# Research on the Use of ChatGPT in Junior High School Mathematics Teaching

**ABSTRACT:**The use of ChatGPT in junior high school mathematics classrooms has been extensively discussed since it is extremely important for teaching mathematics in this age of rapidly advancing intelligent technology. Using the theoretical analysis method, this paper analyzes ChatGPT's features, the current teaching situation, and the problems existing in students' mathematics learning. It also combines the requirements that are emphasized in various aspects of junior high school mathematics teaching in *the Mathematics Curriculum Standards for Compulsory Education (2022 Edition)*. Four strategies for using ChatGPT in junior high school mathematics teaching are presented in this paper. They are as follows: 1. Make full use of ChatGPT's language understanding and generation abilities to create a diversified teaching interaction model; 2. Make use of ChatGPT's exclusive intelligent evaluation feature promptly to evaluate students more thoroughly and completely; 3. Make full use of ChatGPT to generate contextualized mathematical problems, and expand students 'problem-solving ideas with the help of intelligent questions; 4. Build an online personalized mathematics learning platform with ChatGPT to develop students' independent learning ability. These strategies can be used as a reference by mathematics teachers in practical teaching.

**Keywords:**Junior High School Mathematics; ChatGPT; Intelligent Technology; Teaching Strategies



## 1. INTRODUCTION

With the continuous update and development of intelligent technology, the advantages of intelligent teaching in the field of mathematics teaching have become increasingly prominent, which promotes the development of mathematics teaching [1].*TheMathematics Curriculum Standards for Compulsory Education (2022 Edition)* (hereinafter referred to as *TheStandards*) states that teachers should pay attention to the integration of information technology and mathematics teaching, and attach importance to the role of artificial intelligence in promoting the reform of mathematics teaching [2]. ChatGPT is a type of large language model that enables

dialogue between humans and intelligent machines. As it develops, it can make such dialogue more open and natural, thereby providing new possibilities for the transformation and development of teaching methods for teachers. Using ChatGPT for mathematics teaching not only effectively compensates for the shortcomings of traditional blackboard teaching but also provides multifaceted services, playing a role that other technologies cannot replace. It enhances students' enthusiasm for mathematics learning and helps teachers achieve better teaching outcomes in a completely new way. Therefore, ChatGPT holds particularly significant importance for mathematics teaching [3]. Even though the majority of mathematics teachers are somewhat familiar with ChatGPT, teachers are largely unaccustomed to its use in the classroom because of its unique generative function. Because of this, many teachers are unsure about how to use ChatGPT in mathematics classes. As a result, research on ChatGPT's application in mathematics classroom teaching is imperative [4]. What are the features of ChatGPT? What are the requirements of *The Standard* for junior high school mathematics teaching? What is the current status of teaching? What difficulties do students face when learning mathematics? How should teachers effectively use ChatGPT in junior high school mathematics teaching? The aforementioned issues will be examined and discussed in this paper, which will also provide pertinent strategies for math teachers to use ChatGPT in mathematics teaching. This will help teachers use innovative teaching techniques that improve students' mathematical learning and yield the greatest teaching results.

## 2. ANALYSIS OF CHATGPT'S CHARACTERISTICS

In November 2022, OpenAI unveiled ChatGPT, a conversational AI model that can intelligently respond to user inquiries. The use of intelligent technology in the classroom is certain to be a future development trend given the ongoing advancements in technology [5]. Compared with blackboard writing and general multimedia presentation technology, the characteristics of ChatGPT are analyzed in the following aspects:

### 2.1 ChatGPT has powerful natural language understanding and generation capabilities

The ability of computers to comprehend, produce, and imitate human language is known as natural language processing [6]. Because of its deep learning capabilities, ChatGPT can absorb and react to user-provided information quickly, giving users a

specific discussion platform [7]. In this kind of human-machine dialogue, ChatGPT's principle is to process the information provided by users based on the data generation model in a large-scale corpus and carry out unsupervised generative pre-training by using a Transformer decoder and Next Word Prediction. Thus, the natural language text with higher quality can be generated. In addition, ChatGPT can not only solve the questions and requirements raised by users, but also dig deeper into the logic of the questions raised by users, expand the scope of generating answers, and form a two-way dialogue mode of construction and learning between humans and machines. However, it should be noted that the key to the implementation of this function is the detailed level of information and requirements provided by the user. For example, if the user wants ChatGPT to offer a specific learning plan, they can give specific information about their needs and circumstances instead of just asking a question. ChatGPT will process the information promptly and offer an individualized learning plan, as well as expand the pertinent content according to the user's instructions and needs.

### 2.2 ChatGPT has a huge corpus

The data support for intelligent technology conversation models is called a corpus, which can help the models produce and comprehend language more efficiently. Compared with other AI models before, ChatGPT has a larger corpus, which even contains all aspects of the human corpus. Therefore, with the use of such data and training, ChatGPT can quickly and precisely understand the association among different objects and develop a comprehensive understanding of the real world [8]. ChatGPT's corpus system includes language pre-training material and fine-tuning corpus. The CommonCrawl dataset, Reddit links, English Wikipedia data, and other sources make up the majority of the pre-training corpus. A range of public code bases on Github and annotation data created by taggers and contributed by early users are included in the fine-tuning corpus [9]. As a result, users who supply accurate information can use ChatGPT to receive a comprehensive response. ChatGPT can provide more original and distinctive responses than the literal surface meaning since it encodes a wide enough range of hidden information, that goes beyond the extent of explicit knowledge ever stated by humans. For example, when users learn and understand some text materials, it is difficult for them to fully obtain the hidden knowledge behind the information, and ChatGPT can provide a comprehensive analysis and reference interpretation of this information. It should be mentioned, nevertheless, that because ChatGPT's feedback is always derived from a corpus, it occasionally provides responses that fall short of the user's expectations.

### 2.3 ChatGPT enables continuous conversation

ChatGPT has strong self-learning ability. When interacting with users, ChatGPT has the ability to actively recall the topics of past exchanges and integrate them to comprehend the present discussion. Therefore, ChatGPT can realize continuous dialogue with users [10]. ChatGPT relies on the context window for learning. In order to comprehend and retain the knowledge of each discussion round, ChatGPT can save context information in its input window while it is speaking with the user. Furthermore, ChatGPT can be pre-trained using a lot of data and then fine-tuned to fit particular task instructions. This makes ChatGPT's responses logical and cohesive and ultimately enables the natural conversation process between people and computers [9]. ChatGPT offers a more varied communication style with users due to the features of this continuous conversation. For more focused and personalized responses, users can also request scenario support or role identity from ChatGPT. For example, if users want to get some professional guidance, they can first generate a customized role of a certain type of expert for ChatGPT. After setting the scene, users provide certain background information and then ask ChatGPT whether it has entered the role identity. When they get a positive answer, they can gradually provide the necessary data and instructions. However, it is important to note that the user's instructions must be ensured to avoid ambiguity, otherwise, the answer given by ChatGPT may deviate from the user's needs.

### 2.4 ChatGPT is highly inclusive and supports technology embedding

ChatGPT facilitates technology embedding and offers an API interface. Embedded technology can successfully combine many technologies to improve technical services. As an artificial intelligence service interface, ChatGPT can be used by developers to build various kinds of human-machine dialogue applications, strengthen the dialogue effect of intelligent technologies in specific fields and provide personalized services [11]. ChatGPT's use mode and function range are expanded by embedded technology, which also increases the flexibility of integrating numerous technologies, maximizes the benefits of artificial intelligence, and improves the original Internet search engine and application's suitability for user needs. For example, in an application, users are limited to operating based on a single command that has been set, which does not address many of their personalized needs. However, ChatGPT's insertion can effectively address this issue by offering open answers and a variety of technical services to go beyond the generation of single content.

### 2.5 ChatGPT has a limited ability to handle complex and ambiguous problems

Despite its ability to respond to user inquiries, ChatGPT has lagged since it mostly relies on training data for its knowledge. Meanwhile, ChatGPT's understanding of users' requests depends on its statistical model and data training, and it cannot have understanding and reasoning abilities like humans.Therefore, ChatGPT cannot have emotion or consciousness, nor can it perceive the user's emotions and emotional depth [9]. However, because of the large number of training data sources, ChatGPT may react to user questions with bias or even incorrect information, ultimately producing incorrect and biased responses. Further, because ChatGPT largely uses patterns to produce its responses, occasionally the answers it provides may appear acceptable but turn out to be incorrect. Therefore, when using ChatGPT, users should make their questions as specific as possible and should not blindly trust the answers given by ChatGPT. Put another way, the user cannot fully rely on the response and can only use it as a guide and source of inspiration.

## 3. ANALYSIS OF MATHEMATICS TEACHING REQUIREMENTS IN JUNIOR HIGH SCHOOL

The Standards provide pertinent requirements and recommendations regarding the methods of teaching mathematics and the integration of information technology and mathematics teaching in the curriculum implementation section. The specific contents are as follows [2].

### 3.1 Teachers should enrich their teaching methods

Teachers should change the original single teaching style, pay attention to heuristics, inquiry, participation and interactive teaching methods, and choose the teaching method that can arouse students' thinking. Teachers can choose a variety of teaching methods in combination with different learning tasks and learning objects to carry out teaching. To help students grasp fundamental concepts and gain experience in practice, exploration, experience, reflection, cooperation, and communication, teachers should employ rich teaching methods. They should also highlight the educational value of each teaching method and encourage the growth of students' core qualities.

This requires on mathematics teachers to abandon the old one-way approach to teaching, embrace a variety of teaching strategies, clarify the unique circumstances of each student, pay attention to the students' independent thought processes, and work to make each teaching strategy more relevant in order to help students grasp the fundamentals of the subject. Teachers should equally recognize that they should work to change the emphasis of their lessons from merely imparting knowledge to interacting with students and encouraging students to observe, think, and articulate the actual world through the perspective of mathematics.

### 3.2 Teachers should strengthen situation design and question raising

To help students progressively build their mathematical core literacy through activities, teachers should focus on the role that situation design and problem-raising play in encouraging student engagement in mathematical activities. Teachers can concentrate on teaching tasks and select materials that are close to students' life experiences and conform to students' age characteristics and cognitive characteristics from aspects like social life, science, and students' prior mathematical experience. On the one hand, teachers should focus on creating real situations. On the other hand, teachers ought to present mathematical problems derived from real-world scenarios that could stimulate students' thought processes and assist them in posing relevant questions. The questions raised should trigger cognitive conflicts and allow students to experience the learning process of mathematical observation, thinking and expression.

This requires that mathematics teachers should attach importance to the creation of real situations close to students' life experiences and cognitive characteristics, and pay attention to the diversification of situation creation from the actual situation of students so that students can gradually learn mathematics and let them feel the wide application of mathematics in the real world. To make it possible for the challenges to actually stimulate students' thinking, teachers must also be mindful of how the problems are constructed. In addition, teachers should also consider the variety of approaches to posing questions, encouraging students' enthusiasm to study, and enabling students to see the importance of mathematics in identifying, comprehending, and communicating the real world.

### 3.3 Teachers should use information technology to improve teaching methods

Teachers should pay attention to the integration of information technology and mathematics teaching, make reasonable use of modern information technology, provide rich learning resources, pay attention to the role of big data and artificial intelligence in promoting the reform of mathematics teaching, and improve teaching methods and promote the transformation of students' learning methods. Among them, teachers can use information technology to enrich the teaching scene, stimulate students' interest in learning mathematics and desire to explore new knowledge, use information technology to visualize abstract mathematical knowledge and promote students' understanding of mathematical concepts and construction of mathematical knowledge.

This requires teachers to pay attention to the positive role of big data and artificial intelligence in mathematics teaching, try to create a reasonable information learning environment with the help of information technology, and transform complex mathematical knowledge into a form that students can easily understand for teaching. At the same time, teachers should strive to improve students' enthusiasm for learning mathematics and information literacy using information technology and improve teaching in a way that conforms to the characteristics of the information age to obtain better teaching results.

**3.4 Teachers strengthen online and offline links to promote independent learning**

Teachers should use technology to combine online learning with classroom teaching, strengthen the integration of online space and offline physical space, and carry out integrated teaching. At the same time, teachers should pay attention to enriching students' learning resources, guide students to plan their learning tasks and time management, carry out learning activities with the help of technical means, strengthen students' self-monitoring and self-evaluation ability, improve students' independent learning ability and give them personalized guidance in time, to create a good environment for students' independent learning.

This requires teachers to pay attention to the cultivation of students' independent learning ability, strive to break through the time and space restrictions of traditional mathematics education, and carry out integrated teaching combining online and offline. Teachers should make full use of the digital platform, with the means of information technology to carry out personalized mathematics learning activities, and enrich students' learning resources, to create conditions for students' autonomous

learning.

## 4.CURRENTSITUATIONOFMATHEMATICSCLASSROOMTEACHING

### 4.1 Teachers pay too much attention to the imparting of knowledge and ignore the subjectivity of students

In the current junior high school mathematics teaching, there are still many teachers who only pay attention to the explanation of knowledge while ignoring students' understanding and application of knowledge when carrying out teaching activities. Teachers ignore students' subjectivity and do not pay attention to the analysis of students' actual situation, which makes it difficult for students to successfully master and apply knowledge in mathematics learning [12]. Among them, some teachers even do not know how to determine whether students have understood and learned to apply knowledge to solve problems. Teachers spend most of their time teaching knowledge, which reduces students' subjectivity in class and their time for practice, thus making it difficult for students to master the application of knowledge in learning. Such long-term one-way teaching of knowledge by teachers makes students lack independent exploration and learning opportunities, which is not conducive to the cultivation of students' enthusiasm for mathematics learning, nor can it ensure that students can fully grasp knowledge and apply knowledge to solve mathematical problems.

### 4.2 Teachers ignore students' after-class learning, and the network technology resource utilization efficiency is low

In the current mathematics classroom teaching, many teachers pay too much attention to classroom teaching and ignore students' after-class learning, so students' after-class activities such as practice, preview and inquiry become very scattered and cannot be well combined with in-class and after-class learning. At the same time, many teachers do not give full play to the value of network technology when assisting students' learning [13]. On the one hand, teachers mainly promote students' after-class learning through assigned homework exercises, new lesson previews and other tasks. Even though some teachers are able to thoroughly review and edit students' assignments, the results cannot be sent to the students right away. As a result, not only can this not pique students' interest in after-class activities, but the absence of prompt evaluation

will also prevent students from achieving improved learning outcomes. On the other hand, many after-class preview and inquiry tasks assigned by teachers are mostly open, which makes students blind when they preview new lessons or inquiries, so most of these tasks have little effect on students' mathematics learning. At the same time, the absence of timely evaluation and help may make students feel bored, and teachers usually can not know the student's independent learning condition, and so they can not properly combine students' learning in class and after class. In addition, the value of network resources for students' independent learning is great, but many teachers do not pay enough attention to network technology resources.

### 4.3 Teachers do not pay attention to the evaluation of students in teaching and the evaluation content is relatively fixed and single

At present, some mathematics teachers do not pay attention to the evaluation of students in mathematics classroom teaching, which makes them easily ignore the evaluation of students, so that the classroom teaching does not form a closed loop. In addition, although some teachers pay attention to the evaluation of students, there are also major problems with the evaluation content [14]. On the one hand, the impact of teaching evaluation on students' learning is often overlooked by teachers. In addition to decreasing students' interest in learning mathematics, a lack of assessment will also prevent students from correctly identifying their own issues. On the other hand, the evaluation content given by many mathematics teachers mainly focuses on students' memory and application of knowledge points. Although the evaluation content given by teachers is mostly positive, the evaluation content is relatively fixed and lacks pertinency, which is not substantively helpful to students' learning. At the same time, teachers not only fail to evaluate students from multiple perspectives such as mathematical thinking and ability, but also neglect to evaluate students in the process of thinking and solving problems. As a result, although the evaluation given by teachers is timely, it is not comprehensive and specific, and it is not conducive to the development of students. Furthermore, a lot of teachers fail to check in with their students after completing evaluations, which prevents classroom evaluation from being a comprehensive system. These issues will unavoidably impact the effectiveness of instruction [15].

### 4.4 The interaction between teachers and students is stiff and ineffective, and the overall participation of students in classroom teaching is low

In the current mathematics teaching, although many mathematics teachers have noticed the importance of interaction between teachers and students, the interaction effect between teachers and students in classroom teaching is not ideal [17]. On the one hand, most of the interaction between teachers and students is carried out in the form of oral questioning, which is monotonous and fails to take into account the majority of students, thus greatly weakening the overall participation of students in classroom teaching. Although some teachers also carry out other forms of interaction, they still cannot effectively improve the teaching atmosphere and obtain satisfactory teaching results. On the other hand, the interactive content between teachers and students in classroom teaching lacks depth, and the questions raised by teachers still simply stay in the solution of mathematical problems. Many teachers lack the process of inspiring and guiding students when asking questions, and many questions raised by teachers can be answered without students thinking, which will inevitably greatly weaken the significance of the interaction between teachers and students, and is not conducive to the cultivation of students' mathematical thinking. At the same time, many mathematics teachers' understanding of the interaction between teachers and students is too restricted. Teachers only think that the value of classroom interaction is to urge students, but do not play its role in prompting students to think deeply in teaching.

## 5. PROBLEMSIN STUDENTS' MATHEMATICS LEARNING

### 5.1 Students tend to be inattentive and defensive when learning mathematics

Many facets of the mathematics classroom currently influence certain students, causing them to wander throughout class. These students consider mathematics dull and lack excitement for learning it, which will undoubtedly hurt their learning outcomes [18]. Some students lack the patience to learn mathematics because much mathematical knowledge is abstract to them. At the same time, mathematics is also a subject with strict logic, and the mathematical knowledge of each part is closely related. If students fail to grasp the knowledge of a certain part in time, it will deeply affect their learning of the following contents. In this case, students will inevitably gradually lose their motivation to learn mathematics, and eventually, they will have a conflict with the learning of mathematics. Furthermore, some students lack self-control, making it impossible for them to concentrate on their studies. Additionally, if teachers focus too much on explaining mathematical concepts, they will fail to pay attention to their students' learning, which will unavoidably result in more noticeable student distraction.

### 5.2 Students' independent learning ability is weak, and they lack the consciousness and habit of independent practice

Some students currently struggle with independent study. They lack knowledge and habits of independent practice, fail to develop proper awareness and conceptions of mathematics learning, and rely too heavily on the direction and organization of teachers throughout the classroom learning process. Moreover, students' learning content is mostly arbitrary, and their primary method of independent learning is open practice alone after class [19]. Since mathematics is an abstract subject, various students will have varying levels of knowledge. As a result, many students should have a variety of learning objectives, many of which require for independent study beyond class. However, many students lack the ability for independent exploration and learning and do not pay attention to after-class practice and consolidation, which will inevitably deeply affect students' learning of mathematics. At the same time, many students lack initiative in learning mathematics and have poor problem-solving and independent thinking skills as a result of teachers who place too much emphasis on explaining concepts and failing to encourage students to actively participate in class activities. Although some students sometimes learn independently, they often fail to achieve the desired learning results due to the lack of timely supervision and evaluation.

### 5.3 Students generally lack the awareness of reflective learning and lack of understanding of their abilities

At present, some students do not have enough awareness of reflective learning. These students lack the knowledge and desire for active learning, have a hazy understanding of their own talents, and rely too heavily on the direction and assessment of their teachers in the classroom [20]. Many students are not motivated to reflect on their learning, lack clarity regarding their learning objectives, and are unsure of how to do so. A large part of the reason is that they do not have a clear understanding of their abilities and do not know where their weaknesses are. Because there aren't enough opportunities for students to evaluate and supervise one another in the classroom, some students' evaluations of their abilities are too subjective, and their perspectives on evaluation are limited, leading to students knowing themselves based on the evaluations provided by teachers. At the same time, students cannot develop a proper knowledge of their skills if some teachers disregard student evaluations or if the content and format of these evaluations are one-size-fits-all.

### 5.4 Students' problem-solving ideas and methods are too simple and rigid, and they lack divergent thinking

Many students have a weak ability to solve problems in mathematics learning, and their problem-solving methods are too rigid. When facing mathematical problems with multiple solutions, they often bring a single problem-solving idea and pay little attention to other solutions to such problems, which will deeply hinder the development of their divergent thinking [21]. Most of the current students only pay attention to whether the problem is solved, rather than whether there are other solutions to the problem, and do not pay attention to the problem of multiple solutions, which leads to a lack of systematic training in problem-solving skills. At the same time, when solving problems, students only rely on the help of teachers rather than actively thinking. Sometimes, students do not correctly understand the conditions and requirements of mathematical problems because of their habitual thinking, which also leads to frequent mistakes in solving problems and such exercises are bound to be ineffective exercises. In addition, students often rely on fixed problem-solving ideas and methods, which will inevitably make their thinking lack flexibility and divergence when solving problems, and ultimately make it difficult to solve some difficult mathematical problems.

## 6. THE STRATEGY OF USING CHATGPT IN MATHEMATICS TEACHING

This study analyzes the aforementioned material and derives the following teaching strategies for using ChatGPT in mathematics classes to improve teaching outcomes.

### 6.1 Make full use of ChatGPT's language understanding and generation abilities to create a diversified teaching interaction model

Teachers can use ChatGPT to enrich teaching methods, create a diversified interaction mode, change the ineffective oral interaction between teachers and students in the past, highlight the principal position of students in classroom teaching, and give students more opportunities for active learning in order to prevent the negative effects of a single teaching interaction on students [22]. With the help of ChatGPT's strong natural language generation and understanding capabilities, teachers can create an interactive classroom environment that will increase students' interest in mathematics. At the

same time, Teachers can also inspire students to think and explore on their own by using human-computer dialogue. ChatGPT can give students more open-ended and focused responses based on student feedback. Teachers can modify the instructions to allow ChatGPT's feedback to serve a variety of purposes, including inspiration, supervision, response, and expansion. This will ultimately result in a variety of interactive consequences that will inspire students to think more deeply [23].

For example, teachers can use ChatGPT to facilitate student group inquiry when teaching about the sum of the interior angles of triangles. Students can pose questions to ChatGPT based on their current situation and get useful suggestions from ChatGPT's response information to formulate and validate hypotheses. During this process, teachers should encourage students to conduct practical verification and promptly submit the findings of group discussions to ChatGPT. After that, teachers should allow students to conduct further reflection and summary based on ChatGPT's feedback results. After teaching students the Pythagorean theorem, teachers can also provide students with opportunities to broaden their perspective and help them ask open-ended questions to ChatGPT regarding the theorem's contents, its cultural background, and alternative approaches to its proof. To assess students' proficiency and assist them in reviewing what they have learned, teachers can also host competitions based on mathematical knowledge and culture. ChatGPT will randomly generate questions for students to respond to within a certain amount of time, based on the circumstances of the previous session.

It is shown by the aforementioned analysis that current students are resistant to studying mathematics and lack interest in the subject. At the same time, a significant portion of the interactions between teachers and students in the classroom currently are ineffective, which contributes to the low level of student participation in teaching overall. *The Standards* clearly emphasizes that teachers should improve their teaching methods, replace the original single lecture-based teaching, pay attention to heuristic, inquiry, participatory and interactive teaching methods, and adopt teaching methods that can activate students' thinking. It is evident from the analysis of ChatGPT that it can generate and comprehend natural language, provide prompt feedback on user-provided information, and facilitate ongoing communication. Consequently, teachers can fully utilize ChatGPT's powerful natural language understanding and generation abilities to foster a variety of teaching interactions, which can not only meet the teaching requirements of *The Standard* in this respect, but also solve a series of problems when students learn mathematics, and improve the shortcomings of the current teaching situation.

### 6.2 Make use of ChatGPT's exclusive intelligent evaluation feature promptly to evaluate students more thoroughly and completely

When students have completed the questions, teachers should be mindful of their evaluations to avoid making assessments that are overly straightforward or ambiguous. Teachers can use ChatGPT to assess students' learning situations, use ChatGPT's intelligent evaluation feature, and provide personalized feedback once students have completed learning tasks or responded to questions [24]. In addition to avoiding the detrimental effects of oral evaluation on students in the past and increasing their motivation for learning mathematics, student evaluation via ChatGPT can also help students become more self-aware so they can address their learning challenges in a targeted manner. ChatGPT can record the student's usual performance, which can strongly ensure that the evaluation given by ChatGPT is more targeted and objective. At the same time, teachers can also use ChatGPT to record and evaluate students' learning situation to observe the changes in each student's learning, and to adjust the teaching in time. In addition, teachers can also give students opportunities for self-evaluation and mutual evaluation, then let ChatGPT evaluate students, and then guide students to observe the differences, to help students have a more comprehensive understanding of their learning.

For example, for convenience, teachers can use ChatGPT to number the students in the class and to record the unique circumstances of each student in the classroom. This allows ChatGPT to analyze and assess the data and record each student's daily performance in class. Teachers can compare and analyze these recorded results so that they can adjust their teaching in time and pay attention to certain students who need help. Teachers can use ChatGPT not only to record students' daily performance evaluations but also to record students' usual test scores, do comparative analysis, and then provide pertinent evaluations. At the same time, teachers can establish a group scoring system in classroom teaching, score corresponding groups according to their performance every week, and let ChatGPT record and analyze the scores of each group, and select the best group within a period. To put it briefly, teachers can assess students using ChatGPT in a variety of ways, which broadens and targets the evaluation content.

It is evident from the aforementioned research that present students typically lack the awareness of reflective learning and have an imprecise awareness of their own capabilities. Many teachers in current mathematics classrooms do not give student evaluations much thought, and the evaluations are rather straightforward and fixed,

with untargeted content that does not significantly aid in students' learning. Teachers should use information technology in a reasonable way to enhance their teaching methods, provide rich resources, pay attention to the role of artificial intelligence and big data in promoting the reform of mathematics education, and create a reasonable information learning environment, according to *The Standards.* It is evident from the analysis of ChatGPT that it facilitates ongoing communication and possesses a robust capacity for self-learning. By combining the information from earlier dialogues, it is able to comprehend and retain the dialogue content of each round as well as the current dialogue. Although ChatGPT has a sizable corpus as well, occasionally its responses could appear logical but fall short of being entirely accurate. Thus, teachers can quickly assess students more thoroughly and completely by using ChatGPT's unique intelligent evaluation feature. This will not only help them meet the Standard's teaching requirements in this area, but it will also address a number of difficulties with students' mathematical learning and improve the shortcomings of current mathematics teaching.

### 6.3 Make full use of ChatGPT to generate contextualized mathematical problems, and expand students 'problem-solving ideas with the help of intelligent questions

Teachers can use ChatGPT to create teaching scenarios and mathematical problems based on the requirements of classroom instruction, and they should be mindful about the way contextualized mathematical problems are designed. Among them, teachers can gradually guide students to discuss problems by analyzing the actual situation of students and using the intelligent questioning of ChatGPT, to promote students' thinking and expand their problem-solving ideas [25]. When teachers use ChatGPT to create situations, they should adjust the instructions according to the feedback results in time to ensure that the generated teaching situations are closely related to the teaching content and actual life. Teachers should also pay attention to the interestingness of the situation creation so that it can better mobilize the enthusiasm of students in mathematics learning. At the same time, teachers should pay attention to the problems in the situation and the design of intelligent questions of ChatGPT, so that it can effectively inspire students to use different mathematical principles to gradually analyze problems from different angles and promote the development of students' innovative thinking [26]. In addition, teachers should not only pay attention to the practicability of the teaching situation, but also pay attention to the culture of the situation, and promote the integration of mathematics and culture. Moreover, the inspiring methods and guidance processes adopted by teachers should also be diverse, to ensure the development of students' comprehensive thinking.

For example, when the teacher uses ChatGPT to create the teaching situation of plane geometry, the teacher can introduce such a situation, in the flag-raising ceremony, if a student is 10 meters away from the bottom of the flagpole, and the elevation angle of the top of the flagpole is 45°, then how should he calculate the height of the flagpole? After students finish thinking, teachers can use ChatGPT to ask students questions. In this link, teachers should clarify the teaching goal and control the rhythm of intelligent questioning. First, the teacher should guide the student through the problem, asking some enlightening questions, such as can you construct a simplified graph from the problem? What kind of graph is this? What does it look like we can apply what we've learned to solve this problem? What do we know so far? Secondly, the teacher can guide the students to think about more solutions to this problem. According to the answers of the students, the teacher can continue to use ChatGPT to give questions, for example, if this method is not used, is there any other way to solve this problem? If we were to think differently and change some of the information, how would you adjust your calculation? Then, the teacher can use ChatGPT to expand the question, asking students if the site is a slope how should you adjust your approach? Is it possible to measure the height of the flagpole by measuring the length instead of the angle? Finally, teachers should guide students to reflect and summarize, which should not only include the summary of mathematical methods but also guide students to expand the application of other practical scenarios. Teachers should make sure that all questions do not give answers directly, but play an inspirational effect to encourage students to get answers themselves.

From the above analysis, it can be seen that many students lack divergent thinking and their problem-solving ideas and methods are too simple and rigid, which leads to their weak problem-solving ability. In current teaching, teachers pay too much attention to imparting knowledge, which weakens students' subjectivity in teaching and ignores students' understanding and application of knowledge. As a result, students cannot learn to effectively use knowledge to solve problems. *The Standards* clearly state that in order for students to experience the learning process of mathematical observation, thinking, and expression, teachers should support situation design and problem-raising in the classroom, pay attention to creating authentic situations, and pose thought-provoking questions. It is evident from the analysis of ChatGPT that it has a large corpus, is capable of rapidly recognizing correlations between objects, provides a comprehensive comprehension of the real world, facilitates continuous discourse, and possesses a strong natural language generation and understanding capability. Therefore, teachers can generate contextualized mathematical problems through ChatGPT in teaching, and expand students 'problem-solving ideas with the help of intelligent questions. This can not only meet the relevant teaching requirements of *The Standard*, but also solve a series of

problems in the learning of mathematics, and effectively improve the current teaching situation.

### 6.4 Build an online personalized mathematics learning platform with ChatGPT to develop students' independent learning ability

In addition to teachers 'classroom teaching, timely preview and consolidation after class are equally important for students 'mathematics learning, so teachers should pay attention to the cultivation of students 'independent learning ability after class [27]. Teachers can use ChatGPT to establish a personalized mathematics learning platform for students, which not only includes rich in-class and off-class learning resources and micro-lessons but also includes relevant content and tasks in classroom teaching for students to complete after class. Teachers can build a database to store students' learning records, which can include students' learning progress, practice records, practice scores, etc. ChatGPT can be integrated into the back-end of the learning platform to enable it to process students' requests in real-time and realize ChatGPT's monitoring, evaluation, summary, record, answer and other functions for students' independent learning. ChatGPT can also track students' learning situations, provide students with personalized learning paths, recommend learning plans, give corresponding learning suggestions and personalized simulation tests, and provide students with diversified problem-solving ideas to enrich the forms of students' independent learning. In addition, teachers should pay attention to the richness of the mathematical knowledge base in the learning platform, so that it can contain a wide range of mathematical knowledge points, and pay attention to the protection of student privacy to ensure the security of students' learning data.

For example, when students complete quadratic function exercises on the platform, ChatGPT can score and assess their responses based on their responses, then provide feedback and learning recommendations regarding the students' quadratic function comprehension. On the one hand, this can help students understand their mastery of the content, on the other hand, it can increase the interest of students to do math exercises. When a student wants a study plan related to the inverse ratio function, ChatGPT can give the corresponding study plan based on the student's recent study. When students ask questions, ChatGPT can respond with answers and examples of how to use the application. It can also dynamically modify the question bank so that students can practice it based on their learning circumstances, encouraging them to re-consolidate the relevant material and strengthening their comprehension and memory of it. ChatGPT can also generate personalized exercises for students based on

their learning data about a certain chapter and set the corresponding exam time and question type according to the exam specification. After students complete the test, ChatGPT can also help students analyze wrong questions and provide a detailed problem-solving process.

From the above analysis, it can be seen that current students' ability to independent learning and exploration is weak, they do not pay attention to after-class practice and consolidation, and the form of independent learning is boring. In current teaching, many teachers ignore students' independent learning and do not make full use of network technology resources to assist students in learning, so students' independent learning activities are mostly scattered and blind. Teachers should use technology to support network platforms, integrate online learning with classroom instruction, give students access to rich learning resources, and give timely, individualized advice to encourage students' independent learning, according to *The Standards*. Through the analysis of ChatGPT, it can be seen that ChatGPT is highly inclusive and supports technology embedding, which can realize the effect of dialogue service of intelligent technology in specific fields. Thus, ChatGPT can be used by teachers to create a personalized online learning platform for mathematics and to fully utilize network resources to support students' learning. It can not only meet the relevant teaching requirements of *The Standard*, but also solve the problems existing in students 'mathematics learning, and effectively improve the current teaching situation.



## 7. Conclusion

The use of ChatGPT is an unavoidable tendency in the development of mathematics education, and it is extremely important to the subject. As a result, a growing amount of attention is being paid to how to use ChatGPT when teaching mathematics. Teachers should understand the characteristics of ChatGPT, clarify the relevant requirements and suggestions of *The Standard* for junior high school mathematics teaching, and effectively use ChatGPT for mathematics teaching according to the actual teaching situation and needs. To effectively use ChatGPT in mathematics teaching and achieve ideal teaching results, we believe that teachers should make full use of ChatGPT's language understanding and generation ability, create a diversified classroom teaching interaction mode, give full play to ChatGPT's unique intelligent evaluation function in time to make a more comprehensive and objective evaluation of students, make full use of ChatGPT to generate contextualized mathematical problems, and expand students 'problem-solving ideas with the help of intelligent questions, build an online personalized mathematics learning platform with ChatGPT

to develop students' independent learning ability. However, whether the above strategies are truly effective in teaching still needs to be verified extensively and over a long period.

## REFERENCES


1. Zhu Z., Wang MX. Mathematics education in the era of Artificial Intelligence. Classroom Teaching Research in Primary and Secondary Schools, 2023, (06):1-6.
2. Ministry of Education of the People's Republic of China. Compulsory Education Mathematics Curriculum Standards (2022 Edition). Beijing: Beijing Normal Univ ersity Press, 2022.
3. Liu BL. ChatGPT Dialogue Education: Implication Value, Risk Challenge and Practice Approach. Open Education Research, 2024, 30 (04):53-61.
4. You JJ., Tian X., Ding N. Discussion on junior middle school Mathematics learning based on ChatGPT. Middle School Mathematics Monthly, 2023, (05):63-67.
5. Yu T., Yuan JG. Application analysis of Artificial Intelligence Technology in junior Middle School Mathematics Teaching -- Taking "Image and Property of Quadratic Function" as an example. China Educational Technology and Equipment, 2024, (03):21-26+33.
6. Zhang HW. Application of artificial intelligence in natural language processing. Materials for Information Recording, 2024, 25 (05):139-141.
7. Jiao JL., Huang XY. How ChatGPT and Sora revolutionize Learning, curriculum and teaching. Journal of the National Academy of Educational Administration, 2024, (04):60-68.
8. Shao Y. The Working Principle of ChatGPT and Its impact on the future working Mode. Communications and Information Technology, 2023, (04):113-117.
9. Huang Y., Liu HY., Chang HJ., and Yang YS. Potential application and implementation approach of AI tool based on ChatGPT working mode in BIM technology. Science and Technology Innovation and Application, 2024, 14 (26):181-184+188.
10. Shi ZZ., Zheng SM., Jiang Y. ChatGPT and AIGC industry chain. Shanghai Management Science, 2023, 45 (02):12-14.

11. Kuang WB., Wang TJ. Research on the propagation characteristics of ChatGPT in a new generation of artificial intelligence. Journal of Chongqing University of Technology (Social Sciences), 2023, 37 (06):8-16.

12. Dai FG., Xia XS., Xu YN. Research on classroom teaching strategies based on the cultivation of Mathematics Core Literacy in junior middle school. Mathematics and Science World (Junior High School Edition), 2024, (18):102-104.

13. Zhou FQ. Measures to cultivate students' autonomous learning ability in junior middle School Mathematics Teaching in the Network era. Questions and Research, 2024, (31):64-66.

14. Xu YN., Xia XS., Dai FG. Research on Classroom teaching evaluation strategies based on the Cultivation of Mathematics Core Literacy in junior middle school. Mathematics World (Junior High School Edition), 2024, (17):115-117.

15. Guo YY. Research on classroom teaching practice of Mathematics deep learning in junior middle school. Journal of Science, 2024, (21):52-54.

16. Ju YF. Current situation and teaching optimization of junior middle school Mathematics students' autonomous learning. New Curriculum, 2020, (37):46.

17. Xu BY. Discussion on how to realize teacher-student Interaction in junior middle School Mathematics classroom Teaching. Mathematics Learning and Research,2022,(24):35-37.

18. Fu Y., Wang JY., Qi CX. The relationship between metacognitive monitoring and Mathematics academic achievement: Based on large-scale regional monitoring data of 8th grade students. Educational Measurement and Evaluation,2023,(03):46-55.

19. Cao RP. Thinking and exploration on Cultivating students' autonomous learning Ability in junior middle School Mathematics Teaching. Mathematics World (Junior High School Edition), 2024, (03):113-115.

20. Chen JD. Strategies for developing students' reflective ability in junior middle School Mathematics teaching. Asia Pacific Education, 2023, (01):164-167.

21. Xu LQ. On the cultivation strategies of mathematics divergent thinking ability for junior middle school students. Intelligence, 2024, (10):164-167.

22. Fu WH. How to Use information technology to improve the interaction and learning effect of senior high school Mathematics classroom. Mathematics and Science World (Senior High School Edition), 2024, (01):122-124.

23. Ye XJ. Research on Interactive model of junior middle School Mathematics classroom teaching under the concept of literacy. Mathematics and Science World (Junior High School Edition), 2024, (22):84-86.

24. Su GD. Strategy analysis on the integration of "teaching, learning and evaluation"

in junior Middle School Mathematics enabled by intelligent Technology. Educational Communication and Technology, 2024, (02):73-79.

25. Hua FT. Research on the application of situational teaching methods in junior middle School Mathematics under the background of Mathematics Core Literacy. Mathematics and Science World (Junior High School Edition), 2024, (22):113-115.

26. Yu DM. A practical exploration of one-problem multi-solution teaching in junior middle school mathematics. New Curriculum Research, 2024, (26):120-122.

27. Zhang L. Research on High school Students' Autonomous Learning of Mathematics based on Network Teaching Platform. Mathematics World (Late), 2023, (06):14-16.