

# The Research on the Expectation of Homework for Graduate Students Majoring in Mathematics in China

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## Abstract

Homework is an independent learning activity for students in extracurricular time, which is a supplement to classroom teaching. Improving the effectiveness of homework plays an important role in the further realization of effective teaching. However, in the process of graduate education, the effectiveness of homework is often ignored. And graduate students have gradually changed from simple knowledge recipients to knowledge creators. Therefore, it is more necessary to provide effective homework for graduate students and make full use of graduate students' autonomous learning time. From the view of helping graduate students to study better, this paper adopts the method of interview and selects the graduate students majoring in mathematics as the interviewees, to further understand what is the expectation of homework for graduate students. The following conclusions are drawn: (1) For the form of homework, students prefer written assignments to improve the effectiveness of homework. (2) Students hope that the content of the homework is the related variant exercises of the basic knowledge learned in the classroom. In order to ensure the diversity of the content, students also suggest that teachers can insert the contents of the extended knowledge and the knowledge to preview. (3) For the difficulty of homework, students prefer that teachers focus on the Zone of Proximal Development (ZPD) and provide students homework with appropriate difficulty, to arouse students' enthusiasm and develop their learning potential. (4) For the amount of homework, students prefer to control the completion time of each homework within 1 hour. Based on the above conclusions, we put forward some suggestions for teachers on how to arrange effective homework: It can be based on written homework, supplemented by various job reporting methods, such as group cooperation, reporting on stage and so on. At the same time, the difficulty of homework should be controlled in the ZPD, and the completion time of each professional homework should be controlled within 1 hour, so as to improve the effectiveness of homework.

## Keywords

Mathematics, Graduate Students, Homework, Effectiveness

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## 1. Introduction

As an important part of teaching, homework is an important activity to improve teaching efficiency, and the most direct way to test classroom teaching effect [1]. It can not only deepen students' understanding of basic knowledge but also help students form proficient skills and develop students' thinking ability [2]. Therefore, arranging the homework

effectively is a precondition to fulfill the value of the homework. However, the design of homework is often ignored in higher education teaching. In fact, this part can not be missing in the whole teaching link [3]. The essence of homework is to evaluate students' learning process from multiple perspectives. It is a supplement and continuation of classroom teaching and it plays an important role in the actual teaching process of colleges and universities [4]. Therefore, it

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is necessary to study how to improve the effectiveness of graduate students' homework from the perspective of helping graduate students to study. This paper adopts the method of interview and selects the graduate students majoring in mathematics as the interviewees, to further understand what is the expected homework of the graduate students. We hope this paper would provide relevant suggestions for teachers about arranging homework, and provide a reference for further research on the effectiveness of graduate students' homework. The research question of this paper is: what kind of homework do the graduate students majoring in mathematics expect in China.

## 2. Theoretical Basis

### 2.1. The Concept of Homework

This paper uses the literature analysis method to define the keywords. For the word "homework", Cihai defines that homework as an activity to accomplish a given task such as production and study [5]. "The Great Dictionary of Education" divides the homework of completing the study task into two major categories: classroom homework and extracurricular homework. This study mainly discusses extracurricular homework, and the definition of "extracurricular homework" is expressed as follows: According to the requirements of teachers, students carry out learning activities independently in extracurricular time. It is an extension of classroom teaching, which helps to consolidate and perfect the knowledge learned in the class [6]. For the effectiveness of the homework, Lang believes that effective work is to achieve the best results by the scientific design. Therefore, teachers should have a long-term consciousness about effective homework, to make the purpose of the homework clear [7].

### 2.2. The Interview of Homework

The goal of this paper is to study how teachers should assign homework more effectively in students' opinion.

Homework is an extension of classroom teaching activities and a main component of teaching [8]. And effective homework can better cause, maintain, and promote students' learning [9]. By reading the relevant literature, it is concluded that effective homework should be shown in the following aspects: (1) The content of homework should be comprehensive. The homework should pay attention to the basic knowledge and have some difficult questions to develop students' intelligence [10]. (2) Homework should consolidate the contents of classroom teaching and feedback on the teaching effect [11]. (3) Effective homework should control the appropriate amount of homework to not take up students' time too much. (4) Effective homework should reflect flexibility and diversity as far as possible, which should not

only reflect students' personality but also help to improve students' creativity [12]. (5) Effective homework should embody students' center-role. (6) Effective homework should adopt various ways to promote students' development.

Through the above performance, we can classify the contents of this interview, which can be interviewed from the following four aspects: (1) From the form of homework, we can interview students' suggestions on homework arrangement. (2) From the content of homework, we can interview students' suggestions on the content of the homework. (3) From the difficulty of homework, we can interview students' suggestions on the difficulty of homework. (4) From the amount of homework, we can interview students' suggestions on the amount of homework.

## 3. Methods

### 3.1. Sample

In order to better understand the relevant suggestions on the homework of graduate students majoring in mathematics, this study adopts the interview method and selects 14 graduate students of the School of Mathematics and Statistics, Shandong Normal University. There are 2 students majoring in Curriculum and Teaching Theory, 3 students majoring in Applied Mathematics, 2 students majoring in Basic Mathematics, 2 students majoring in Computational Mathematics, 1 student majoring in Statistics, 1 student majoring in Operational Research and Cybernetics, 1 student majoring in Applied Statistics and 2 masters of Education.

### 3.2. Instrument

In order to create a suitable interview environment, this interview adopts the method of the face-to-face interview in a quiet classroom. During the interview, we take notes on the spot. After the interview, we count and analyze the data by coding.

### 3.3. The Content of Interview

According to the above theoretical analysis, the following interview questions are designed:

Question 1: What form of homework do you want your teacher to assign to help students learn better?

Question 2: What content of homework do you want your teacher to assign to help students learn better?

Question 3: What difficulty of homework do you want your teacher to assign to help students learn better?

Question 4: How long do you want to complete your homework to help students learn better?

### 3.4. Data Processing

We code the answers of 14 interviewees and code the four interview questions: A: the form of homework; B: the content of homework; C: the difficulty of homework; D: the quantity of homework. By recording the answers of each interviewee and carrying out coding statistics, we can count the number of people mentioned in the recommendations and calculate the percentage.

**Table 1.** The statistics of the homework form.

Interviews	Interview results	Number	Percentage (%)	
Form	Homework type	A1: Written assignments	9	64.29
		A2: Practical activity	3	21.43
	Homework completion	A3: Group cooperation	3	21.43
		A4: Reporting on stage	2	14.29
	Homework design	A5: Teachers design the content of homework independently	3	21.43
	Other views	A6: The form is not important	1	7.14

It can be seen from the data in the table that 64.29% of students suggest that teachers should assign written homework to improve the efficiency of homework. As the main form of homework, written homework has been widely accepted by graduate students majoring in mathematics. However, a small number of students think that practical homework can also improve the efficiency of homework. To develop students' innovative potential, a very important way is to promote students to participate in practice, so that they can explore independently with questions [13]. Therefore, graduate students should apply knowledge and gain experience in practice. And

## 4. Results

### 4.1. The Form of Homework

According to the relevant data processing of the homework form, the students' answers can be summarized into four aspects: homework type, homework completion mode, assignment arrangement mode, and other viewpoints. The detailed data are shown in Table 1.

some students suggest using the form of group cooperation or reporting on stage to complete homework. In addition, 21.43% of students also mention that teachers should not rely on textbook exercises too much to assign homework, and suggest that teachers design homework by themselves.

### 4.2. The Content of Homework

According to the relevant data processing of the homework content, the students' answers can be summarized into three aspects: classroom content, expansion content, preview content. The detailed data are shown in Table 2.

**Table 2.** The statistics of the homework content.

Interviews	Interview results	Number	Percentage (%)	
Content	Classroom content	B1: Variant practice	7	50.00
		B2: Knowledge application	5	35.71
	Expansion content	B3: Content for self-study	4	28.57
		B4: Expansion exercise	4	28.57
	Preview content	B5: Preview content	2	14.29

It can be seen from the data in the table that most students think that homework is an extension of classroom teaching. In their opinion, the content of homework should be based on the variant practice or the related application of classroom knowledge. Some students think that the arrangement of homework should be based on the content of extracurricular expansion. They suggest that teachers can arrange related extended questions or provide relevant self-study materials to expand students' horizons. In addition, some students from the perspective of strengthening students' learning autonomy suggest teachers should arrange the preview of the new knowledge.

### 4.3. The Difficulty of Homework

According to students' suggestions on the difficulty of

homework, we can see that the students' answers are mainly divided into three aspects: (1) Students suggest that teachers assign homework with less difficulty; (2) Students suggest that teachers assign homework with medium difficulty; (3) Students suggest that teachers assign homework with more difficulty. For the less difficult homework, the students explain that teachers should arrange the related variation of classroom knowledge, mainly with simple basic questions. For the problem of moderate difficulty, students explain that the teacher should assign the related homework within the scope of the student's ability, which is the problem that students can solve after careful thinking. For difficult problems, students explain that teachers should arrange difficult homework to improve graduate students' learning ability. The detailed data are shown in Table 3.

**Table 3.** The statistics of the homework difficulty.

Interviews	Interview results	Number	Percentage (%)
Difficulty	C1: Homework with less difficulty	7	50.00
	C2: Homework with medium difficulty	3	21.43
	C3: Homework with more difficulty	4	28.57

It can be seen from the data in the table that half of the students think that teachers should assign homework of moderate difficulty to improve the effectiveness of homework. 28.57% of students think that the teacher should assign less difficult and basic homework. 21.43% of students think that teachers should assign difficult problems to improve their learning ability. It can be seen that in the graduate stage, students hope that teachers can focus on the students' Zone of Proximal Development (ZPD), and provide students with appropriate

difficulty to arouse students' enthusiasm.

#### 4.4. The Amount of Homework

By counting the relevant suggestions of the students on the amount of homework, we can see that the students mainly from the completion time and the way of completing homework provide their suggestions about the amount of homework. The specific statistical data are shown in Table 4.

**Table 4.** The statistics of the homework amount.

Interviews	Interview results	Number	Percentage (%)	
Amount	Time	D1: No more than 45 minutes.	1	7.14
		D2: No more than 1 hour.	9	64.29
		D3: No more than 2 hours.	4	28.57
	Homework arrangement	D4: Teachers should cooperate with each other to control the total amount of homework.	3	21.43
		D5: Teachers should give students the initiative to choose the homework independently.	2	14.29

It can be seen from the table that 64.29% of the students suggest that a professional course assignment should be completed within 1 hour. If the time is too long, it will not only increase the burden of learning but also reduce the enthusiasm of students. From the point of view of homework arrangement, 21.43% of students suggest that teachers should master the total amount of homework, so as to adjust the amount of homework according to their own teaching situation. A small number of students think that graduate students have gradually changed from the simple knowledge receivers to the creators of knowledge and they have strong autonomous ability. Therefore, teachers should let students choose their own homework according to their own learning conditions. Rong also pointed out that different students have different abilities to remember, understand, master, and use knowledge, so students should be given the right to choose freely in the amount of homework. In this way each student can choose the number of homework flexibly according to their own mastery ability [14].

## 5. Discussion

### 5.1. The Form of Homework

Through the interview of homework form and the processing of interview data, we can see that most students suggest that homework should be mainly in the form of written homework. This result is affected by the interviewees who are graduate students majoring in mathematics. For the learning of basic knowledge of mathematics, they think that the form of written homework can effectively promote the consolidation of

students' basic knowledge. In terms of homework reporting, students suggest that group cooperation or reporting can be used to enrich the form of homework.

### 5.2. The Content of Homework

Through the interview of homework content and the processing of interview data, it can be seen that most students suggest that the content of homework should be based on classroom content. As an extension of classroom teaching, homework content should be based on variant exercises of classroom knowledge or related applications of classroom knowledge, so as to improve the effectiveness of homework. Homework is an exercise for students to consolidate what they have learned, and its purpose is to enable students to form certain abilities. Therefore, when designing and arranging homework, teachers must carefully study the teaching materials and think about the contents of the homework [15].

### 5.3. The Difficulty of Homework

For the difficulty of homework, most students suggest that the teacher assign the homework with moderate difficulty and the homework should conform to the students' existing level of development. Therefore, the difficulty of homework should focus on the students' ZPD. It is necessary that provide students with difficult content between students' existing level of development and their potential level of development to promote their activeness and stimulate their potential [16].

### 5.4. The Amount of Homework

For the volume of homework, most students suggest that the

homework assigned by the teacher should be completed within 1 hour, and too long homework time will reduce the enthusiasm of students to learn. The students also put forward some suggestions on the volume of homework from the point of view of the homework arrangement, and they suggest that the teachers should control the total amount of homework through coordinating with other teachers. In the process of learning, students have great individual differences, which directly affect students' learning styles and learning strategies [17]. Therefore, some students suggest that teachers should arrange homework in layers so that students can choose the appropriate amount of homework according to their own situation.

## 6. Conclusion

This study mainly carries on the interview from the form, the content, the difficulty, the amount of homework. Through the statistical analysis of the interview data, we obtain the following conclusion: (1) For the assignment form, students want teachers to assign the written homework to improve the effectiveness of homework. For homework reporting, students expect more diverse ways, such as group discussions, reporting on stage, and so on. (2) In order to ensure the diversity of the content, the students also suggest that the teacher can insert the contents of the extended knowledge and the preview knowledge. (3) For the difficulty of homework, students prefer that teachers focus on the ZPD and provide students homework with appropriate difficulty. (4) For the amount of work, students prefer to control the completion time of each homework within 1 hour.

Based on the above conclusion, we also put forward some suggestions for teachers on how to arrange effective homework: For the homework arrangement of graduate students majoring in mathematics, it can be based on written homework, supplemented by various reporting methods, such as group cooperation, reporting on stage and so on. At the same time, the difficulty of homework should be controlled in the students' ZPD, and the completion time of each homework should be controlled within 1 hour, so as to improve the effectiveness of homework.

However, there are still the following shortcomings in this study: (1) The research object of this interview is graduate students from the school of Mathematics and Statistics of Shandong normal University. Therefore, the results of this study can not be accurately applied to other learning groups. (2) This paper determines the interview outline through the literature analysis method. Therefore, there may be some problems such as the design of the question is incomplete. (3) The research just interviewed the students, and the research method is relatively single. To make the results more reliable,

the students and teachers can be further investigated by the way of the questionnaire.

Therefore, in the future, it is necessary to carry out a deeper study on improving the effectiveness of graduate students' homework from many angles, to find out more reasonable conclusions and suggestions.

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