who learned by the traditional method, using the t-test (independent) the results of the analysis were shown in Table 4.3 - 4.4

Table 4.3 Comparative analysis of the learning achievement in the mathematics course of secondary 3 students before learning between the students learning by the micro-class teaching method and the students learning by the traditional method.

Learning Management	n	\bar{X}	SD	t	p
by the micro-class teaching method.	30	19.13	1.19	1.33	.191
by traditional method.	30	18.73	1.14		

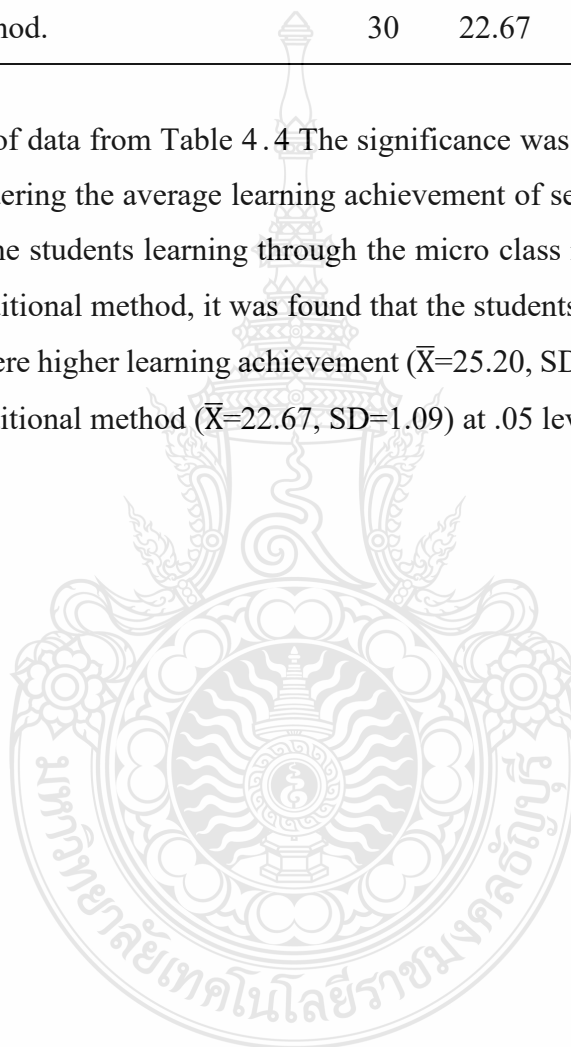
Analysis of data from Table 4.3 The significance was found in t-tests. ($t=1.33$, $p=.191$) When considering the average learning achievement of the secondary 3 students before learning between the students learning through the micro class teaching method and the students learning through the traditional method, it was found that the students learning through the micro class teaching method ($\bar{X}=19.13$, $SD=1.19$) was not significantly different at the .05 level from the students learning by the traditional method ($\bar{X}=18.73$, $SD=1.14$).

Table 4.4 Comparative analysis of the learning achievement in the mathematics course of secondary 3 students after learning between the students learning by the micro-class teaching method and the students learning by the traditional method.

Learning Management	n	\bar{X}	SD	t	p
by the micro-class teaching method.	30	25.20	1.13	8.84*	.000
by traditional method.	30	22.67	1.09		

*p<.05

Analysis of data from Table 4.4 The significance was found in t-tests. (t=8.84, p<.05) When considering the average learning achievement of secondary 3 students after learning between the students learning through the micro class method and the students learning by the traditional method, it was found that the students learning by micro class teaching method were higher learning achievement (\bar{X} =25.20, SD=1.13) than the students learning by the traditional method (\bar{X} =22.67, SD=1.09) at .05 level.



CHAPTER 5

DISCUSSION AND RECOMMENDATION

This research develops the learning achievement in the mathematics course by learning management with the micro class teaching method of secondary 3 students. The purposes of this research were to: 1) compare the learning achievement in the mathematics course of secondary 3 students before and after learning management by using the micro class teaching method, 2) compare the learning achievement in the mathematics course of secondary 3 students before and after learning management by using traditional methods, and 3) compare the learning achievement in the mathematics course of secondary 3 students between the group of students learning management by using the micro class teaching method and another group of students learning management by using traditional methods. The samples of this research were 60 secondary 3 students in the Zigong Lusheng Experimental School, China. The research instruments were the micro class teaching method lesson plans, traditional lesson plans, and learning achievement tests.

5.1 Summary of Findings

Developing the ability to solve math problems by learning management with the micro class teaching method of secondary 3 students as follows:

5.1.1 The learning achievement in the mathematics course of secondary 3 students after learning management with the micro class teaching method was significantly higher than before learning management at the .05 level, based on research hypothesis 1.

5.1.2 The learning achievement in the mathematics course of secondary 3 students after learning management by traditional methods was significantly higher than before learning management at the .05 level, based on research hypothesis 2.

5.1.3 The learning achievement in the mathematics course of secondary 3 students learning management with the micro class teaching method was significantly higher than another group of students learning management by traditional methods at the .05 level, based on research hypothesis 3.

5.2 Discussion

Developing the learning achievement in the mathematics course by learning management with the micro class teaching method of secondary 3 students can discuss research findings into 3 issues as follows:

5.2.1 According to the research result it was found that the learning achievement in the mathematics course of secondary 3 students who received learning management with the micro class teaching method, after studying higher than before studying with statistical significance at the .05 level. Because the learning management with the micro class method is a kind of micro course resource in a network environment that is structured through multiple composite resources, using short video files as the carrier and presentation of teaching content, and operating in a Web network environment. It can break through the constraints of time and space and can support multiple learning environments. For mathematics classroom teaching in the third grade of junior high school, micro classes can provide students with more convenient learning assistance based on the original teaching resource system, helping them quickly master mathematical knowledge and problem-solving skills that previously took a long time to master (Lippényi et al, 2016) In the meantime, because the micro class is still a relatively new teaching method, it can meet the curiosity of junior high school students in grade three, and it is also relatively easy to be accepted by students, improving their enthusiasm and enthusiasm for learning. At the same time, the short characteristics of micro-class resources also facilitate the teaching of individual knowledge points, and the overall learning difficulty is not high. It is also relatively easy to accept for vocational high school students with very poor basic mathematical knowledge (Jin, 2015).

5.2.2 According to the research which found that the learning achievement in the mathematics course of secondary 3 students who received learning by using traditional methods after studying was higher than before studying with statistical significance at the .05level. Because the traditional teaching form is relatively simple, and students lack the space for independent thinking: Currently, the teaching form of mathematics courses in vocational schools is still mainly using the "one talk hall" teaching form, with teachers conducting classroom teaching and students passively accepting it. However, the teaching content in mathematics courses has a strong logic, and students have limited space for

independent learning and independent thinking (Iksanetc et al, 2014). At the same time, due to the generally poor knowledge level and quality ability of students in the third grade of junior high school, although the content setting in the mathematics curriculum is relatively simple, the difficulty of learning is still relatively high for some students with poor basic knowledge. While most teachers are faced with problems such as tight class hours and low student learning efficiency during classroom teaching, and students' enthusiasm for autonomous learning after class is generally not high, resulting in students' relatively prominent fear and psychology for learning math courses, affecting the overall learning effect (Zhou, 2017).

5.2.3 According to the research which found that the learning achievement in the mathematics course of secondary 3 students who received learning management with the micro class teaching method was higher than the groups that were managed by using traditional methods with statistical significance at the level of .05. This may because the teaching content and knowledge points of the selected chapters in this experiment are relatively dense, and there is a relatively close relationship between them and the actual life experience of students. There is a relatively obvious progressive relationship between each knowledge point. Teachers can use situational settings and knowledge point teaching methods in a short time to conduct teaching, which is more suitable for the micro class teaching mode, and the teaching effect is relatively good (Zhou, 2016). At the same time, the micro-class teaching system provides convenient ways for students to learn independently and answer questions after class. After the author introduced the micro-class teaching mode, students can conduct autonomous learning after class by reviewing micro-videos, consolidating the knowledge-learning effect in the classroom, and adding ways to solve problems when there are questions (Luo, 2020). Therefore, as a newly emerging learning resource and teaching method in recent years, the micro class teaching mode is in line with the basic requirements of current quality education. At the same time, students also prefer to introduce the micro class teaching method into the classroom teaching of in-service high school mathematics. Micro-class teaching can effectively enhance and stimulate students' learning enthusiasm and interest, maintain students' attention in the classroom through resources such as demonstration videos, promote

students to quickly grasp the knowledge and skills learned, and advance the improvement of students' comprehensive quality and ability.

Therefore, with the rapid development of information technology such as network technology, software technology, and multimedia technology, today's society has entered the development stage of the micro era in recent years. In the field of education, new teaching models represented by micro classes and micro courses have emerged, attracting the attention of experts, scholars, and front-line teachers at home and abroad, and gradually becoming a research hotspot in the field of education (Wang, 2021). The micro-class teaching method meets the educational needs of the network environment and also provides solutions to the shortcomings of traditional teaching models. Through the research work on this topic, it can be seen that the application prospect of micro class in junior high school mathematics teaching activities is very broad, and micro class can effectively improve students' learning enthusiasm and learning effectiveness in junior high school mathematics teaching (Su, 2020). At the same time, to effectively integrate the micro-class education system with junior high school mathematics teaching, it is necessary to further strengthen the quality of micro-class resource development and design, as well as the mastery of micro-class related theories and skills by teachers. Through research, it can be seen that micro classes can effectively enhance students' interest in learning and provide effective help for students' knowledge understanding and deepening (Ma, 2018). At the same time, the micro-class teaching model can also improve students' self-learning ability and overall learning quality. Introducing the micro-class teaching resource system into the current domestic junior high school mathematics teaching classroom can play a role in improving teaching quality and learning effectiveness (Li, 2021). In recent years, the achievements achieved in the design and development of micro-class resources in China have begun to take shape. By analyzing and investigating these existing micro class resource design and development achievements, it can also provide necessary reference and guidance for the design and development of micro class teaching resources for the junior high school mathematics curriculum.

5.3 Recommendation

5.3.1 Recommendations for the Implementation of research results

5.3.1.1 Based on the findings, the micro-class teaching method requires teachers' comprehensive technical ability. As a new teaching system in the information era, the micro class teaching method requires teachers to master the basic teaching ability and knowledge of the course teaching content, as well as the basic operation of some information-based software tools, Therefore, to adopt a micro class teaching system, it is necessary for teachers to continuously strengthen their mastery of relevant tools for the design and development of micro class resources. Only in this way can the quality of the design and development of micro class resources be improved, and the teaching effect of the micro class teaching mode be improved.

5.3.1.2 Based on the findings, in the implementation process of the micro class teaching method, it is necessary to adopt a combination of the micro class system and the traditional teaching system to conduct micro class teaching and select suitable teaching content for micro class teaching.

5.3.1.3 Based on the findings, teachers should also actively solve students' learning problems outside of micro-class teaching resources, attach great importance to answering students' questions and doubts after class, and actively provide students with relevant materials and books to help them consolidate their classroom learning achievements.

5.3.2 Recommendations for next research

5.3.2.1 Apply the method of learning management with the micro class method to develop the ability to solve math problems in other content or at other levels.

5.3.2.2 Bringing learning management methods with the micro class method. Develop other abilities or process skills, such as creative thinking abilities other mathematical communication skills.

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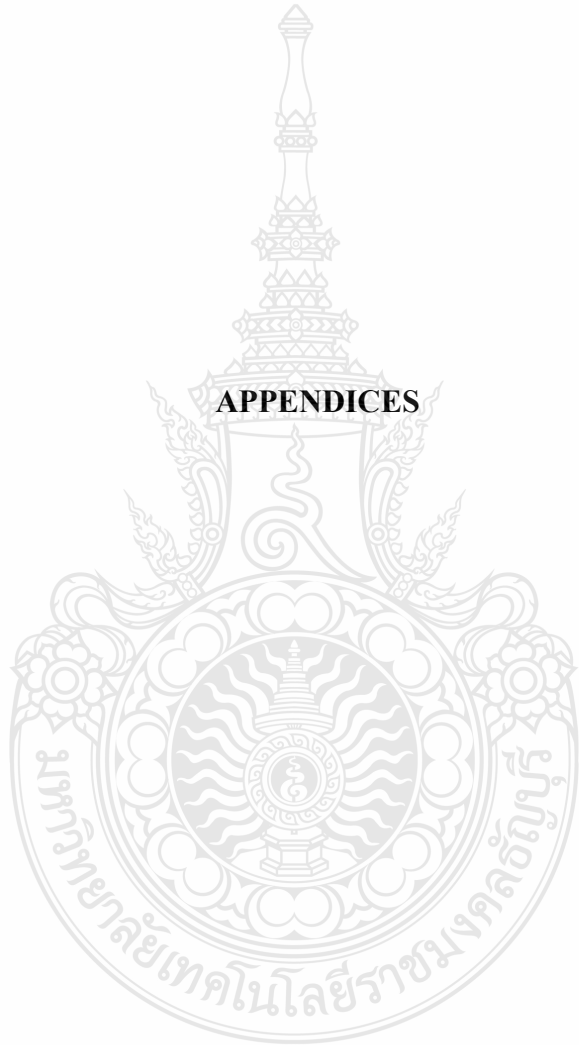
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APPENDICES





APPENDICE A

Letter to Experts and Specialists for Research Instruments Validation

No. 0649.02/ 0121.1



Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi
39 Moo 1, Rangsit-Nakhon Nayok Road,
Klong Hok, Khlong Luang, Pathum Thani
Postal Code 12110, Thailand

17 January 2023

Subject Invitation letter inviting experts to validate research instruments

Dear Assoc. Prof. Jianping Zhong

Due to Mr Yi Liang, a student who is taking up Master of Education Program in Curriculum Development and Instructional Innovation, Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), is currently processing a thesis for this semester entitled "The Results of Using the Micro Class Teaching Method in Teaching Mathematics to Develop Learning Achievement for Junior High School Students in Zigong Lusheng Experimental School" with Asst. Prof. Dr. Saiphin Siharak, a research advisor.

In relation to this, the researcher has a strong desire to be assisted with regard to the validation of the instruments required studies. The curriculum administration committee consider that you are the most qualified professional with knowledge and capabilities to provide such, the researcher has chosen and would like to ask approval from your good office to be the evaluator. I would like to invite you to be an expert to the validation research instruments for Mr. Yi Liang for the benefit of further education. I am highly anticipating your kind approval regarding this matter.

Thank you for your kind consideration.

Sincerely Yours,

(Asst. Prof. Arnon Niyomphol)
Dean, Faculty of Technical Education

Department of Education
Tel: +66-2549-3207
Fax: +66-2577-3207

No. 0649.02/ 0121.1



Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi
39 Moo 1, Rangsit-Nakhon Nayok Road,
Klong Hok, Khlong Luang, Pathum Thani
Postal Code 12110, Thailand

27 January 2023

Subject Invitation letter inviting experts to validate research instruments

Dear Prof. Zhijie Jiang

Due to Mr. Yi Liang , a student who is taking up Master of Education Program in Curriculum Development and Instructional Innovation, Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), is currently processing a thesis for this semester entitled "The Results of Using the Micro Class Teaching Method in Teaching Mathematics to Develop Learning Achievement for Junior High School Students in Zigong Lusheng Experimental School" with Asst. Prof. Dr. Saiphin Siharak, a research advisor.

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Thank you for your kind consideration.

Sincerely Yours,

(Asst. Prof. Amon Niyomphol)
Dean, Faculty of Technical Education

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27 January 2023

Subject Invitation letter inviting experts to validate research instruments

Dear Assoc. Prof. Dr. Dowroong Watcherinnrot

Due to Mr. Yi Liang , a student who is taking up Master of Education Program in Curriculum Development and Instructional Innovation, Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), is currently processing a thesis for this semester entitled "The Results of Using the Micro Class Teaching Method in Teaching Mathematics to Develop Learning Achievement for Junior High School Students in Zigong Lusheng Experimental School". With Asst. Prof. Dr. Saiphin Siharak, a research advisor.

In relation to this, the researcher has a strong desire to be assisted with regard to the validation of the instruments required studies. The curriculum administration committee consider that you are the most qualified professional with knowledge and capabilities to provide such, the researcher has chosen and would like to ask approval from your good office to be the evaluator. I would like to invite you to be an expert to the validation research Instruments for Mr. Yi Liang for the benefit of further education. I am highly anticipating your kind approval regarding this matter.

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Dean, Faculty of Technical Education

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APPENDIX B

**Lesson plan The micro class teaching method lesson plans 1 - 3
and the traditional lesson plans 1-3**

The micro class teaching method lesson plans1 - 3,

Lesson Plan 1

Lesson Plans No.1 name: rational number

Class Level: junior high school third grade

Time 2 hours

1. Learning Standards or Indicators or Learning Outcomes

Learning Standards: Understand the concept of rational numbers and the practical significance of adding and subtracting rational numbers.

Indicators: can judge what is positive and negative numbers and positive and negative integers, and can add and subtract rational numbers.

2. Concept

Rational number: Rational number is the general name of integer and fraction, and is the collection of integers and fractions. The integer can also be regarded as a fraction with one denominator.

3. Learning Objectives (KPA)

3.1 Students Correctly identify positive and negative numbers, positive and negative integers, and rational numbers, and add and subtract rational numbers (K)

3.2 Students do exercise by focus on learning objectives and content, and use textbooks and micro-class resources to learn within the specified time (P)

3.3 Students enjoy the learning process of learning content, textbooks, and micro-class resources (A)

4. Content

4.1 Basic concepts: 1) What are integers, positive integers and negative integers? 2)What is a rational number? 3)Addition and subtraction rules of rational numbers

4.2 Micro class resources

Resource 1: The generation of positive and negative numbers. The concept of positive and negative numbers is introduced through real life examples in the micro-class video.

Resource 2: Definition of positive integer, 0, and negative integer. Use the actual examples of positive and negative numbers to derive the concepts of positive integer and negative integer.

Resource 3: Introduction to the concept of rational numbers. Positive integers, 0, negative integers and fractions are collectively called rational numbers.

Resource 4: Addition and subtraction rules of rational numbers. In the micro-class video, we introduce the addition and subtraction rules of rational numbers by taking the goods in and out of the warehouse as an example.

5. Learning Activity or Learning Management Process

Introduction Step

1. Teachers welcome students to study.
2. Teacher asks the students whether they understand the concepts of positive numbers, negative numbers, positive integers, and negative integers, and develops communication between the teacher and the students
3. Designate students to illustrate the examples of positive numbers, negative numbers, positive integers, and negative integers with practical examples in life
4. Teacher summarizes the students' answers and gives the formal concepts of positive numbers, negative numbers, positive integers, and negative integers, and gives the following examples:

7 meters up and 8 meters down, 50 meters forward and 70 meters backward, 1 ton of goods out of the warehouse and 4 tons of goods in the warehouse are quantities of opposite significance in real life, which can be expressed by positive and negative numbers and expressed by 7, - 8, 50, - 70, - 1 and 4

1. 2, 3, 4, 5, etc. are positive integers

-1, - 2, - 3, - 4, - 5 are negative integers

Guide students to observe positive and negative integers and their relationship with 0

Encourage students to summarize the concepts of positive and negative numbers and positive and negative integers.

5. Teacher briefly explains the teaching objectives and contents, and gives the concept of a rational number.

Teaching Step

1. Teacher guides students to review the concepts of positive and negative numbers and positive and negative integers.

2. Teacher gives the concept of a rational number

Positive integers, negative integers, 0, and fractions are collectively called rational numbers. Positive and negative integers can be considered as positive and negative fractions with a denominator of 1.

3. Teachers play micro-class videos

Video 1: Generation of positive and negative numbers

Video 2: positive and negative integers and 0

Video 3: The concept of rational numbers

Video 4: Addition and subtraction rules of rational numbers

4. Teacher gives an example of adding and subtracting rational numbers

For an example of adding rational numbers, let the student do an exercise from the example before the teacher tells the answer:

Example 1: $1+(-2)=1-2=-1$

Example 2: $(-3)+(-4)=- (3+4) = -7$

Example 3: $2+4=6$

Example 4: $1/2+1/3=5/6$

Example 5: $(-1/4)+1/2=1/2-1/4=1/4$

Example 6: $(-2/5)+(-3/7)=- (2/5+3/7)=- 29/35$

Example 7: $2+0=2, (-4)+0=-4$

Example of rational number subtraction:

Change the "+" in the above six examples to "-" and guide students to learn the calculation rules independently

5. Teacher summarizes the concept of rational numbers and the calculation rules of addition and subtraction of rational numbers.

Addition rule: add the same sign to take the same sign, and add the absolute value; Add different signs to take the sign of the larger absolute value, and subtract the smaller absolute value from the larger absolute value; A number is added to zero to get

the original number. Subtraction rule: subtracting a number is equal to adding the opposite number of the number.

6. Teacher asked the students what are positive and negative numbers, positive and negative integers, and rational numbers, and summarized them into formal concepts.

7. Teacher guides students to give practical examples of positive and negative numbers, positive and negative integers, and rational numbers.

The number less than 0 is negative, and the number greater than 0 is positive.

An integer less than 0 is a negative integer, and an integer greater than 0 is a positive integer.

Stock-in and stock-out, increase and decrease, increase and decrease, and forward and backward can be expressed with positive and negative numbers and positive and negative integers.

8. Teacher asks the students about the rules of addition and subtraction of rational numbers and guides the students to learn the examples in the textbook.

Summary Step

1. Teacher tells students to conclude their learning from this lesson and asks questions if students are not clear.

2. Teacher gives the student to do Test1.

3. Let students do exercises in the textbook at home.

6. Materials & Resources

PPT Micro lesson video

Worksheet 1 Test 1

7. Measurement and Evaluation

Learning Objectives	How to measure	Measuring Instruments/ Tools	Measurement and Evaluation Criteria
1. Students Correctly identify positive and negative numbers, positive and negative integers, and rational numbers, and add and subtract rational numbers (K)	Testing	Test 1	Correctly more than 70%
2. Students do exercise by focus on learning objectives and content, and use textbooks and micro-class resources to learn within the specified time (P)	Observing students do exercise	-Teacher log	Students could discuss this in their group at least 70% of activities
3. Students enjoy the learning process of learning content, textbooks, and micro-class resources (A)	Observing	Teacher log	do activities and show appropriate behavior

Worksheet 1

Positive and negative numbers, positive and negative integers

Name _____ Class _____ Number _____

1. Have you ever heard of positive and negative numbers? How do you understand positive and negative numbers?

2. Can you give an example of positive and negative numbers in your life?

3. Xiaoming deposited RMB 40000 in the bank on the first day, withdrew RMB 10000 on the second day, deposited RMB 20000 on the third day and withdrew RMB 30000 on the the fourth day day. Can we use positive and negative numbers to express this process?

4. Assume that Xiaoming is now at the origin, and then drive eastward for 5 kilometers, then turn westward for 3 kilometers, then turn eastward for 4 kilometers, then turn westward for 10 kilometers, and finally turn eastward for 2 kilometers. If you use a positive and negative integer (driving eastward is positive, and driving westward is negative) to express the distance from Xiaoming to the origin (unit: kilometers), So how do you express the relationship between Xiaoming's position and the origin when you turn around each time?

When turning around for the first time: _____

At the second turn: _____

On the third turn: _____

At the fourth turn: _____

5. If you understand the concepts of positive numbers and negative numbers, what are positive integers and negative integers? Try to give examples in life?

6. Think about it. What is the relationship between positive and negative numbers, positive and negative integers and 0? Have you found any rules?

Test 1

The addition and subtraction of rational numbers

Name _____ Class _____ Number _____

1. What numbers does rational number include? Give some specific examples?

2. Summarize the characteristics of rational numbers and try to give a definition of rational numbers?

3. Please try to use addition and subtraction to express the following life examples:

A vacant warehouse has 3 tons of goods on the first day and 2 tons on the second day. How many tons of goods are left?

Xiao Ming walked 80 meters forward and 40 meters backward from the origin. How far is Xiao Ming from the origin now?

The average temperature of the day before yesterday was 10 degrees centigrade. Yesterday it dropped 3 degrees centigrade. Today it rises 8 degrees centigrade. Will the average temperature rise or fall today compared with the day before yesterday? What is the average temperature difference?

4. Calculate the following formula

$$(-40) + (-19) = \underline{\hspace{2cm}} \quad 10 - (-7) = \underline{\hspace{2cm}}$$

$$(-30) - (-10) = \underline{\hspace{2cm}} \quad (-28) - 2 = \underline{\hspace{2cm}}$$

$$(4/7) + (3/8) = \underline{\hspace{2cm}} \quad (-2/9) - 1/6 = \underline{\hspace{2cm}}$$

$$3 + (2/5) = \underline{\hspace{2cm}} \quad (7/8) - (-4) = \underline{\hspace{2cm}}$$

5. Calculate the following

$$(-20) + 33 - (-31) = \underline{\hspace{2cm}} \quad 27 + (-10) - (-3) = \underline{\hspace{2cm}}$$

$$(-9) - (-20) - 30 = \underline{\hspace{2cm}} \quad 21 - (-19) + (-8) = \underline{\hspace{2cm}}$$

$$(-3) - (-5) - (-7) = \underline{\hspace{2cm}} \quad 22 + 23 + (-24) - (-25) = \underline{\hspace{2cm}}$$

$$(-2) + (-4) - (-6) + (-8) - (-10) = \underline{\hspace{2cm}}$$

Teacher log 1

Activity Details: _____ Date: _____

Student's no./name	Comments	
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Lesson Plan 2

Lesson Plans No 2 name: Add and Subtract of Integer

Class Level Class Level: junior high school third grade

Time 2 hours

1. Learning Standards or Indicators or Learning Outcomes

Learning Standards Correctly understand the concept of integral and master the law of combination, distribution, and exchange of addition and subtraction of integral

Indicator: can correctly add and subtract integers

2. Learning Objectives (KPA)

1. Students Correctly identify add and subtract integers
2. Students can do exercise by a focus on learning objectives and content, and use textbooks and micro-class resources to learn within the specified time (P)
3. Students enjoy the learning process of learning content, textbooks, and micro-class resources (A)

3. Content

1. Basic concepts: 1) What is an integral? 2) Addition and subtraction rules of integral

2. Micro class resources

Resource 1: The coefficient and order of the integer. The concept of the integer is introduced through specific examples in the micro-class video.

Resource 2: The operation rules of the addition and subtraction of integers. The exchange law, association law, and distribution law of the addition and subtraction of integers are introduced in the micro-class video.

4. Learning Activity or Learning Management Process

Introduction Step

1. Teachers welcome students to study
2. Teacher asks the students whether they understand the concept of integral form, and develops communication between teachers and students

3. Designate students to use real examples in life to illustrate the example of integral form

4. Teacher summarizes the students' answers and gives the formal concept of the integral and the coefficient characteristics of the integral

5. Teacher briefly explains the teaching objectives and contents, and guides students to think about how to add and subtract the two integral forms

Teaching Step

1. Teacher guides students to review the concept of integral and asks students how to add and subtract integral

2. Teacher gives the rules of integral addition and subtraction

If you encounter brackets, remove the brackets first according to the rule of removing brackets: remove the "ten" sign before the brackets and the "+" sign in front of the brackets. All items in the brackets remain unchanged. Remove the "one" sign before the brackets and the "one" sign in front of the brackets. Each item in the brackets changes the symbol.

Merge similar items: the coefficients of similar items are added together, and the result is taken as the coefficient. The index of letters and letters remains unchanged.

3. Teachers play micro-class videos

Video 1: Form and concept of integral

Video 2: Addition and subtraction rules of integers

4. Teacher gives an example of adding and subtracting rational numbers, let the student do an exercise from the example before the teacher tells the answer:

Example of adding an integer:

Example 1: $3(a+5b) - 2(b-a) = (3a+5b) - (2b-2a) = 3a+5b-2b+2a = (3+2)a + (5-2)b = 5a+3b$

Example 2: $2(2a^2+9b)+3(-5a^2-4b) = (4a^2+18b)+(-15a^2-12b) = 4a^2+18b-15a^2-12b = -11a^2+6b$

Example 3: $(x^3 - 2y^3 - 3x^2y) - (3x^3 - 3y^3 - 7x^2y) = (1-3)x^3 - ((-2) - (-3))y^3 - ((-6) - (-14))xy = -2x^3 - y^3 + 8xy$

5. Teacher summarizes the concept of integral and the calculation rules of integral addition and subtraction

If you encounter brackets, remove the brackets first according to the rule of removing brackets: remove the "ten" sign before the brackets and the "+" sign in front of the brackets. All items in the brackets remain unchanged. Remove the "one" sign before the brackets and the "one" sign in front of the brackets. Each item in the brackets changes the symbol.

Merge similar items: the coefficients of similar items are added together, and the result is taken as the coefficient. The index of letters and letters remains unchanged.

6. The teacher asked the students what is an integral form and summarized it as a formal concept.

7. The teacher asks the students about the rules of the addition and subtraction of the integer, and guides the students to learn the examples in the textbook,

Summary Step

1. Teacher tells students to conclude their learning from this lesson and asks questions if students are not clear.

2. Let students do Test 2.

3. Let students do exercises in the textbook at home.

5. Materials & Resources

PPT

Micro lesson video

Test 2

6. Measurement and Evaluation

Learning Objectives	How to measure	Measuring Instruments/ Tools	Measurement and Evaluation Criteria
1. Students Correctly identify add and subtract integers(K)	Testing	Test 2	Correctly more than 70%
2. Students can do exercise by focus on learning objectives and content, and use textbooks and micro-class resources to learn within the specified time (P)	Observing students do exercise	-Teacher log	Correctly more than 70%
3. Students enjoy the learning process of learning content, textbooks, and micro-class resources (A)	Observing	-Teacher log	do activities and show appropriate behavior

Test 2

Addition and subtraction of integral

Name _____ Class _____ Number _____

1. Try to describe the rule of merging similar items?

2. Calculate the following formula:

3. Find the sum of the monomial expressions $5x^2y, -2x^2y, 2xy^2, -4xy^2$

4. Sum $3x^2-6x+5$ 与 $4x^2-7x-6$

5. Find the difference between $2x^2+xy+3y^2$ 与 $x^2-xy+2y^2$

6. Known: $A=5a^2-2b^2-3c^2$, $B=-3a^2+b^2+2c^2$, calculate $2A-3B$

7. Known: $A=3a^2+10b^2+2c^2+4d^2$, $B=4a^2+12b^2+13c^2+4d^2$, $C=a^2-10b^2+2c^2-7d^2$,

Find $4A+2B-3C$, $2A-4B-5C$

Teacher log 2

Activity Details: _____ Date: _____

Student's no./name	Comments	
	(Knowledge, Process, or Practice)	Attitude
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Lesson Plan 3

Lesson Plans No 3 name: univariate linear equation

Class Level Grade 3 junior high school

Time 2 hours

1. Learning Standards or Indicators or Learning Outcomes

Learning Standards: Master the concept of structure and coefficient of univariate linear equation, and the calculation rules of solution.

Indicator: can correctly solve univariate linear equation

2. Learning Objectives (KPA)

1. Students Correctly identify the univariate linear equation, master the operation rules for solving the univariate linear equation, and correctly solve the univariate linear equation according to the calculation rules.

2. Students do exercise by focus on learning objectives and content, and use textbooks and micro-class resources to learn within the specified time (P).

3. Students enjoy the learning process of learning content, textbooks, and micro-class resources (A).

3. Content

1. Basic concepts: 1) What is a univariate linear equation? 2) Calculation rules for solving univariate linear equations.

2. Micro class resources:

Resource 1: concepts and coefficients of univariate linear equations, examples of univariate linear equations, and real-life examples.

Resource 2: Calculation rules for solving univariate linear equations.

4. Learning Activity or Learning Management Process

Introduction Step

1. Teachers welcome students to study.

2. Teacher asks the students if they understand the concept of equation and starts the communication between the teacher and the students.

3. Designate students to illustrate the practical application of the equation with practical examples in life.

4. Teacher summarizes the students' answers and gives the formal concept of univariate linear equation

A univariate linear equation is an equation that contains only one unknown number, the highest degree of the unknown number is 1, and both sides are integers

5. Teacher briefly explains the teaching objectives and contents, and guides the students to think about how to solve the univariate linear equation

Teaching Step

1. Teacher guides students to review the concept of univariate linear equation and asks students how to solve the univariate linear equation.

2. Teacher gives the calculation rules for solving univariate linear equations.

1) Denominator removal: multiply the items on both sides of the equation by the least common multiple of each denominator, and remove the denominator;

2) Remove brackets: remove the brackets first, then the brackets, and finally the braces;

3) Moving items: move the items containing unknown numbers to one side of the equation, and other items to the other side of the equation; Change the number when moving items;

4) Merge similar terms: transform the equation into $ax=b$ ($a \neq 0$);

5) The coefficient is converted into 1: divide both sides of the equation by the unknown coefficient a to get the solution of the equation.

3. Teacher play micro-class videos

Video 1: concepts and coefficients of univariate linear equations, examples of univariate linear equations, and real-life examples.

Video 2: Calculation rules for solving univariate linear equations.

4. The teacher gives an example of solving a univariate linear equation

Example of solving the univariate linear equation, let the student do an exercise from the example before the teacher tells the answer:

Example 1: The sum of three consecutive odd numbers is 387. Solve the three odd numbers.

Establish the equation: if the second odd number is x

$$(x-2) + x + (x+2) = 387$$

$$3x = 387$$

$$x = 387/3 = 129$$

The three odd numbers are 127, 129 and 131 respectively

Example 2: The sum of three consecutive even numbers is 18, and their product is calculated

Establish the equation: if the second even number is x

$$(x-2) + x + (x+2) = 18$$

$$3x = 18$$

$$x = 6$$

The three even numbers are 4, 6 and 8

$$4 \times 6 \times 8 = 192$$

5. Teacher summarizes the concept of integral and the calculation rules of integral addition and subtraction

1) Denominator removal: multiply the items on both sides of the equation by the least common multiple of each denominator, and remove the denominator;

2) Remove brackets: remove the brackets first, then the brackets, and finally the braces;

3) Moving items: move the items containing unknown numbers to one side of the equation, and other items to the other side of the equation; Change the number when moving items;

4) Merge similar terms: transform the equation into $ax=b$ ($a \neq 0$);

5) The coefficient is converted into 1: divide both sides of the equation by the unknown coefficient a to get the solution of the equation.

6. Teacher asks the students what is the univariate linear equation and summarized it as a formal concept.

7. Teacher asks the students about the operation rules of solving the univariate linear equation and guides the students to learn the examples in the textbook.

Summary Step

1. Teacher tells students to conclude their learning from this lesson and asks questions if students are not clear.

2. Let students do Test3.

3. Let students do exercises in the textbook at home.

5. Materials & Resources

PPT

Micro lesson video

Test 3

6. Measurement and Evaluation

Learning Objectives	How to measure	Measuring Instruments/ Tools	Measurement and Evaluation Criteria
1. Students Correctly identify the univariate linear equation, master the operation rules for solving the univariate linear equation, and correctly solve the univariate linear equation according to the calculation rules	Testing	Test 3	Correctly more than 70%
2. Students do exercise by focus on learning objectives and content, and use textbooks and micro-class resources to learn within the specified time (P)	Observing students do exercise	-Teacher log	Correctly more than 70%
3. Students enjoy the learning process of learning content, textbooks, and micro-class resources (A)	Observing	-Teacher log	do activities and show appropriate behavior

Test 3

Univariate linear equation

Name _____ Class _____ Number _____

1. The distance between the two stations is 275km. The slow train will drive from Station A to Station B at a speed of 50km/hour. After 1h, the fast train will drive from Station B to Station A at a speed of 75km/hour. How many hours will the slow train run into the fast train?
2. The fitter team in a workshop is divided into two teams. The number of team A is twice that of team B. If 16 people are transferred from team A to team B, the remaining number of team A is 3 less than half of the number of team B. How about the original number of team A and team B?
3. It is known that the profit of a store was 100,000 yuan in March and 132,000 yuan in May. The monthly growth rate in May was 10 percentage points higher than that in April Find the monthly growth rate in March.
4. A school arranges dormitories for boarding students. If there are 7 students in each dorm, no 6 students can not be arranged. If there are 8 people living in each dormitory, there are only 4 people living in one dormitory, and there are still 5 vacant dormitories. How many people?
5. One kilogram of peanuts can be fried with 0.56 kg of peanut oil. How much peanut oil can be fried with 280 kg?
6. It is known that there are 102 students in Class A of Grade One in a school, of which there are 5 more boys than girls. How many boys and girls are there in this class?
7. The sum of the three consecutive odd numbers is 57. What are the three odd numbers?
8. The sum of four consecutive even numbers is 108. What are the four even numbers?
9. A pitcher filled with water can exactly fill 4 small cups or 2 large cups. It is known that the capacity of this pitcher is 1600 ml. What is the capacity of a small cup and a large cup?

10. It is known that Xiaoming is 10 years old, Xiaohong is 4 years younger than Xiaoming, Xiaoyu is 2 years older than Xiaohong, and Xiaoli is twice as old as Xiaohong. How old is Xiaoli older than Xiaoyu?

Teacher log 3

Activity Details: _____ Date: _____

Student's no./name	Comments	
	(Knowledge, Process, or Practice)	Attitude
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The traditional lesson plans 1-3

Lesson Plan 1

Lesson Plans No1 name: rational number

Class Level: junior high school third grade

Time 2 hours

1. Learning Standards or Indicators or Learning Outcomes

Learning Standards: Understand the concept of rational numbers and the practical significance of adding and subtracting rational numbers.

Indicators: can judge what is positive and negative numbers and positive and negative integers, and can add and subtract rational numbers.

2. Concept

Rational number: Rational number is the general name of integer and fraction, and is the collection of integers and fractions. The integer can also be regarded as a fraction with one denominator.

3. Learning Objectives (KPA)

1) Students Correctly identify positive and negative numbers, positive and negative integers, and rational numbers, and add and subtract rational numbers. (K)

2) Students do exercise by focus on learning objectives and content, and use textbooks to learn within the specified time. (P)

3) Students enjoy the learning process of learning content, textbooks, (A)

4. Content

Basic concepts: 1) What are integers, positive integers and negative integers?
2) What is a rational number? 3) Addition and subtraction rules of rational numbers.

5. Learning Activity or Learning Management Process

Introduction Step

1) Teachers welcome students to study.

2) Teacher asks the students whether they understand the concepts of positive numbers, negative numbers, positive integers, and negative integers, and develops communication between the teacher and the students

3) Teacher gives the formal concepts of positive numbers, negative numbers, positive integers, and negative integers, and gives the following examples:

7 meters up and 8 meters down, 50 meters forward and 70 meters backward, 1 ton of goods out of the warehouse and 4 tons of goods in the warehouse are quantities of opposite significance in real life, which can be expressed by positive and negative numbers and expressed by 7, - 8, 50, - 70, - 1 and 4

1. 2, 3, 4, 5, etc. are positive integers

-1, - 2, - 3, - 4, - 5 are negative integers

Guide students to observe positive and negative integers and their relationship with 0

Encourage students to summarize the concepts of positive and negative numbers and positive and negative integers

5. Teacher briefly explains the teaching objectives and contents, and gives the concept of a rational number.

Teaching Step

1. Teacher guides students to review the concepts of positive and negative numbers and positive and negative integers.

2. Teacher gives the concept of a rational number positive integers, negative integers, 0, and fractions are collectively called rational numbers. Positive and negative integers can be considered as positive and negative fractions with a denominator of 1.

3. Teacher gives an example of adding and subtracting rational numbers

For an example of adding rational numbers, let the student do an exercise from the example before the teacher tells the answer:

Example 1: $1+(- 2)=1-2=- 1$

Example 2: $(- 3)+(- 4)=- (3+4) = - 7$

Example 3: $2+4=6$

Example 4: $1/2+1/3=5/6$

Example 5: $(- 1/4)+1/2=1/2-1/4=1/4$

Example 6: $(- 2/5)+(- 3/7)=- (2/5+3/7)=- 29/35$

Example 7: $2+0=2, (- 4)+0=- 4$

Example of rational number subtraction:

Change the "+" in the above six examples to "-" and guide students to learn the calculation rules independently.

4. Teacher summarizes the concept of rational numbers and the calculation rules of addition and subtraction of rational numbers.

Addition rule: add the same sign to take the same sign, and add the absolute value; Add different signs to take the sign of the larger absolute value, and subtract the smaller absolute value from the larger absolute value; A number is added to zero to get the original number. Subtraction rule: subtracting a number is equal to adding the opposite number of the number.

5. Teacher asked the students what are positive and negative numbers, positive and negative integers, and rational numbers, and summarized them into formal concepts.

6. Teacher guides students to give practical examples of positive and negative numbers, positive and negative integers, and rational numbers

The number less than 0 is negative, and the number greater than 0 is positive an integer less than 0 is a negative integer, and an integer greater than 0 is a positive integer.

Stock-in and stock-out, increase and decrease, increase and decrease, and forward and backward can be expressed with positive and negative numbers and positive and negative integers.

8. Teacher asks the students about the rules of addition and subtraction of rational numbers and guides the students to learn the examples in the textbook.

Summary Step

1. Teacher tells students to conclude their learning from this lesson and asks questions if students are not clear.

2. Teacher gives the student to do Test1.

3. Let students do exercises in the textbook at home.

5. Materials & Resources

PPT

Textbook

Worksheet 1

Test 1

6. Measurement and Evaluation

Learning Objectives	How to measure	Measuring Instruments/ Tools	Measurement and Evaluation Criteria
1. Students Correctly identify positive and negative numbers, positive and negative integers, and rational numbers, and add and subtract rational numbers. (K)	Testing	Test 1	Correctly more than 70%
2. Students do exercise by focus on learning objectives and content, and use textbooks to learn within the specified time. (P)	Observing students do exercise	-Teacher log	Students could discuss this in their group at least 70% of activities.
3. Students enjoy the learning process of learning content, textbooks. (A)	Observing	Teacher log	do activities and show appropriate behavior

Worksheet 1

Positive and negative numbers, positive and negative integers

Name _____ Class _____ Number _____

1. Have you ever heard of positive and negative numbers? How do you understand positive and negative numbers?

2. Can you give an example of positive and negative numbers in your life?

3. Xiaoming deposited RMB 40000 in the bank on the first day, withdrew RMB 10000 on the second day, deposited RMB 20000 on the third day and withdrew RMB 30000 on the the fourth day day. Can we use positive and negative numbers to express this process?

4. Assume that Xiaoming is now at the origin, and then drive eastward for 5 kilometers, then turn westward for 3 kilometers, then turn eastward for 4 kilometers, then turn westward for 10 kilometers, and finally turn eastward for 2 kilometers. If you use a positive and negative integer (driving eastward is positive, and driving westward is negative) to express the distance from Xiaoming to the origin (unit: kilometers), So how do you express the relationship between Xiaoming's position and the origin when you turn around each time?

When turning around for the first time: _____

At the second turn: _____

On the third turn: _____

At the fourth turn: _____

5. If you understand the concepts of positive numbers and negative numbers, what are positive integers and negative integers? Try to give examples in life?

6. Think about it. What is the relationship between positive and negative numbers, positive and negative integers and 0? Have you found any rules?

Test 1

The addition and subtraction of rational numbers

Name _____ Class _____ Number _____

1. What numbers does rational number include? Give some specific examples?

2. Summarize the characteristics of rational numbers and try to give a definition of rational numbers?

3. Please try to use addition and subtraction to express the following life examples:
A vacant warehouse has 3 tons of goods on the first day and 2 tons on the second day.
How many tons of goods are left?

4. Xiao Ming walked 80 meters forward and 40 meters backward from the origin.
How far is Xiao Ming from the origin now?

5. The average temperature of the day before yesterday was 10 degrees centigrade. Yesterday it dropped 3 degrees centigrade. Today it rises 8 degrees centigrade. Will the average temperature rise or fall today compared with the day before yesterday? What is the average temperature difference?

6. Calculate the following formula

$$(-40) + (-19) = \underline{\hspace{2cm}} \quad 10 - (-7) = \underline{\hspace{2cm}}$$

$$(-30) - (-10) = \underline{\hspace{2cm}} \quad (-28) - 2 = \underline{\hspace{2cm}}$$

$$(4/7) + (3/8) = \underline{\hspace{2cm}} \quad (-2/9) - 1/6 = \underline{\hspace{2cm}}$$

$$3 + (2/5) = \underline{\hspace{2cm}} \quad (7/8) - (-4) = \underline{\hspace{2cm}}$$

5. Calculate the following

$$(-20) + 33 - (-31) = \underline{\hspace{2cm}} \quad 27 + (-10) - (-3) = \underline{\hspace{2cm}}$$

$$(-9) - (-20) - 30 = \underline{\hspace{2cm}} \quad 21 - (-19) + (-8) = \underline{\hspace{2cm}}$$

$$(-3) - (-5) - (-7) = \underline{\hspace{2cm}} \quad 22 + 23 + (-24) - (-25) = \underline{\hspace{2cm}}$$

$$(-2) + (-4) - (-6) + (-8) - (-10) = \underline{\hspace{2cm}}$$

Teacher log 2

Activity Details: _____ Date: _____

Student's no./name	Comments	
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Lesson Plan 2

Lesson Plans No 2 name: Add and Subtract of Integer

Class Level Class Level: junior high school third grade Time 2 hours

1. Learning Standards or Indicators or Learning Outcomes

Learning Standards Correctly understand the concept of integral and master the law of combination, distribution, and exchange of addition and subtraction of integral.

Indicator: can correctly add and subtract integers.

2. Learning Objectives (KPA)

- 1) Students Correctly identify add and subtract integers.
- 2) Students can do exercise by a focus on learning objectives and content, and use textbooks to learn within the specified time. (P)
- 3) Students enjoy the learning process of learning content, textbooks. (A)

3. Content

Basic concepts: 1) What is an integral? 2) Addition and subtraction rules of integral.

4. Learning Activity or Learning Management Process

Introduction Step

- 1) Teachers welcome students to study.
- 2) Teacher asks the students whether they understand the concept of integral form, and develops communication between teachers and students.
- 3) Teacher gives the formal concept of the integral and the coefficient characteristics of the integral.
- 4) Teacher briefly explains the teaching objectives and contents, and guides students to think about how to add and subtract the two integral forms.

Teaching Step

- 1) Teacher guides students to review the concept of integral and asks students how to add and subtract integral.

2) Teacher gives the rules of integral addition and subtraction.

If you encounter brackets, remove the brackets first according to the rule of removing brackets: remove the "ten" sign before the brackets and the "+" sign in front of the brackets. All items in the brackets remain unchanged. Remove the "one" sign before the brackets and the "one" sign in front of the brackets. Each item in the brackets changes the symbol.

Merge similar items: the coefficients of similar items are added together, and the result is taken as the coefficient. The index of letters and letters remains unchanged.

3) Teacher gives an example of adding and subtracting rational numbers, let the student do an exercise from the example before the teacher tells the answer:

Example of adding an integer:

$$\text{Example 1: } 3(a+5b) - 2(b-a) = (3a+5b) - (2b-2a) = 3a+5b-2b+2a = (3+2)a + (5-2)b = 5a+3b$$

$$\text{Example 2: } 2(2a^2+9b)+3(-5a^2-4b) = (4a^2+18b)+(-15a^2-12b) = 4a^2+18b-15a^2-12b = -11a^2+6b$$

$$\text{Example 3: } (x^3 - 2y^3 - 3x^2y) - (3x^3 - 3y^3 - 7x^2y) = (1-3)x^3 - ((-2) - (-3))y^3 - ((-6) - (-14))xy = -2x^3 - y^3 + 8xy$$

4) Teacher summarizes the concept of integral and the calculation rules of integral addition and subtraction

If you encounter brackets, remove the brackets first according to the rule of removing brackets: remove the "ten" sign before the brackets and the "+" sign in front of the brackets. All items in the brackets remain unchanged. Remove the "one" sign before the brackets and the "one" sign in front of the brackets. Each item in the brackets changes the symbol.

Merge similar items: the coefficients of similar items are added together, and the result is taken as the coefficient. The index of letters and letters remains unchanged.

5. The teacher asked the students what is an integral form and summarized it as a formal concept.

6. The teacher asks the students about the rules of the addition and subtraction of the integer, and guides the students to learn the examples in the textbook.

Summary Step

1. Teacher tells students to conclude their learning from this lesson and asks questions if students are not clear.
2. Let students do Test 2.
3. Let students do exercises in the textbook at home.

5. Materials & Resources

PPT

Textbook

Test 2

6. Measurement and Evaluation

Learning Objectives	How to measure	Measuring Instruments/ Tools	Measurement and Evaluation Criteria
1. Students Correctly identify add and subtract integers. (K)	Testing	Test 2	Correctly more than 70%
2. Students can do exercise by focus on learning objectives and content, and use textbooks resources to learn within the specified time. (P)	Observing students do exercise	-Teacher log	Correctly more than 70%
3. Students enjoy the learning process of learning content, textbooks. (A)	Observing	-Teacher log	do activities and show appropriate behavior

Test 2

Addition and subtraction of integral

Name _____ Class _____ Number _____

1. Try to describe the rule of merging similar items?

2. Calculate the following formula:

3. Find the sum of the monomial expressions $5x^2y, -2x^2y, 2xy^2, -4xy^2$

4. Sum $3x^2-6x+5$ 与 $4x^2-7x-6$

5. Find the difference between $2x^2+xy+3y^2$ 与 $x^2-xy+2y^2$

6. Known: $A=5a^2-2b^2-3c^2$, $B=-3a^2+b^2+2c^2$, calculate $2A-3B$

7. Known: $A=3a^2+10b^2+2c^2+4d^2$, $B=4a^2+12b^2+13c^2+4d^2$, $C=a^2-10b^2+2c^2-7d^2$,

Find $4A+2B-3C$, $2A-4B-5C$

Teacher log 2

Activity Details: _____ Date: _____

Student's no./name	Comments	
	(Knowledge, Process, or Practice)	Attitude
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Lesson Plan 3

Lesson Plans No 3 name: univariate linear equation

Class Level Grade 3 junior high school

Time 2 hours

1. Learning Standards or Indicators or Learning Outcomes

Learning Standards: Master the concept of structure and coefficient of univariate linear equation, and the calculation rules of solution

Indicator: can correctly solve univariate linear equation

2. Learning Objectives(KPA)

1) Students Correctly identify the univariate linear equation, master the operation rules for solving the univariate linear equation, and correctly solve the univariate linear equation according to the calculation rules.

2) Students do exercise by focus on learning objectives and content, and use textbooks to learn within the specified time. (P)

3) Students enjoy the learning process of learning content, textbooks. (A)

3. Content

Basic concepts: 1) What is a univariate linear equation? 2) Calculation rules for solving univariate linear equations.

4. Learning Activity or Learning Management Process

Introduction Step

1) Teachers welcome students to study.

2) Teacher asks the students if they understand the concept of equation and starts the communication between the teacher and the students.

3) Teacher gives the formal concept of univariate linear equation.

A univariate linear equation is an equation that contains only one unknown number, the highest degree of the unknown number is 1, and both sides are integers.

4) Teacher briefly explains the teaching objectives and contents, and guides the students to think about how to solve the univariate linear equation.

Teaching Step

1. Teacher guides students to review the concept of univariate linear equation and asks students how to solve the univariate linear equation.

2. Teacher gives the calculation rules for solving univariate linear equations.

1) Denominator removal: multiply the items on both sides of the equation by the least common multiple of each denominator, and remove the denominator;

2) Remove brackets: remove the brackets first, then the brackets, and finally the braces;

3) Moving items: move the items containing unknown numbers to one side of the equation, and other items to the other side of the equation; Change the number when moving items;

4) Merge similar terms: transform the equation into $ax=b$ ($a \neq 0$);

5) The coefficient is converted into 1: divide both sides of the equation by the unknown coefficient a to get the solution of the equation.

3. The teacher gives an example of solving a univariate linear equation

Example of solving the univariate linear equation, let the student do an exercise from the example before the teacher tells the answer:

Example 1: The sum of three consecutive odd numbers is 387. Solve the three odd numbers

Establish the equation: if the second odd number is x

$$(x-2) + x + (x+2) = 387$$

$$3x = 387$$

$$x = 387/3 = 129$$

The three odd numbers are 127, 129 and 131 respectively

Example 2: The sum of three consecutive even numbers is 18, and their product is calculated

Establish the equation: if the second even number is x

$$(x-2) + x + (x+2) = 18$$

$$3x = 18$$

$$x = 6$$

The three even numbers are 4, 6 and 8

$$4 \times 6 \times 8 = 192$$

4. Teacher summarizes the concept of integral and the calculation rules of integral addition and subtraction.

1) Denominator removal: multiply the items on both sides of the equation by the least common multiple of each denominator, and remove the denominator;

2) Remove brackets: remove the brackets first, then the brackets, and finally the braces;

3) Moving items: move the items containing unknown numbers to one side of the equation, and other items to the other side of the equation; Change the number when moving items;

4) Merge similar terms: transform the equation into $ax=b$ ($a \neq 0$);

5) The coefficient is converted into 1: divide both sides of the equation by the unknown coefficient a to get the solution of the equation.

5. Teacher asks the students what is the univariate linear equation and summarized it as a formal concept.

6. Teacher asks the students about the operation rules of solving the univariate linear equation and guides the students to learn the examples in the textbook.

Summary Step

1. Teacher tells students to conclude their learning from this lesson and asks questions if students are not clear.

2. Let students do Test 3.

3. Let students do exercises in the textbook at home.

5. Materials & Resources

PPT

Textbook

Test 3

6. Measurement and Evaluation

Learning Objectives	How to measure	Measuring Instruments / Tools	Measurement and Evaluation Criteria
1. Students Correctly identify the univariate linear equation, master the operation rules for solving the univariate linear equation, and correctly solve the univariate linear equation according to the calculation rules.	Testing	Test 3	Correctly more than 70%
2. Students do exercise by focus on learning objectives and content, and use textbooks to learn within the specified time. (P)	Observing students do exercise	-Teacher log	Correctly more than 70%
3. Students enjoy the learning process of learning content, textbooks. (A)	Observing	-Teacher log	do activities and show appropriate behavior

Test 3

Univariate linear equation

Name _____ Class _____ Number _____

1. The distance between the two stations is 275km. The slow train will drive from Station A to Station B at a speed of 50km/hour. After 1h, the fast train will drive from Station B to Station A at a speed of 75km/hour. How many hours will the slow train run into the fast train?

2. The fitter team in a workshop is divided into two teams. The number of team A is twice that of team B. If 16 people are transferred from team A to team B, the remaining number of team A is 3 less than half of the number of team B. How about the original number of team A and team B?

3. It is known that the profit of a store was 100,000 yuan in March and 132,000 yuan in May. The monthly growth rate in May was 10 percentage points higher than that in April Find the monthly growth rate in March.

4. A school arranges dormitories for boarding students. If there are 7 students in each dorm, no 6 students can not be arranged. If there are 8 people living in each dormitory, there are only 4 people living in one dormitory, and there are still 5 vacant dormitories. How many people?

5. One kilogram of peanuts can be fried with 0.56 kg of peanut oil. How much peanut oil can be fried with 280 kg?

6. It is known that there are 102 students in Class A of Grade One in a school, of which there are 5 more boys than girls. How many boys and girls are there in this class?

7. The sum of the three consecutive odd numbers is 57. What are the three odd numbers?

8. The sum of four consecutive even numbers is 108. What are the four even numbers?

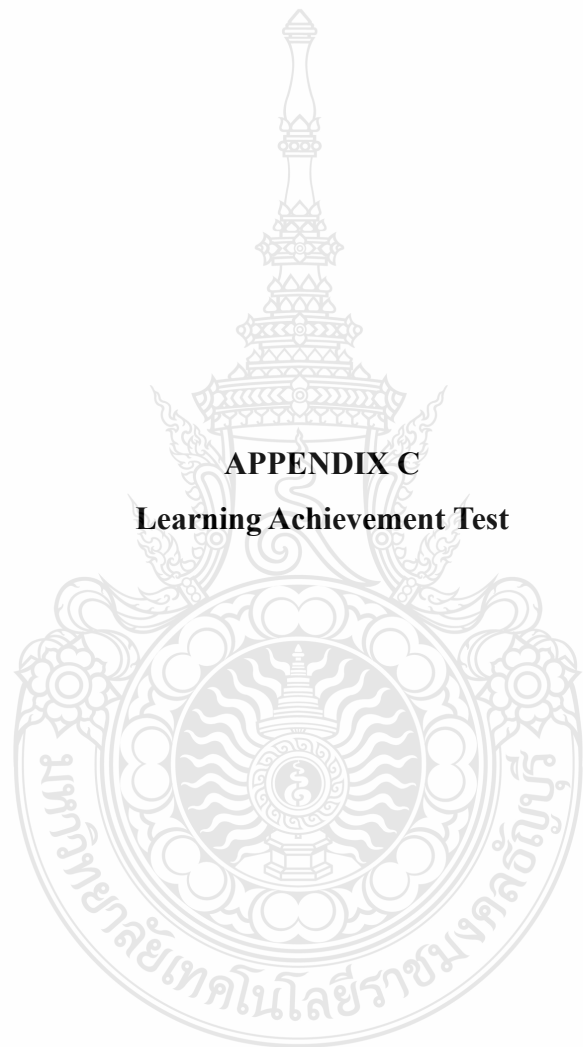
9. A pitcher filled with water can exactly fill 4 small cups or 2 large cups. It is known that the capacity of this pitcher is 1600 ml. What is the capacity of a small cup and a large cup?

10. It is known that Xiaoming is 10 years old, Xiaohong is 4 years younger than Xiaoming, Xiaoyu is 2 years older than Xiaohong, and Xiaoli is twice as old as Xiaohong. How old is Xiaoli older than Xiaoyu?

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APPENDIX C

Learning Achievement Test

Learning Achievement Test

Read the following sentences and choose the right answer from A, B, C, and D, and choose the correct answer and write the symbol on the answer sheet.

- The following calculation results are correct ()
 - $4-9=5$
 - $-5+6=-11$
 - $-6-3=-3$
 - $0-2=-2$
- Formula $-9-5$ cannot be read and done ()
 - -9 minus 5
 - the sum between -9 and -5
 - the difference between -9 and 5
 - the difference between -9 and -5
- The difference between the larger number and the smaller number must be ()
 - zero
 - positive
 - negative
 - zero or negative
- If $a=3$ and $b=-3$, the value of $a+b$ is ()
 - -6 or 6
 - -6 or 0
 - -6
 - 0
- The difference between the opposite number of -6 and the number greater than the opposite number of 5 is ()
 - 10
 - -2
 - -12
 - 0
- If $a+b > 0$ and $-(-a) < 0$, then ()
 - $a > 0, b < 0$
 - $a < 0, b > 0$
 - $a < 0, b > 0$
 - $a < 0, b < 0$
- The following conclusion is incorrect ()
 - If $a > 0, b < 0$, then $a-b > 0$
 - If $a < 0, b > 0$, then $a-b < 0$
 - If $a < 0, b < 0$, then $a - (-b) > 0$
 - If $a < 0, b < 0$, and $b > a$. Then $a-b > 0$

18. Take $(a+b)$ as a factor, then $3(a+b) - 5(a+c) = (\quad)$
 A. $-2a - (-2b)$ B. $3(A+B)$ C. $5(A+C)$ D. $-2(A+D)$
19. The following polynomials represent 2 times the sum of orders a and b is (\quad)
 A. $2a+2b$ B. $2(A+b)$ C. $2a+b$ D. $a+2b$
20. Of the following equations, which belong to the univariate linear equation is (\quad)
 A. $2y=1$ B. $3x-5$ C. $3=7=10$ D. $2x+1=2x$
21. The solution of the equation of $x(x) - 3(a+x) = a - 2(x-a)$ is (\quad)
 A. $6a$ B. $-6a$ C. $2a$ D. $-2a$
22. If $x = -3$ is the solution of equation $k(x+4) - 2k - x = 5$, then the value of k is (\quad)
 A. -2 B. 2 C. 3 D. 5
23. The circumference of a quadrilateral ABCD company is 48 cm, and it is known that the length of the disc before BC is 2 times more than that of the United Arab Emirates by 3 cm. The length of the disc is equal to the sum of the lengths of the United Arab Emirates and the United Arab Emirates and the length of the disc before BC is (\quad)
 A. 14cm B. 5cm C. 16cm D. 17cm
24. If 6 times of a number is 15 less than 9 times of this number, then this number is (\quad)
 A. -5 B. 4 C. $4/5$ D. $.5$
25. There are 25 multiple-choice questions in a test paper. 4 points will be given if one is right, and 1 point will be deducted if one is wrong. A student has done all the test questions, and a total of 70 points will be given. The number of correct questions is (\quad)
 A. 17 B. 18 C. 19 D. 20
26. In the following statements, the correct number is (\quad)
 ① If $mx = mine$, then $mx - my = 0$
 ② If $mx = mine$, then $x = y$
 ③ If $mx = mine$, $mx + my = 2my$
 ④ If $x = y$, $mx = mine$.
 A. 1 B. 2 C. 3 D. 4

Biography

Name – Surname Mr. Yi Liang

Date of Birth June 9, 1980

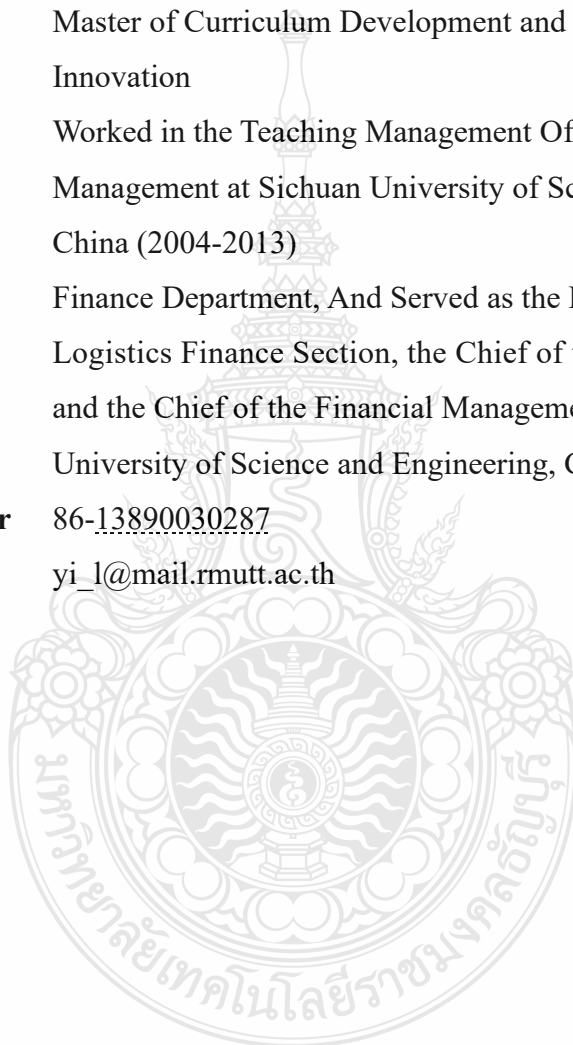
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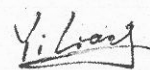
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วิทยานิพนธ์ฉบับนี้เป็นงานวิจัยที่เกิดจากการค้นคว้าและวิจัย ขณะที่ข้าพเจ้าศึกษาอยู่ใน คณะครุศาสตร์อุตสาหกรรม มหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี ดังนั้น งานวิจัยในวิทยานิพนธ์ ฉบับนี้ถือเป็นลิขสิทธิ์ของมหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี และข้อความต่าง ๆ ในวิทยานิพนธ์ ฉบับนี้ ข้าพเจ้าขอรับรองว่าไม่มีการคัดลอกหรือนำงานวิจัยของผู้อื่นมานำเสนอในชื่อของข้าพเจ้า

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(Mr. Yi Liang)



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คณะครุศาสตร์อุตสาหกรรม
มหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี