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Research on the Application Strategies of Teaching Methods in Physics Teaching

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Abstract: *Social and economic development increasingly relies on education and technology, posing new requirements for the development of education. China implements the strategy of revitalizing the country through science and education, and continuously deepens educational reform. In physics teaching, it is required that the teaching content be close to life, linked to life, and cultivate students' abilities of cooperation, exploration, and independent thinking. Traditional teaching methods can no longer fully meet the new requirements of current society. By studying traditional and new teaching methods in physics teaching, we can obtain application strategies that better meet the development needs of students. This article investigates the research achievements of middle school physics teachers on teaching methods and the current teaching activities in middle school physics classrooms, and proposes the problems that exist in current teaching. Propose practical and feasible teaching strategies based on the laws of student psychological development and the requirements of society for student development. Emphasize teaching reflection, help teachers optimize teaching methods, and truly improve the efficiency of physics classroom teaching.*

Keywords: *middle school physics, teaching methods, strategies*

1. Introduction

1.1 Background and practical significance of the research topic

1.1.1 Research background

Physics, as a fundamental natural discipline, has been widely applied in biology, chemistry, medicine, and other fields, and has been applied to all aspects of daily life. In the middle school stage, physics teaching can help students understand the physical phenomena around them, learn to summarize the physical laws and understand the essence of physics while enabling them to master physical knowledge. More importantly, it is important for students to cultivate a sense of self-directed exploration, form a scientific worldview, exercise their thinking ability, and be able to use physics knowledge to explain phenomena in life. How to better organize the classroom and achieve teaching objectives has always been a research topic for experts and frontline teachers. Now, research is being conducted on the application strategies of teaching methods in physics teaching.

The background of the topic selection mainly includes the following aspects:

(1) The development of social economy and technology requires the updating of teaching methods and application strategies

With the development of social economy and technological progress, the trend of social information globalization and economic globalization is becoming increasingly evident. The continuous strengthening of informatization and automation requires members of society to have a higher level of knowledge and the ability to apply knowledge. If members of society want to adapt to the development and changes of society, they must constantly develop themselves. This also puts forward new requirements for education, requiring schools to increase efforts to carry out quality education and cultivate interests and skills that are in line with students' internal conditions and social development. In addition, due to the continuous development of China's economy and increasing investment in education, more and more schools are introducing whiteboards, multimedia, physical simulation laboratories, and other equipment. With the application of more and more technological means in current teaching activities, teachers' teaching activities have become much easier. Not only do they save time in writing on the blackboard, but they also enable some life problems and experimental phenomena that cannot be directly presented to students to be presented to them. This requires teachers to update their teaching

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methods to adapt to the new classroom environment. Although most teachers have already applied the new equipment they have introduced to the classroom, the teaching format of "one talk class" has not changed, and it is still easy for students to feel bored during the class process. Sometimes, teachers may even use new equipment to lecture too quickly, resulting in a significant decrease in teaching efficiency. Therefore, it is necessary to explore application strategies that are more suitable for the current teaching process.

(2) New Requirements of Curriculum Standards for Physics Teaching

There are new requirements for physics teaching in the "2017 edition of the General High School Physics Curriculum Standards". In terms of teaching objectives, a teaching objective based on the core competencies of the physics discipline was proposed. This goal requires that high school physics teaching should not be divorced from real life, and should enable students to understand the application of physics concepts in daily life, help students develop the habit of paying attention to cutting-edge technology, let students experience the joy of scientific exploration, and thus cultivate scientific thinking that is in line with students' own elements. In terms of physics curriculum content, a curriculum content module based on the core competencies of the physics discipline has been proposed. This module has clearer content and no repetitive and miscellaneous content, making the entire high school physics learning system more clear [1]. These new requirements further encourage teachers to explore new application methods of physics classroom teaching methods. Traditional teaching methods can no longer meet the requirements of curriculum standards. If only pre class preview is adopted, the teacher fills the classroom with teaching, and students are required to practice through a large number of exercises outside of class, which clearly goes against the requirements of the curriculum standards. Not only is it not conducive to the cultivation of students' core competencies in physics, but it is also more likely to cause students to develop a sense of disgust with learning, and teachers are also more likely to experience professional burnout. Therefore, teachers should optimize the application strategies of teaching methods, use teaching facilities reasonably, and strengthen the connection between the classroom and society[1-3].

(3) The new curriculum reform poses new challenges to teachers' teaching methods

The core concept of the new curriculum reform is "everything for the development of students". With the implementation of the new curriculum reform, teaching activities are increasingly emphasizing student-centered and improving students' initiative in learning. Due to the fact that schools and society still use high or low scores as the most direct evaluation method for teaching, many teachers tend to lean towards traditional teaching methods and neglect the development of students' own interests while attempting to use new teaching methods. The phenomenon of students passively accepting knowledge cannot be fundamentally changed, and it is also easy for students to develop a fractional view. By studying the application strategies of teaching methods in physics teaching, teachers can pay more attention to the comprehensive development of students, teach according to their aptitude, and enable students to discover their own strengths, enhance confidence, and enhance learning interest.

1.1.2 The practical significance of the topic selection

With the development of the economy and the progress of technology, the application of technology in teaching activities is becoming increasingly widespread. Especially with the advancement of network technology, more and more people are taking the path of online learning. Micro courses, flipped classrooms, and other teaching forms are gradually being applied in the classroom. The form of teaching is undergoing tremendous changes. The use of teaching methods directly affects the effectiveness of teaching, which requires teachers to adopt teaching methods that are more suitable for students' physical and mental development laws, and improve students' learning enthusiasm.

In the process of education development in China, exam oriented education has always played a major role. Curriculum reform has been proposed for many years, and although quality education is now being advocated, the final decision on students' retention is often based on their grades in the college entrance examination. Therefore, in advocating quality education today, although teachers and students have realized the drawbacks of traditional education and that traditional teaching methods can no longer meet the needs of society. However, the evaluation of students based on their scores has led many teachers and students to prefer traditional teaching methods that can quickly improve their grades. This has resulted in an asymmetry between teachers' teaching perspectives and teaching methods in classroom teaching. With the advancement of curriculum reform, more and more teachers are trying new teaching methods, but the main purpose of implementing new teaching methods is still to improve students' academic performance, neglecting to improve students' learning initiative, creativity, and self-learning ability.

ISSN 2663-8169 Vol. 5, Issue 9: 11-19, DOI: 10.25236/IJNDE.2023.050903

In current physics teaching, a common problem is that students find physics courses difficult, which leads to low interest in learning. In the process of physics teaching, teachers use teaching methods reasonably to find teaching methods that are suitable for students' thinking development level, truly realizing that through learning physics, middle school students not only exercise their scientific thinking ability, but also cultivate a scientific attitude and responsibility.

1.2 Research objectives and content

1.2.1 Research objectives

The new curriculum reform has given a new definition to the nature of physics, and has put new demands on teachers' teaching and students' learning activities. Traditional education methods are deeply ingrained in the impression of teachers, and this mechanical, simple and repetitive teaching method can no longer meet the current social needs, requiring teachers to make fundamental changes in their teaching methods. Implement methods that enable students to learn knowledge while also actively discovering and solving problems.

The research on the application strategies of teaching methods in physics teaching has played a certain promoting role in helping teachers achieve the transformation and application of teaching methods.

Studying the nature of physics and the psychological development patterns of students plays a certain promoting role in cultivating students' core competencies in physics.

1.2.2 Research content

Starting from the actual situation of middle school students, based on factors such as students' psychological development patterns, life experiences, and learning habits, and combined with the content set up in the physics course of this stage, explore the application strategies of teaching methods suitable for students' physical and mental development.

Analyze the teaching methods applied in practical physics teaching, conduct more in-depth research based on them, and explore teaching methods that can enhance students' interest in learning, help students learn independently, and reduce their learning burden[4-6].

2. Educational Elements and Teaching Methods in Physics Teaching

There is a method in teaching, but there is no fixed method in teaching. The value lies in obtaining the method. Teachers should follow teaching laws and make reasonable use of teaching methods during the teaching process. They should not use teaching methods mechanically, but should coordinate multiple teaching methods to help students learn efficiently. In physics teaching, teachers should effectively organize the classroom and cultivate talents that meet the needs of society. This requires teachers not only to teach students knowledge, but also to pay more attention to the cultivation of students' core literacy in physics. In the process of physics teaching, teachers should plan the classroom reasonably and effectively based on the content of the course and the actual situation of students, and choose appropriate teaching strategies.

2.1 Educational Elements and Teaching Methods

There are three main aspects of educational elements: teachers, students, and educational intermediaries. These three aspects are closely related to the teaching process, and the selection of teaching methods must be adapted to them. Below, we will discuss the relationship between the three elements of education and teaching methods:

2.1.1 Teachers and teaching methods

In classroom teaching, teachers play diverse roles: disseminators and creators of knowledge, guides and facilitators of student learning, and designers of teaching processes. Teaching methods have emerged with teaching, and since ancient times, scholars in the field of education have been continuously exploring, creating, and researching teaching methods. The purpose is to find teaching strategies that are suitable for the current social situation and meet the characteristics of students. Confucius proposed "not to be angry, not to be open, not to express oneself", requiring students to obtain their own viewpoints through independent thinking. Socrates' midwifery, on the other hand, involves constantly asking

ISSN 2663-8169 Vol. 5, Issue 9: 11-19, DOI: 10.25236/IJNDE.2023.050903

questions to force the educated to contradict themselves and be speechless, helping students to think. It has always been a common teaching requirement for teachers to require students to think independently in their teaching activities. In today's advocacy of quality education, more and more teachers are paying attention to the transformation of teaching methods, constantly trying various teaching methods, and striving to make students pay equal attention to learning, thinking, and doing in the classroom.

The labor of teachers is creative. The object that teachers face is all students, and each student has its own unique characteristics. This requires teachers to use teaching methods that can balance all students, creatively use teaching methods in combination with the teaching environment, cultivate students' physics concepts, and improve their scientific thinking level.

Each teacher has their own characteristics, and different teachers have different personalities and temperament types, which makes different teachers have different teaching styles. Therefore, teachers should choose teaching methods based on their own situation[7-9].

2.1.2 Students and teaching methods

As the main body of teaching activities, students are the objects of practical teaching activities. The psychological structure of middle school students is constantly changing, which requires teachers to timely discover the stage where students' thinking level is and change teaching strategies in a timely manner.

Middle school students are often in a critical period of continuous physical and psychological development, with plasticity. The reasonable choice of teaching methods plays a very important role in students' potential development and choosing their life direction. Middle school students have a strong interest in the subject of physics in the early stages of learning physics, but after studying for a period of time, they will find that some students gradually lose interest in the subject of physics. The reason for this phenomenon largely lies in the teacher's application of classroom organization and teaching methods.

Our country adopts a class teaching system, where every student learns and grows collectively, and the teaching process of teachers is also carried out within the student group. Students are unique, each with their own characteristics, but each student is a member of the collective. When selecting teaching methods, teachers should consider the collective influence on individual students.

2.1.3 Educational impact and teaching methods

Educational influence, as a link between educators and learners, mainly includes educational content, educational materials, and textbooks in terms of content. With the gradual increase in the application of technology in teaching, teaching media has changed from the original language, blackboard writing, and textbooks to a combination of various educational influences. Especially with the popularization of information technology and the attempt to flip the classroom, there are more applicable teaching methods and teachers have more choices in the classroom.

3. Optimize teaching methods and strategies

Physics teachers creatively carry out physics teaching work based on the core competencies of the physics discipline and the requirements of curriculum objectives, combined with educators, learners, and educational influences, breaking through traditional classrooms, optimizing teaching structures, and cultivating students' core competencies in the physics discipline. Below is a discussion on the means of optimizing teaching.

3.1 Analyze the actual teaching environment and create optimized teaching conditions

3.1.1 Enrich teaching methods

The knowledge in the physics classroom is closely related to students' actual lives. During the teaching process, physics teachers strive to incorporate real-life phenomena into the classroom, which can greatly improve students' learning efficiency. Teachers use real-life examples to transform the classroom into a part of students' lives, thereby successfully transforming real life into students' physics classrooms. This requires teachers to strengthen the flexible application of teaching methods, design more teaching methods that are closely related to life, and improve students' participation. For example, in some experimental classes, in previous physics teaching, teachers mostly used simple demonstrations and explanations, with students passively accepting experimental conclusions. Only a small portion of the experiments allowed students to participate by themselves. Teachers should create appropriate

ISSN 2663-8169 Vol. 5, Issue 9: 11-19, DOI: 10.25236/IJNDE.2023.050903

experimental teaching scenarios based on students' own situations and teaching conditions, and flexibly use physics teaching methods. For example, the use of "simulated physics laboratory" in virtual electrical experiments combines modern technology with physics teaching [4]. The application of modern information technology in physics teaching not only greatly saves teaching time and costs, but also presents some experiments that are difficult to complete in the classroom to students in another way. This can help students better participate in the classroom, enhance their interest in learning physics, and cultivate their scientific exploration ability.

Due to the different personalities and temperament types of each teacher, it is necessary for each teacher to have their own teaching style. The same teaching method can have different effects when used by different teachers. Teachers should apply the teaching method according to their actual situation, create teaching scenarios, and never copy the teaching processes of other excellent teachers. Therefore, teachers should develop teaching methods that meet their own characteristics based on their own characteristics.

Students are the main body of the classroom, and the purpose of education is to cultivate the people needed by society. Whether teaching can achieve educational goals depends on students, which requires teaching to be carried out around students. Pay attention to the differences between students and recognize that even students in the same class have their own characteristics. When teaching students, teachers should take into account their personality differences and individual psychological development levels, and take into account the development of all students. Teachers discover the characteristics of students, teach according to their aptitude, and strive to ensure that all students can gain and develop together in teaching activities. Teachers should also pay attention to time management in the classroom. Middle school students' physical and mental development is not yet mature, and it is impossible to maintain intentional attention for a long time, and the stability of attention is weak. This requires teachers to timely change teaching methods and enrich teaching strategies[10-11].

3.1.2 Cultivate students' ability to learn independently

Modern teaching requires the promotion of students' lifelong development, so it is extremely important to create a positive and open classroom for students, improve their enthusiasm for learning physics, and cultivate their autonomous learning ability. The prerequisite for cultivating students' autonomous learning ability is to involve them in the classroom, which is mainly reflected in their ability to consciously and proactively solve classroom problems and explore subject knowledge. This not only requires students' own efforts, but also requires teachers to create an atmosphere of self-directed learning for students. Teachers need to pay attention to the following aspects when creating independent learning scenarios for students:

(1) Reasonable design issues

When teachers guide students in learning, reasonable design of questions helps students grasp key points and knowledge more quickly. During the pre-class preview process, teachers cleverly design questions to enhance students' learning enthusiasm and help them prepare for the new lesson. Promptly ask questions in class and guide students to think. The design of the problem should be both vivid and interesting, combined with classroom content, and of moderate difficulty. Some students should not feel that the questions are too simple to think about, nor should they give up thinking because the questions are too difficult. Whether the teacher's design of the problem is vivid and reasonable is related to whether students can truly actively participate in the classroom and think independently.

(2) Be a good guide

Teachers in the new era should play the role of guides for students. During the teaching process, teachers should guide students to think about problems from all aspects and perspectives, and strive to cultivate students' scientific exploration awareness. [5]

The teaching process of teachers is not simply to impart knowledge to students, but to adopt flexible teaching methods to guide students to think independently, thus finding solutions to problems and solving them independently. When students encounter difficulties or overlook certain content during their learning process, teachers can play a guiding role.

(3) Encourage students to dare to try and make mistakes

During the learning process, students inevitably make mistakes, and teachers cannot solve problems comprehensively. Some teachers may criticize and educate students when they make mistakes, which may dampen their learning enthusiasm. There are no students who do not want to achieve good grades.

ISSN 2663-8169 Vol. 5, Issue 9: 11-19, DOI: 10.25236/IJNDE.2023.050903

When facing students' mistakes, teachers should encourage them, help them analyze the problem, guide them to find the key to the problem, and thus correct their mistakes. Teachers should encourage students to have the courage to explore, to try and make mistakes, and to challenge difficult problems.

(4) Creating an open and free learning environment

In traditional teaching, teachers place too much emphasis on imparting knowledge to students, believing that indoctrination based teaching methods can impart a large amount of knowledge to students in a short period of time, forming a teacher centered classroom environment. The traditional teaching mode has created a superior image of teachers, which is not conducive to students communicating with teachers and expressing their opinions. Students have rich creativity, and if teachers adopt a holistic approach to exam oriented education in teaching, it is easy to diminish students' creative enthusiasm. Create an open and free learning environment, where teachers and students work together to guide their learning while also instilling wings of courage to explore and innovate. Teachers create an open classroom, where they collaborate with each other and classmates to draw conclusions when researching problems. This is not only beneficial for problem-solving, but also for cultivating students' sense of cooperation, enhancing emotions between teachers and students, and enhancing collective cohesion.

3.2 Grasp the laws of physics classroom and create more effective teaching application strategies

Students are the main body of the physics classroom, and today's society advocates quality education, requiring the improvement of students' innovative awareness and the strengthening of the cultivation of core competencies in the physics discipline. The classroom is the main place for students to learn. Seizing the importance of classroom teaching in cultivating students' core competencies, grasping the laws of classroom teaching, analyzing students' psychological needs, tailoring remedies to the situation, transforming classroom interaction modes, and implementing more effective application strategies.

3.2.1 Effective explanation strategy

The effectiveness of a teacher's teaching in a physics classroom not only depends on whether the content taught by the teacher is scientific and specific, but more importantly, on whether the students can truly understand the vocabulary used by the teacher. Before giving a lecture, teachers should not only conduct a comprehensive and detailed analysis of the courses to be taught, but also consider the potential impact of students' life experiences on learning this part of the course. The content of physics in middle school is mainly mechanics and electromagnetism, which is closely and intuitively linked with students' life. Teachers should help students establish the connection between their knowledge and the original cognitive system according to the actual situation. The current situation of middle school students' aversion to learning is largely due to the fact that teachers use too many words during the teaching process or use vocabulary that does not match the students' existing cognitive level, resulting in learning difficulties for students. Even some teachers only recite the content from textbooks or courseware to students during teaching, which cannot fundamentally help students understand the knowledge. When teaching in the classroom, teachers should arouse students' interest in learning, transform the teaching content into familiar and easy to understand language, and provide timely and appropriate explanations of physics vocabulary. In addition, teachers should also control the teaching time within a certain range, follow the psychological development laws of students, and improve classroom efficiency.

3.2.2 Reasonably creating situational strategies

Physics originates from life, and people have developed the discipline of physics at different times in society to solve real-life problems or explain certain phenomena. Teachers should grasp this characteristic of physics in the teaching process. Students studying physics not only to cope with exams, but also to solve real-life problems. In the process of physics teaching, it is important for students to understand the importance of learning physics. Only in this way can students be more proactive in learning physics. The quality of teacher created scenarios directly affects students' classroom participation. Different physics knowledge, due to its different nature and exploration time and location, requires teachers to create different teaching scenarios.

Teachers create different scenarios to stimulate students' interest in learning and actively engage in the classroom. Different physical knowledge, ways of thinking, and problem-solving processes often vary greatly. Through the construction of scenarios, students can engage in thinking and promote their flexibility in thinking.

The reasonable use of resources in middle school physics teaching directly affects whether students can correctly grasp the knowledge they have learned. With the development of society, some examples in

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physics textbooks are no longer in line with the current social situation, which requires teachers to explore new scenarios based on the actual situation. For example, incandescent lamps and fluorescent tubes, which are often mentioned in textbooks, are no longer common in real life. Nowadays, lighting in society is mostly made up of light-emitting diodes. Some students do not have much understanding of physical objects, so teachers need to pay attention to the way they introduce them when creating scenarios. They should not neglect them in a single sentence. Otherwise, creating scenarios based on the principles and physical characteristics of incandescent lamps may confuse students, applying this property to fluorescent tubes or light-emitting diodes can hinder subsequent physics learning.

By creating scenarios, teachers enable students to have a more direct understanding of the relationship between the physics knowledge they have learned and actual life, building a bridge that can connect existing life experiences with the new knowledge they have learned, making it easier for students to categorize and consolidate their knowledge.

3.2.3 Teaching strategies for demonstration experiments

Teachers should conduct demonstration experiments based on experimental principles and actual situations, and strive to enable students to also participate in the demonstration experiments. The development of physics cannot be separated from experiments. It is through the continuous experimentation, observation, and deduction of predecessors that the current formulas and theorems have emerged. Students need to have a clear understanding of a certain physical concept through demonstration experiments, but demonstration experiments are not so many as precision, and not all experiments need to be demonstrated in the classroom. Teachers should have a correct view of the purpose of classroom demonstration experiments. Through demonstration experiments, teachers should enable students to have a clear understanding of the conceptual theorems related to the experiment, and through cooperation between teachers and students, deduce and summarize formulas to cultivate students' experimental abilities.

When conducting demonstration experiments, teachers should ensure the accuracy of the experiment and take into account all students. Some experimental equipment is relatively small, and only some students can observe experimental phenomena during the experiment. This requires teachers to use multimedia technology to amplify experimental details, explain experimental steps, remind students to pay attention to relevant experimental content, and grasp the key points of the experiment. Ensure that experiments can help students learn physics knowledge, rather than just formality. If students treat it as magic or performance, the experiment will be ineffective.

Teachers can design their own experiments based on the knowledge to be taught in the classroom and conduct experiments using materials from daily life. Students can hands-on use the physical objects around them for experiments outside of class, enabling them to perceive the fun and practicality of physics experiments, transforming life into a physics classroom, and improving the connection between the classroom and life.

3.2.4 Collaborative exploration strategy

Physics teachers should attach importance to cooperation between students in their teaching. The recent development zone of Soviet psychologist Vygowski pointed out that there are two levels of student development, one of which refers to the current level of students' ability to solve problems through their own efforts, and the other level is the level of ability to solve problems under the guidance of teachers or more capable peers. The teaching object faced by teachers is a collective, and different members of the collective have different levels of psychological development and recent development zones. Some students can easily understand a certain physical phenomenon and the operation method of physical experiments, while some students find it difficult to accept. Different students have different levels of acceptance of the same content, which can easily lead to a decline in their grades and a loss of interest in physics.

Group discussion method is a teaching method that can alleviate the dull atmosphere in the classroom and enhance the learning interest of students with learning difficulties. When teachers group students, they need to have a sufficient understanding of the students and purposefully group them according to their own situation. Ensure that members within the group can complement each other in temperament types and have unique thinking levels. The comprehensive level of members between groups is balanced. In this way, students can make common progress in cooperative learning.

Teachers should organize cooperative learning according to the actual classroom situation. cooperative learning is only an auxiliary teaching method in the teaching process. Teachers must find the

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right time to carry out cooperative learning. When students encounter obstacles in thinking when learning and are difficult to carry out, the way of group cooperative learning can enable students to solve problems in learning through their own efforts.

3.2.5 Self-reflection strategy

Middle school physics classrooms should strive to be lively and interesting, so that students can experience the joy of learning physics. The application of self-reflection strategies can regulate dull classroom environments and improve students' learning enthusiasm. The level of physical and mental development of middle school students is not yet complete, and their ability to learn independently is weak, making it difficult to form a sense of self-reflection. Teachers should use appropriate teaching strategies in teaching to help students learn to reflect and fill in gaps in reflection. For example, when students are training exercises, ask them to classify the exercises and think about which physics knowledge points they have applied; When there are errors in exercise exercises, urge students to summarize and reflect in a timely manner and further explore and think. There are several ways to solve this problem, and how to avoid similar problems from making mistakes. Help students establish an orderly knowledge system, deepen their understanding of conceptual formulas, and cultivate the habit of self-directed reflection.

Teachers should learn to reflect on their own and not only focus on the form of post class summaries, but also make them truly effective. Teachers reflect on the classroom teaching process and student learning outcomes, thereby improving classroom organization. Teachers should reflect in various ways, such as using video devices to record and review the class process, in order to identify problems in their teaching.

The strategy of self-reflection is not limited to form, but rather to truly expose one's own problems and strive to find corresponding solutions to enable teachers and students to progress together and improve classroom efficiency.

3.2.6 Network assisted teaching strategies

Online education is an educational model that has emerged in recent years, aiming to enable students to learn online without leaving their homes. With the development and popularization of mobile internet, network assisted teaching has been put into practice in daily life. Students who lack understanding in the classroom can learn independently through online video calls with teachers or related application software at home. The development of technology has also made it possible to improve the efficiency of online teaching by using artificial intelligence technology to analyze students' class status and promptly remind them to adjust their learning status.

4. Conclusion

Physics, as an important natural science, will have a wider application in future society and require more talents in the field of physics. Physics teachers shoulder an important historical responsibility to enhance students' interest in learning physics and cultivate their core competencies in the field of physics. This requires physics teachers to constantly update their teaching methods and improve the efficiency of physics classrooms. There is still great room for exploration in the application strategies of teaching methods in physics teaching. Teachers should establish the concept of lifelong learning, keep up with social development, pay attention to the environment and cutting-edge technological trends in which students live, and truly become "learning oriented" teachers. I hope that in the future, more teachers will innovate teaching methods and explore more effective application strategies based on their practical experience and combined with the laws of students' psychological development.

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