DISCOVERY LEARNING ENHANCE STUDENTS' PERCEPTION OF MATHEMATICS LEARNING IN PRIMARY SCHOOL

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ABSTRACT

The purposes of this study were to**:** 1**)** study discover learning enhance students' perception of mathematics learning in Primary School., and 2**)** to compare students' perception of mathematics learning between traditional learning and discovery learning**.** Target group was 60 students Hongyun primary school in Kunming, Yunnan Province, China**.** Research tools were interview, and questionnaire**.** Before the teaching experiment, the researcher used 23 structured questions to target group 60 students, and divided them into 1**)** experimental group **(**discovery learning**)**-discover and control group **(**discover learning**)**-tradition, with 30 students in each group**.** The researcher pretested the learning effect of each group before applying the discovery learning method**.** Then the students in the experimental group **(**discovery learning**)** and the control group **(**traditional learning**)** were given test papers to test and score the basic knowledge of mathematics and scores in the first half of the year**.** Statistical analysis was the total score, average score, mean, standard deviation and percentage**.**

The results showed that**:** 1**)** the discovery educational of learning can be improved the learning effect of students' mathematical knowledge**.** In the process of discovery learning and teaching, teachers can design the teaching mode such as construction of game scenes and teaching links from the perspective of students and, 2**)** primary school students can better understand and master the content of mathematical knowledge taught by teachers through better autonomous learning and knowledge exploration add more for discovery learning than tradition learning**.**

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CHAPTER 1

INTRODUCTION

1.1 Background

Primary school education is not only the basic education stage in the process of compulsory education in China, but also an important stage to cultivate students' basic cognitive ability and learning ability. China's "guiding outline of national basic education curriculum reform" clearly requires that students should not only pay attention to knowing time and memory, but actively cultivate students' learning and exploration ability. Primary school mathematics education is an important link to cultivate students' thinking ability and computing ability, which plays an important role in promoting the cultivation of students' logical thinking. The development of primary school mathematics teaching activities needs to adapt to the students' cognition and understanding level. Teachers need to use appropriate teaching models to stimulate students' learning enthusiasm and correctly guide students' learning behavior. The construction theory emphasizes that the process of learning knowledge is essentially the process of building knowledge in the knowledge carrier with the help of others in a certain learning situation and social and cultural environment. Traditional learning overemphasizes the imparting of knowledge, neglects the cultivation of learning attitudes, the cultivation of learning habits and learning ability, and the improvement of students' overall quality. Too much emphasis on book knowledge, ignoring the cultivation of students' interest in learning and the accumulation of direct experience. Too much emphasis is placed on accepting learning, rote memorization, and mechanical training, ignoring the subjectivity of students' learning, and ignoring students' independent learning and independent research learning methods. Through the comparative experiment of empirical research and behavioral research, 60 third grade students of Hongyun primary school in Kunming, Yunnan Province, China were divided into two groups to conduct a group control experiment on discovery learning and teaching mode. This study found that compared with the traditional teaching mode, the discovery learning and teaching mode can improve the enthusiasm of primary school students

to learn mathematical knowledge under the guidance and help of teachers, and the discovery learning education mode can improve the learning effect of students' mathematical knowledge. In the process of discovery learning, teachers need to give up the identity and role of teachers in the traditional teaching mode. These conclusions are of great significance to help primary school mathematics teaching process apply discovery theory and improve students' learning effect. This paper suggests that primary school mathematics teachers should gradually form a teaching guided by discovery learning theory in the process of primary school mathematics teaching. Teachers should learn more visual teaching tools to help better present the teaching process of discovery learning. Schools and other educational institutions need to popularize the key points of discovery learning related theories and knowledge to teachers, and help teachers better apply discovery learning theory to teaching model reform. In the process of promoting the teaching mode of discovery learning, schools and teachers need to create a classroom cultural atmosphere of active exploration and discovery.

1.2 Research questions

1. How discover learning enhance students' perception of mathematics learning in Primary School?

2. How different for students' perception of mathematics learning for students between traditional learning and discovery learning?

1.3 Research objectives

The objectives of this study were:

1.To study discovery learning enhance students' perception of mathematics learning in Primary School.

2. To compare students' perception of mathematics learning for students between traditional learning and discovery learning.

1.4 Definition of terms

Primary school mathematics: primary school mathematics refers to the teaching process of imparting mathematical knowledge to students by using primary school teaching and material education methods in the primary school education stage. It belongs to the early stage of mathematics education. The purpose of primary school mathematics education is to help human beings learn basic mathematical language in primary school and use mathematical language to observe and explain the world. In this process, teachers need to cultivate the basic ability and exploration spirit of human acquisition of mathematical knowledge, which will provide an important foundation for future mathematical learning. In the process of primary school mathematics teaching, people should also pay attention to cultivating students' ability to observe, analyze and apply mathematics knowledge.

Students' mathematics learning: Mathematical learning refers to a stable personality characteristic of an individual to quickly and successfully complete mathematical activities (mathematical learning activities, mathematical research activities). Logical thinking ability shows the typical characteristics of Mathematics learning, although this ability is also required in other fields, but in mathematics, it is manifested as the ability to use numbers and symbols to carry out thinking activities, with a higher level of abstraction and higher standards of mental activity. In fact, it is manifested in mathematical perception, memory, thinking, and imagination. A strong personality, and this personality feature is fixed in the individual in a certain functional system or structural form, so that it has a constant and stable nature, this personality feature is Mathematics learning. Mathematics learning is from the level of activity It can be divided into "reproducible" Mathematics learning and "creative" Mathematics learning. The so-called reproducible Mathematics learning refers to the ability to quickly and smoothly master knowledge, form skills and flexibly use knowledge and skills. This usually manifests as the ability of students to learn mathematics. The so-called creative Mathematics learning refers to the ability to discover new mathematical facts and create new achievements in mathematical research activities.

Mathematics means the science of structure, order, and relation that has evolved from elemental practices of counting, measuring, and describing the shapes of objects. It deals with logical reasoning and quantitative calculation, and its development has involved an increasing degree of idealization and abstraction of its subject matter.

Traditional learning means students learn from tradition teaching by teachers who only explain textbooks, and teachers and students form a closed learning environment in which students receive the knowledge taught by teachers. As the master of knowledge, teachers will pour the sweat of students into the container of knowledge, and students need to remember the knowledge points as firmly as possible. This passive learning environment will make students inert to knowledge.

Discovery learning means that teachers shape students' independent exploration ability and understanding ability through textbooks, teaching tools and teaching process, and build students' knowledge discovery environment. In the process of discovery learning and teaching, the main task of teachers is to guide students to actively think and discover knowledge through questioning. Discovery is the best way for students to acquire knowledge. Discovery learning is essentially an important process for human beings to explore and acquire knowledge through their own thinking and practice. Although the knowledge taught in schools belongs to human discovery experience, the acquisition process of discovery experience is still very important for students to acquire knowledge.

Perception means that is a series of processes in which consciousness perceives, feels, pays attention, and perceives internal and external information. Perception can be divided into sensory process and perceptual process. In the process of perception, the sensory information is processed in an organized manner, and the existence of things is understood and recognized.

1.5 Expected benefits

1. This paper can be helped change the problem of students' passive learning in the traditional education mode of Chinese primary school mathematics.

2. This paper can be helped the reconstruction of Chinese primary school mathematics education mode, actively improve students' enthusiasm and initiative in learning mathematical knowledge, and cultivate students' ability of independent thinking and judgment.

3. This paper can also be helped educators combine discovery theory with teaching practice, so that educators can further understand the objective laws in primary school mathematics education activities, so as to improve the efficiency and quality of mathematics education activities.

4. At the same time, the Ministry of education of the Chinese government has formulated the plan for enhancing teachers' ability in basic education in the new era, which is a national education reform policy. The policy requires Chinese educational institutions to actively cultivate students' independence in the teaching process, enable students to form a certain ability of investigation and research, and encourage students to dare to question and ask questions.

5. The research on mathematics discovery and primary school mathematics education model can help Chinese primary school mathematics teachers achieve the above objectives in teaching practice, and then help Chinese education departments smoothly implement the policy of education reform.

1.6 Conceptual framework

Discovery theory emphasizes that teachers guide students to explore knowledge in the teaching process, which includes three aspects: goal, process and evaluation. Under the guidance of teachers, students' learning enthusiasm and potential will be fully explored and knowledge will be found. In the above process, teachers need to adjust students' possible deviant behaviors and deepen students' knowledge. The following is the conceptual framework of the paper:

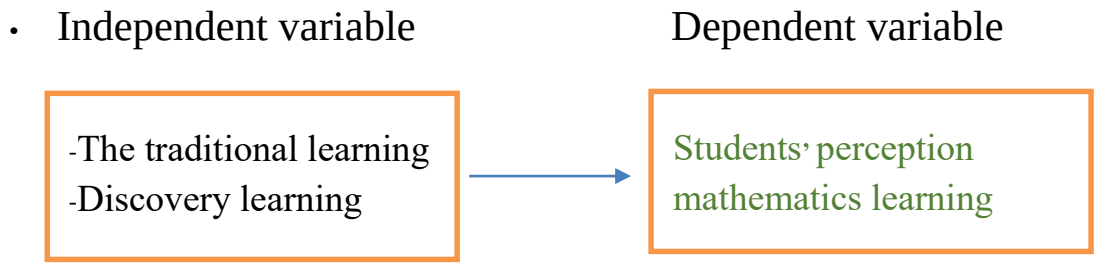

Figure 1.1 Conceptual Framework

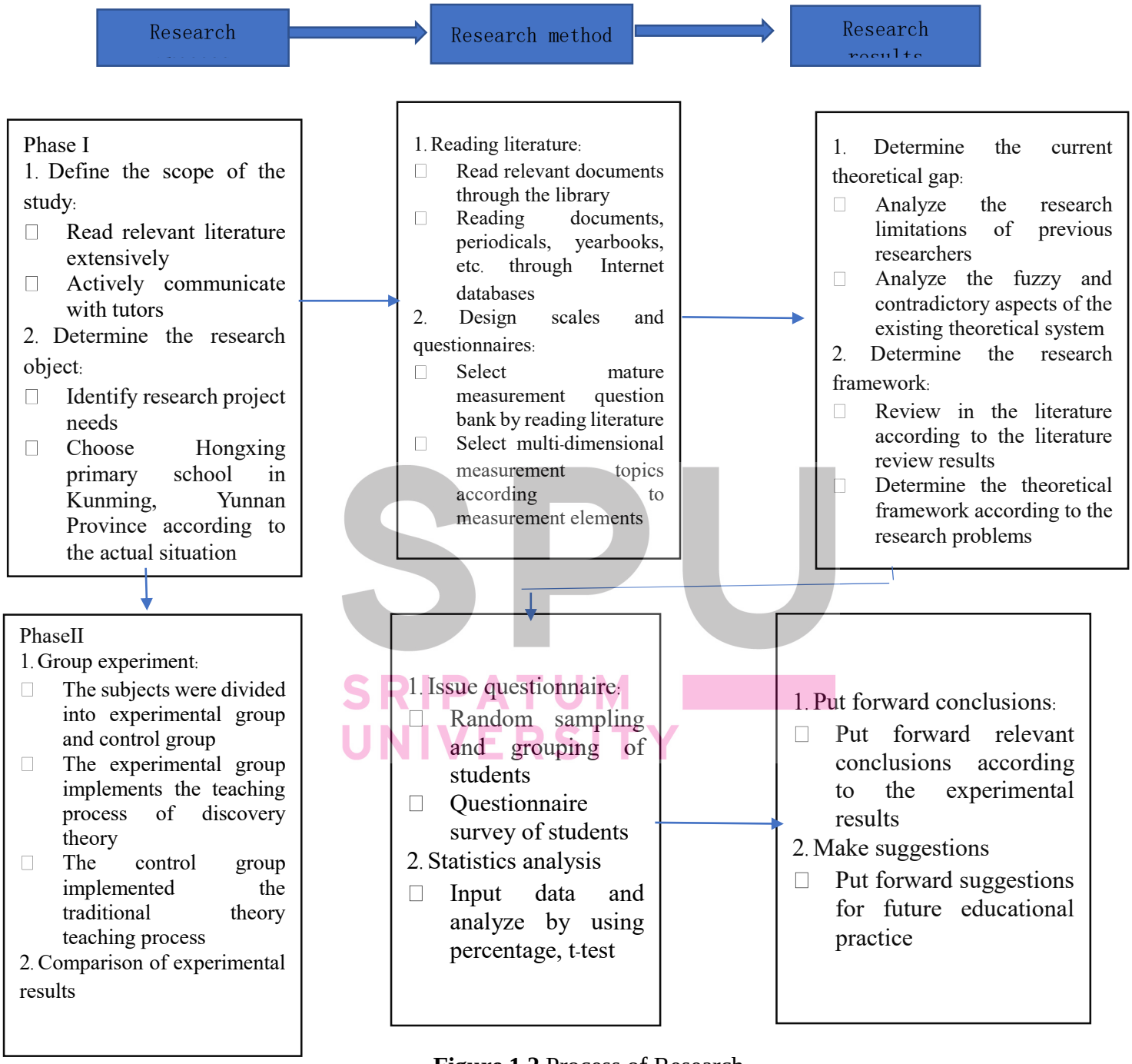

Figure 1.2 Process of Research

CHAPTER 2

REVIEW OF LITERATURE

This part includes two parts: the relevant theoretical framework of this study and the theoretical literature review of previous researchers, so as to provide a theoretical basis and research direction for subsequent research. Research theories include：1) Discovery learning theory. 2)The traditional learning. 3)Instructional design theory. Literature review includes two aspects: 1) The review on the application of discovery learning in the process of educational practice. 2)The review of stimulating learning motivation in educational activities. A final statement of current research theoretical gaps.

2.1 Research Theories

- Discovery learning theory
- The traditional learning
- Instructional design theory

2.2 literature review

- The review on the application of discovery learning in the process of educational practice
- The review of stimulating learning motivation in educational activities

2.3 Current research theory gap

2.1 Research Theories

The relevant theories of this paper include discovery learning theory, learning motivation technique theory and teaching design theory.

The relevant theories of this paper include discovery learning theory, learning motivation technique theory and teaching design theory.

Discovery learning theory

In the process of discovery learning, the main task of teachers is to guide students to actively think and discover knowledge through questioning. The purpose of these activities is to shape students' independent exploration ability and understanding ability, and build students' knowledge discovery environment through textbooks, teaching tools and teaching process (Serevina, Luthfi, 2021). Some scholars believe that discovery is the best way for students to acquire knowledge. Discovery learning is essentially an important process for human beings to explore and acquire knowledge through their own thinking and practice. Although the knowledge taught in schools belongs to the human experience of discovery, the acquisition process of discovery experience is still very important for students to acquire knowledge (Straits, 2020). Discovery learning theory requires that teachers' role in the teaching process is no longer to explain and demonstrate, but to stimulate students' desire for knowledge and curiosity about strange things, encourage students' confidence in exploration and discovery, guide and help students establish the relationship between new problems and already mastered knowledge, and cultivate students' habit of using knowledge to solve problems.

The traditional learning

Traditional learning means that textbook educators and knowledge recipients form a closed learning environment in which students receive the knowledge taught by teachers. As the owner of knowledge, teachers will sweat students into a container of knowledge, and students need to remember the knowledge points as firmly as possible (Swetnam, 2018). This passive learning environment will make students inert to knowledge. When carrying out educational practice activities, teachers will despise students' initiative and enthusiasm in learning, and also ignore students' innovation and practical ability in learning, so that students can form a limited knowledge system. In the learning process, students' original ability to actively explore and think will gradually deteriorate, which will affect the learning efficiency and quality of students' subsequent learning process (Womack, Muti, 2020).

Instructional design theory

Instructional design refers to the process and method of planning knowledge teaching process and system. Learning theory and communication theory have become an important basis for the development of instructional design theory. In the process of teaching design, educators need to analyze and sort out the teaching needs and possible problems in the teaching process through systematic thinking. Under the guidance of teaching objectives, establish teaching strategies that match educational objects, educational environment and educational tools. Then through analysis and research, the teaching design scheme is constantly optimized, and the teaching results reach the most ideal level. Teaching design includes curriculum design, unit design, classroom activity design, courseware design and teaching media design (Zeedick, 2020). Personnel elements, information elements and material elements together constitute the teaching system, and teaching design is to take the teaching system as the research object and make reasonable arrangements for each element. The purpose of instructional design is to improve the teaching effect of educators and help learners improve the learning efficiency of knowledge by designing reasonable teaching programs.

2.2 The application of discovery learning

The application of discovery learning in the process of educational practice

Discovery learning theory has been concerned by educational researchers. Some scholars have found through psychological experiments and teaching experiments that learning methods can better stimulate students' thirst for knowledge and encourage them to explore unknown knowledge. In this process, students' enthusiasm and initiative are fully mobilized, and students also develop creative thinking and critical thinking in the process of acquiring knowledge (Svinicki, 2018). Through case studies, some scholars believe that the learning process requires teachers to make effective arrangements for teaching links and the sequence of teaching activities, which should be compatible with the intelligence level of students receiving knowledge and the original knowledge accumulation level (Ozdem-Yilmaz, & Bilican, 2020). Through studying teaching cases, some scholars also found that in the process of applying learning theory to teaching

practice, teachers should pay attention to helping students review relevant basic knowledge and theories, which is the basis for guiding students to further explore and discover knowledge. At the same time, in the process of discovery learning, teachers should also guide students' learning strategies, so that they understand the importance of using learning strategies to acquire knowledge (Rieber, & Tzeng, 2018). After studying the practice and implementation of instructional design, some scholars believe that instructional design is essentially the arrangement and optimization of educational activities and learning activities. They find that learning can help teachers better inspire and guide students' learning behavior, but educators need to consider both teachers and students in the process of educational design, Its essence is to integrate teaching theory and learning theory into the process of instructional design(Gagne, 2019). After studying the different educational practices and teaching results of learning and acceptance learning, some scholars believe that acceptance learning starts from the knowledge of textbooks and regards students as the container of knowledge acceptance. Teachers do not need to consider the relationship between students, teachers and educational activities in teaching practice. Students are more achievement oriented and lack the ability to innovate and explore. The learning environment of accepting learning makes students only pay attention to textbook knowledge. Such a teaching environment is closed, and students' knowledge is not complete. The teaching process is also lack of practical students, who can only master knowledge through mechanical memory. And discovery learning is more creative and investigative. On the one hand, teachers build an exploratory learning environment. Teachers and students reorganize the learning structure and learning process according to the existing knowledge in the textbook. In this way, students can actively create, rather than understand knowledge within the scope of the original textbook. Teachers stimulate students' exploration behavior by encouraging students to put forward their own ideas. On the other hand, teachers can guide students to actively explore around the learning theme. In this process, students can expand and discover independently, so as to expand their scope of knowledge (Alimuddin, 2021).

Stimulating learning motivation in educational activities

Learning motivation has been studied by many educational theories and psychologists believe that it is an important factor to promote the teaching effect. Some scholars believe that stimulating students' learning motivation requires building a scientific learning situation in the process of education. In the process of constructing learning conditions and learning situations, the novelty of problems and the complexity of learning have become two important factors. The novelty of questions can easily attract students' attention and attract students to actively explore relevant knowledge. The complexity of learning should be kept at a reasonable level, which means that students can understand part of the foundation of the knowledge, but have not fully mastered it. This sense of distance from knowledge can make students feel a certain challenge in the learning process. This challenge will give students a sense of achievement after they acquire knowledge (Suratno, & Tonra,2019). Through the research on students' learning behavior and learning results, some scholars found that stimulating students' learning motivation requires correct attribution of students' learning results. This process not only helps students explain the existing learning results, but also helps students set future learning goals. In many cases, students will attribute their learning failure to the complexity of their own ability and knowledge (Wigfield, & Koenka, 2020). In this case, the number of learning failures will lead to an increase in students' expectations of future failures. When students think that learning failure is due to insufficient action, students' expectations of future learning failure will be reduced. Therefore, when teachers guide and cultivate students' learning motivation, they need to be able to scientifically build an evaluation system for students' learning results, help students scientifically attribute learning results, and help students build confidence in future learning (Koenka, 2020). Through the theoretical research of instructional design, some scholars believe that systematic theories and methods can help instructional design analyze the logical relationship between the elements of the teaching system from the perspective of integrity, and learning motivation is an important factor that needs attention. On this basis, educators need to study and find various problems in the teaching process, and let the problems be systematically analyzed and solved by educators. Systematic method can enable educators to design a teaching process that can more stimulate students' learning motivation, because it can realize the unified development of various elements in educational activities through the overall design of the educational process according to the internal relations between the influencing elements in the educational system and between the elements and the system (Isman,

2012). Some scholars have studied the learning cases of primary and junior high schools and found that the process of students' learning knowledge is inherently complex and difficult, and students' learning motivation needs interest to guide. Therefore, teachers need to stimulate students' learning motivation in the learning process, so they need to build a novel and interesting learning environment for students(Lee,2016).

2.3 Current research theory gap

Combing and summarizing the research views of previous researchers, it can be found that scholars have made relatively sufficient research on the application of discovery learning theory and stimulating students' learning motivation in the teaching process. However, at present, scholars rarely focus their research on Mathematics Education in primary school. As an important basic teaching content, primary school mathematics education has an important impact on stimulating students' learning thinking and cultivating learning habits. Therefore, this study takes the third grade mathematics of Hongyun primary school in Kunming, Yunnan Province as a case to study the application of discovery theory and teaching design in the process of primary school mathematics education.

2.4 Related Research

Research and Application of Traditional Learning and e-Learning ： Traditional learning still has an important influence on us. It is impossible for everyone to deviate from traditional learning. Traditional learning plays a decisive role in the development of people's learning concept. The advent of the Internet age and the rise of e-Learning have given learners a with new thinking and media applications, e-Learning has the incomparable advantages of traditional learning, making learners even more powerful. However, whether it is traditional learning or e-Learning, its essence is learning, and only learners can truly understand its advantages.

（Li Ying & Jing Weidong,2009）

Mathematical Inquiry Learning Research: In-depth participation in mathematical thinking, the role of mathematical intuition, the richness of inquiry content, the mainstream of

problem-solving inquiry, etc. Constructing the Process Theory of Mathematical Inquiry Learning Constructing the process theory of inquiry learning is the characteristic of this research. In order to effectively implement mathematical inquiry learning, several key elements should be grasped in the process of inquiry learning: process knowledge, mathematical reasoning, self-monitoring, process evaluation, etc. (Ning Lianhua., 2004).

CHAPTER 3

RESEARCH METHODOLOGY

This paper needs to complete the following research Objective 1: To study discover learning enhance students' perception in mathematics learning in Primary School. And 2: To compare students' perception in mathematics learning between traditional learning and discovery learning.

3.1 Research design

This study was used the content of fraction, addition and subtraction in the second volume of grade 3 mathematics of primary school approved by the Ministry of education of China as the teaching experiment content- discovery, and carries out the Teaching comparative experiment through the way of control group (traditional learning)-.

1. The researcher used target group selected 60 students in grade 3 of Hongyun primary school in Kunming, Yunnan Province.

2. Divided the students into two groups with 30 students in each group. The first group was the experimental group (discovery learning)-discover learning and the second group was the control group (traditional learning).

3. Before the teaching experiment, the researcher used 3 structured questions to pre-test the learning effect of students before the application of mathematical discovery method.

4. During the experiment, the experimental group (discovery learning) was taught by the method of discovery learning, and the students in the control group (traditional learning) were taught by the traditional learning method. The survey was conducted using 14 structured questions.

5. After the experiment, the researchers used the form of interview and 6 structured questions to record and study and score and compare them.

3.2 Participants

The participants of this study are the thirdgrade students of Hongyun primary school in Kunming, Yunnan Province, China. Hongyun primary school in Kunming, Yunnan Province, located in Wuhua District, Kunming, Yunnan Province, China, is a public six-year compulsory education primary school in Kunming. The whole school is divided into six grades and 27 classes, with more than 1200 students.

3.3 Target Group

The researcher used target group selected 60 students in grade 3 of Hongyun primary school in Kunming, Yunnan Province from Hongyun primary school in Kunming, Yunnan Province, China.

Tradition learning - 30 students in the control group (traditional learning) participated in the primary school mathematics teaching control activities mainly given by teachers. After the traditional learning and teaching activities, the researcher conducted a survey on the learning effect of mathematics knowledge and verified the difference in learning effect with the control group (traditional learning) of 30 students.

Discovery learning- In the experimental group (discovery learning), 30 students participated in primary school mathematics teaching control activities that were mainly guided by teachers and discovered by students themselves. After the discovery learning and teaching activities, the researcher investigated the learning effect of mathematical knowledge, and verified the difference between the learning effect and the experimental group (discovery learning) of 30 students.

3.4 Research Instruments

The main tool was used in the experimental group (discovery learning) of this paper is the questionnaire. The questionnaire was evaluated by **five primary school math experts** for IOC. Five experts were Gu Tingting, Liu Bei, Pi Guofeng, Houchun, and Han Jiazhi.

In the process of discovering learning, teachers use games to create problem situations, ask questions that students are interested in, and make students conflict in this situation, so as to propose problems that need to be solved or must be solved.

In the traditional learning process, a teacher uses textbooks and chalk on the podium to write down knowledge, students keep taking notes, then review, and then take the test.

3.5 Teaching plan

Table 3.1 Comparison Traditional Learning and Discovery Learning

Tradition learning/teaching	**Discovery learning/teaching**
Teaching objects: 30 students from the third grade target group control group(discover learning) of Hongyun Primary School in Kunming City, Yunnan Province.	Teaching objects: 30 students in the experimental group(discovery learning) of the third grade target group of Hongyun Primary School in Kunming City, Yunnan Province.
Textbook: the second volume of the third grade of primary school mathematics approved by the Ministry of education of the people's Republic of China	Textbook: the second volume of the third grade of primary school mathematics approved by the Ministry of education of the people's Republic of China
Teaching content: fraction addition and subtraction	Teaching content: fraction addition and subtraction
Learning objectives: students can master the algorithm of fraction addition and subtraction and calculate accurately.	Learning objectives: students can master the algorithm of fraction addition and subtraction and calculate accurately.
Training goal: tell the knowledge directly to the students, and let the students memorize them by rote.	Training goal: to stimulate students' desire to explore mathematical knowledge, and to improve students' intrinsic motivation for learning.
Computer, chalk, textbooks, etc.	Multimedia, games, textbooks, etc.

3.6 Research process

In order to build a free exploration teaching environment for students and help educators better use discovery learning theory in the process of education, this study uses life-oriented games to build learning scenes and carry out teaching design. The following steps will be implemented:

1. Selection of teaching content

In order to better stimulate students' learning motivation and active exploration spirit in the learning process, according to the provisions of the 2022 primary school syllabus issued by the Ministry of education of the people's Republic of China, this study selected the elementary school fraction addition and subtraction operations, which meet the requirements of the third grade students' education stage and are difficult and exploratory, as the teaching content.

2. Construction of game scenes

In order to start from the life perspective of primary school students and build interesting activity scenes for students, this study selects the life scene of fruit selling in the fruit supply station as the learning situation of this time, and endows students with the theme role of participating in the game by recruiting small assistants and consumption experience members in the fruit supply station, which can stimulate students' enthusiasm to explore score knowledge and learning ability in familiar life scenes, Let students actively think about the operation process of fractional addition and subtraction, and improve their learning effect by attracting students' attention.

3. Activity design

Because Chinese students have the characteristics of strong obedience, strong executive ability, weak enthusiasm for exploration, fear of failure and so on, the teaching process of this study designed a game activity of buying apples at the fruit supply station for the experimental group (discovery learning).

The background of the game is designed for Hongyun primary school in Kunming, Yunnan Province. In order to facilitate the shopping of students and teaching staff, a fruit supply

station has been established. Now the teacher will select two assistants from the student group to help sell the fruit. At the same time, a consumption experience team needs to be established to help the school evaluate the service of the fruit supply station. The teacher actively invited students to sign up and told students to raise their hands if they are willing to act as little assistants. The teacher is choosing a male classmate and a female classmate to sell fruits according to the enthusiasm of students, and choosing three students to set up a consumption experience team.

The teacher began to build a consumption scene. There were 16 apples in a box in the fruit supply station. He told the first consumer experiencer that he now needed to buy four apples. The first consumer experiencer and his little assistant performed the process of buying apples and bargaining. Then the teacher told the second consumer experiencer that he still needed to buy two apples, and the second consumer experiencer and his little assistant performed the process of buying apples and bargaining. Then the teacher asked the children in the class what percentage of the box of apples the two consumers had taken, and how to calculate the score in the process.

Next, the teacher told the members of the consumption experience team that the purpose of this consumption is to experience and investigate the service level of the supply station and the little assistant. In order not to waste things, we need to return the apples. First, the third consumer experience returns four apples, and then the old teacher returns two apples. Then, by explaining the inverse operation of fraction addition, we can help students understand the algorithm of fraction subtraction.

To conduct a comparative experiment, this study used both traditional and discovery instructional design processes to teach two groups of students.

3.7 Lesson Plan evaluated by five experts

This is the lesson plan evaluated by five experts, the IOC are Gu Tingting, Liu Bei, Pi Guofeng, Hou Chun, and Han Jiazhi from China.

Table 3.2 course schedule

Title	Teaching of addition and subtraction of grades in grade three of primary school
Lesson Format	Onsite
Students	Thirty third grade students of Hongyun primary school in Kunming, Yunnan Province were in the experimental group(discovery learning) and the control group(discover learning) respectively
mathematics Level	Passed the mathematics tests of the second grade of compulsory education primary school in China, and has the foundation of learning mathematics of the third grade of primary school
Objective	1. Help students master the addition and subtraction method of mathematical scores in grade 3 of primary school 2. Stimulate students' exploration spirit and improve students' learning motivation and learning effect
Material	A box of apples (16)
Teaching Time	45min
Teaching Process	experience group teaching experiment process: Part I: the teacher helped the students review the concepts of integer, fraction, denominator, numerator and so on through the example of Xiaoming's mother taking apples. Part II: build a consumption scenario. There are 16 apples in a box in the fruit supply station. The teacher told the first consumer experiencer that he now needs to buy four apples. The first consumer experiencer and his little assistant performed the process of buying apples and bargaining. Then the teacher told the second consumer experiencer that he still needed to buy two apples, and the second consumer experiencer and his little

Title	Teaching of addition and subtraction of grades in grade three of primary school
	assistant performed the process of buying apples and bargaining. Then the teacher asked the children in the class what percentage of the box of apples the two consumers had taken, and how to calculate the score in the process. Part III: next, the teacher told the members of the consumption experience team that the purpose of this consumption is to experience and investigate the service level of the supply station and the little assistant. In order not to waste things, we need to return the apples. First, the third consumer experience returns four apples, and then the teacher returns two apples. Then, by explaining the inverse operation of fraction addition, we can help students understand the algorithm of fraction subtraction. Control group (discover learning) teaching experiment process: Part I: the teacher shows the concepts of integer, fraction, numerator and denominator through the computer, and the students read them aloud. Then there are students to explain their understanding of these concepts. Part II: the teacher led the students to read aloud the arithmetic of addition and subtraction of fractions, and explained the addition and subtraction through the process of 4/16+2/16 and inverse operation to help the students understand. Then the students ask their doubts and the teacher answers them. The process is controlled in about 20 minutes. Part III: the teacher assigns exercises after class, which are completed by the students independently.
Evaluation and Assessment	Observe the enthusiasm of students in class and the efficiency and correctness of exercises

3.8 Research method

The experimental group (discovery learning) and the control group (traditional learning) used the following two experimental methods:

Empirical analysis

Empirical analysis refers to the study of the quantitative relationship between survey data to obtain the development law of things with universal significance. This paper used the empirical analysis method and mean, standard deviation and percentage to make a descriptive analysis of the survey data as the evidence to draw a conclusion.

Action research method

Action research method is an important method in the field of education. Researchers need to design educational situations and educational programs, organize the implementation, and evaluate the results by observing the implementation process and effect. This method can be directly applied to teaching activities. Guided by the idea of data discovery, this paper designs and implements the research project, teaching scheme and teaching activities, analyzes the learners' learning process, learning effect and emotional attitude through the results of the experimental process, and then uses SPSS software to verify the effectiveness of the design scheme.

3.9 Research Instruments

The main tool was used in the experimental research of this paper was the questionnaire. The questionnaire of students' perception in mathematics learning includes four aspects: demographic elements, students' learning process, learning results and students' evaluation. Each aspect includes six indicators, a total of 24 indicators. Each indicator has a maximum of five points and a minimum of zero points. The full score of the questionnaire is 120 points. In order to ensure the validity and reliability of the questionnaire, the researchers used 23 structured questions to pre-test the students' learning effect and students' evaluation of the educational process before the application of mathematical discovery method.

3.10 Data collection procedures

In order to obtain true, effective and objective data, help this research project carry out scientific experiments and draw rigorous conclusions, the researchers carried out the following data collection steps.

Step 1: the researcher selected 60 students as the research sample from the population of 264 students in grade 3 of Hongyun primary school in Kunming, Yunnan Province, and.

Step 2: use 23 structured questions to pre-test the learning effect of students before the application of mathematical discovery method.

Step 3: use 17 semi-structured questions to pre-test students' evaluation of the educational process.

Step 4: invite the 60 students to participate in the experimental activities of primary school mathematics teaching guided by the thought of mathematical discovery.

Step 5: issue a questionnaire to students. The questionnaire includes four aspects: demographic elements, students' learning process, learning results and students' evaluation. Each aspect includes six indicators, a total of 24 indicators. Each indicator has a maximum of five points and a minimum of zero points. The full score of the questionnaire is 120 points.

3.11 Data analysis

1. Use mean, standard deviation and percentage to statistically analyze the elements of the questionnaire.

2. Compare and analyze the evaluation results of the two groups

CHAPTER 4

RESULTS

4.1 Learning effect teaching experiment

In order to design discovery learning in primary school mathematics teaching and compare the Mathematics learning of traditional teaching and discovery learning. Before the teaching experiment, researcher used two target groups as experimental group(discovery learning)-discover learning and control group(discover learning)-tradition learning, with 30 students in each group using 23 structured questions to teach mathematics, while the control group(discover learning)-tradition learning used traditional learning methods. The researcher pretested the learning effect of each group before applying the discovery learning method. Each student answered "yes" with a weight of 1, answered "no" with a weight of 0, and the highest score was 30. Then the students in the experimental group(discovery learning)-discover learning and the control group(discover learning)-tradition learning were given test papers again for posttest to test and score the basic knowledge of mathematics and scores in the first half of the year.

Table 4.1 Students' Perception Mathematics Learning before learning process

Content	Discovery Learning - Yes	Discovery Learning - No	Tradition Learning - Yes	Tradition Learning - No	Total
1. Are you interested in adding and subtracting math scores	26 86.7%	4 13.3%	24 80%	6 20%	30
2. Do you think the addition and subtraction of math scores is difficult for you to master	8 26.7%	22 73.3%	7 23.3%	23 76.7%	30
3.Do you think you have mastered the knowledge of relationship scores well before	23 76.7%	7 23.3%	25 83.3%	5 16.7%	30

From Table 4.1, it can be seen that the experimental group(discovery learning) before the learning process, most students predict that they are very interested in the addition and subtraction of primary school grades, and the knowledge difficulty of this learning module is not high, so they are very confident to master it this part of the knowledge. While the control group(discover learning), it can be seen that before the learning process, most of the students predict that they are interested in learning this part of knowledge and are confident that they can overcome the difficulties in learning and master this

Table 4.2 Students' Perception Mathematics Learning in the process of learning:

	Content	Discover Learning - Yes	Discover Learning - No	Tradition Learning - Yes	Tradition Learning - No	Total
1.	Do you think you can easily follow the teacher's ideas	22 73.3%	8 16.7%	20 66.7%	10 33.3%	30
2.	Do you think you can quickly understand the concepts explained by the teacher	19 63.3%	11 36.7%	20 66.7%	10 33.3%	30
3.	Do you think the teacher's teaching guidance process in class has a great impact on your knowledge understanding process	23 76.7%	7 23.3%	24 80.0%	6 20.0%	30
4.	Do you think the teacher's explanation of the concept can better help the learning of score addition and subtraction	8 26.7%	22 73.3%	9 30.0%	21 70.0%	30
5.	Do you think teachers can better help students learn the addition and subtraction method by explaining examples	14 46.7%	16 53.3%	13 43.3%	17 56.7%	30
6.	Do you prefer to recite relevant algorithms	5 16.7%	25 73.3%	6 20.0%	24 80.0%	30
7.	Do you prefer to understand related algorithms	21 70.0%	9 30.0%	24 80.0%	6 20.0%	30
8.	Do you think you can easily master the algorithm of fraction addition and subtraction	18 60.0%	13 40.0%	17 56.7%	13 33.3%	30
9.	Do you think you can answer the questions raised by the teacher in the class of score	25 83.3%	5 16.7%	27 90.0%	3 10.0%	30

	Content	Discover Learning - Yes	Discover Learning - No	Tradition Learning - Yes	Tradition Learning - No	Total
	addition and subtraction quickly					
10.	Do you think you can quickly understand the cases taught by the teacher	20 66.7%	10 33.3%	18 60.0%	12 40.0%	30
11.	Do you think you will learn math score addition and subtraction very efficiently	18 60.0%	12 40.0%	20 66.7%	10 33.3%	30
12.	Do you think the teacher's teaching method has an important impact on your attention	20 66.7%	10 33.3%	19 63.3%	11 36.7%	30
13.	Do you think you can calculate all the examples quickly	18 60.0%	12 40.0%	21 70.0%	9 30.0%	30
14.	Do you think the result of your example is correct	17 56.7%	13 43.3%	18 60.0%	12 40.0%	30

From Table 4.2, for the learning process. Experimental group (discovery learning) most students predict that they can well follow the teacher's teaching ideas and understand the concepts and knowledge taught by the teacher. Most students predict that they can master the rules of score addition and subtraction and complete the example exercises smoothly. At the same time, most students think the teacher's guidance is very important. They are more willing to master knowledge through understanding rather than reciting. Control group (discover learning) most students predict that they are very confident in following the teacher's teaching ideas and understanding the concepts taught by the teacher. Most students predict that it is easy for them to master knowledge points and classroom exercises. At the same time, most of the students in the control group (discover learning)-tradition learning also believe that the teacher's guidance is very important for students to learn mathematical knowledge, and understanding and memory is more popular than recitation.

Through the above investigation and analysis, it can be found that before the teaching experiment, the students in the control group (discover learning)-tradition learning and the experimental group (discovery learning)-discover learning have roughly the same prediction about

the learning of score addition and subtraction method. The students are full of confidence in mastering this part of mathematical knowledge and getting good results in classroom exercises, homework and future exams. Compared with reciting and explaining concepts, students prefer to understand memory and example teaching. Students generally believe that teachers' teaching methods and models will affect students' news effect.

4.2 After teaching experiment

After the teaching experiment, the researchers used an interview format to ask students about the knowledge content of the lesson, and the last 6 structured questions in the questionnaire to investigate the experimental group (discovery learning)-discovery learning and control group (discover learning)-traditional learning students. The researchers recorded the students' subjective responses by recording, and then analyzed and summarized them.

Table 4.3 Students' Perception Mathematics Learning after the learning process:

Content	Discover Learning - Yes	Discover Learning - No	Tradition Learning - Yes	Tradition Learning - No	Total
1. Do you think you can finish the homework of score addition and subtraction in a short time	19 63.3%	11 36.7%	21 70.0%	9 30.0%	30
2. Do you think the homework assigned by the teacher is difficult for you	10 33.3%	20 66.7%	8 26.7%	22 73.3%	30
3. Do you think you can finish the task independently	22 73.3%	8 26.7%	20 66.7%	10 33.3%	30
4. Do you think your homework is correct	17 56.7%	13 43.3%	16 53.3%	14 46.7%	30
5. Do you think you can get good results in the content of score addition and subtraction in future tests	23 76.7%	7 23.3%	25 83.3%	5 16.7%	30
6. Do you think your academic performance on score addition and subtraction can be better than the class average	18 60.0%	12 40.0%	19 63.3%	11 36.7%	30

From Table 4.3, after the learning process. Experimental group (discovery learning) most students predict that they can successfully complete the after-school homework of score addition and subtraction method independently, maintain a high accuracy, and get better results in the future exams. Control group (discover learning) most of the students in the control group(discover learning)-tradition learning also predicted that they could complete their homework smoothly and correctly under the condition of independence, and predicted that they could obtain ideal academic results in the later exams.

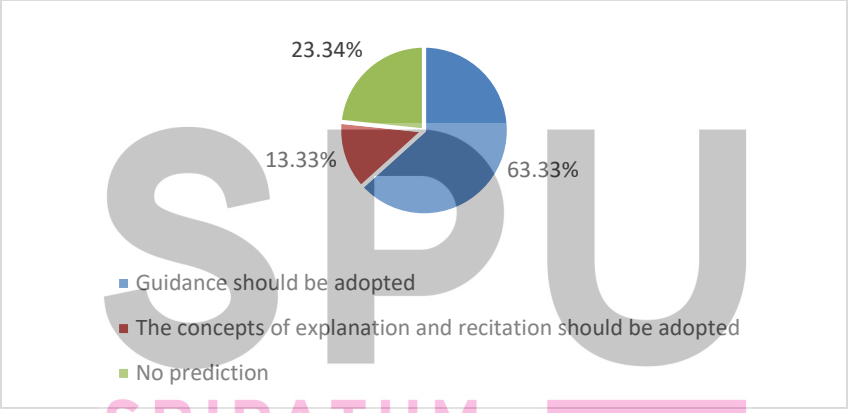

Figure 4.1 The survey results of the teaching methods of the experimental group (discovery learning)-discover learning

The prediction of the teaching process of 30 students in the experimental group (discovery learning)-discover learning shows that figure 2 shows the prediction survey results of the teaching methods of the experimental group (discovery learning)-discover learning. It can be seen that in terms of the teaching methods, 76.66% of the students think that the teaching process of the score addition and subtraction method should adopt the guidance method, 13.33% of the students think that the teaching process of the score addition and subtraction method should adopt the way of explaining and reciting concepts, and of the students do not predict the teacher's teaching methods.

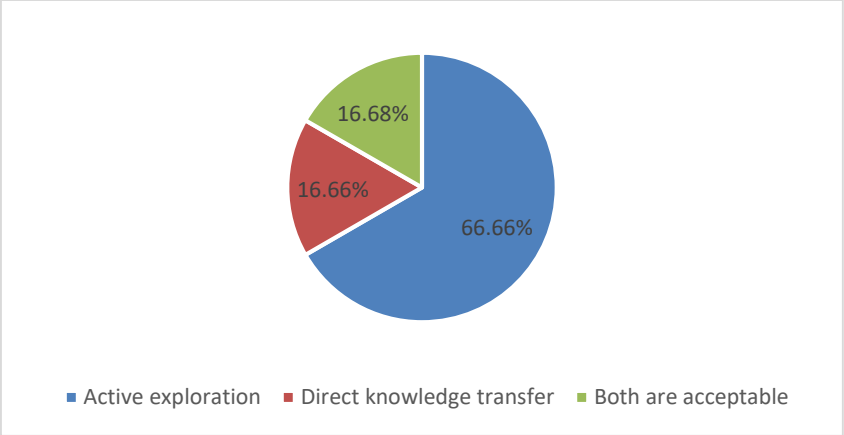

Figure 4.2 The results of learning initiative prediction of the experimental group (discovery learning)-discover learning

Figure 4.2 shows the results of the investigation on the prediction of learning initiative of the experimental group (discovery learning)-discover learning. It can be seen that in terms of learning initiative, 66.66% of the students prefer to explore actively with the help of the teacher, 16.66% of the students think they want the teacher to impart knowledge directly, and% of the students think that both self-exploration and direct teaching by the teacher are acceptable.

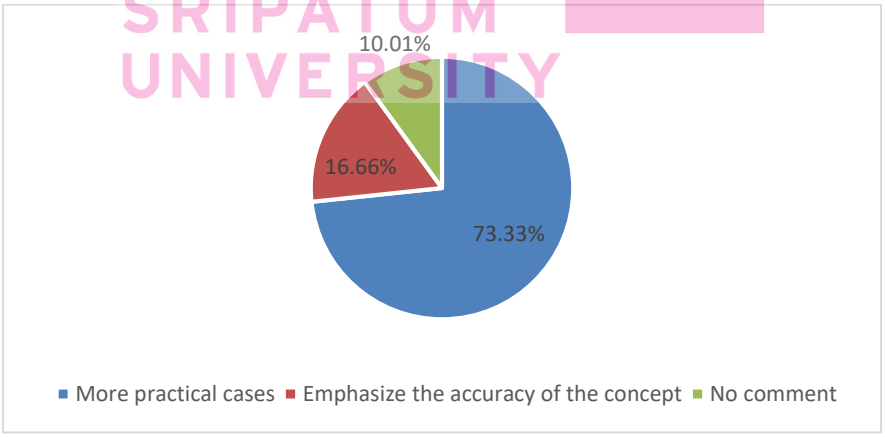

Figure 4.3 the results of the investigation on the prediction of the teaching

Figure 4.3 shows the prediction survey results of the teaching environment of the experimental group (discovery learning)-discover learning. It can be seen that in terms of the teaching environment, 73.33% of the students think that teachers should help them understand knowledge through more practical cases, 16.66% of the students think that teachers should

emphasize the accuracy of concepts, and 60% of the students think they have no more opinions on the teaching environment.

4.3 Environment of the experimental group (discovery learning)-discover learning

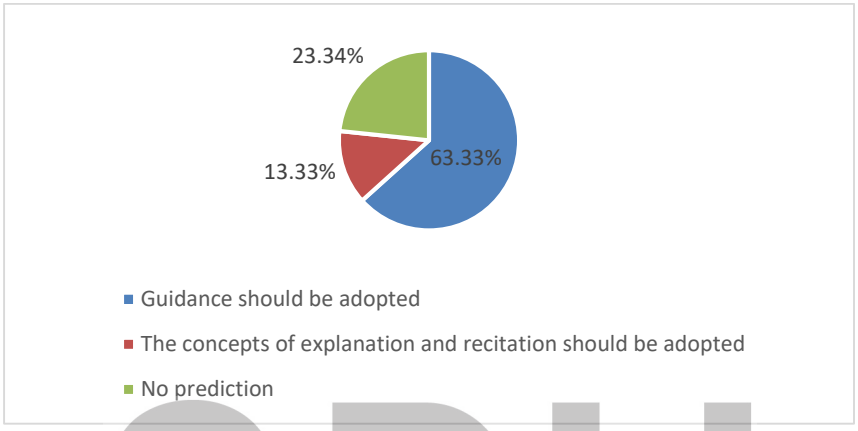

Figure 4.4 the predicted survey results of the teaching methods of the control group (traditional learning)

The prediction of the teaching process of 30 students in the control group (traditional learning)-traditional learning shows that figure 5 shows the prediction survey results of the teaching methods of the control group (traditional learning)-tradition learning. It can be seen that in terms of the teaching methods, 63.33% of the students think that the teaching process of the score addition and subtraction method should adopt the guidance method, 13.33% of the students think that the teaching process of the score addition and subtraction method should adopt the way of explaining and reciting concepts, and of the students do not predict the teaching methods of the teachers.

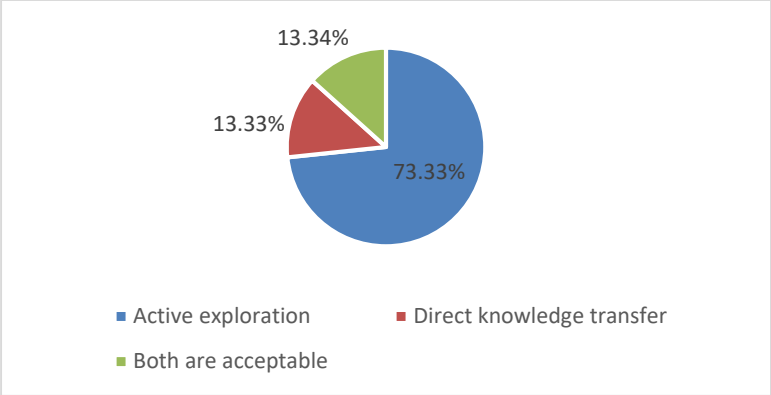

Figure 4.5 the survey results of learning initiative prediction of the control group (traditional learning)-traditional learning

Figure 4.5 shows the prediction survey results of the learning initiative of the control group (traditional learning)-traditional learning. It can be seen that in terms of learning initiative, 73.33% of the students prefer to explore actively with the help of the teacher, 13.33% of the students think they want the teacher to impart knowledge directly, and 13.34% of the students think that both self-exploration and direct teaching by the teacher are acceptable.

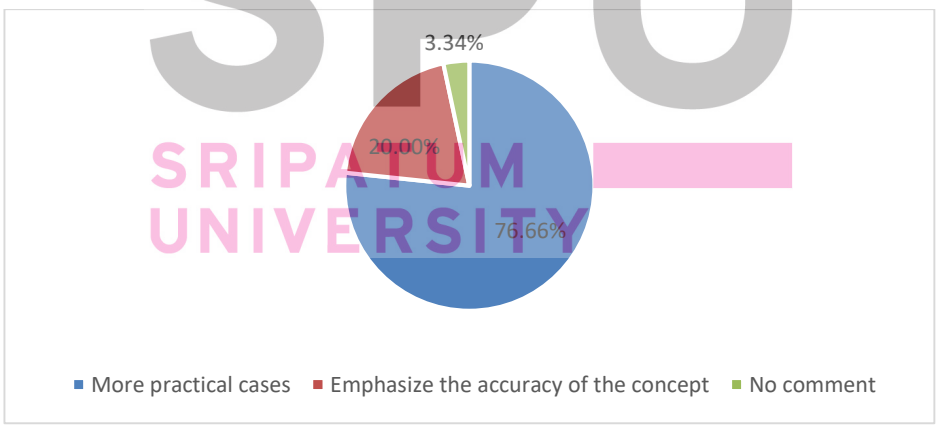

Figure 4.6 the prediction and survey results of the teaching environment of the control group (traditional learning)-tradition learning

Figure 4.6 shows the prediction survey results of the teaching environment of the control group traditional learning. It can be seen that in terms of the teaching environment, 76.66% of the students think that teachers should help them understand knowledge through more examples in life, 20% of the students think that teachers should emphasize the accuracy of concepts, and 30% of the students think they have no more opinions on the teaching environment.

From the above analysis, it can be seen that the students in the experimental group (discovery learning)-discover learning and those in the experimental group (discovery learning)-discover learning have basically the same expectations for the teaching process. Most students believe that teachers should encourage students to study independently through guidance, and build a happy learning environment by being closer to life examples. A small number of students accept the process of direct explanation and passive acceptance of knowledge.

4.4 Summary

Through the analysis of the prediction and investigation results of the students in the experimental group(discovery learning)-discover learning and the control group(discover learning)-tradition learning on the learning effect and teaching process, it can be seen that before the discovery learning experiment, the students in the experimental group (discovery learning)-discover learning and the control group (traditional learning)-tradition learning had the same learning effect and expected performance in the teaching process of the relevant knowledge of the addition and subtraction method of primary school scores, and the students showed confidence in learning this part of mathematical knowledge, And think they can well accept the guidance of teachers and successfully absorb relevant knowledge. They also think they can get satisfactory results in future tests. Most of the students in the two groups prefer to obtain a more free and active way of learning in the process of learning the mathematical knowledge. Understanding and guidance are more popular than passive acceptance and forced recitation. The students in the two groups did not have the same basic performance as the students in the control group (traditional learning)-tradition learning in the teaching process. In this case, the difference of learning discovery teaching experiment results will be mainly affected by the teaching process.

4.5 Teaching experiment implementation

Teaching and experimental process of experimental group (discovery learning)-discover learning

In this study, 30 students in the experimental group (discovery learning)-discover learning carried out a learning teaching process with score addition and subtraction as the teaching content. The implementation place of this experimental teaching process is the first teaching observation room. The following is the implementation process:

(1) Five minutes before class, the research assistant will bring 30 students in the experimental group(discovery learning)-discover learning into the classroom and arrange seats. Then remind students to check the textbooks and stationery they need to prepare for class.

(2) After class, the teacher leads out the first example through the observation room computer and constructs the scene. Xiao Ming's mother took a box of apples, a total of 16. Xiao Ming said he wanted two, and Xiao Ming's brother said he needed four. Xiaoming's sister said she needed eight, so Xiaoming's mother took out two, four and eight in the apple box. Through the above examples, the teacher helps the students review the concepts of integer, fraction, denominator and numerator, and the relationship between 2 / 16, 4 / 16, 8 / 16 and 1 / 8, 1 / 4 and 1 / 2. Through the above examples, the teacher stimulates the students' interest and attention to scores and improves the students' attention. The process is controlled in about 5 minutes.

(3) The teacher began to lead the students to play games. The background of the game is that Hongyun primary school in Kunming, Yunnan Province has set up a fruit supply station for the convenience of students and teaching staff. Teachers and students can choose their favorite fruits here. Now the teacher will select two fruit supply station assistants from the student group to help sell the fruit.

The teacher actively invited the students to sign up and told the students to raise their hands if they are willing to act as little assistants. The teacher is choosing a male student and a female student to sell fruit according to the students' enthusiasm.

Then the teacher invited other students to form a consumption experience team to carry out the consumption experience and score and evaluate the newly established fruit supply station and small assistants. Similarly, if the teacher tells the students that they are willing to join the consumption experience team, please raise your hands and select three students according to their enthusiasm.

The teacher began to build a consumption scenario. There were 16 apples in a box in the fruit supply station. He told the first consumer experiencer that he now needed to buy four apples. The first consumer experiencer and his assistant performed the process of buying apples and bargaining.

Then the teacher tells the second consumer experiencer that he needs to buy two more apples, and the second consumer experiencer and his assistant perform the process of buying apples and bargaining.

Then the teacher asked the whole class what percentage of the box of apples the two consumers had taken, and the method of score calculation in the process. The teaching included method 1: 4+2=6, and then divided by 16. Method 2: 4/16+2/16 process, denominator unchanged, numerator added. In this process, teachers need to help students understand the concept of fractional addition in the process of examples. The process is controlled within 10 minutes.

(4) Under the guidance of the teacher, the students will complete this part of the after-school exercises, and the students will talk about which method has been applied. The process is controlled within about 5 minutes.

(5) The teacher once again put the students into the game situation of fruit supply station consumption. The teacher told the members of the consumption experience team that the purpose of this consumption is to experience and investigate the service level of the supply station and small assistants. In order not to waste things, we need to return the apples. First, the third consumer will return four apples, and then the teacher will return two apples, Then the students can understand the arithmetic of fraction subtraction by explaining the inverse operation of fraction addition.

The teacher invited the little assistants and consumers to express their feelings in the consumption experience, and the consumption experience team and the little assistants evaluated the service level and improvement measures of the supply station. The process is controlled in about ten minutes.

(6) Under the guidance of the teacher, the students complete this part of the after-school exercises, and the students speak about how to carry out the inverse operation of addition. The process is controlled in about 5 minutes.

(7) Through the way of students' speech, the teacher guides students to summarize the knowledge points of this course and assign homework after class. The process is controlled in about ten minutes.

Control group (traditional learning)-tradition learning teaching experiment process

In this study, 30 students in the experimental group (discovery learning)-discover learning carried out the traditional teaching process with the score addition and subtraction method as the teaching content. The implementation place of this experimental teaching process is the second teaching observation room. The following is the implementation process:

(1) Five minutes before class, the research assistant will bring 30 students in the experimental group(discovery learning)-discover learning into the classroom and arrange seats. Then remind students to check the textbooks and stationery they need to prepare for class.

(2) The teacher showed the concepts of integer, fraction, numerator and denominator on the computer, and the students read them aloud. Then students will speak to explain their understanding of these concepts. The process is controlled in about ten minutes.

(3) The teacher led the students to read the arithmetic of addition and subtraction of fractions, and explained the addition and subtraction through the process of 4 / 16 + 2 / 16 and inverse operation to help the students understand. Then the students ask their doubts and the teacher answers them. The process is controlled in about 20 minutes.

(4) After class exercises are assigned by the teacher and completed by the students independently, and their application of calculation rules is explained through the students' speech. The process is controlled in about 5 minutes.

(5) The teacher will guide the students to review and summarize the knowledge learned in this course. The process is controlled in about ten minutes.

4.6 Questionnaire data analysis

Descriptive statistics

Table 4.4 shows the descriptive statistics of the questionnaire of the experimental group (discovery learning)-discover learning. It can be seen from the table that the average and median scores of the students in the experimental group (discovery learning)-discover learning on the learning process are 23 and 25 respectively, which shows that the students are more interested in the discovery learning mathematics learning process. At the same time, the average and median learning results of the experimental group (discovery learning)-discover learning are 24 points, and the highest score reaches the full score of 30 points, which shows that learning mathematics teaching has made students obtain good learning results. In terms of student evaluation, the average score is 20 and the median score is 23, which shows that students are generally satisfied with the discovery of learning mathematics model.

Table 4.4 Descriptive statistics of the questionnaire of the experimental group (discovery learning)-discover learning

	Dimension	Mean	Median	Maximum	minimum	Std.Dev.	N
experimental group	learning process	23	25	28	19	1.23	30
	Learning results	24	24	30	18	2.64	30
	Student evaluation	20	23	30	16	2.44	30

Table 4.5 shows the descriptive statistics of the questionnaire of the control group (discover learning)-tradition learning. It can be seen from the table that the average and median scores of the students in the control group (traditional learning)-tradition learning on the learning process are 16 and 17 respectively. Although they exceed 15, it shows that the students have low interest in the traditional mathematics learning process. At the same time, the average learning result of the control group (discover learning)-tradition learning is 14 points, and the median is 15 points, which shows that the learning effect of traditional mathematics teaching for students is not good, close to the middle level. From the aspect of student evaluation, the average is 15 points and the median is 15 points, which shows that the students' satisfaction with the traditional mathematics teaching mode is at the middle level.

Table 4.5 descriptive statistics of the questionnaire of the control group (traditional learning)

	Dimension	Mean	Median	Maximum	minimum	Std.Dev.	N
control group (traditional learning	learning process	16	17	23	12	1.45	30
	Learning results	14	15	30	11	2.96	30
	Student evaluation	15	15	24	9	3.23	30

According to the above data, it can be found that there are significant differences in learning process, learning results and student evaluation between the experimental group (discovery learning)-discover learning and the control group (traditional learning). Students have a higher interest in the score addition and subtraction learning process of discovering learning methods. People welcome the active discovery of learning environment and learning process with situational guidance as an important means, while the traditional learning model based on concept understanding and memory has gained lower recognition. From the perspective of learning results, it is found that the learning teaching process has achieved better learning results, and students have a stronger understanding and mastery of relevant knowledge. The students have performed very well in the accuracy and speed of answering questions in the operation process of fraction addition and subtraction. The teaching process of traditional learning methods makes the learning results

obtained by the students seem not good enough. In fact, the learning results of the students have only reached the general level. From the perspective of students' evaluation, students' evaluation of the learning process of discovering learning methods is better than the teaching process of traditional learning methods. Students have achieved good results in terms of the difficulty of accepting knowledge, the exploratory initiative of knowledge and the sense of knowledge acquisition. However, the performance of traditional education methods in these aspects has only reached the middle level.

4.7 Summary

Through the group control experiment and the analysis of the survey results after the experiment, it can be found that the open teaching method makes students get better results in the learning process and teaching evaluation, and is superior to the traditional teaching mode in the above aspects. Teachers tend to have a better understanding of the teaching environment and help students achieve better results through the active exploration of knowledge.

Table 4.6 Compare and analyze the assessment results of the two sets of data.

	Score-Traditional	Score-Discovery	% Traditional	% Discovery
Low	1	1	4.35	4.35
Median	3	3	13.04	13.04
High	7	5	30.43	21.74
Highest	12	14	52.17	60.87
Total	23	23	100.00	100.00

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

In this research project, 60 students in grade 3 of Hongyun primary school in Kunming, Yunnan Province, China were divided into groups to conduct a group control experiment on the discovery learning and teaching mode. The students in the experimental group (discovery learning) and the control group (traditional learning) were investigated and analyzed on the learning process and learning effect of relevant knowledge points such as fraction addition and subtraction algorithm. The discovery learning and teaching mode was compared with the traditional teaching mode, and the following conclusions were drawn:

First, it is found that the educational model of learning can improve the learning effect of students' mathematical knowledge. In the process of discovery learning and teaching, teachers can design the teaching mode and teaching links from the perspective of students. Students improve their mastery and application ability of knowledge through understanding memory. Discovery learning allows students to integrate knowledge with their own knowledge system and structure through associative memory and imagination, so as to form a suitable law of knowledge application. The direct explanation and repetitive memory of the concept of mathematical knowledge in the traditional teaching mode are not very helpful for students to master mathematical knowledge. This educational mode will hurt students' learning enthusiasm, and then reduce students' learning effect of mathematical knowledge. The students' learning results also reflect the autonomy and enthusiasm of learning, which has an important impact on the learning of mathematical knowledge. Teachers need to pay attention to the cultivation of students' learning autonomy and enthusiasm in the process of teaching mathematical knowledge.

Second to compare with the traditional learning mode, it is found that the learning and teaching mode can be improved the enthusiasm of primary school students to learn mathematical knowledge under the guidance and help of teachers, and primary school students can better understand and master the content of mathematical knowledge taught by teachers through better

autonomous learning and knowledge exploration. In this process, primary and secondary school students will form an understanding of knowledge with personal characteristics through self-cognition, which will become a key step for primary school students to apply and summarize knowledge. It is found that the learning and teaching mode allows students to obtain the active position of knowledge learning. It changes the role of teachers as the authority of knowledge interpretation and publisher in the traditional mathematics teaching mode, makes students become the protagonist of knowledge exploration, and teachers become the guide of thinking and helper in the learning process. The main responsibility of teachers is to build a teaching environment conducive to students' knowledge exploration, So that students can freely give full play to their creativity and imagination in the educational environment, so as to form a continuous knowledge network. Students can timely obtain relevant knowledge to deal with mathematical problems according to the knowledge network, so as to help students improve their mathematical performance while mastering mathematical knowledge.

Third, it is found that the educational model of learning has higher requirements for teachers. First of all, teachers need to give up the identity and role of teachers in the traditional teaching mode, which is a thorough change in the role of teachers in the teaching mode. Teachers need to redefine their position in teaching, which requires teachers to rethink their teaching ideas. Secondly, teachers need to master more multimedia technology, which is because multimedia technology can help teachers better present the designed educational scene and present various elements in the educational environment more vividly in front of students. This requires teachers not only to master the skills of knowledge teaching, but also to further learn the relevant knowledge of computer and multimedia technology. In addition, teachers need to further understand more examples and attractive stories in life and integrate them into their teaching process, which will become an important tool for teachers to stimulate students' interest in learning.

5.2 Discussion

The results of the grouping control experiment of primary school score addition and subtraction teaching help us confirm the importance of finding learning mode for students to master learning knowledge and obtain good learning results in the process of autonomous learning.

From the perspective of students' learning process, it is found that the learning and teaching process emphasizes shaping students' independent exploration ability and in-depth understanding ability of mathematical knowledge to help students acquire and master mathematical knowledge more actively. Different from the traditional teaching methods, learning discovery is that the teaching model emphasizes the dominant position of students, while teachers only exist as guidance and assistance. Teachers need to stimulate students' interest in the field of knowledge through examples and language guidance (Balim, 2009). For example, in the process of this discovery learning experiment teaching, teachers vividly describe the operation process of fraction addition and subtraction through the example of Apple division. This example fits students' real life and is easy for students to accept and understand, which greatly improves students' interest in knowledge learning and exploration. This interest can stimulate students' enthusiasm for active thinking and exploration of knowledge, and they will pay more attention and thinking to the questions raised by the teacher. At the same time, the exploratory learning environment constructed by teachers through examples can more easily stimulate students' Association and imagination. This allows them to think and solve related problems better through association when dealing with mathematical problems independently (Balim &Gormally, 2009). At the same time, good imagination can help students extend their exploration in this learning field. For example, in the process of explaining fractional subtraction, middle school students will recall and associate the apple example of fractional addition to think about the operation of addition independently. Therefore, it is found that the teaching process of learning is more conducive for students to master knowledge on the basis of understanding knowledge and improve students' academic performance.

From the effect of students' learning, it is found that the learning and teaching process can make students more easily master the knowledge they have learned, because it can attract students' attention and thinking ability through novel teaching things. Under such conditions,

students will reduce their fear of difficulties in knowledge exploration and learning (Joolingen, & Mizoguchi,1997). They have stronger interest and initiative to actively analyze the confusion encountered in learning. At this time, students no longer regard these problems as a source of pain, but as a challenge to meet their thirst for knowledge. Students will have a strong sense of achievement because they actively explore and obtain the correct answers. This sense of achievement will further strengthen the spirit of students' active exploration and further explore and discover the development of knowledge. Through the guidance and help of teachers, students begin to attribute their knowledge acquisition to their own efforts. Students begin to carry out self-goal management in the learning process and improve their learning efficiency through self-control. Therefore, it is found that the learning process of learning can make students acquire the core of knowledge more smoothly and leave a deep impression in memory.

From the perspective of teaching process, the teaching process of discovery learning requires teachers to think about the process of knowledge exploration and acquisition from the perspective of students. This may be a challenge for teachers, because teachers need to abandon their dominant identity in the traditional teaching mode. In the process of discovery and learning, teachers need to guide students' thinking through language and examples, while in the traditional teaching mode, teachers' responsibility is mainly to explain and analyze knowledge (Joolingen, 1998). Therefore, teachers need to switch their teaching thinking. First, they assume that they are students with relevant mathematical knowledge, analyze the relevant knowledge from the perspective of students, and record the problems and difficulties that students may encounter in this process, as well as the possible loss of direction. Then the teacher needs to return to the identity of the guide to solve the above problems and difficulties. The solution adopted by the teacher needs to be able to adapt to the understanding and intelligence level of primary school students. This is because examples can help students build a simple thinking situation, which can stimulate students' Association and imagination about life information. Students can get clues related to their knowledge from their life experience (Gijlers, & Jong, 2005). These clues can help students solve problems encountered in knowledge exploration, and may even become skills for students to master knowledge. Although these skills may not be mature, they can help students deepen their

understanding and memory of knowledge, so as to improve their mastery of knowledge. The display of computer technology and three-dimensional animation can help teachers more vividly and vividly show the scene of the occurrence and application of mathematical knowledge (Tribble, 2004). It can help students associate and imagine through the concrete things in life. Therefore, teachers need to be able to master the relevant multimedia technology as much as possible and apply it in the teaching process of discovery learning.

It is found that the essence of learning and teaching mode is to connect the learning process with the human nature of exploring the laws and truth of the external world in the growth stage, and enable students to actively learn mathematical knowledge by stimulating human thirst for knowledge and exploration spirit. This is because in the process of human learning, learning motivation is an important factor affecting students' learning efficiency and learning results. In traditional teaching methods, compulsory learning and punishment are the way of learning, which will reduce students' motivation to explore knowledge and even make students bored with learning. The pressure on students to acquire knowledge does not come from the external factors, but from the positive effect of students' acquisition of knowledge. In the process of traditional teaching mode, middle school students will even lose interest in knowledge exploration because of excessive pressure. In the subconscious of students, they will associate knowledge exploration with factors such as pressure and pain, which will cause strong negative psychological hints for students to explore knowledge. At the same time, in the traditional teaching method, students' understanding of the mathematical principles of conceptual algorithms is based on abstract interpretation. This abstract concept is difficult for students to construct the relationship between knowledge points in their thinking, and even can not understand the real meaning of these algorithms. It is found that the learning and teaching model can effectively solve the above problems. It is found that learning makes the learning process of knowledge become the process of students' self-learning. Students can not only obtain the correct knowledge through self-learning, so as to get the positive incentive given by the environment, but also carry out efficient continuous learning and knowledge exploration under this positive emotional incentive. At the same time, in the process of understanding based examples and knowledge explanation, students can have self-awareness of

knowledge, which makes knowledge become students' own knowledge from textbooks. This process plays a vital role in students' mastering knowledge and dealing with related problems. Therefore, the teaching method of discovery learning is also called learning method. When using the discovery learning education mode, teachers emphasize that students obtain the understanding of knowledge through discovery, and even cultivate knowledge discovery as their own ability. After the students have developed certain discovery ability and self-learning skills, they can actively explore relevant knowledge freely, which not only enables the students to obtain more possibilities in the primary school mathematics learning stage, but also enables the students to form an independent knowledge system according to the teaching materials, This knowledge system can not only enable students to deeply remember knowledge, but also enable students to reasonably speculate and judge relevant problems in a certain environment of unfamiliar knowledge, and even explore a new kind of knowledge. In other words, with the help of discovering learning ability, students begin to have the spirit of exploring the external world of mankind alone, which is of great help to students' future learning career. It can even be said that cultivating students' ability to explore alone itself is an important part of education.

When students can develop a good habit of active learning and the ability to explore knowledge, they can reduce their anxiety about mathematics knowledge learning. This is because the sense of achievement and acquisition in the process of knowledge makes them believe that they can overcome the difficulties and problems in learning through their own efforts. It is found that learning improves students' participation in the process of knowledge teaching and transmission, which is an important basis for students to cultivate learning confidence and learning ability. The traditional way of education ignores the ability of students as knowledge recipients to actively explore knowledge and participate in the process of knowledge acquisition, and even provides students with the enthusiasm of acquiring knowledge and the ability of self-management. Discovery learning can build the trust relationship with students in the process of knowledge exploration from a new perspective. The goal of the learning process has also changed from simply improving students' mastery of knowledge to cultivating students' ability to discover and understand knowledge. This is a transcendence of teaching ideas. Teachers need to realize the

fundamental change of teaching thinking in order to truly master the teaching mode of discovery learning.

5.3 Recommendations

Based on the analysis of discovery learning education model, this paper puts forward the following suggestions:

Recommendation 1: primary school mathematics teachers should gradually form a teaching model guided by discovery and learning theory in the process of primary school mathematics teaching. Teachers need to actively understand the characteristics of pupils' thinking mode and possible difficulties in the process of learning primary school basic mathematics knowledge, and design teaching methods and links from the perspective of pupils, In the teaching mode, teachers should highlight the cultivation of students' autonomous learning ability, and form the teaching goal of shaping students' discovery ability and pursuing students' learning effect. In the teaching process, teachers should emphasize the encouragement of students' autonomous learning ability, and give a positive response to the phased achievements of students' autonomous learning, so as to help students form Sustainable Autonomous Learning and analysis ability. On the basis of students' forming certain learning ability, supervise and control students' mastery of knowledge, and help students form a good learning model, which will become the basis for students' continuous learning of mathematical knowledge.

Recommendation 2: teachers should learn more visual teaching tools to help better present the teaching process of discovery learning. This includes the need to learn computer software technology and new media technology. Since most teachers have not been exposed to many relevant technical contents in the process of business training and on-the-job training, and have not accumulated relevant contents in the previous teaching process, the school can provide relevant training for teachers to help them master these technologies quickly, so as to help them build a more perfect teaching situation. Teachers also need to design novel and interesting teaching cases in the teaching plan. These examples should conform to the aesthetics and interests of primary school students. In this way, in the teaching process, teaching cases can better stimulate

the interests and attention of primary school students, and then promote the desire of primary school students to explore knowledge.

Recommendation 3: schools and other educational institutions need to popularize the key points of discovery learning related theories and knowledge for teachers, and help teachers better apply discovery learning theory in the reform of teaching model. Teachers can extend the discovery learning theory according to their teaching time and form their own unique educational style. Under the guidance of discovery learning theory, teachers need to innovate their educational ideas and use new teaching ideas to guide their teaching process. Schools can encourage teachers to redesign the existing teaching activities by using discovery learning theory through teaching competitions and other forms, so as to realize the reconstruction of school teaching mode. In the application of discovery theory, teachers and students can form a development model of mutual trust and mutual promotion.

Recommendation 4: in the process of promoting the teaching mode of discovery learning, schools and teachers need to create a class cultural atmosphere of active exploration and active discovery. Teachers need to help students transform their thinking and redefine their role in knowledge learning by encouraging students' enthusiasm for knowledge exploration. Teachers can encourage students to speak and establish a learning group learning model to make students feel the new learning atmosphere, which can help students adapt to the learning methods of discovery learning faster and cultivate students' learning ability of active learning. Through rich practical activities, students can better adapt to the learning process of independent exploration under the guidance of teachers. The serious feedback given by teachers will further enhance students' sense of achievement and enthusiasm. For example, students will be praised when speaking or become a key role in group discussion, which can make students feel their self-worth in the process of independent learning, then let the students quickly master the learning skills of discovery learning.

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