

# Research on the Cognition of Pre-service Mathematics Teachers about the Usage of PowerPoint(PPT) in Mathematics Teaching in China

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## ABSTRACT:

Under the background of the information age, information technology has gradually been widely used in mathematics classroom teaching, and how to use PowerPoint (hereinafter referred to as PPT) in mathematics teaching has received great attention. At present, many scholars have carried out research in this aspect, but there is no research on the cognition of pre-service mathematics teachers about the usage of PPT in mathematics teaching. This paper adopts the method of open interview to investigate 32 pre-service mathematics teachers in China. It was found that and finds out through the analysis of the data: (1) Current pre-service teachers' view recognition of the value of PPT mainly for focuses on teaching and knowledge presentation. Their recognition of the use of PPT mainly focuses on the aspects that should be paid attention to when using and designing PPT. On As for how to make better use of PPT, the recognition of pre-service teachers mainly use PPT for focuses on the presentation of PPT. (2) the At present, pre-service teachers do not have a comprehensive recognition of using PPT for mathematics teaching. Although the dimensions they pay attention to are consistent with previous studies, there are still many aspects that they do not know. (3) the At present, pre-service teachers do not have a deep recognition of the usage of PPT in mathematics teaching, and there are many contradictory views in different dimensions. Based on the findings, Therefore, the following suggestions are given: (1) In the training of pre-service teachers, we should systematically teach them how to operate PPT and assign them a series of tasks to enhance their ability of information resource mining and integration and improve their understanding of PPT. (2) teacher educators should sShow the different effects of PPT on pre-service teachers, and lead them to explore the techniques and principles to achieve these effects. This will enable them and think about the integration measures of PPT and mathematics teaching, to improve their ability of independent learning and development. (3) Educators should iIncrease practical training, and provide more opportunities for pre-service teachers to use PPT in mathematics teaching, to let them feel the value of PPT in practice and explore the best time to use PPT, and finally enable them to master the method of using PPT in mathematics teaching.

**Keywords:**Pre-service Teacher, Mathematics Teaching, PowerPoint, Information Technology

## 1. INTRODUCTION

With the continuous update and development of information technology, teachers'

classroom teaching methods have gradually become more diverse. The "Compulsory Education Mathematics Curriculum Standards (2022 edition) ~~...of which country?~~" states that it is necessary to make reasonable use of modern information technology, provide rich learning resources, design vivid teaching activities, and promote the reform of mathematics teaching methods [1]. PowerPoint (hereinafter referred to as PPT) is a presentation tool, it can play its specific functions to effectively assist teachers in achieving better teaching results, so it is of great significance for mathematics classroom teaching [2]. However, the current mathematics teachers often have a series of problems when using PPT to teach mathematics, which always bothers them and deeply affects the teaching [3]. It can be seen that although current mathematics teachers generally have an awareness of using PPT for mathematics teaching, they are unable to obtain ideal teaching results in practice. What are the reasons for this situation? How should mathematics teachers effectively use PPT? This paper adopts the method of open interviews to investigate the pre-service mathematics teachers. This paper explores the ~~recognition~~ of pre-service mathematics teachers on the usage of PPT in mathematics teaching and puts forward relevant suggestions to help mathematics teachers find solutions to problems and promote them to get better teaching results.

## 2. LITERATURE REVIEW

~~Currently~~ ~~At present~~, there have been many researches on the usage of PPT in mathematics teaching. It can be found that previous researches on this topic mainly focus on the value, use and skills of PPT in mathematics teaching.

### 2.1 Research on the Value of PPT in Mathematics Teaching

Based on previous views, the research on the value of PPT in mathematics teaching mainly focuses on three aspects, which are the value of PPT in student learning, classroom teaching and knowledge presentation.

#### 2.1.1 The value of PPT on students' learning

Cui, Wu, Zhang, Liang and ~~other 27 scholars all~~ pointed out that PPT can stimulate students' interest in learning [4-24]. Cui, Chen, Li, Guo ~~and other 11 scholars~~ pointed out that PPT can encourage students to understand and remember knowledge [4,12,14,15,16,18,24,25]. Zhang, Hong, Lan, Chen, Du ~~and other 8 scholars~~ pointed out that PPT can attract students' attention [6,9,19,20,23,26]. Zhang, Yang, Chen, Li, Guo and Liu pointed out that PPT can cultivate students' mathematical logical thinking [6,10,12,14,24,25]. Huang and Liu believe that PPT can promote students' active participation in learning and cultivate students' creative spirit and ability [8,11]. Zhang believes that PPT can cultivate students' ability to independent learning [6].

#### 2.1.2 The value of PPT to mathematics classroom teaching

Cui, Hong, Liu, Zhang, Wang, Du, Ma ~~and other 19 scholars~~ pointed out that PPT can improve the efficiency of classroom teaching [4,11,15,16,19,20,21,24,26,27,28,29]. Hong, Liang, Liu, Hong, Ma, Ren and other 14 scholars believe that PPT can expand the capacity of courses and enrich teaching [7,11,19,20,21,23,24,26,27,28]. Gong, Liang, Chen, Li, Zhang and other 10 scholars believe that PPT can make classroom teaching more vivid [7,12,13,22,24,25,30,31,32]. Zhang, Liu, Wang, Qiao, Ma and other 10 scholars pointed out that PPT can improve the quality of classroom teaching [6,11,16,20,22,23,29]. Huang, Yang, Liu, Chen, Guo ~~and other 10 scholars~~ pointed out that PPT can invigorate the classroom atmosphere [8,10,11,12,14,18,19,21,23]. Hong, Du, Ren ~~and other 8 scholars~~ pointed out that PPT can save teachers' time and improve classroom teaching efficiency [19,21,22,23,26,28]. Gong, Chen, Wu and Song pointed out that PPT itself is simple, convenient and functional, which is helpful for teachers' classroom teaching [9,22,29,30]. Hong, Lan, Wu and Song pointed out that PPT is convenient for students to review and consolidate knowledge [26,29].

### 2.1.3 The value of PPT for knowledge presentation

Cui, Chen, Yang, Li, Huang ~~and other 12 scholars~~ pointed out that PPT can highlight key points and break through difficulties [4,8,9,10,19,24,25,27,29]. Wu, Huang, Chen, Li, Wang, Ren ~~and other 10 scholars~~ pointed out that when teachers face abstract mathematical knowledge, PPT can help teachers present it intuitively [5,8,12,16,21,23,25,28,32]. Du, Ma, Hu and Zhang pointed out that PPT can dynamically display mathematical knowledge [19,20,27]. Ma and Hu pointed out that PPT can quickly present mathematical knowledge [20].

## 2.2 Research on the Use of PPT in Mathematics Teaching

Through sorting out the previous studies, it is found that the predecessors gave many suggestions on how to use PPT in mathematics teaching and the aspects that should be paid attention to when using PPT. Among them, previous studies mainly involve three aspects: what teachers should pay attention to when using PPT, what teachers should pay attention to when designing PPT, and teachers' attitudes and ability requirements for using PPT.

### 2.2.1 The aspects to pay attention to when using PPT

Hong, Liang, Cui, Liu, Chen, Li ~~and other 13 scholars~~ pointed out that teachers should combine PPT with traditional blackboard writing in teaching [7,11,12,20,21,22,26,31,33]. Wu, Ma, Zou, Wu ~~and other 7 scholars~~ pointed out that teachers should gradually play PPT and by the order of the course content [5,20,22,29,32]. Zhang, Liu, Chen, Du, Li ~~and other 7 scholars~~ pointed out that teachers should pay attention to the interaction with students when using PPT

[6,11,12,19,23,24,34].Ma, Hu, Wu and Song pointed out that teachers should pay attention to the rhythm of PPT, which should not be too fast or too slow [20,22,29].Liu, Chen, Li and Liu pointed out that teachers should pay attention to students' feedback when using PPT [11,12,23,34].Cai, Wang and Liu pointed out that teachers should combine their explanations when using PPT in teaching [16,24,35].Liu pointed out that when teachers use PPT to review knowledge, they should try their best to delete words, graphics and symbols that have nothing to do with teaching objectives [34].Wu pointed out that teachers should be familiar with the content of PPT before classroom teaching [22].

### 2.2.2 The aspects to pay attention to when designing PPT

Cui, Kang, Huang, Wang, Du ~~and other 12 scholars~~ pointed out that the presentation of PPT should be simple and intuitive and important knowledge should be highlighted [4,8,16,19,20,29,33,36].Wu, Zhang, Huang, Chen, Yang, Wu ~~and other 13 scholars~~ pointed out that the content design of PPT should conform to the age characteristics of students [5,6,8,9,10,12,17,20,21,24,36].Cui, Liang, Chen ~~and other 8 scholars pointed out-~~ reported that the font size of PPT should be moderate [4,7,9,18,36].Cui, Chen, Liu, Yang ~~and other 7 scholars~~ pointed out that teachers should pay attention to the color matching of content, and the font color of PPT should adapt to the background color [4,9,11,18,36].Cui, Zhao, Kang, Wu and Song pointed out that the animation presented by PPT should be smooth and novel [4,29].Liang, Cui, Chen, Wang and Liu pointed out that the presentation of PPT should be concise and beautiful [7,9,16,34].Huang, Chen, Li, Ren and Ma pointed out that the design of PPT should meet the learning needs of students [8,12,21,31].Cui, Zhao, Kang and Wu pointed out that the amount of PPT content should be moderate [4,36]. Hong, Lan, Ma and Hu pointed out that teachers should strengthen the logical correlation between various parts of PPT [20,26]. Liang, Cui, Chen and Wu pointed out that the content of PPT should not be completely copied from textbooks, and it should be expanded [7,12,22]. Wu, Liang and Cui pointed out that teachers should use different fonts and colors in PPT to emphasize important knowledge [5,7].Liang and Cui also pointed out that teachers should pay attention to the visual impact that PPT brings to students [7].Hong and Lan pointed out that teachers should arrange the content of the PPT in the order of mathematical logic [26].Hong and Lan pointed out that PPT should be designed as a thinking guide for teachers and students to teach and learn, and "blank" art should be included in it [26].Chen pointed out that PPT content should be based on teaching materials [12].Qiao pointed out that teachers should ensure that PPT content is rigorous and scientific [17].Liu pointed out that before designing a PPT, teachers can create a sketch on paper to clarify their ideas [39].

### 2.2.3 Teachers' attitude and ability requirements for using PPT

Gong, Zhang, Huang, Liu, Li ~~and other 12 scholars~~ pointed out that teachers should master the operation technology of PPT [6,8,11,16,22,23,24,25,29,30,32].Liu, Chen,

Du, Ma and other 8 scholars pointed out that teachers should regard PPT as a teaching auxiliary tool [11,12,19,20,22,24,34].Chen, Liu, Qiao and Du pointed out that teachers should improve their ability to make PPT [9,11,17,19].Li, Wu, Sun and Zhang point out that teachers should avoid relying too much on PPT[25,27,33,36].

## **2.3 Research on the Use Skills of PPT in Mathematics Teaching**

The research on the skills of using PPT in mathematics teaching mainly focuses on three aspects: presentation of PPT, application of PPT, timing of using PPT and requirements for teachers.

### **2.3.1 PPT presentation skills**

Wu, Liang, Cui, Huang, Chen ~~and other 15 scholars~~ pointed out that teachers should use the dynamic display function of PPT to show the process of knowledge formation [5,7,8,9,11,16,18,20,21,23,32,34].Liu further pointed out that teachers can use the "trigger" and "custom animation" of PPT to display the symmetry, expansion and translation of graphics [11].Liang, Cui and Liu pointed out that teachers can add audio and video content in PPT to better serve teaching [7,11].Wu, Song and Liu pointed out that teachers can use the font color of PPT to highlight key knowledge [29,34].Wu and Sun pointed out that teachers can use PPT to show the mathematical operation process [5,33].Liang and Cui pointed out that teachers insert bar charts and bar charts into PPT to help students integrate what they have learned [7].Hong and Lan pointed out that the content of the PPT presentation should be simplified, only the important and difficult points and exercises should be presented, and the rest of the process should be written on the board [26].Sun pointed out that teachers could use PPT to directly and quickly present mathematical problems to improve teaching efficiency [33].

### **2.3.2 PPT application skills**

Huang, Chen, Ma, Hu and Ren pointed out that content related to students' daily life can be incorporated into PPT [8,12,20,21].Chen, Yang, Liu, Ma and Hu pointed out that teachers can use PPT to create relevant problem situations and learning tasks to attract students and stimulate their learning interest [9,10,11,20].Gong, Wu and Song pointed out that teachers can combine PPT with other software to enrich teaching [22,29,30].Liang, Cui, Liu and Chen pointed out that teachers can use PPT to show the mind map of knowledge in the summary [7,11,12].Gong pointed out that the geometric drawing board software could be inserted into the PPT to teach mathematics [30].Liu also proposed that teachers can use PPT to present the knowledge system of a class for students to help students systematically master what they have learned [11].Cai pointed out that PPT can be used to present relevant content and important and difficult points in advance and explain them to lay a good foundation for classroom teaching [35].Gong, Huang and Qiao pointed out that

teachers can use the resource-sharing platform to select appropriate content to put into their PPT [8,17,30].Gong and Zou pointed out that teachers can use PPT to create interactive projections to increase the interactive effect of PPT [30,32].Chen and Liu pointed out that teachers can use PPT to design exercises of different degrees for different students [9,11].Ma and Hu pointed out that teachers can often use PPT to explain conceptual knowledge, and also proposed that PPT can be combined with objects for teaching [20].Gong pointed out that teachers can use PPT to edit mathematical formulas [30].Liu pointed out that teachers can use PPT to appropriately expand teaching content [11].Yang pointed out that teachers can insert hyperlinks in PPT and jump in time when needed [18].Cai pointed out that teachers can use PPT to sort out the contents of a chapter before learning it, and briefly introduce the key points in the chapter [35].Xu pointed out that teachers can make a series of small games around the teaching content to attract students' learning interest and enable students to master knowledge in a relaxed atmosphere [38].

### 2.3.3 PPT uses timing and other aspects

Huang, Chen, Yang, Wang, Ren and Ma pointed out that when confronted with complex and abstract mathematical knowledge, teachers can choose to use PPT for visual presentation [8,9,10,16,21,24,34].Zhang, Chen, Qiao, Ma, Hu, Liu and Zhang pointed out that teachers' use of PPT should be determined according to the teaching content [6,9,17,20,24,27].Wei pointed out that after teaching the new course, teachers can directly present exercises through PPT for students to practice, and then present problem-solving steps to strengthen classroom training [37].Liang and Cui pointed out thatto better use PPT, teachers should strengthen the management and maintenance of hardware equipment [7].

Through sorting out previous studies, it can be found that the current scholars' research on the usage of PPT for mathematics teaching mainly focuses on the value of PPT, the use of PPT and the use skills of PPT. For the use skills of PPT, many scholars provide a lot of suggestions based on their understanding.However, it can also be found that the previous research methods are single, the survey method is rarely used for research, and the research on teachers' understanding of the usage of PPT in mathematics teaching is still blank.At present, teachers often encounter many problems when using PPT to teach mathematics, which makes it difficult for teachers to obtain good teaching results. However, it can be known from the existing research that teachers' understanding of information technology will deeply affect the integration of information technology into classroom teaching, so it is an important factor affecting the teaching effect [40].Therefore, it is of great significance to study teachers' understanding of the usage of PPT in mathematics teaching.

The ~~main issues studied in~~objectives of this ~~study~~ ~~paper~~ are:([please send to the end of introduction section](#))

- (1) What are the main aspects of pre-service mathematics teachers' understanding of the usage of PPT in mathematics teaching?
- (2) Is the current pre-service mathematics teachers' understanding of the usage of PPT in mathematics teaching comprehensive?
- (3) Is the current pre-service mathematics teachers' understanding of the usage of PPT in mathematics teaching reasonable?

The hypotheses of this study are: [\(please send to end of introduction section\)](#)

- (1) The current understanding of pre-service mathematics teachers about the usage of PPT in mathematics teaching is mainly focused on the value and use of PPT for teaching.
- (2) Current pre-service mathematics teachers do not have a comprehensive understanding of the usage of PPT in mathematics teaching.
- (3) The current pre-service mathematics teachers' understanding of the usage of PPT in mathematics teaching is not reasonable.

### 3. RESEARCH METHODS

#### 3.1 Sample [and sampling procedure](#) [Analysis please how was the sample selected?](#)

To truly reflect the pre-service mathematics teachers' understanding of the usage of PPT in mathematics teaching, we selected 32 education masters from the subject teaching (Mathematics) major of the School of Mathematics and Statistics of Shandong Normal University as research objects, including 28 female students and 4 male students. They all have mathematics teaching certificates and have the intention to engage in mathematics teaching in middle school in the future, so they are representative.

#### 3.2 Instrument

To accurately know the understanding of pre-service mathematics teachers on the usage of PPT in mathematics teaching, this paper adopts ~~the method of~~ open interviews to investigate them. Three questions were designed for the interview. The first question was "What do you think is the value of PPT in mathematics teaching?" The second question ~~was is~~ "What do you think should be paid attention to when using PPT in mathematics teaching?" The third question ~~was is~~ "How do you think PPT can be better used in mathematics teaching?" [The questions were subjected to expert scrutiny.](#) According to the evaluation of experts, these questions have high validity and ~~and credibility~~ [reliability](#), which can effectively let us know the relevant understanding of pre-service mathematics teachers. The ~~method of~~ open interviews [were used because it](#) is more flexible, which ~~can help~~ [the researchers as](#) conduct an in-depth investigation and ensure the authenticity and [trustworthiness](#) ~~reliability~~ of the information collected.



### 3.3 Data Collection

In this study paper, the open interview method was used to conduct face-to-face interviews with 32 masters of education one by one pre-service mathematics teachers, and the time of each interview lasted is for about 10 minutes. After obtaining the consent of the interviewees, the interview was we also recorded the whole interview to ensure the integrity of the data.

### 3.4 Data Processing Method

First, the data was coded. This paper first divides based on and codes the research questions using and uses A, B and C respectively to represent the pre-service mathematics teachers' master of Education's understanding of the value of PPT, their understanding of the use of PPT, and how to better use PPT in classroom teaching. Besides the modal words such as ah, um, and uh, the recorded content of the interview is converted into text and sorted out strictly according to the original words in the interview. Data was analyzed. Analyzing the data to further extract and categorize participants' their core ideas. This was done by we also classifying id different dimensions in different problems. coded. The different dimensions and specific contents were coded after classification, and represented them with serial numbers in turn. Next, the researchers we calculated the number of people under each view and the total number of people holding all views under each dimension, and then calculated the percentage corresponding to each content and the percentage of each dimension in the total number of people holding all views under this problem, and finally made a statistical table.

## 4. RESULTS

### 4.1 Cognitive Content

A total of 32 pre-service mathematics teachers were investigated in this study, and three aspects of PPT usage were investigated: pre-service mathematics teachers' understanding of the value of PPT in mathematics teaching, their understanding of the use of PPT in mathematics teaching, and their understanding of how to better use PPT in mathematics classroom. According to the results obtained after the survey, the following is summarized.

#### 4.1.1 Recognition of the value of PPT in mathematics teaching

In this regard, a total of 24 views were put forward by pre-service teachers, with a total of 101 people holding these views. It is found that pre-service mathematics teachers' these views were are mainly concentrated in four aspects, which are the value of PPT in knowledge, students' learning, teachers and teaching.



In terms of knowledge gain with PPT, ~~there are 4 opinions, among which 19 people pre-service mathematics teachers (59.38% of the total number)~~ realize that PPT can visually and dynamically present knowledge, ~~and 15 people— pre-service mathematics teachers (46.88% of the total number)~~ realize that PPT can promote students' understanding of knowledge (35.64%), ~~and the number of persons holding this type of view is 35.64% of the total.~~ In terms of students' learning, ~~there are 4 opinions~~, 5 people (15.63% ~~of the total number~~) think that PPT can help attract students' attention, 4 people (12.5% ~~of the total number~~) think that PPT can stimulate students' interest in learning, ~~and the number of persons holding this type of view is 11.88% of the total.~~ In terms of teachers, ~~there are 4 opinions~~, among which 10 (31.25% ~~of the total number~~) believe that PPT can save time for teachers to write on the blackboard, and several persons hold this type of view 12.87% of the total. In terms of teaching, there are 12 views, among which 19 people (59.38% ~~of the total number~~) believe that PPT can improve the efficiency of classroom teaching, and some people express their views from the perspectives of teaching quality, teaching form, teaching interaction, etc., ~~and the number of persons holding this type of view is 39.60% of the total.~~ The details are shown in table 1.

It ~~can be was~~ found that pre-service teachers' views on the value of PPT in mathematics teaching were mainly focused on teaching and knowledge, and the most abundant views mentioned were on teaching. Among all the above views, there are two views with the largest number of holders, which are that PPT can present knowledge intuitively and dynamically and that PPT can improve the efficiency of classroom teaching, from which it can be known that most of the pre-service teachers think that the value of PPT is mainly embodied in the efficiency of teaching and the presentation of knowledge. However, during the interviews and analysis collation, it was found that pre-service teachers had more difficulty in distinguishing between the role of PPT and its advantages, and it appeared in the interviews that they confused these two aspects.

**Table 1: Descriptive sStatistics on pre-service teachers' recognition of the value of PPT**

| Dimension       | Label | Content  | Number | Percentage | Percentage |
|-----------------|-------|--|--------|------------|------------|
| A1<br>knowledge | A11   | It can promote students' understanding of knowledge  | 15     | 46.88      | 35.64      |
|                 | A12   | It can display knowledge intuitively and dynamically | 19     | 59.38      |            |
|                 | A13   | It can show the knowledge block diagram              | 1      | 3.13       |            |
|                 | A14   | It can emphasize key knowledge                       | 1      | 3.13       |            |
| A2<br>students' | A21   | It can attract students' attention                   | 5      | 15.63      | 11.88      |

|             |      |  |    |       |       |
|-------------|------|--|----|-------|-------|
| learning    | A22  | It can stimulate students' interest in learning                | 4  | 12.5  | 12.87 |
|             | A23  | It is convenient for students to review what they have learned | 2  | 6.25  |       |
|             | A24  | It can deepen students' memory of knowledge                    | 1  | 3.13  |       |
|             | A31  | It can help teachers accumulate teaching resources             | 1  | 3.13  |       |
| A3 teachers | A32  | It can save the time of teachers writing on board              | 10 | 31.25 |       |
|             | A33  | It can help teachers master the teaching process               | 1  | 3.13  |       |
|             | A34  | It can help teachers prepare lessons                           | 1  | 3.13  |       |
|             | A41  | It can make classroom teaching more efficient                  | 19 | 59.38 |       |
|             | A42  | It can enrich teaching   | 4  | 12.5  |       |
|             | A43  | It can be used repeatedly                                      | 1  | 3.13  |       |
|             | A44  | It can provide a more realistic situation                      | 1  | 3.13  |       |
|             | A45  | It can improve the quality of classroom teaching               | 1  | 3.13  |       |
| A4 teaching | A46  | It can make teaching more interesting                          | 1  | 3.13  | 39.60 |
|             | A47  | It can increase the interaction between teachers and students  | 2  | 6.25  |       |
|             | A48  | It can show more content                                       | 2  | 6.25  |       |
|             | A49  | It can provide convenience for teaching                        | 2  | 6.25  |       |
|             | A410 | It can enrich the teaching form                                | 2  | 6.25  |       |
|             | A411 | It can make the classroom teaching more organized              | 1  | 3.13  |       |
|             | A412 | The content presented can be designed in advance               | 4  | 12.5  |       |
|             |      |  |    |       |       |

#### 4.1.2 Recognition of the use of PPT in mathematics teaching

In this regard, a total of 35 views were raised by pre-service teachers, with a total of 135 [pre-service mathematics teachers](#) holding these views. After sorting out, it

is found that these views mainly focus on three aspects, which are the aspects to be paid attention to when using PPT, the aspects to be paid attention to when designing PPT and the attitude of teachers towards PPT.

There are 15 opinions on the aspects that should be paid attention to when using PPT, among which 24 [pre-service mathematics teacherspeople](#) (75% ~~of the total number~~) mentioned that teachers should combine blackboard writing in mathematics teaching when using PPT, and 11 [pre-service mathematics teacherspeople](#) (34.38% ~~of the total number~~) realized that teachers should explain more when using PPT, 8 [pre-service mathematics teacherspeople](#) (25% ~~of the total number~~) realized that the use of PPT should be determined according to the needs of teaching content, 8 [pre-service mathematics teacherspeople](#) (25% ~~of the total number~~) believed that teachers should grasp the rhythm of PPT, and the number of [pre-service mathematics teachers persons](#) holding this type of view is 55.56% of the total. 17 opinions should be paid attention to when designing PPT, among which 14 (43.75% ~~of the total number~~) realize that the content of PPT should be streamlined, 6 (18.75% ~~of the total number~~) realize that teachers' thoughts should be integrated into PPT, and 6 people (18.75% of the total number) think that the key knowledge presented by PPT should be highlighted, and the number of [pre-service mathematics teachers persons](#) holding this type of view is 33.34% of the total. In terms of teachers' attitudes towards PPT, there are three opinions, among which 7 [pre-service mathematics teacherspeople](#) (21.88% ~~of the total number~~) think that PPT should be used as an auxiliary tool, 4 people (12.5% ~~of the total number~~) realize that teachers should not rely on PPT, and only 2 [pre-service mathematics teacherspeople](#) (6.25% ~~of the total number~~) realize that teachers need to master the operation of PPT, and the number of persons holding this type of view is 9.62% of the total. The details are shown in table 2.

It can be seen that the views [recognition](#) of pre-service teachers on the use of PPT mainly focuses on the aspects that should be paid attention to when using and designing PPT? [not clear](#). Although the number of views on the two aspects is similar, most of the pre-service teachers' views focus more on the aspects that should be paid attention to when using PPT? [not clear](#). Among all the opinions, the opinion held by the largest number of people is that teachers should combine blackboard writing when using PPT in mathematics teaching.

Table 2: [Descriptive s](#)Statistics on pre-service teachers' recognition of the use of PPT

| Dimension                                  | Label | Content  | Number | Percentage | Percentage |
|--|-------|--|--------|------------|------------|
| Aspects to pay attention to when using PPT | B1    | The use of PPT should be determined according to the needs of the teaching content | 8      | 25         | 55.56      |
|  | B12   | Turn on the PPT when the teacher needs it and turn it off when not in use          | 1      | 3.13       |            |

|  |      |   |    |       |       |
|--|------|---|----|-------|-------|
|  |      | The use of PPT in mathematics   |    |       |       |
|  | B13  | teaching should be combined with blackboard writing   | 24 | 75    |       |
|  | B14  | Teachers should grasp the rhythm of PPT   | 8  | 25    |       |
|  | B15  | Teachers should pay attention to students' feedback when using PPT                            | 4  | 12.5  |       |
|  | B16  | Teachers should pay attention to the interaction between teachers and students when using PPT | 4  | 12.5  |       |
|  | B17  | Teachers should emphasize key knowledge repeatedly when using PPT                             | 4  | 12.5  |       |
|  | B18  | Teachers should have clear directions when using PPT  | 2  | 6.25  |       |
|  | B19  | Teachers should be familiar with the content of PPT before teaching                           | 3  | 9.38  |       |
|  | B110 | Teachers should use PPT to present complex content  | 2  | 6.25  |       |
|  | B111 | Teachers should give students time to think when using PPT                                    | 1  | 3.13  |       |
|  | B112 | Teachers should guide students to learn when using PPT  | 1  | 3.13  |       |
|  | B113 | Teachers can not directly present the answers when using PPT to present the examples          | 1  | 3.13  |       |
|  | B114 | Teachers should use PPT in combination with learning plans                                    | 1  | 3.13  |       |
|  | B115 | Teachers should explain knowledge when using PPT  | 11 | 34.38 |       |
|  | B21  | The presentation of PPT should be beautiful   | 4  | 12.5  |       |
| B2   | B22  | Teachers' thoughts should be incorporated into the PPT  | 6  | 18.75 |       |
| Aspects to pay attention to when designing PPT | B23  | The content of PPT should be concise  | 14 | 43.75 |       |
|  | B24  | The key knowledge presented by PPT should be highlighted                                      | 6  | 18.75 |       |
|  | B25  | The content of the PPT cannot be completely copied from the textbook                          | 1  | 3.13  |       |
|  | B26  | PPT animation presentation  | 2  | 6.25  |       |
|  |      |   |    |       | 33.34 |

|           |     |   |   |       |      |
|-----------|-----|---|---|-------|------|
|           |     | should not be too much                                      |   |       |      |
|           |     | Teachers should pay attention to                            |   |       |      |
| B27       |     | the color collocation of PPT presentation                   | 1 | 3.13  |      |
|           |     | Teachers should appropriately                               |   |       |      |
| B28       |     | use sound and dynamic effects to present knowledge with PPT | 1 | 3.13  |      |
|           |     | The presentation of PPT should                              |   |       |      |
| B29       |     | be novel  | 1 | 3.13  |      |
|           |     | PPT presentation content should                             |   |       |      |
| B210      |     | be complete   | 1 | 3.13  |      |
|           |     | PPT presentation content size                               |   |       |      |
| B211      |     | should be moderate  | 2 | 6.25  |      |
|           |     | The content of the PPT should                               |   |       |      |
| B212      |     | be gradual  | 2 | 6.25  |      |
|           |     | Teachers should update the                                  |   |       |      |
| B213      |     | content of PPT in time                                      | 1 | 3.13  |      |
|           |     | The content of PPT should                                   |   |       |      |
| B214      |     | conform to the psychological characteristics of students    | 1 | 3.13  |      |
|           |     | The presentation of PPT can be                              |   |       |      |
| B215      |     | varied  | 1 | 3.13  |      |
|           |     | The PPT played by the teacher                               |   |       |      |
|           |     | should be combined with                                     |   |       |      |
| B216      |     | pictures and text as far as possible                        | 1 | 3.13  |      |
|           |     | PPT content should be coherent                              |   |       |      |
| B217      |     |   | 2 | 6.25  |      |
| B3        | B31 | Teachers can't rely on PPT                                  | 4 | 12.5  |      |
| Teachers' | B32 | Teachers should master the                                  | 2 | 6.25  |      |
| attitude  |     | operation of PPT  |   |       | 9.62 |
| towards   | B33 | Teachers should regard PPT as                               | 7 | 21.88 |      |
| PPT       |     | an auxiliary tool   |   |       |      |

#### 4.1.3 Recognition of how to better use PPT in mathematics teaching

On how to better use PPT in mathematics teaching In this regard, pre-service teachers presented a total of 18 viewpoints, and the total number of people who presented these viewpoints was 53. After sorting out, it can be seen that the views of pre-service teachers mainly focus on three aspects, which are the presentation of PPT, the use of PPT and the use time of PPT, but the number of people who hold these views in this regard is not very large.

On the presentation of PPT, there are 13 opinions, among which 8 people (25% of the total number) realize that PPT can be used to present complex and abstract

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mathematical knowledge, 6 people (18.75% ~~of the total number~~) think that PPT can be used to display three-dimensional graphics intuitively, 4 people (12.5% ~~of the total number~~) think that PPT can be used to show example problems, 4 people (12.5% ~~of the total number~~) think that PPT can be used to show dynamic knowledge, pre-service teachers also put forward many other views, but the number of people holding these views is small and the views expressed are not specific, and the number of persons holding this type of view is 67.92% of the total. In terms of the use of PPT, there are 2 opinions, among which 3 people (9.38% ~~of the total number~~) think that teachers can use PPT to interact with students, and 1 person (3.13% of the total number) thinks that they can use PPT in combination with other software, and the number of persons holding this type of view is 7.55% of the total. In terms of the timing of using PPT, there are 3 opinions, among which 5 people (15.63% ~~of the total number~~) think that PPT can be used more in the teaching of new courses, 5 people (15.63% ~~of the total number~~) think that PPT can be used more in the introduction process, 3 people (9.38% of the total number) think that PPT can be used as much as possible in the review process, and the number of persons holding this type of view is 24.53% of the total. The details are shown in table 3.

It can be seen from this that pre-service mathematics teachers have few views on how to better use PPT in mathematics teaching ~~this aspect~~, their views ~~on how to better use PPT~~ mainly focus on the presentation of PPT, and many of their views are not specific. In this regard, the most popular opinion is that teachers can use PPT to present complex and abstract mathematical knowledge, but the number of people who hold this opinion is not more than 25% of the total number. In the process of interview and arrangement, it is also found that most people have only a simple understanding of how to better use PPT, and some people can only give vague opinions and lack a clear understanding of the use of PPT during the interview. Some people even clearly say that they do not know how to better use PPT, so they cannot give answers.

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**Table 3: Descriptive Statistics on pre-service teachers' recognition of how to use PPT better**

| Dimension                    | Label | Content   | Number | Percentage | Percentage |
|------------------------------|-------|---|--------|------------|------------|
| C1<br>Presentation<br>of PPT | C11   | Teachers can use PPT to present complex and abstract mathematical knowledge | 8      | 25         | 67.92      |
|                              | C12   | Teachers can use PPT to present the specific calculation process and method | 3      | 9.38       |            |
|                              | C13   | Teachers can use PPT to show examples                                       | 4      | 12.5       |            |
|                              | C14   | Teachers can use PPT to visually show solid geometry                        | 6      | 18.75      |            |
|                              | C15   | Teachers can use PPT to show dynamic knowledge                              | 4      | 12.5       |            |

|                   |  |  |   |       |       |
|-------------------|--|--|---|-------|-------|
|                   |  | Teachers can properly use PPT to expand mathematical knowledge       | 3 | 9.38  |       |
|                   |  | Teachers can use PPT to present math problems and concepts           | 2 | 6.25  |       |
|                   |  | Teachers can try more novel PPT presentation skills                  | 1 | 3.13  |       |
|                   |  | Teachers can use PPT to show students' excellent homework            | 1 | 3.13  |       |
|                   |  | Teachers can appropriately add dynamic effects to attract students   | 1 | 3.13  |       |
|                   |  | Teachers can use PPT to highlight key knowledge                      | 1 | 3.13  |       |
|                   |  | Teachers can add audio and video to PPT to enrich their teaching     | 1 | 3.13  |       |
|                   |  | Teachers can use PPT to show the summary of lesson                   | 1 | 3.13  |       |
|                   |  | Teachers can use PPT for interaction between teachers and students   | 3 | 9.38  |       |
| C2                |  | Teachers can combine the use of PPT with other software for teaching | 1 | 3.13  | 7.55  |
|                   |  | Teachers can use PPT more often when teaching new lessons            | 5 | 15.63 |       |
| C3                |  | Teachers can use PPT more in the introduction process                | 5 | 15.63 | 24.53 |
| Timing of PPT use |  | Teachers can use PPT more when leading students to review knowledge  | 3 | 9.38  |       |

#### 4.2 Review of Previous Studies [is this an objective?](#)

In this paper, previous studies on the usage of PPT in mathematics teaching are sorted out and counted. To facilitate the comparison of data information between predecessors and samples, the aspects studied by predecessors are represented by D, E and F respectively, and the different dimensions of the research results of each aspect are classified and represented by serial numbers in turn. Finally, 76 items are summarized. The details are shown in table 4.

**Table 4: Statistics of previous studies on the usage of PPT in teaching mathematics [table](#)**



presentation not clear, e.g percentage repeated

| Theme   | Dimension                       | Label | Content  | Number | Percentage? | Percentage? |
|---|---------------------------------|-------|--|--------|-------------|-------------|
| D<br>Research on<br>the value of<br>PPT in<br>mathematics<br>teaching | D1<br>Students<br>learning      | D11   | PPT can stimulate students'<br>interest in learning  | 27     | 60          |             |
|   |                                 | D12   | PPT can help students<br>understand and remember<br>knowledge  | 11     | 24.44       |             |
|   |                                 | D13   | PPT can attract students'<br>attention   | 8      | 17.78       |             |
|   |                                 | D14   | PPT can help cultivate<br>students' mathematical<br>logical thinking   | 6      | 13.33       | 33.74       |
|   |                                 | D15   | PPT can promote students'<br>active participation in<br>learning and cultivate<br>students' creative spirit and<br>ability | 2      | 4.44        |             |
|   |                                 | D16   | PPT can cultivate students'<br>ability of independent<br>learning  | 1      | 2.22        |             |
|   | D2<br>Classroom<br>teaching     | D21   | PPT can improve the<br>efficiency of classroom<br>teaching   | 19     | 42.22       |             |
|   |                                 | D22   | PPT can expand the<br>capacity of the course and<br>enrich the teaching  | 14     | 31.11       |             |
|   |                                 | D23   | PPT can make classroom<br>teaching more vivid  | 10     | 22.22       |             |
|   |                                 | D24   | PPT can improve the<br>quality of classroom<br>teaching  | 10     | 22.22       | 49.08       |
|   |                                 | D25   | PPT can liven up the<br>classroom atmosphere   | 10     | 22.22       |             |
|   |                                 | D26   | PPT can save teachers' time  | 8      | 17.78       |             |
|   | D3<br>Knowledge<br>presentation | D27   | PPT is simple, convenient<br>and functional, which is<br>helpful to teachers'<br>classroom teaching                        | 5      | 11.11       |             |
|   |                                 | D28   | PPT is convenient for<br>reviewing knowledge   | 4      | 8.89        |             |
|   |                                 | D31   | PPT can highlight key<br>knowledge and<br>breakthrough difficulties  | 12     | 26.67       | 17.18       |

|   |  |     |   |    |       |       |
|---|--|-----|---|----|-------|-------|
| E<br>Research on<br>the use of<br>PPT in<br>mathematics<br>teaching | E1<br>The aspects<br>to pay<br>attention to<br>when using<br>PPT | D32 | PPT can show abstract<br>mathematical knowledge<br>intuitively  | 10 | 22.22 | 27.70 |
|   |  | D33 | PPT can dynamically show<br>mathematical knowledge  | 4  | 8.89  |       |
|   |  | D34 | PPT can quickly present<br>mathematical knowledge   | 2  | 4.44  |       |
|   |  | E11 | When teachers use PPT,<br>they should combine it<br>with blackboard writing to<br>teach mathematics   | 13 | 28.89 |       |
|   |  | E12 | Teachers should pay<br>attention to playing the<br>PPT gradually according to<br>the content order  | 7  | 15.56 |       |
|   |  | E13 | Teachers should pay more<br>attention to communicate<br>and interact with students<br>when using PPT  | 7  | 15.56 |       |
|   |  | E14 | Teachers should grasp the<br>rhythm of PPT playback,<br>not too fast or too slow  | 5  | 11.11 |       |
|   |  | E15 | Teachers should pay<br>attention to students'<br>feedback when using PPT  | 4  | 8.89  |       |
|   |  | E16 | Teachers should pay<br>attention to the teacher's<br>explanation when using<br>PPT  | 3  | 6.67  |       |
|   |  | E17 | When using PPT to guide<br>students to review<br>knowledge, teachers should<br>try to delete words,<br>graphics and symbols that<br>are not related to the<br>teaching objectives | 1  | 2.22  |       |
|   |  | E18 | Teachers should be familiar<br>with the content of PPT<br>before teaching   | 1  | 2.22  |       |
|   |  | E21 | The presentation of PPT<br>should be concise and<br>intuitive, and the key<br>knowledge should be<br>highlighted  | 12 | 26.67 |       |
|   | E2<br>The aspects<br>to pay<br>attention to<br>when              |     |   |    |       | 53.38 |

|                  |      |   |    |       |
|------------------|------|---|----|-------|
| designing<br>PPT |      | The content of PPT involves adapting to the age characteristics of students   | 13 | 28.89 |
|                  | E22  |   |    |       |
|                  | E23  | PPT presentation font size should be moderate   | 8  | 17.78 |
|                  |      | Teachers should pay attention to the color matching of the PPT content, and the theme color should also adapt to the background color |    |       |
|                  | E24  |   | 7  | 15.56 |
|                  |      | The animation of the PPT presentation should be novel   |    |       |
|                  | E25  |   | 5  | 11.11 |
|                  |      | The presentation of the PPT should be simple and beautiful  |    |       |
|                  | E26  |   | 5  | 11.11 |
|                  |      | The design of PPT should meet students' learning needs  |    |       |
|                  | E27  |   | 5  | 11.11 |
|                  |      | The amount of PPT content should be moderate  |    |       |
|                  | E28  |   | 4  | 8.89  |
|                  |      | Teachers should strengthen the logical correlation between each part of the PPT   |    |       |
|                  | E29  |   | 4  | 8.89  |
|                  |      | The content of the PPT can not be completely copied from the textbook, and there should be a relevant expansion of the content        |    |       |
|                  | E210 |   | 4  | 8.89  |
|                  |      | Teachers should use different fonts and colors in PPT to emphasize key knowledge  |    |       |
|                  | E211 |   | 3  | 6.67  |
|                  |      | Teachers should pay attention to the visual impact of PPT for students  |    |       |
|                  | E212 |   | 2  | 4.44  |
|                  |      | Teachers should arrange the content of PPT according to the logical order of mathematics  |    |       |
|                  | E213 |   | 2  | 4.44  |
|                  | E214 | Teachers should design the  | 2  | 4.44  |

|   |  |      |   |    |       |       |
|---|--|------|---|----|-------|-------|
| F<br>Research on<br>the use<br>skills of<br>PPT in<br>mathematics<br>teaching | E3<br>Teachers'<br>attitude and<br>ability<br>requirements<br>for using<br>PPT |      | PPT into a thinking guide<br>for teachers and students to<br>teach and learn, and there<br>should be "white space" art                                    |    |       |       |
|   |  | E215 | The content of PPT should<br>be based on the textbook   | 1  | 2.22  |       |
|   |  | E216 | Teachers should ensure that<br>the content of the PPT is<br>rigorous and scientific   | 1  | 2.22  |       |
|   |  | E217 | Before designing each<br>slide, the teacher can create<br>a sketch on the paper to<br>clarify the idea  | 1  | 2.22  |       |
|   |  | E31  | Teachers should be<br>proficient in the operation<br>of PPT   | 12 | 26.67 |       |
|   |  | E32  | Teachers should regard<br>PPT as a teaching aid   | 8  | 17.78 | 18.92 |
|   |  | E33  | Teachers should improve<br>their ability to make PPT  | 4  | 8.89  |       |
|   |  | E34  | Teachers can't rely too<br>much on PPT  | 4  | 8.89  |       |
|   |  | F11  | Teachers should use the<br>dynamic display function<br>of PPT to show the<br>formation process of<br>knowledge  | 15 | 33.33 |       |
|   |  | F12  | Teachers can use the<br>"trigger" and "custom<br>animation" functions of the<br>PPT to show the symmetry,<br>expansion and translation<br>of the graphics | 1  | 2.22  |       |
|   |  | F13  | Teachers can add audio and<br>video content to PPT to<br>better serve teaching  | 3  | 6.67  | 34.12 |
|   |  | F14  | Teachers can use the font<br>color of PPT to highlight<br>key knowledge   | 3  | 6.67  |       |
|   |  | F15  | Teachers can use PPT to<br>show the mathematical<br>operation process   | 2  | 4.44  |       |
|   |  | F16  | Teachers can insert bar<br>charts and other content in  | 2  | 4.44  |       |

|             |     |  |   |       |       |
|-------------|-----|--|---|-------|-------|
|             |     | the PPT to help students integrate what they have learned  |   |       |       |
|             |     | The content of the PPT presentation should be simplified, and only the key knowledge and difficulties should be presented as far as possible. The rest of the PPT should be written on the board |   |       |       |
|             | F17 | Teachers can use PPT to show math problems quickly and improve teaching efficiency   | 2 | 4.44  |       |
|             | F18 | Teachers can integrate content related to students' daily life into PPT  | 1 | 2.22  |       |
|             | F21 | Teachers can use PPT to create relevant problem scenarios and learning tasks to attract students and stimulate students' interest in learning  | 6 | 13.33 |       |
|             | F22 | Teachers can combine PPT with other software to enrich their teaching  | 5 | 11.11 |       |
| F2          | F23 | Teachers can use PPT to show the mind map of knowledge in summary  | 4 | 8.89  |       |
| PPT         | F24 | Teachers can insert the geometric drawing board software in PPT to teach mathematics   | 4 | 8.89  | 44.71 |
| application | F25 | Teachers can use PPT to present the knowledge system of a lesson to students   | 1 | 2.22  |       |
| skills      | F26 | Teachers can use PPT to present key knowledge and difficulties before class and explain them to lay a good foundation for classroom teaching   | 1 | 2.22  |       |
|             | F27 |  |   |       |       |

|   |      |  |   |       |       |
|---|------|--|---|-------|-------|
|   | F28  | Teachers can use the resource-sharing platform to choose the appropriate content to put in their PPT                           | 3 | 6.67  |       |
|   | F29  | Teachers can use PPT to create interactive projections, to increase the interactive effect of PPT                              | 2 | 4.44  |       |
|   | F210 | Teachers can use PPT to design exercises of different levels for different students  | 2 | 4.44  |       |
|   | F211 | Teachers can use PPT frequently to explain conceptual knowledge  | 2 | 4.44  |       |
|   | F212 | When teachers use PPT to teach mathematics, they can combine it with real objects  | 2 | 4.44  |       |
|   | F213 | Teachers can use PPT to edit mathematical formulas   | 1 | 2.22  |       |
|   | F214 | Teachers can use PPT to expand the teaching content appropriately  | 1 | 2.22  |       |
|   | F215 | Teachers can insert hyperlinks in the PPT so that they can jump in time when needed  | 1 | 2.22  |       |
|   | F216 | Teachers can use PPT to sort out the content of a chapter before students learn, and briefly introduce the key knowledge in it | 1 | 2.22  |       |
|   | F217 | Teachers can make a series of small games around the teaching content to attract students' interest in learning                | 1 | 2.22  |       |
| F3<br>PPT uses<br>timing and<br>other aspects | F31  | In the face of complex abstract mathematical knowledge, teachers can use PPT to display it intuitively                         | 8 | 17.78 | 21.18 |

|     |  |   |       |
|-----|--|---|-------|
| F32 | The teacher's use of PPT should be determined according to the teaching content                            | 7 | 15.56 |
| F33 | After teaching new knowledge, teachers can use PPT to directly present exercises for students to practice  | 1 | 2.22  |
| F34 | To make better use of PPT, teachers should strengthen the management and maintenance of hardware equipment | 2 | 4.44  |

### 4.3 Cognitive Comprehensiveness

Based on the previous studies, this study compares pre-service teachers' recognition of the usage of PPT for mathematics teaching with the previous studies to find out whether pre-service teachers' recognition of PPT has been covered in all the previous studies and to determine whether pre-service teachers' recognition of PPT is comprehensive or not.

#### 4.3.1 The value of PPT in mathematics teaching

There are a total of 18 items in the previous studies on [the value of ppt in mathematics teaching this aspect](#). Comparing the pre-service teachers' recognition of the value of PPT in mathematics teaching with the previous studies on this aspect, it can be found that the current pre-service teachers recognized 12 items in the previous studies, accounting for 66.67% of the total.

In the aspect of students' learning, the predecessors? [Who are they, be specific](#) put forward 6 items, and the pre-service teachers can recognize 3 of them, accounting for 50.00% of the total. In terms of classroom teaching, 8 items were proposed by predecessors, and 5 items were recognized by pre-service teachers, accounting for 62.50% of the total. In terms of knowledge presentation, predecessors proposed 4 contents, and pre-service teachers recognized all the contents of this part, accounting for 100.00% of the total. In addition, the current pre-service teachers also explained the value of PPT from the dimension of teachers and put forward many other views on this aspect, but the meanings of these views are very similar and can be considered almost the same point of view.

It can be seen that current pre-service teachers do not have a comprehensive recognition of the value of PPT in mathematics teaching, but they have a very

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comprehensive recognition of the value of PPT in the presentation of knowledge. According to the data obtained, current pre-service teachers only recognize many superficial values of PPT but fail to recognize many deep-seated values of PPT in mathematics teaching, among which many key points have not been mentioned. Although some people explain the value of PPT from a new dimension, the meaning of these views is very similar. The details are shown in table 5.

**Table 5: Statistics on the comprehensiveness of pre-service teachers' recognition of the value of PPT**

| Dimension              | Recognizing Points | Total | Percentage | Recognizing Points | Total | Percentage |
|------------------------|--------------------|-------|------------|--------------------|-------|------------|
| Students learning      | 3                  | 6     | 50.00      |                    |       |            |
| Classroom teaching     | 5                  | 8     | 62.50      | 12                 | 18    | 66.67      |
| Knowledge presentation | 4                  | 4     | 100.00     |                    |       |            |

#### 4.3.2 The use of PPT in mathematics teaching

There are a total of 29 items? [What do you mean by items?](#) in the previous studies in this aspect. Comparing the pre-service teachers' recognition of the use of PPT in mathematics teaching with the previous studies in this aspect, it can be found that the current pre-service teachers recognize a total of 17 items in the previous studies, which accounts for 58.62% of the total.

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In terms of the aspects that should be paid attention to when using PPT, a total of 8 contents were proposed by predecessors, and 7 contents were recognized by pre-service teachers, accounting for 87.50% ~~of the total in this part~~. In terms of the aspects that should be paid attention to when designing PPT, there were 17 contents in the previous research, and preservice teachers recognized 7 contents of the previous research, accounting for 41.18% of the total number of this part. In terms of teachers' attitudes toward PPT and ability requirements, there were 4 contents in previous studies, and preservice teachers could recognize 3 of them, accounting for 75% of the total. The dimensions considered by pre-service teachers in this aspect are more comprehensive. However, it can be found from the obtained data that the main reason why many viewpoints of pre-service teachers cannot match the previous research content is that their understanding of this aspect is very vague and not in-depth.

It can be seen from this that the current pre-service teachers do not have a comprehensive understanding of the aspects to pay attention to when designing PPT, which is less than half of the contents studied by predecessors, but they have a comprehensive understanding of the aspects to pay attention to when using PPT and the attitude and ability requirements of teachers towards PPT. However, except for a

few opinions, the number of people holding other opinions in this regard is not large, so their overall recognition of the use of PPT in mathematics teaching is not comprehensive. The details are shown in table 6.

**Table 6: Descriptive Statistics on the comprehensiveness of pre-service teachers' recognition of the use of PPT**

| Dimension   | Recognizing Points | Total | Percentage | Recognizing Points | Total | Percentage |
|---|--------------------|-------|------------|--------------------|-------|------------|
| Aspects to pay attention to when using PPT              | 7                  | 8     | 87.50      |                    |       |            |
| Aspects to pay attention to when designing PPT          | 7                  | 17    | 41.18      | 17                 | 29    | 58.62      |
| Teachers' attitude towards PPT and ability requirements | 3                  | 4     | 75.00      |                    |       |            |

#### 4.3.3 How to better use PPT in mathematics teaching

There are a total of 29 items? [Be specific](#) in the previous studies in this regard. Comparing the pre-service teachers' recognition of how to better use PPT in teaching mathematics with the previous studies, it can be found that the current pre-service teachers recognize 13 items in the previous studies, accounting for 44.83% of the total.

Among them, in terms of PPT presentation skills, the predecessors put forward a total of 8 contents, 4 of which were recognized by pre-service teachers, accounting for 50.00% of the total, and many specific contents were not mentioned by pre-service teachers. In terms of the application skills of PPT, a total of 17 items were proposed by predecessors, and pre-service teachers could recognize 8 of them, accounting for 47.06% of the total. For many specific functions of PPT and how to integrate it with teaching, pre-service teachers failed to explain them in detail. In terms of the timing of PPT use and other aspects, 4 items were proposed by predecessors, but pre-service teachers only recognized 1 of them, accounting for 25.00% of the total.

It can be seen that the current pre-service teachers do not have a comprehensive recognition of the skills of using PPT in mathematics teaching. Among them, their understanding of each aspect is less than half of the previous research content, so it can be seen that most pre-service teachers do not know how to use PPT in mathematics teaching to obtain better teaching results, and many of the views they mentioned are not in-depth. The details are shown in table 7.

**Table 7: Descriptive Statistics on the comprehensiveness of pre-service teachers' recognition of PPT use skills**

| Dimension                        | Recognizing Points | Total | Percentage | Recognizing Points | Total | Percentage |
|----------------------------------|--------------------|-------|------------|--------------------|-------|------------|
| PPT presentation skills          | 4                  | 8     | 50.00      |                    |       |            |
| PPT application skills           | 8                  | 17    | 47.06      | 13                 | 29    | 44.83      |
| PPT use timing and other aspects | 1                  | 4     | 25.00      |                    |       |            |

From the above analysis, it can be found that a total of 76 items have been proposed in previous studies on the usage of PPT in mathematics teaching, and pre-service teachers can recognize 42 of them, accounting for 55.26% of the total. For each aspect, the dimensions they focus on are the same as those studied by predecessors, but many of the points they put forward are not in-depth, and many of the key points are not mentioned. It can be seen that pre-service teachers do not have a comprehensive understanding of the usage of PPT in mathematics teaching. The details are shown in table 8.

**Table 8: Descriptive Statistics on the comprehensiveness of pre-service teachers' recognition of the usage of PPT in teaching mathematics**

| Theme   | Recognizing Points | Total | Percentage | Recognizing Points | Total | Percentage |
|---|--------------------|-------|------------|--------------------|-------|------------|
| The value of PPT in mathematics teaching        | 12                 | 18    | 66.67      |                    |       |            |
| The use of PPT in mathematics teaching          | 17                 | 29    | 58.62      | 42                 | 76    | 55.26      |
| The skills of using PPT in mathematics teaching | 13                 | 29    | 44.83      |                    |       |            |

#### 4.4 Cognitive Rationality

Based on the previous studies, this study compares the pre-service teachers' recognition of the usage of PPT for mathematics teaching with the previous studies to find out whether the pre-service teachers' recognition is the same or similar to the previous studies, and ultimately to determine whether the pre-service teachers' recognition of the usage of PPT for mathematics teaching is reasonable or not.

#### 4.4.1 The value of PPT in mathematics teaching

Pre-service teachers' recognition of the value of PPT in mathematics teaching has 12 items, and by comparing the pre-service teachers' recognition of this with the content of the previous research, it can be found that 8 items in the previous research are the same or similar to the pre-service teachers' recognition, accounting for 66.67% of the total.

In terms of knowledge presentation, pre-service teachers proposed a total of 4 items, 3 of which were involved in previous studies, accounting for 75.00% of the total. In terms of student learning, pre-service teachers proposed 4 contents, all of which were involved in previous studies, accounting for 100% of the total number of this part. In terms of teachers, pre-service teachers proposed a total of 4 contents, and previous relevant studies involved 1 of them, accounting for 25.00% of the total. According to previous studies, teachers should regard PPT as an auxiliary tool, but some pre-service teachers regard it as a necessary tool in classroom teaching.

It can be seen that the pre-service teachers' overall recognition of the value of PPT in mathematics teaching is not reasonable, but the recognition of PPT in terms of student learning and knowledge presentation is very reasonable, and all the points mentioned in these two aspects have been covered by previous studies. However, in the aspect of teachers, it can be seen from the analysis that many views of pre-service teachers are unreasonable, among which some teachers' views exaggerate the advantages of PPT and tend to rely on PPT. The details are shown in table 9.

**Table 9: Statistics on the reasonableness of pre-service teachers' recognition of the value of PPT**

| Dimension              | Recognizing Points | Total | Percentage | Recognizing Points | Total | Percentage |
|------------------------|--------------------|-------|------------|--------------------|-------|------------|
| Knowledge presentation | 3                  | 4     | 75.00      | 8                  | 12    | 66.67      |
| Students learning      | 4                  | 4     | 100.00     |                    |       |            |
| teachers               | 1                  | 4     | 25.00      |                    |       |            |

#### 4.4.2 The use of PPT in mathematics teaching

There are 35 contents of pre-service teachers' recognition of the use of PPT in mathematics teaching. By comparing with the contents of previous research, it can be found that 18 contents in the previous research are the same or similar to the recognition of pre-service teachers, accounting for 62.86% of the total.

In terms of the aspects that should be paid attention to when using PPT, the pre-service teachers put forward a total of 15 contents, and the previous related

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research involved 6 of them, accounting for 66.67% of the total, and many of the views mentioned by the pre-service teachers were vague and not deep enough. In the aspects that should be paid attention to when designing PPT, 17 contents were proposed by pre-service teachers, 9 of which were involved in previous research, accounting for 52.94% of the total. In terms of teachers' attitudes towards PPT, pre-service teachers put forward 3 contents, which are all involved in previous studies, accounting for 100% of this part.

It can be seen that the pre-service teachers' overall recognition of the use of PPT in mathematics teaching is less reasonable, and some of their views are not in-depth, but they have a better recognition of teachers' attitudes towards PPT. The details are shown in table 10.

**Table 10: Statistics on the reasonableness of pre-service teachers' recognition of PPT use**

| Dimension                                      | Recognizing Points | Total | Percentage | Recognizing Points | Total | Percentage |
|--|--------------------|-------|------------|--------------------|-------|------------|
| Aspects to pay attention to when using PPT     | 10                 | 15    | 66.67      |                    |       |            |
| Aspects to pay attention to when designing PPT | 9                  | 17    | 52.94      | 22                 | 35    | 62.86      |
| Teachers' attitude towards PPT                 | 3                  | 3     | 100.00     |                    |       |            |

#### 4.4.3 How to better use PPT in mathematics teaching

There are a total of 18 contents in pre-service teachers' recognition of PPT skills used in mathematics teaching. Through comparison, it can be found that 9 contents in previous studies are the same or similar to pre-service teachers' recognition, accounting for 50.00% of the total.

In terms of PPT presentation, pre-service teachers proposed 13 contents, of which 8 were involved in previous research, accounting for 61.54% of the total. In terms of the application of PPT, pre-service teachers put forward 2 contents, 1 of which was involved in previous studies, accounting for 50.00% of the total. In terms of the timing of PPT use, pre-service teachers put forward 5 items, among which the views are very general and not specific, and previous studies have not involved any of them.

It can be seen that the pre-service teachers' overall recognition of the skills of PPT use is not reasonable, especially regarding the timing of PPT use, in which all the views have not been covered by previous studies. The details are shown in table 11.

**Table 11: Statistics on the reasonableness of pre-service teachers' recognition of the skills of PPT use**

| Dimension             | Recognizing Points | Total | Percentage | Recognizing Points | Total | Percentage |
|-----------------------|--------------------|-------|------------|--------------------|-------|------------|
| Presentation of PPT   | 8                  | 13    | 61.54      |                    |       |            |
| Application of PPT    | 1                  | 2     | 50.00      | 9                  | 18    | 50.00      |
| The use of PPT timing | 0                  | 3     | 0.00       |                    |       |            |

From the above analysis, it can be found that there are 65 contents of pre-service teachers' recognition of the usage of PPT in mathematics teaching, 39 of which are involved in the previous research, accounting for 60.00% of the total. The dimensions they focus on are the same as those of predecessors, and some of their views are reasonable. However, from a comprehensive perspective, the overall recognition of pre-service teachers on the usage of PPT in mathematics teaching is still not reasonable. The details are shown in Table 12.

**Table 12: Statistics on the reasonableness of pre-service teachers' recognition of the usage of PPT in teaching mathematics**

| Theme   | Recognizing Points | Total | Percentage | Recognizing Points | Total | Percentage |
|---|--------------------|-------|------------|--------------------|-------|------------|
| The value of PPT in mathematics teaching        | 8                  | 12    | 66.67      |                    |       |            |
| The use of PPT in mathematics teaching          | 22                 | 35    | 62.86      | 39                 | 65    | 60.00      |
| The skills of using PPT in mathematics teaching | 9                  | 18    | 50.00      |                    |       |            |

## 5. DISCUSSION

### 5.1 Cognitive Content

The above analysis reveals that pre-service teachers have many different perceptions of using PPT for teaching mathematics from different perspectives, and the dimensions they focus on in this regard are largely consistent with previous research.

Regarding the recognition of the value of PPT in mathematics teaching, pre-service teachers are mainly concerned about the value of PPT in teaching and knowledge

presentation, and they mainly believe that the value of PPT lies in its ability to visually and dynamically present knowledge and improve the efficiency of classroom teaching, and some of the pre-service teachers have elaborated on the value of PPT from different perspectives, which can be seen that they have different understandings of the value of PPT. However, during the interviews and collations, it was found that most of the pre-service teachers have a vague understanding of many aspects in this regard, and it is difficult for them to distinguish the value of PPT and its role, and many of them have exaggerated the value of PPT. By analyzing their views, it can be found that many pre-service teachers tend to rely on PPT for teaching, which will undoubtedly affect the effectiveness of classroom teaching.

In terms of On the use of PPT in mathematics teaching, most pre-service teachers pay more attention to the aspects that should be paid attention to when using PPT, and there are also many views on the aspects that should be paid attention to when designing PPT. They mainly think that teachers should use PPT in combination with blackboard writing for mathematics teaching, and their recognition of other aspects is not specific enough. It can be seen that pre-service teachers' recognition of the use of PPT only stays in some basic aspects, and they do not pay enough attention to the details of the use of PPT. Among them, some of the views put forward by pre-service teachers are very reasonable, but through analysis, it is found that their views on different aspects are contradictory. For example, they mentioned that teachers should regard PPT as an auxiliary tool, but through analysis, it is found that they tend to rely on PPT, which indicates that many pre-service teachers can put forward some reasonable views, but their understanding of these ideas is still not deep enough.

In terms of Regarding how to better use PPT, pre-service teachers' recognition is not much and relatively single, most of them just mentioned some basic operations of PPT, and these views are mainly focused on the presentation of PPT and are very vague, they mainly think that teachers can use PPT to present complex and abstract mathematical knowledge. It can be found that pre-service teachers have a single understanding of the effects that PPT can present and are unfamiliar with many of the techniques of using PPT, which leads to the fact that they are not clear about how they should better use PPT in classroom teaching.

## 5.2 Cognitive Comprehensiveness

The above analysis reveals that while pre-service teachers' recognition of some aspects is consistent with the content of previous research, there is still a significant portion of many previous studies that pre-service teachers do not recognize.

In terms of On the value of PPT, pre-service teachers have a more comprehensive recognition of the presentation of knowledge. However, but they did not mention many of the key points, while although some of them elaborated on the value of PPT from different aspects, these views are very similar and do not have too much new



significance. Therefore, pre-service teachers do not have a comprehensive overall recognition of the value of PPT in the mathematics teaching. As for the use of PPT in mathematics teaching, although pre-service teachers have a lot of recognition about the aspects that should pay attention to when using PPT and the teachers' attitude towards PPT and ability requirements, which are consistent with previous studies, the number of them holding these views is not large, so their overall recognition of the use of PPT in mathematics teaching is not comprehensive. As for how to make better use of PPT, there are not many opinions mentioned by pre-service teachers, and these opinions are relatively vague. It can be seen that pre-service teachers do not have a comprehensive recognition of how to better use PPT.

Therefore, it is known that pre-service teachers do not have a comprehensive recognition of the usage of PPT in mathematics teaching. This finding which is also consistent with the content of previous research. Although multimedia technology brings new opportunities for mathematics teaching, but also brings numerous challenges, many current mathematics teachers do not have a high level of information technology literacy, which restricts the in-depth application of the technology in teaching and expanding it [41].

### 5.3 Cognitive Rationality

Through the above analysis, it was found that the dimensions that pre-service teachers are concerned about in terms of using PPT for mathematics teaching are the same as those of previous studies, and some of these views are more reasonable, but from all aspects, the overall recognition of pre-service teachers about the usage of PPT for mathematics teaching is still relatively unreasonable.

In terms of Regarding the value of PPT in mathematics teaching, pre-service teachers have a reasonable recognition of students' learning and knowledge presentation, but many views on teachers are not reasonable, and some of them exaggerate the value of PPT and tend to rely on it, which shows that they do not understand and feel the value of PPT for mathematics teaching. Therefore, their overall recognition of this aspect is not reasonable. As for the use of PPT in mathematics teaching, although the dimensions that pre-service teachers pay attention to are consistent with previous studies, some of their views are not in-depth, so their overall recognition of this aspect is also unreasonable. For how to use PPT better, most of the views put forward by pre-service teachers are some basic operations, which obviously cannot obtain better teaching effects. Even in terms of the use time of PPT, all the views of pre-service teachers do not match the previous research. It can be seen that they do not know when it is best to use PPT and how to use PPT in teaching. Many pre-service teachers rarely describe in detail what effect PPT can bring to students when talking about the use of PPT.

From the above analysis, it can be known that pre-service teachers have a more

unreasonable recognition of the usage of PPT for mathematics teaching, which is also consistent with the previous research, and many current mathematics teachers have many misunderstandings about the application of multimedia technology in mathematics teaching, and meanwhile the integration of multimedia technology and mathematics teaching is not deep enough, which makes multimedia technology unable to play its role in mathematics teaching [42].

## 6. CONCLUSION

Previous studies have shown that teachers' understanding of information technology will affect the effect of classroom teaching. The current mathematics teachers ~~can not~~ cannot effectively use PPT for mathematics teaching, and then ~~can not~~ cannot obtain satisfactory teaching results, is this because the mathematics teachers' understanding of using PPT for mathematics teaching is not comprehensive and reasonable enough? In this study, 32 pre-service mathematics teachers were selected as the research objects, and the method of open interview was used to investigate their recognition of the usage of PPT in mathematics teaching. ~~Through investigation and analysis, it was~~ is found that: (1) Current pre-service teachers' recognition of the value of PPT mainly focuses on teaching and knowledge presentation; Their recognition of the use of PPT mainly focuses on the aspects that should be paid attention to when using and designing PPT; ~~As for~~ On how to make better use of PPT, the recognition of pre-service teachers mainly focuses on the presentation of PPT. (2) At present, pre-service teachers do not have a comprehensive recognition of using PPT for mathematics teaching. Although the dimensions they pay attention to are consistent with previous studies, there are still many aspects that they do not know. (3) ~~Again At present~~, pre-service teachers do not have a deep recognition of the usage of PPT in mathematics teaching, and there are many contradictory views in different dimensions.

Therefore, the following suggestions are given: (1) In the training of pre-service teachers, teacher educators ~~we~~ should systematically teach them how to operate PPT and assign them a series of tasks to enhance their ability of information resource mining and integration and improve their understanding of PPT [43]. (2) educators ~~should~~ show the different effects of PPT on pre-service teachers, teacher educators ~~should~~ lead pre-service teachers ~~them~~ to explore the techniques and principles to achieve these effects, and think about the integration measures of PPT and mathematics teaching, to improve their ability of independent learning and development [44]. (3) Educators ~~should~~ increase practical training, and provide more opportunities for pre-service teachers to use PPT in mathematics teaching, let them feel the value of PPT in practice and explore the best time to use PPT, and finally enable them to master the method of using PPT in mathematics teaching [45].

The research object of this paper is 32 graduate students majoring in subject teaching (mathematics) from the same university and the same grade, which does not involve

other types of pre-service mathematics teachers, so the sample size is small and the scope is narrow. Therefore, in the future, it is necessary to expand the scope of the research sample and adopt various research methods to conduct more in-depth research on the recognition of pre-service mathematics teachers about the usage of PPT in mathematics teaching, to find more detailed and comprehensive results.

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