

INNOVATIVE DESIGN OF PRIMARY SCHOOL MATHEMATICS HOMEWORK UNDER THE BACKGROUND OF DOUBLE REDUCTION POLICY

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ABSTRACT

As an important part of elementary school mathematics teaching design, homework is indispensable in the learning process of primary school students. The process of completing homework is to consolidate the knowledge learned in class, deepen the impression, strengthen the understanding, apply what they have learned, and solve problems through the knowledge learned. At the same time, completing homework is also a process for primary school students to think independently and cultivate their ability to analyze and solve problems. The teacher's correction of students' homework is the process of receiving students' feedback. Through the completion of the homework, we can understand students' acceptance, understanding and application of the knowledge. However, most schools focus on classroom and teaching, and do not make specific requirements and norms for after-school homework, there are some problems in the design of after-school homework. In 2021, the government issued the "double reduction" policy, which aims to reduce students' burden and reduce their homework. This means that it is particularly important to improve the quality of homework design. Based on Bloom's educational goal taxonomy theory and the Zone of Proximal Development theory, this paper understands the current situation of primary school mathematics homework design after the "double reduction" through literature method and interview method. According to the survey results, the main problems of primary school mathematics homework are the single form of homework, lack of function, boring content and inappropriate difficulty. Based on the existing research theories and survey analysis, this paper aims to improve the function of primary school mathematics homework, enrich its content, integrate mathematical culture into primary school mathematics homework; enrich the form of homework, reasonably control the difficulty of homework, adopt the mode of stratified homework in primary school mathematics, and teach students according to their aptitude. So as to stimulate students' interest in learning, "reduce the burden" and "increase efficiency".

Keywords: "Double reduction"; primary school mathematics; homework optimization.

INTRODUCTION

After the introduction of the "double reduction" policy, teachers responded positively to the national call to improve the quality of students' after-school homework design, but there are many difficulties in the implementation process. After understanding the existing problems in primary school mathematics homework, this paper gives corresponding solutions to implement the requirements of "double reduction" policy and reduce the burden of primary school students' mathematics homework.

1.1 Research Background

In July 2021, The State Council and the General Office of the CPC Central Committee jointly issued a proposal on further reducing the burden of homework and extracurricular training for students in compulsory education. The document clearly requires improving the quality of homework and reducing the burden on students. Traditional math homework adopts the mode of exercise training, with a large amount of homework, repetitive and boring content, which is easy to make students feel bored. With the implementation of the policy, how to arrange homework reasonably has become one of the main jobs of teachers. The homework design of primary school mathematics should be targeted at all students, interesting and informative, so that primary school students can get a sense of satisfaction and pleasure after completing the homework. As of February 2022, the CNKI database contained over 13,000 articles related to the "Double Reduction" policy, including 2,216 Chinese academic journals, 89 English-language publications, and 1,617 Chinese doctoral dissertations. Additionally, there were more than 5,000 articles on "primary school mathematics homework," comprising 125 Chinese doctoral dissertations and 3 English doctoral dissertations. A total of 701 articles focused on optimizing primary school mathematics homework assignments. In general, there are few studies on the innovative design of after-school homework for primary school students under the background of "double reduction" policy. Based on the after-school homework of primary school mathematics, this paper focuses on the innovative design of homework, gives full play to the function of homework, and truly realizes the reduction of burden for students, parents and even teachers.

1.2 Research Significance

Teaching is not a teacher's simple indoctrination of knowledge to students, but the cultivation of students' ability. Homework is a process for students to think independently and solve problems, as well as a process to cultivate students' thinking and ability. The "double reduction" requires that students' homework burden should not only be reduced in quantity, but also improve their homework efficiency. The design of homework should also change the traditional "sea of questions" strategy, break the repetitive and boring mode of answering questions, and innovate the design to stimulate students' enthusiasm for learning. Follow the national policy and comprehensively promote the implementation of "double reduction".

METHODOLOGY

In order to understand the current situation of primary school mathematics homework after class after the introduction of the "double reduction" policy, this paper adopts the following methods for investigation and research.

2.1 Literature Research Method

This paper consulted the relevant literature on "double reduction policy" and "after-school homework design for primary school mathematics" in CNKI and other databases, sorted out and summarized the research results at home and abroad, enriched the theoretical guidance, and prepared for further research on innovative design of primary school mathematics homework.

2.2 Interview Method

We conducted in-depth interviews with primary school math teachers, focusing on their understanding of the "double reduction" policy and the assignment and correction of primary school math homework. We also interviewed primary school students, focusing on the

completion time of math homework, the difficulty degree of math homework and their attitude towards math homework. According to the analysis of the problems existing in primary school mathematics homework, the design of primary school mathematics homework can be optimized.

RESULTS

The "double reduction" policy clearly requires teachers to improve the quality of homework design. As an extension of classroom teaching, homework plays a vital role in students' consolidation of knowledge. This chapter investigates and analyzes the current situation of primary school mathematics homework under the implementation of the "double reduction" policy, affirming the advantages and finding out the shortcomings, so as to innovate and optimize the after-school mathematics homework.

3.1 Purpose And Method Of Investigation

The purpose of this survey is to understand the design status of primary school mathematics homework under the implementation of the policy, so as to find out the existing problems and lay a foundation for the innovative design of primary school mathematics homework in the next chapter.

The research methods are literature survey and interview survey. In order to understand the current real situation, I first searched the CNKI database and read the relevant articles. In the process of reading the article, I summarized and summarized. I learned that there have been many articles about homework design and innovation under the "double reduction" policy. It is enough to see that teachers actively respond to the national policy, timely adjust the assignment, and try to reduce the burden of students. However, it is far from enough to rely solely on literature to understand the extent to which the current assignment is implemented. Therefore, I specially went back to my Alma mater —— Fusong County No.5 Primary School, and had a more in-depth exchange with students of different grades and math teachers of various teaching segments to understand the real thoughts of teachers and students.

3.2 Subjects

This interview selected 12 teachers and 12 students as subjects, and analyzed different questions to understand the current situation of primary school mathematics homework design as clearly as possible. Teachers are selected based on academic qualifications, teaching experience and grade level. Academic qualifications include college degree or below, undergraduate degree, graduate degree or above; teaching experience ranges from 0 to 15 years; grade level taught ranges from grade 1 to grade 6. Students are selected based on academic performance, expressive ability and grade level. Academic performance includes middle, above and below average; expressive ability should be clear; grade level should cover grades 1 through 6.

3.3 Interview Survey

After clarifying the investigation method and determining the investigation object, we designed the following interview questions to interview teachers and students respectively, and the results are as follows.

3.3.1 Teacher Interview (Similar Results Are Only Shown Once)

Interview 1: What do you think is the purpose of homework?

Teacher A: I think assigning homework is to help students better grasp the knowledge they have learned. The process of students completing homework is also a process of deepening their understanding and strengthening their memory.

Teacher B: I believe mathematics is a subject that requires hands-on practice. Many concepts must be written down to truly grasp them, as visualizing abstract ideas through paper isn't easy. Given the complexity of current academic content and limited class time, homework becomes essential for reinforcing classroom learning. Moreover, completing assignments helps cultivate students' ability to think independently and solve problems on their own.

Teacher C: I think assigning math homework helps improve students' academic performance. Students learn how to solve such problems through a lot of homework practice, so they can get good grades in exams.

Interview 2: What form do you usually use to assign homework?

Teacher A: I currently teach younger students with relatively simpler curriculum content. I typically assign game-based or oral assignments. Considering the physical and mental development patterns of young learners, I prefer to let them learn joyfully through games. To cultivate their communication skills, I often assign verbal expression tasks that help them practice speaking.

Teacher B: When assigning homework, I typically use corresponding post-class exercises or supplementary workbooks. These materials comprehensively cover classroom content and suit most students in the class. By monitoring accuracy rates through these exercises, I can gauge how well students grasp the material, which helps me design more effective learning plans for the next phase.

Interview 3: How do you understand the reduction of students' homework burden in the "double reduction" policy?

Teacher A: The "Double Reduction" policy aims to reduce students' homework burden. I will optimize classroom content by allocating time for practice exercises during lessons. This approach helps students stay focused and complete assignments more efficiently, thereby reducing after-class workload and easing their academic load.

Teacher B: I think the "double reduction" policy is to control the amount of homework and reduce the time for students to complete homework. It allows students to have more time after class and develop their own interests.

Teacher C: I think the policy of reducing the burden is not only to reduce the burden but also to increase the efficiency. Therefore, we should not simply reduce the amount of homework for students, but make efforts in the design of homework.

Interview 4: What kind of innovation and optimization do you think should be carried out in primary school math homework?

Teacher A: I think interest is the best teacher for primary school students, so we should pay special attention to stimulate students' interest in learning when designing homework. We

should assign as few written homework as possible and choose group cooperative homework and inquiry-based learning homework to make learning fun.

Teacher B: I think primary school math homework should be close to life, and the questions are closely related to life. Let students feel the satisfaction of solving problems in life when they finish the homework.

Teacher C: I think math homework should pay attention to the design of form, refuse boring exercises and change the mode of homework. Let students practice more, think more and communicate more.

Teacher D: I think according to the theory of zone of proximal development, in order to stimulate students' potential, homework should be assigned in a targeted way. Different homework should be set according to different weak points of different students, so as to maximize the potential of each student.

3.3.2 Student Interviews (Similar Results Are Only Shown Once)

Interview 1: What is your attitude towards math homework?

Student A: I am very interested in math. I listen carefully in math class every day. After school, I usually do math homework first. Every time I finish math homework, I feel a sense of achievement.

Student B: I think math homework is a task that the teacher assigns and must be completed. If I don't finish it, my parents and teachers will criticize me, so I have to finish my math homework every day.

Student C: I find math homework so difficult that I spend hours on it every time, leaving me no time to play. So sometimes I just pick easy problems to do. When I really can't figure them out, I ask classmates how they solved them. Just scribbling down the answers makes me feel like I've done my homework.

Interview 2: Do you think the amount of math homework assigned by your teacher is appropriate?

Student A: I can finish my math homework in about half an hour every day, which is roughly the same time as other homework. After finishing my homework every day, I still have a lot of free time. Sometimes I even preview the next lesson after finishing my homework. I feel happy to learn math.

Student B: I think math homework seems to have few questions, but each one takes a long time. Sometimes I don't have an idea for a long time. I always do math homework last. Sometimes I do it very late at night, and I still feel sleepy in class the next day.

Student C: I think the amount of math homework is moderate. After finishing the homework of each subject after class, I have just enough time to spend every day.

Interview 3: How difficult do you think math homework is?

Student A: I think the math homework is very simple. As long as I listen carefully in math class, I can do most of the homework problems after class.

Student B: I think the first few questions in math homework are relatively easy and can be done

correctly. The later questions are more difficult and take a long time. But most of them can be done correctly if you use your brain.

Student C: I think the math homework is difficult, and the knowledge in math class is also obscure and difficult to understand. Many of them are only half-understood. When I look at the homework exercises, I am confused. Few of them can do it, and many problems have no way of solving.

Interview 4: What do you think is the function of math homework?

Student A: I think doing math homework can consolidate the knowledge learned in class. I can remember simple knowledge well through the consolidation of exercises.

Student B: I think completing math homework carefully can improve my math score. The content of math homework is very similar to the form of exam questions. I can do the exercises on the test paper based on memory and generalization, so as to get a relatively satisfactory learning result.

Student C: Doing math homework has helped me develop good study habits. I summarize what I learned every day when I get home, and then I finish the homework after that. I also finish my homework efficiently.

3.4 Analysis Of Interview Results

This survey examines the current landscape of elementary school math homework design from multiple perspectives. The findings reveal that when discussing assignment objectives, teachers predominantly focus on improving academic performance and reinforcing knowledge retention. Students, meanwhile, often emphasize how completing assignments enhances math scores and deepens understanding, yet both groups overlook the educational value inherent in homework^[2]. The process of completing the homework is a process of cultivating students' independent thinking ability and perseverance. In addition, in the survey, we found that the vast majority of teachers chose exercise books as the form of homework. After the introduction of "double reduction", some teachers actively responded to the national call and assigned game-based and oral homework, but only a few. Most teachers still focus on the students' mastery of knowledge, the increase in grades, etc. The form of homework often drives students' interest in learning, and students who are suitable for themselves and like their homework will spend a lot of time to complete it carefully. The one-size-fits-all mode of work has brought great trouble to the students who are struggling, and the excellent students cannot get further improvement. Generally speaking, most teachers can understand the requirements of the "double reduction" policy and design math classes and homework according to the requirements. However, there are still the following shortcomings in the implementation process.

First, the operation function is lacking. When the function of homework was mentioned in the interview, most teachers thought it was to consolidate knowledge and improve grades, but few mentioned the cultivation of students' ability. The examination system has become deeply rooted in people's hearts. Teachers, parents and even schools regard grades as one of the important criteria to measure students' performance. Under the influence of the environment, mathematics teachers often adopt the strategy of sea of questions. A lot of exercises are done to consolidate what students have learned and other functions of homework are ignored. Students also focus on the mastery of knowledge, the improvement of grades, and even forget the satisfaction of acquiring knowledge.

Second, the form of homework is monotonous. According to the interview results, some teachers have understood the requirements of "double reduction" and adopted various forms of homework such as games and hands-on operations in their homework design. However, as students get older, the amount of learning increases, and they face problems like primary school to junior high school, most teachers still focus on improving students' grades. Homework is also often in the traditional written form. The accompanying workbooks cover a full range of knowledge points and are suitable for most students. Some teachers use multimedia or design innovative questions by themselves, but their energy is limited and they only have one or two times a semester. Although the workbook is suitable for most students, it can be a blow to those who have weak knowledge of mathematics and difficult questions, which will make students lose their interest in mathematics little by little.

Third, the level of homework is vague and the amount of homework is unreasonable. According to the survey results, teachers tend to assign the same homework to students in their classes. However, each student is an individual and the ability to receive knowledge is not the same. Teachers use a one-size-fits-all approach to choose homework that suits most students [7]. For students with good grades, the homework is simple and does not allow students to have a deeper understanding and thinking. For students who do not accept knowledge well, homework is difficult and it takes most of their time to complete math homework. Slow students no longer have hope for mathematics and gradually lose their enthusiasm. This mode of operation is not conducive to the development of all students.

DISCUSSION

According to the survey results, we have learned about the problems existing in primary school mathematics homework at the present stage. In order to implement the "double reduction" policy, we put forward improvement methods for the found problems and make innovative design for primary school mathematics homework.

4.1 Enrich The Function Of Math Homework

Influenced by traditional educational concepts, teachers often regard homework as the key to improve students' performance, ignoring other functions of homework. In class, the teacher leads the students to learn, and the homework is often completed by the students independently. The assignment cultivates students' ability to solve problems independently. Due to the unique logic and rigor of mathematics, continuous thinking in homework is also the cultivation of students' thinking ability.

4.2 Integrate Mathematical Culture Into Mathematics Homework

Homework has always been presented in written form, and a lot of practice exercises often make students feel bored. To solve this problem, we can try to integrate mathematical culture into the design of mathematics homework. There are various forms of rich mathematical homework, such as oral type, group inquiry type, investigation type, independent design type, game type and so on.

Because of the uniqueness of mathematics, its rigor often makes students feel bored. When we integrate mathematical culture into math homework, students see not a set of exercises, but a vivid story. Be curious about mathematical culture, so as to actively explore and greatly improve the interest in learning mathematics.

By integrating mathematical culture into math homework, math homework is no longer a

boring knowledge point, but a mathematical cultural story. In the process of completing the homework, students have expanded their horizons, understood the origin of mathematical knowledge, and realized the connection between mathematics and life, as well as between mathematics and other subjects. Using mathematical culture as the background to introduce mathematical knowledge makes students more receptive. The development of mathematics is not accomplished overnight, but gradually explored and discovered by the persistent efforts of countless mathematicians to form the mathematical knowledge we learn today. When students learn the story behind mathematical culture, they realize that learning mathematics is a process of constant exploration, discovery and problem solving. Students develop the excellent quality of perseverance unconsciously when they finish their math homework.

4.3 Adopt The Stratified Mode Of Primary School Mathematics Homework

Just as there are no two identical leaves in the world, British educator John Locke once said that there are no two identical students in the world. Every student is an individual developing independently, with different levels of knowledge and acceptance ability. Traditional homework often adopts a one-size-fits-all mode, so that different students have different attitudes towards homework^[11]. Students with strong learning ability often find the homework easy and finish it very quickly. In order to adapt to most of the students in the class, teachers often choose moderately difficult questions. Good students do not explore further in the process of completing the homework, and they cannot find satisfaction in the math homework, so that they cannot improve their ability. Students with poor academic performance think that the questions are very difficult and it takes a long time to finish the homework. They are discouraged in the process of completing the homework and gradually lose their interest in learning mathematics. The "Compulsory Mathematics Curriculum Standards" also put forward that education should be oriented to all students, respect the differences among students, assign learning tasks in a targeted way, and achieve teaching according to individual aptitude. Therefore, it is necessary for mathematics homework to adopt a stratified model.

The hierarchical operation mode should first classify students into different levels according to their academic performance, personal ability, learning attitude and other aspects. In the process of implementation, teachers should pay attention to language expression, respect all students and protect their self-esteem. Secondly, teachers should classify the homework into different levels by consulting materials, organizing the content of the homework, and giving priority to trial doing, etc. Arrange homework according to the corresponding level of students. Teachers can understand students' mastery by the completion of students' homework. Design the next stage of math homework based on student feedback.

The stratified operation requires teachers to consider the characteristics of each student, master the learning situation of students, and the weak points of knowledge mastery. When assigning homework, consider the zone of proximal development theory and break through the weak points of students, so that students can give full play to their potential.

Teachers should always keep in mind that students are developing individuals and their levels are not fixed. They need to pay close attention to students' conditions, adjust their levels in a timely manner, and view students from a developmental perspective. Update and adjust the level of students in time, so that students can get satisfaction in learning, so as to fall in love with learning.

CONCLUSIONS

This paper mainly proposes the problems in the design of primary school mathematics homework after the "double reduction" policy and makes improvements. Innovative design of primary school mathematics homework, so as to reduce students' after-school homework burden. This paper mainly adopts the interview method. Through the interview results of teachers and students, we can see that under the requirements of the "double reduction" policy, teachers think and design the assignment of after-school homework to reduce the burden of students' after-school homework as much as possible. However, there are still some problems in the assignment of homework, such as the lack of function of homework; the form of homework is too monotonous; the level of homework is not clear; the amount of homework is unreasonable and so on. Based on these problems, in order to effectively reduce students' after-school homework burden, this paper puts forward a lot of targeted measures after consulting a large number of literature, such as enriching the function of mathematics homework; integrating mathematics culture into mathematics homework; adopting the stratified model of primary school mathematics homework. Based on the requirements of the "double reduction" policy, this study is based on Bloom's educational goal taxonomy theory and the zone of proximal development theory, deeply studies the existing problems in the assignment of primary school mathematics homework, and puts forward targeted solutions and suggestions to reduce the burden of students' after-school homework. However, there are still many shortcomings in this paper. Education is based on classroom and practice. Due to time and identity, I only had three months of internship experience, so I lacked experience in the process of research and had strong subjectivity. Secondly, the limited selection of interviewees may make the survey results limited. In general, there are few studies on the innovative design of after-school homework for primary school students under the background of "double reduction" policy. It is hoped that this paper can contribute to relevant research. In the future, I will continue to accumulate experience in study and work, increase the interview intensity, constantly enrich and update the data, so that the research results are more persuasive. I will strive to contribute to the implementation of the "double reduction" policy and the reduction of students' after-school homework burden.

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