



Research on the Use Power Point (PPT) in Junior High School Mathematics Classroom Teaching

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Since PowerPoint (hereinafter referred to as PPT) is of great significance to mathematics teaching, more and more attention has been paid to how to use PPT effectively in junior high school mathematics classroom teaching. This paper uses the method of theoretical analysis, through the analysis of the characteristics of PPT, the current teaching situation and the problems existing in students' mathematics learning, combined with the various requirements of *the Mathematics Curriculum Standards for Compulsory Education (2022 Edition)* (hereinafter referred to as *The Standards*) for junior high school mathematics teaching, puts forward four strategies for using PPT in junior high school mathematics classroom teaching. Through analysis, we can know that PPT is characterized by its powerful presentation function, dynamic presentation effect, lacks of procedural presentation, multiple ways of emphasis, and strong inclusiveness. The current problem of students in mathematics learning is students do not have a firm grasp of basic knowledge and have an inaccurate understanding of many concepts, students' ability to analyze and solve mathematical

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problems is weak, and they cannot accurately understand the conditions and requirements of the problems, students lack enthusiasm for learning mathematics, and students have improper learning methods and lack the habit of writing on time. The current situation of mathematics classroom teaching is teachers pay too much attention to the teaching of problem-solving methods and calculations and neglect the inspiration and training of problem-solving ideas, teachers' teaching resources are obsolete, and the use of information technology in teaching is inadequate, teachers' teaching methods are rigid and lack diversity and innovation, and the interaction between teachers and students is mostly ineffective and the overall participation of students is low. *The standard* puts forward specific requirements for the teaching of number and algebra, graphics and geometry, statistics and probability in junior high school. Therefore, through the above analysis, we give the following suggestions: 1. Making full use of the multiple emphasis effect of PPT to highlight different mathematical symbols; 2. Skillfully using the dynamic presentation function of PPT to make the process of mathematical knowledge formation dynamic; 3. Expanding the scope of use of PPT and give full play to the value of PPT in all aspects of teaching; 4. Integrating and collocating a variety of technologies reasonably, and use PPT in a variety of ways to teach mathematics. These strategies can be used for reference by junior high school mathematics teachers in practical teaching.

Keywords: Junior high school mathematics; power point; information technology; teaching strategies.

1. INTRODUCTION

Under the background of the information age, information technology is widely used in mathematics teaching, which undoubtedly provides new opportunities and challenges for the development of mathematics teaching. *The Mathematics Curriculum Standards for Compulsory Education (2022 Edition)* (hereinafter referred to as *The Standards*) states that teachers should make reasonable use of modern information technology, provide rich learning resources, design lively teaching activities, and promote changes in the ways and methods of mathematics teaching [1]. PowerPoint (hereinafter referred to as PPT) is a kind of presentation production software, that provides new inspiration and thinking for the change of teachers' teaching methods, and by playing the specific functions of PPT, it can effectively make up for the shortcomings of the traditional board and assist teachers to obtain a better teaching effect. Therefore, PPT is of great significance for mathematics teaching [2]. However, in the current mathematics classroom teaching, due to the numerous functions and various forms of PPT, many mathematics teachers cannot effectively use PPT for mathematics teaching, which leads to their failure to obtain ideal teaching effects [3-5]. Therefore, the research on how PPT should be used in mathematics classroom teaching is particularly critical [6,7-9]. What are the characteristics of the PPT? What problems do students have in learning mathematics? What is the current situation of teaching? What are the characteristics of junior high school mathematics?

What are the requirements of *The Standard* for junior high school mathematics teaching? How should teachers effectively use PPT in junior high school mathematics teaching? This paper will analyze and discuss the above problems, to give relevant strategies for mathematics teachers to use PPT in mathematics teaching, and help teachers effectively use PPT in mathematics classroom teaching to obtain ideal teaching results.

2. ANALYSIS OF PPT CHARACTERISTICS

In 1987, PPT 1.0 for the Mac operating system was officially launched, and due to its powerful functions, PPT was widely used in the field of teaching and was popular among teachers [10]. By comparing the blackboard writing and combining with previous studies, the characteristics of PPT are analyzed as follows:

2.1 PPT has a Powerful Presentation Function

PPT has a powerful presentation function, which is mainly reflected in the presentation speed and presentation mode of PPT. Through previous studies, we know that the presentation function of PPT can be applied to many aspects, and the presentation form is relatively flexible [11]. On the one hand, PPT can quickly present the content that users want to present. On the other hand, PPT has rich presentation methods, and its content can be text, pictures, audio, animation and other forms, so that PPT can present the content that needs to be displayed in a variety of

forms. For example, when the user is short of time or the content presented is too complex and boring, they can use PPT to present, which can not only quickly present the relevant content, but also help the viewer to understand the content to be presented more intuitively. Therefore, PPT can not only quickly present the content that users want to present, but also display it in different ways for different audience groups, so the presentation function of PPT is more rapid and flexible.

2.2 PPT has a Dynamic Presentation Effect

PPT has the function of presenting animation effects, which can show dynamically changing content. From previous studies, we know that PPT can vividly present the information that users need to convey through dynamic forms [12]. PPT has a variety of object animations, among which there are different types of animation styles. Users can get different animation effects by selecting different animation styles in the process of designing PPT. For example, users can add animation effects to the introduced parts to better attract viewers' attention, and for some abstract content, users can design dynamic effects to better let viewers understand these contents. Therefore, PPT can be designed with various dynamic effects according to users' wishes to better attract viewers' attention and interest.

2.3 PPT Lacks Procedural Presentation

Although PPT has rich dynamic presentation effects, the dynamic presentation of PPT is a display of the whole object, which directly presents the complete elements in different ways. The lack of a board-written presentation of the construction process of each element in PPT will lead to viewers seeing that some elements are presented in a variety of interesting ways, but they have no opportunity to understand how the presented elements are constructed [12]. For example, PPT cannot fully present some special symbols in accordance with the specifications of the blackboard, which will lead to the viewer does not know how to write these special symbols, and the viewer will also have a sense of strangeness to the presented content. Therefore, PPT lacks the necessary process for the display of some contents, and cannot present the complete construction process of a single element.

2.4 PPT has Multiple Ways of Emphasis

PPT can emphasize important content more prominently, and it has a variety of ways to emphasize it. From previous studies, we know that PPT has a powerful presentation function, so PPT can use this function to present the effect of emphasis, and the way of emphasis is diverse [13]. PPT can emphasize the content to be displayed in different ways. On the one hand, users can design different animation effects to emphasize the content in PPT. On the other hand, users can also adjust the color of the text to highlight the key content to achieve the purpose of emphasis. When the user presents some important content, they can design the way of emphasis according to the preferences of the viewer, for example, the user can make the font color of the important content more eye-catching, or design the important content into a dynamic effect to attract the attention of the viewer, and even use a variety of ways to achieve the effect of emphasis. All in all, PPT can use a variety of ways to present the key content to the viewer in a distinctive form, to leave a deep impression on the viewer. However, it should be noted that if the way emphasized by PPT is too gorgeous, it will easily distract the attention of the viewer.

2.5 PPT is Inclusive

We know from previous studies that PPT can be used in combination with many other software, and can also be added to various presentation effects from other resource libraries, which is highly inclusive [13]. The inclusiveness of PPT is mainly reflected in two aspects. On the one hand, if users are not satisfied with the original font effects, background styles, sound effects, etc., in PPT, they can download their favorite effects from other resource libraries and insert them into PPT for presentation. For example, if the user wants to present a content that can highlight personal characteristics, it is obvious that the original font and other effects of the PPT can not meet such needs, then the user can insert their favorite effect in the PPT. On the other hand, PPT can be well combined with other software for use, users can add the corresponding plug-in in PPT to meet their needs, and PPT has the function of hyperlink, it can link a wide range of things. Users can add relevant links to the PPT, as long as they click this link when playing PPT, they can jump directly to the relevant interface. For example, if users want to present more flexible and diverse content, they can present it

by adding links to the content to be presented or adding related plug-ins, which greatly broadens the scope of application of PPT.

3. JUNIOR HIGH SCHOOL MATHEMATICS REQUIREMENTS TEACHING

The content of the junior high school mathematics curriculum consists of four learning areas: number and algebra, graphics and geometry, statistics and probability, and synthesis and practice [1]. The recommendations and requirements of *The Standard* for junior high school mathematics teaching are as follows:

3.1 Teaching Requirements in the Field of Number and Algebra

In the teaching of number and algebra in junior high school, teachers should pay attention to the combination of mathematical knowledge and practice, let students understand the quantitative relationship and its change rule in the actual situation, and let them experience the process of building and solving mathematical models based on real problems, and verify and reflect on them. Teachers should also pay attention to the teaching of algebraic logical reasoning and improve students' ability to find, ask, analyze and solve problems in complex situations. This requires that teachers should put forward mathematical problems in actual situations, let students experience the process of establishing and solving mathematical models, and be able to verify and reflect on the results they get. In algebraic reasoning, teachers should guide students to understand the meaning of mathematical symbols, and let them learn to use mathematical symbols for general reasoning.

3.2 Teaching Requirements in the Field of Graphics and Geometry

In the teaching of graphics and geometry in junior high school, teachers should lead students to study the basic properties and relationships of graphics from three aspects: deductive proof, movement change and quantitative analysis, and pay attention to students' understanding of the properties, relationships and change rules of graphics. Especially for the teaching of graphic changes, teachers should make students understand the basic characteristics of graphic axis symmetry, rotation and translation changes

through the demonstration of information technology or physical operation. This requires teachers to pay attention to deductive proof, movement change and quantitative analysis methods in teaching, and lead students to deduce geometric properties and theorems of graphs based on the understanding of basic facts. Teachers should also guide students to study graphs from a dynamic perspective, to understand the change rules and invariants in the changes of graphs. For the teaching of graphs and coordinates, Teachers should pay attention to the combination of numbers and shapes and lead students to study figures with algebraic methods.

3.3 Teaching Requirements in the Field of Statistics and Probability

The teaching of statistics and probability in junior high school mainly includes two topics: sampling and data analysis and probability of random events. In the teaching of sampling and data analysis, teachers should guide students to collect, organize, describe and analyze the data in practical problems in an orderly manner under the background of real life, and let students learn to analyze relevant problems with the numerical characteristics of sample data. The most important point is that teachers should let students analyze practical problems. Teachers should also let students learn to use appropriate statistical charts to describe and express data so that students can feel the necessity of data analysis. The teaching of probability of random events should gradually move towards quantitative analysis. teachers should guide students to conduct a large number of repeated experiments to find the stability of the frequency of random events and finally learn to estimate probability with frequency. As such teaching practice activities will involve a large amount of data calculation, teachers can use information technology to assist teaching, guide students to learn to use computers to process data, and develop the habit of using information technology to carry out research.

4. ANALYSIS ON THE CHARACTERISTICS OF JUNIOR HIGH SCHOOL MATHEMATICS CURRICULUM

Number and algebra, graphics and geometry, statistics and probability in junior high school mathematics curriculum are the core content and

basic ideas of mathematics as the main line, which is the further development and continuation of primary school mathematics curriculum content [1]. Compared with the primary school stage, the characteristics of the junior high school mathematics curriculum are analyzed as follows.

4.1 Characteristics of the Field of Numbers and Algebra

In the field of number and algebra, the content of junior high school mathematics curriculum is more abstract. The content of the course focuses on students using symbols to represent algebraic expressions and operations of algebraic expressions, requiring students to use symbols as numbers to operate and reason, and equations and inequalities as a class of widely used mathematical tools. For the study of this field, the mathematics curriculum in junior high school emphasizes the formation and development of students' abstract ability, reasoning ability and model concepts.

4.2 Characteristics of the Field of Graphics and Geometry

In the field of graphics and geometry, the mathematics course of junior high school emphasizes the movement and change of graphics, uses the method of reasoning and demonstration to study graphics, and also emphasizes the cultivation of the idea of combining numbers and shapes. Junior high school students will further study points, lines, faces, angles, triangles, polygons and circles and other geometric figures, and the study of this part needs to start from three aspects: deductive proof, motion change and quantitative analysis. The content of the course emphasizes the establishment of students' geometric intuition and the improvement of their abstract ability and reasoning abilities.

4.3 Characteristics of the Field of Statistics and Probability

In the field of statistics and probability, junior high school mathematics courses put more emphasis on the collection, sorting, description and analysis of data in the actual background and the quantitative description of the probability of random events. For the content of this part, students will learn some simple methods to obtain data, learn how to infer the overall

characteristics through sample data and learn to quantitatively describe the probability of random events. This part puts more emphasis on the formation and development of students' data concepts.

5. PROBLEMS IN STUDENTS' MATHEMATICS LEARNING

5.1 Students do not have a firm Grasp of Basic Knowledge and have an Inaccurate Understanding of Many Concepts

In the current junior high school mathematics learning, some students do not have a firm grasp of basic knowledge and even cannot distinguish some concepts clearly [14]. There are quite several students in the process of mathematics learning who can not accurately understand some mathematical concepts and even confuse these mathematical concepts, and these students also easily ignore some details. For example, when students learn the knowledge of algebra, they are not clear about some concepts such as variables and coefficients, which will inevitably affect the later learning of equations. Some students also have a weak grasp of mathematical formulas. As the explanation of the formula is too boring, students are unwilling to understand the logical derivation behind the formula, so they will memorize the mathematical formula by rote.

5.2 Students' Ability to Analyze and solve Mathematical Problems is Weak, and they Cannot Accurately Understand the Conditions and Requirements of the Problems

A common problem of current students in learning mathematics is their insufficient ability to analyze problems. After learning relevant knowledge, students still cannot find a way to solve problems [15]. When students solve problems under the guidance of teachers, students tend to ignore the process of reading and analyzing mathematical problems led by teachers, which makes students unable to accurately understand the conditions and requirements of the problems and thus unable to solve mathematical problems correctly when they face mathematical problems alone. In addition, students' problem-solving thinking is inflexible, and they often rely too much on fixed ideas and methods, so they often have no ideas

to solve problems when they encounter difficult problems.

5.3 Students Lack Enthusiasm for Learning Mathematics

At present, some students lack motivation and enthusiasm for mathematics learning, which seriously affects their learning effect [16]. Some students think that the study of mathematics is very boring, so they lack patience for the study of mathematics. Since mathematics is a very logically rigorous subject and knowledge is closely related, if students do not fully grasp a certain part of knowledge, it will inevitably affect the learning of the following content. Therefore, students will think that mathematics is so difficult that it is difficult for them to build up their confidence in mathematics learning. Over time, students will have the emotion of resisting mathematics learning, making them unwilling to learn mathematics.

5.4 Students have Improper Learning Methods and Lack the Habit of Writing on Time

At present, some students lack the habit of writing after learning some new knowledge or a certain exercise, and they cannot take the initiative to practice or take notes in time, which will inevitably affect the effect of students' mathematics learning [17]. Many students do not develop good learning habits, and they do not realize the importance of hands-on practice, on the one hand, it will lead to students in the study of mathematics being easily distracted, not keeping up with the rhythm of the teacher, over time, affect their mathematics learning. On the other hand, after teachers lead students to learn new knowledge, students may mistakenly think that they have mastered it, but when they encounter similar problems again, they still have no way to solve the problem.

6. CURRENT SITUATION OF MATHEMATICS CLASSROOM TEACHING

6.1 Teachers Pay too much Attention to the Teaching of Problem-Solving Methods and Calculations and Neglect the Inspiration and Training of Problem-Solving Ideas

Mathematics is a discipline that explores rules to solve problems. In current classroom teaching,

some teachers pay too much attention to the teaching of problem-solving routines and methods and neglect the training of students' problem-solving ideas [18]. At present, to catch up with the teaching progress, some mathematics teachers directly teach students the routines and methods of problem-solving, only paying attention to the cultivation of students' calculation ability, and ignoring the formation process of students' problem-solving ideas. Students directly learn the routines of problem-solving under the guidance of teachers without experiencing the process of thinking, which will inevitably affect the development of their logical thinking and creative thinking. In addition, some teachers do not know how to inspire students, but simply tell students to listen, rather than teach students to learn, this kind of one-way transmission of teaching methods splits the interaction between teachers and students, affecting the effect of classroom teaching.

6.2 Teachers' Teaching Resources are Obsolete, and the use of Information Technology in Teaching is Inadequate

In current classroom teaching, although the Internet has brought abundant resources to mathematics teaching, many teachers still use outdated teaching resources, and the content presented by information technology is almost copied from textbooks, without relevant knowledge expansion and innovation, and the form of knowledge presentation is no different from blackboard teaching, which will undoubtedly limit the development of students' thinking [19]. In addition, many teachers do not make full use of information technology in teaching, they simply use information technology to present knowledge, so that information technology has become a new means of indoctrination, It can be seen that information technology does not give full play to its real value in mathematics teaching.

6.3 Teachers' Teaching Methods are Rigid and Lack diversity and Innovation

At present, although teachers generally have an awareness of using information technology to assist mathematics teaching, most teachers only change their teaching forms, and their teaching methods remain unchanged [20]. Many teachers only focus on whether they use information technology in a class, and do not pay attention to

and do not know whether their use of information technology in teaching is effective. Therefore, many teachers lack innovation in the way of mathematics teaching combined with information technology. They only make changes in the teaching tools but do not change the teaching methods in essence. They are still limited in the dilemma of traditional teaching, and it is difficult to stimulate students' enthusiasm for learning mathematics. The current teaching methods of these mathematics teachers are rigid and lack novelty, which will inevitably lead to their inability to use information technology to obtain better teaching results, and sometimes even counterproductive. In addition, the teaching method used by teachers is too rigid, which will make teaching efficiency low and make students tired, and may also reduce the enthusiasm of students to learn mathematics.

6.4 The Interaction between Teachers and Students is Mostly Ineffective and the Overall Participation of Students is Low

In the current classroom teaching, many interactions between teachers and students are ineffective, and such interactions are often carried out with some simple dialogues or questions, which are usually only targeted at a few students in the class [21]. In classroom teaching, many teachers only ask some simple math questions to carry out teacher-student interaction, and information technology is just a tool for teachers to present these simple questions to students, some of which can be answered without students' thinking. In addition, some teachers are used to asking students whether they understand what they have just said to achieve the interaction between teachers and students. This way only urges students to keep up with the teaching rhythm of teachers and is ineffective in cultivating students' mathematical thinking ability. When teachers communicate with students in this kind of interactive way, only a small number of active students may give responses, most of the students often do not care about such questions, and it is impossible to follow the teacher's questions to think deeply, resulting in the majority of students do not participate in the classroom learning.

7. THE STRATEGY OF USING PPT IN MATHEMATICS TEACHING

To effectively use PPT in mathematics classroom teaching to get better teaching results, this paper

analyzes the above content and obtains the following teaching strategies.

7.1 Make Full use of the Multiple Emphasis Effect of PPT to Highlight Different Mathematical Symbols

When teaching pure blackboard writing, many experienced teachers generally use different colors of chalk to distinguish different mathematical symbols and variables, while PPT can not only distinguish and emphasize different colors but also emphasize different variables and symbols through various presentation effects, to enrich the presentation of knowledge. In addition, for some complex problem scenarios, PPT can be presented quickly, so teachers can make full use of different emphasis effects of PPT to highlight different mathematical symbols and variables according to the teaching needs of a class [18].

For example, when students are learning problems related to functions, teachers can introduce a situation about detecting the driving speed of all kinds of racing cars with the help of PPT. PPT presents a driving record of all kinds of racing cars, including the driving speed and time of these cars in a period, and hides the conditions required for the problem. Assuming that the average speed of racing cars at a certain distance is unchanged, students are asked to draw functional images of these racing cars in terms of distance and time. First of all, the teacher asked students to try to compare which racing car was faster, and then used PPT to mark different function images with different effects, and put them together through dynamic functions for students to compare. Then the mathematical symbols of different function expressions are distinguished with different colors so that students can visually connect some features of the function with some variable symbols in the function. When leading students to explore the relationship between roots and coefficients of quadratic equations with one variable, teachers can use PPT to mark symbols in different colors. In the process of moving the terms in the equation, teachers can use PPT to design an animation effect to show the transformation process of the coefficients of each term in the equation. In this way, students can realize that the meaning of the symbol before and after the change of the equation is unchanged and that the corresponding mathematical formula and the roots of the equation are obtained [22].

From the above analysis, it can be seen that current students do not have a firm grasp of basic knowledge in the process of mathematics learning, and even cannot distinguish some mathematical concepts. At the same time, in the current classroom teaching, a considerable number of teachers ignore the inspiration and training of students' problem-solving ideas, and students lack the opportunity to think about problems. As for the teaching requirements in the field of number and algebra, *The Standard* emphasizes that teachers should pay attention to algebraic logical reasoning, enable students to understand the quantitative relationship and the law of change in the actual background, and guide students to understand the meaning represented by mathematical symbols. The course content in this field is more abstract, emphasizing the formation and development of students' abstract ability and reasoning abilities. This requires teachers to lead students to experience the process of model building in the actual situation and understand the quantitative relationship and its change rule. At the same time, teachers also need to pay attention to the inspiration of students' problem-solving ideas, let students experience the logical reasoning process of algebra, and improve students' grasp of basic mathematical knowledge. Through the analysis of PPT, it can be seen that PPT has the effect of multiple emphases, and diversified dynamic presentation effects can be designed according to the wishes of users. Therefore, teachers can make full use of the multiple emphasis effect of PPT, and use PPT to mark the variables in the function expression with different colors in the actual situation. Through the comparison of different function images, students can realize the different meanings represented by different symbols. At the same time, before PPT presents the function images, teachers ask students to think independently and draw the images by themselves. Then let the students compare the results with the content presented in the PPT, which can help them better consolidate and further master the relevant knowledge. Using different colors to label the coefficients of quadratic equations with one variable, and then using dynamic effects to show the process of equation change, students can experience the reasoning process of formulas and understand the logical reasoning of algebra, helping them to better distinguish the relevant mathematical concepts. Therefore, to meet the relevant teaching requirements emphasized in *The Standard*, reverse the current teaching status, and solve a series of

problems in students' learning of mathematics, teachers should make full use of the multiple emphasis function of PPT, and visually present different mathematical symbols and mathematical reasoning processes in diverse forms.

7.2 Skillfully use the Dynamic Presentation Function of PPT to Make the Process of Mathematical Knowledge Formation Dynamic

The dynamic presentation function of PPT perfectly makes up for the defect of static presentation of knowledge in blackboard teaching. Teachers should make full use of the dynamic presentation function of PPT to make abstract and difficult mathematical knowledge more intuitive [19]. According to the actual teaching needs, teachers can dynamically present the knowledge difficult for students to understand and master in various forms, but teachers should pay attention to the purpose of such dynamic presentation is not to pursue visual beauty, but to reflect the process of knowledge, so that students can feel the process of knowledge formation. This requires teachers to design the dynamic effect of PPT in a way that is easier for students to understand according to the law of students' cognitive development so that students can truly experience the process of knowledge formation.

For example, when teachers lead students to learn the perfect square formula, teachers can use PPT to present the square of a and b first, guide students to realize that this may represent a square area with side length $a + b$, and then use PPT to present such a square. After that, the teacher inspired the students to think that the larger square could be divided into two squares of different sizes and two identical rectangles, and then marked these shapes with different colors and combined them into large squares with PPT, thus obtaining the perfect square formula. After that, the teacher matched each figure with each item of the perfect square formula. In this way, teachers can help students understand numbers with the help of figures, and realize that each term of the perfect square formula can represent a different figure in a large square, to help them master this knowledge. Especially for the teaching of graphic changes, teachers can make full use of the dynamic presentation function of PPT to let students understand the basic characteristics of graphic axisymmetry, rotation and translation changes,

and let students realize that the perception of changes needs reference objects [23].

From the above analysis, it can be seen that current students are weak in the ability to analyze and solve mathematical problems, can not accurately understand the conditions and requirements of the problems, and they also lack confidence in mathematics learning. In the current classroom teaching, teachers' teaching resources are too old, and many of the contents are not novel enough. At the same time, teachers' use of information technology is unreasonable, and they only use it as a tool to copy textbooks. On the other hand, the teaching requirements in the field of graphics and geometry in *The Standards* emphasize that teachers should guide students to study graphics from a dynamic point of view, pay attention to the cultivation of the idea of combining numbers and shapes, and pay attention to the teaching of deductive proof, motion change and quantitative analysis methods. The characteristics of the course content in this field lie in more emphasis on the movement change of graphics and the cultivation of the idea of combining numbers and shapes. This requires teachers to pay attention to the introduction of the dynamic presentation effect, establish the relationship between number and form, pay attention to deductive proof and quantitative analysis and highlight the motion change process of figures, update their teaching resources, pay attention to the development of students' ability to analyze problems, and improve students' confidence in mathematics learning. Through the analysis of PPT, we know that PPT has a dynamic presentation effect and can show dynamic changes in content. Therefore, teachers can use the dynamic presentation function of PPT to realize the dynamic formation process of mathematical knowledge, which can not only make complex and abstract mathematical knowledge more intuitive and help students build up their confidence in learning mathematics but also lead students to deeply understand the conditions and requirements of some mathematical problems and help students improve their ability to analyze and solve problems. In addition, in the process of using PPT to dynamically present mathematics knowledge, teachers can successfully get rid of the shackles of traditional teaching, provide a broader space for the diversification of knowledge, and make the classroom teaching content more vivid and novel. Teachers use the dynamic presentation function of PPT to

establish a connection between graphics and numbers, to perfectly realize the combination of numbers and shapes, and also help students to form the idea of combining numbers and shapes. Therefore, teachers should make full use of the dynamic presentation function of PPT in the process of knowledge formation, and design different dynamic presentation modes for different mathematical knowledge, which can not only meet the requirements of *The Standards* in this aspect, but also solve a series of problems in students' mathematics learning, and make up for the deficiencies in the current teaching situation.

7.3 Expand the Scope of use of PPT and give full Play to the Value of PPT in all Aspects of Teaching

The function of PPT is not only to show students the mathematics knowledge to be learned in a class but also to help teachers carry out activities that cannot be completed by blackboard teaching. Therefore, teachers should update the concept of using PPT, not just using PPT to present mathematical knowledge, but trying to expand the scope of use of PPT. This does not mean that teachers must use PPT in the whole process of teaching, but requires teachers to break away from the shackling of traditional concepts and give full play to the value of PPT in all aspects of a lesson. In other words, teachers should give full play to other functions of PPT in addition to presenting knowledge, to obtain better teaching effects [21].

For example, when explaining the content of sampling and data analysis, teachers can first use PPT to present an actual background, list several groups of data under this background, design a time-limited rush answer session, and ask students to calculate the median, mode and variance of these groups respectively, and then ask students to explain the meaning they represent and analyze relevant issues under this background through these sample data. In this process, teachers can use PPT to present the countdown time to stimulate students' competitive psychology. Teachers can also use PPT to design different music effects in different links of classroom teaching, render the classroom atmosphere, infect students' learning emotions, and make classroom teaching more interesting [24].

From the above analysis, it can be seen that current students are not very enthusiastic about

mathematics learning. In the current classroom teaching, teachers' teaching methods are rigid, and many teachers' teaching lacks diversity and innovation, which leads to unsatisfactory teaching results even after they use information technology to assist teaching. According to the teaching requirements in the field of statistics and probability, *The Standard* emphasizes that teachers should guide students to analyze problems with the numerical characteristics of sample data based on real-life examples. At the same time, teachers should also guide students to conduct a large number of repeated experiments to find the stability of the frequency of random events. The characteristics of the course content in this field lie in emphasizing the formation and development of students' concept of data. This requires teachers to let students learn to analyze problems through the numerical characteristics of samples and to lead students to experience a large number of repeated experiments to feel the stability of the frequency of random events. Meanwhile, teachers should update their teaching methods, so that students can participate in learning and get a sense of spiritual pleasure, and improve the attraction of classroom teaching. Through analysis, it can be seen that PPT has a powerful presentation function, which can quickly and completely present content that cannot be directly presented in blackboard writing. In addition, PPT has a variety of presentation effects. Therefore, teachers can expand the scope of use of PPT and use PPT as a countdown clock for timely response, which can promote students' participation in response and improve their sense of participation. At the same time, students will also gain the pleasure brought by competition and thinking in this process, so that they can actively participate in learning and experience the process of analyzing questions through the numerical characteristics of samples. Setting corresponding sound effects in different teaching links can infect students' learning emotions and promote students' learning enthusiasm. By using the dynamic display function of PPT, teachers can also lead students to carry out a large number of repetitive experiments and visually show them to students, so that students can intuitively feel the stability of the frequency of random events. Therefore, to meet the relevant teaching requirements of the "Standard", solve the current problem of students' learning of mathematics, and update the way of classroom teaching, teachers must jump out of the traditional teaching thinking, update the concept of using PPT, and find ways

to expand the scope of use of PPT, so that PPT can play its real value in all aspects of teaching. Teachers should not just use PPT as a means of presenting mathematical knowledge.

7.4 Integrate and Collocate a Variety of Technologies Reasonably, and use PPT in a Variety of ways to Teach Mathematics

In the context of the information age, mathematics teaching should be reasonable, coordinated and effective to pursue the best teaching effect, which requires teachers to reasonably integrate and match various technologies and use PPT in various ways for mathematics teaching [25]. The technology integration mentioned here means not only the integration of other information technologies but also the integration of various teaching skills and teaching methods. In addition, teachers should also recognize that PPT and other technologies are only auxiliary tools for teachers to teach, and teachers should reasonably match these teaching methods and technologies in teaching, including the combination in order and the choice of methods. When teaching a class, teachers should choose appropriate teaching methods according to the course objectives, combine them with PPT for teaching, and gather the advantages of different methods so that these technologies and teaching methods can play a role in different links.

For example, when teachers lead students to learn quadratic functions since GeoGebra software is more advantageous in setting sliders and variables, teachers can insert function images made by GeoGebra software into the PPT so that students can feel how function images change by changing different variables. When teachers explain example questions or important knowledge, teachers can use PPT to present complex questions and knowledge content, and specific steps to do questions can be combined with teachers' blackboard writing and explanation, which can not only help teachers quickly present topic information to save time but also avoid the deficiency of PPT lacking a single element construction process. In addition, Blackboard writing and explanation can effectively highlight the process of mathematics teaching, and teachers can urge students to follow the teaching rhythm and practice together through language in this process. Teachers can also try to insert a scoring mini-program into the PPT by setting hyperlinks. When a student

answers the question correctly, the mini program on the PPT will add one point to the student's group, to stimulate the enthusiasm of students in learning. In addition, teachers can also use PPT in combination with hardware equipment. For example, after teaching a chapter, teachers can use PPT to present a page for summarizing mathematical knowledge, so that students can complete the knowledge context of this chapter on the electronic whiteboard equipment by combining the existing inspiring content of PPT [26].

From the above analysis, it can be seen that some students currently have improper learning methods, do not have the habit of writing when learning, think that mathematics is difficult and lack the enthusiasm to learn mathematics. In the current teaching, the interaction between teachers and students is poor, the overall participation of students is also low, and the teaching methods of teachers lack innovation. *The Standard* emphasizes that teachers should make reasonable use of modern information technology and create a reasonable information learning environment. This requires teachers to make reasonable use of technology, turn the original abstract and complex mathematical knowledge into simple and interesting knowledge, and adopt innovative teaching methods that can achieve effective interaction between teachers and students, stimulate students' enthusiasm for learning, and urge students to develop good learning habits. Through the analysis of PPT, it can be seen that PPT is highly inclusive and can be used in combination with a variety of software, while it is easy to miss the construction process of a single element. Therefore, teachers can create a good information learning environment by combining PPT with different software and hardware for mathematics teaching, and can effectively stimulate students' enthusiasm for learning by inserting small programs with corresponding functions into PPT. In addition, by using PPT in combination with other math software, teachers can make students understand math knowledge more intuitively and stimulate their desire to explore. The combination of teachers' blackboard writing and PPT, on the one hand, because students tend to imitate teachers, will help students develop good learning habits, on the other hand, it can avoid the lack of a single element in the composition of PPT, and help students learn silent knowledge. Therefore, to solve the current problems in students' mathematics learning, change the teaching

status, and meet the relevant teaching requirements in *The Standards*, teachers should reasonably match and integrate various technologies, and adopt various ways to comprehensively use PPT in mathematics teaching.

8. CONCLUDING REMARKS

PPT is very important for mathematics teaching, so people pay more and more attention to how to use PPT in mathematics teaching. Teachers should understand the characteristics of PPT, clarify the requirements and suggestions of *The Standard* for junior high school mathematics teaching, and effectively use PPT in mathematics classroom teaching according to the needs of actual teaching. To effectively use PPT to teach mathematics and get the ideal teaching effect, we believe that teachers should make full use of the multiple emphasis effect of PPT to highlight different mathematical symbols, skillfully use the dynamic presentation function of PPT to make the process of mathematical knowledge formation dynamic, expand the scope of use of PPT and give full play to the value of PPT in all aspects of teaching, and integrate and collocate a variety of technologies reasonably, and use PPT in a variety of ways to teach mathematics. However, whether the above strategies are truly effective in teaching still needs to be verified extensively and over a long period.

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DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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