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Strengthening the Popularization Education of Applied Knowledge in Middle School Physics Teaching

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Abstract: With the continuous progress of the times, the goal of teaching has gradually shifted from accumulating knowledge to cultivating more comprehensive abilities and improving students' core literacy. With the implementation of the new curriculum reform, middle school teachers at all levels also intentionally cultivate students' core competencies in the teaching process, but significant results cannot be achieved due to various factors. This article aims to improve the previous teaching structure, teach students how to learn, and enhance their ability to flexibly apply knowledge by strengthening the application of knowledge in middle school physics teaching. Strengthening the application of knowledge in teaching, on the one hand, enhances the application of knowledge from other disciplines such as educational psychology in the teaching process of teachers, helps students understand physics knowledge, and thus establishes a systematic knowledge network. On the other hand, increasing the proportion of physics knowledge learned by students in classroom teaching, improving teaching methods, changing consolidation question types, and handing over the classroom to students. The teaching methods and models explored in this article to improve knowledge application can help teachers activate the classroom atmosphere, optimize teaching content and structure, and ultimately promote students' comprehensive development.

Keywords: Physics Knowledge; Physics Teaching; Knowledge Application; Classroom Teaching.

1. Introduction

1.1. Strengthening the Application of Knowledge in Middle School Physics Teaching and Popularizing Education Topic Background

With the progress and development of the times, competition among countries around the world has become increasingly fierce. In the era of knowledge economy based on knowledge innovation and ability application, in order to improve China's comprehensive national strength, China has also vigorously advocated improving the basic quality of workers in recent years. However, improving the quality of workers and even the overall quality of the population cannot be separated from quality education, so many countries have turned their attention to improving education mechanisms. In the science curriculum standards of South Korea, it is proposed to strengthen students' ability to understand scientific phenomena, principles, and laws, so that they can consciously learn to apply basic scientific methods and develop creative problem-solving skills. With the decline of education since the 1980s, the new reform of physics education in the United States has put forward new requirements, including the requirement to incorporate new knowledge and content from technological developments since the 1970s into physics curriculum; Request to adapt to the development of technology, improve teaching methods and audio-visual teaching aids; It is required to fully utilize the wisdom and experience of technology professionals, arrange for these professionals to give lectures, part-time courses or speeches in schools, in order to enhance students' understanding of the application and practical value of physics theory [1] From this, we can see that many countries in the world, especially developed countries, have put forward new requirements for their own educational development. With the convening of the 19th National Congress, China has entered a new era of comprehensive development. The original teaching mode can no longer meet the needs of society, and the shortcomings of traditional classroom teaching methods are becoming increasingly prominent. In order to promote the development of education in our country, the new curriculum reform has clearly put forward the following requirements: "Teachers should strengthen active interaction with students in the teaching process, develop together, handle the relationship between imparting knowledge and cultivating abilities, pay attention to cultivating students' independence and autonomy, guide students to question, investigate, and explore, learn in practice, and promote students to actively learn with personality under the guidance of teachers. Teachers should pay attention to individual differences of students, meet the learning needs of different students, create a learning environment that can guide students to actively participate, stimulate students' enthusiasm for learning, cultivate students' attitudes and abilities to master and apply knowledge, and enable every student to achieve full development To achieve the above goals, we need to focus on the teaching process in classroom teaching, strengthen the connection between theory and practice, and enhance the application of physics knowledge. However, in the past, physics teaching in Chinese middle schools placed too much emphasis on the accumulation of knowledge and problem-solving methods, neglecting the cultivation of students' abilities, life philosophy, values, and other aspects. At the same time, rigid knowledge transmission in the classroom teaching process can lead to students developing habitual thinking, which is not conducive to the development of students' innovative thinking. After the implementation of the new curriculum reform, although teachers have noticed the importance of knowledge application, due to the influence of traditional concepts, they still overly emphasize knowledge-based teaching in the process of teaching physics concepts, greatly shortening the teaching of the formation process of physics concepts and making teaching only focus on results. Many teachers do not pay attention to connecting concepts with life and reality, and do not allow students to form a sensory understanding of the key points of physics concepts. Instead, they directly impart their summarized physical laws and formulas to students, causing them to only remember the surface meaning of these physics concepts without understanding their essence. This turns the process of physics teaching into a process of textual memory and understanding. Students' understanding of physics knowledge is scattered, independent, and does not form a close knowledge network. The physics knowledge learned through this method is obviously just an empty attic, which cannot exist for a long time, and students cannot feel the fun of physics as a science. Meanwhile, due to the influence of exam oriented education, most teachers believe that a teaching model that can achieve high scores is a good teaching model, and scores are obtained through doing exercises. Therefore, in classroom teaching, only a small part of the time is allocated for students to learn knowledge, and the rest of the time is used for repetitive practice. Although students have improved their exam scores by doing a large number of real and simulated questions, this is only a repetitive practice of problem-solving steps, which does not help students' innovative thinking. Instead, it can lead to students developing fixed thinking patterns and being accustomed to using daily practice methods to solve novel problems. This not only does not help solve problems, but also creates certain obstacles. In recent years, there have been more and more application type questions in middle school physics competitions and college entrance exams, with an increasing proportion of innovative questions. Although the knowledge points applied have not changed much, there have been many students who do not know which physics knowledge to choose to solve the problems. Therefore, it is urgent to help students build connections between physics concepts, form knowledge networks, and enhance their ability to apply innovation.

1.2. The Main Research Content of Strengthening the Popularization Education of Applied Knowledge in Middle School Physics Teaching

In response to the current situation and development requirements of classroom teaching, this design mainly conducts the following research: based on developing students' ability to analyze and solve problems, cultivating students' rigorous learning spirit, designing a reasonable and effective classroom teaching mode, optimizing classroom teaching content, helping teachers implement quality education, and ultimately achieving the effect of improving students' comprehensive literacy.

The main research content of this design includes the following parts:

One is to explore the concept of ability and its connection with knowledge and skills, and determine the ways and methods to cultivate students' ability to apply physics knowledge.

The second is to use constructivist learning theory and the characteristics of tacit knowledge to help students understand the implicit components of physics knowledge, construct physics scenarios, guide students to think independently, analyze problems, and discover the connections in physics knowledge on their own, so as to learn the implicit parts of physics knowledge well.

The third is to improve the classroom teaching structure. In the process of applying physics knowledge in teaching and practicing, this article links physics knowledge with real-life physics situations and combines physics experiments to exercise students' ability to analyze physical phenomena and cultivate their ability to apply physics knowledge to solve practical problems.

1.3. The Significance of Strengthening the Popularization Education of Applied Knowledge in Middle School Physics Teaching

Strengthening the popularization and education of the application of physics knowledge in middle school physics can effectively solve the phenomenon of emphasizing results over processes in the current middle school physics teaching process. Help teachers improve their past teaching habits, improve classroom teaching models, and enable effective physics teaching. By applying the physics knowledge learned in the past to introduce new knowledge and linking physics knowledge with physical phenomena, it not only exercises students' ability to observe and analyze phenomena, but also cultivates their ability to think independently, helps students establish a solid knowledge system, and improves their level of applying knowledge to solve problems. At the same time, in classroom teaching, mechanical calculations are reduced and emphasis is placed on creating physics scenarios, allowing students to analyze problems independently and use their learned knowledge to solve problems. This can break the rigid thinking of students who only know how to repeatedly use problem-solving routines, cultivate students' divergent thinking and innovative ability, and ultimately enable students to achieve comprehensive and healthy growth.

2. Exploration into Cultivating the Ability to Apply Knowledge in Physics Teaching

2.1. General Statements about Abilities

Given that the ultimate goal of this study is to cultivate students' core competencies and improve their ability to analyze and solve problems using physics knowledge, the author has consulted some psychological works to gain a certain understanding of their abilities. Ability refers to the individual psychological characteristics that affect the smooth completion of activities, and is divided into general abilities and special abilities. Psychology originated from Aristotle's "On the Soul" written in the Greek period, where it first appeared as "Psyche". Nowadays, it is believed that psychology is a function of the brain, a response of the human brain to the objective world, and has subjective initiative.

Personality psychological characteristics, different from other psychological phenomena, are the characteristics that individuals can stably express through long-term accumulation in the process of psychological activities, and are a psychological phenomenon that can highlight individual differences. Therefore, the formation of abilities is dependent on external things, perception, memory, and thinking, requiring long-term accumulation. Psychological factors such as emotions and willpower also have a certain impact on it, reflecting the subjective initiative of abilities.

This article mainly aims to cultivate students' knowledge application ability and teachers' educational teaching ability by strengthening the proportion of knowledge application in physics teaching.

2.2. Differences and Connections Between Abilities, Knowledge, And Skills

A person's inability to complete a task may not be due to a lack of ability, but rather a lack of basic knowledge and corresponding skills to solve the problem. Therefore, it can be seen that ability is not equivalent to knowledge or skills. In concept, knowledge is a summary of past cognitive experience, skills are an automated way of activity through long-term practice, and abilities are a psychological level demonstrated when summarizing and applying experience and training skills. Secondly, ability is formed through continuous application of knowledge and training skills, and compared to the formation of knowledge and skills, the formation of ability occurs later. Finally, knowledge and skills are more specific, while abilities are more abstract. Therefore, in the past, our examination system only tested students' knowledge and skills, making it difficult to determine their level of ability. This indicates that the previous view of prioritizing scores is incorrect. At the same time, it also reminds us teachers to pay attention to cultivating the development of students' abilities when imparting essential knowledge and skills to them.

Although abilities differ from knowledge and skills, there is a close connection between the three. On the one hand, the formation of abilities is based on proficient mastery of knowledge and skills, and only by mastering certain basic knowledge and skills can abilities be developed. For example, in the process of observing the natural environment, the differences in students' observation and thinking abilities are manifested by their varying degrees of knowledge and skills in mastering things. On the other hand, the level of personal ability has a certain impact on the mastery of knowledge and the formation of skills. To put it in an extreme sense, when a person lacks the ability to observe, analyze, and think about problems, they cannot actively acquire knowledge from the outside world and thus cannot develop skills. And people with strong abilities can easily find key points when facing problem situations, quickly analyze and solve problems, and acquire knowledge. Similarly, their ability to apply knowledge can also accelerate the formation of skills.

Obviously, in order to improve students' ability to apply physics knowledge, it is necessary to first focus on their learning and practice of physics knowledge. In classroom teaching, emphasis should be placed on the extensive application of knowledge to establish a solid knowledge structure and cultivate their ability to apply physics knowledge.

3. Construction of Physics Knowledge Network

3.1. Characteristics of Physics Knowledge and Teaching Theory

Physics is a discipline that originates from natural life, and physics knowledge is derived and summarized from various natural phenomena in daily life. At the same time, in order to achieve rapid development in natural science and modern science and technology, it is necessary to rely on continuous innovation in the field of physics and the application and transformation of physics knowledge. But whether it is textbooks or other teaching materials, they are only carriers of knowledge. Many teachers only focus on teaching textbook knowledge. Accumulation of knowledge is important, because without knowledge, applying knowledge is just empty talk. However, we need to be clear about the purpose of learning knowledge? It is to apply the learned content to daily life. Academician Wu Jieping of the Chinese Academy of Sciences once said, "Knowledge is not a skill. Knowledge needs to be transformed into a skill through thinking and practice. Therefore, in the teaching process, attention should also be paid to cultivating students' ability to apply physics knowledge. It is necessary to guide students to observe various phenomena in daily life, discover problems, analyze problems, distinguish the physics knowledge contained in them, and then use the learned knowledge to find solutions to problems, in order to achieve the transformation of knowledge into ability. In this process, students not only learn new knowledge and exercise their ability to apply it, but also experience the fun of physics problems, which is conducive to cultivating their interest in learning physics.

3.1.1. Characteristics Analysis of Physics Knowledge

The first step in developing the ability to apply physics knowledge is to acquire it. To effectively acquire solid knowledge, we need to start from the characteristics of physics knowledge itself and the teaching process.

It is well known that physics is difficult to learn, and many students have the phenomenon of "understanding at first listen, understanding at first glance, and making mistakes as soon as they do it" during the learning process. The root cause is that students do not have a deep understanding of the newly learned physics knowledge, and are unable to transform it into their own abilities to solve physics problems. Compared to junior high school, high school physics knowledge has the following characteristics: 1)The depth of knowledge understanding deepens, and many of the knowledge learned in junior high school will be further studied in high school, shifting from qualitative discussions to quantitative calculations. For example, from knowing the influencing factors of kinetic energy to mastering the concept of kinetic energy, one can now calculate the magnitude of kinetic energy. 2)The breadth of knowledge has expanded, and high school requires learning many unfamiliar knowledge compared to middle school, such as Newton's law of universal gravitation, the synthesis and decomposition of forces, the first law of thermodynamics, etc. 3)The demand for knowledge and ability has increased. Compared to junior high school, high school students not only need to have the ability to acquire physics knowledge, but also the ability to apply physics knowledge. It requires students to develop the ability to learn independently, master the methods of researching physics phenomena, and be able to use physics knowledge to analyze phenomena in life and solve problems.

Obviously, the learning of physics knowledge in high school is more difficult, and students find it harder to understand physics. With the implementation of the high school course selection system, there has been a phenomenon where students dare not learn physics, and the proportion of high school physics classes has significantly decreased. The abstract and complex nature of physics knowledge itself, the indescribable nature of physical concepts, and the individual differences make us have to face the fact that physics knowledge has a high implicit content. To make students learn physics well and find it simple and interesting, the first step is to solve the problem of ineffective teaching of implicit knowledge in the teaching content.

Based on the characteristics of the mutual transformation between explicit and implicit knowledge, teachers should attach importance to the application of implicit knowledge from the following aspects.

(1) Change the teaching mode: The teaching mode should focus on students' "learning". The traditional teacher centered teaching mode usually directly hands over physics knowledge in the textbook to students through teachers' course lectures and demonstration analysis. This can enable students to quickly acquire systematic and complete explicit knowledge. Although this knowledge can quickly solve problems with specific situations, when the problem situation changes, students cannot make corresponding changes, cannot be flexible, and even hinder the solution of the problem. The student-centered teaching model emphasizes the importance of the learning process and requires students to participate in the process of knowledge acquisition. Teachers provide scenarios with physics knowledge, allowing students to self guide and explore the generation of knowledge, and acquire physics knowledge through independent thinking and active exploration. The knowledge obtained by students through independent exploration can be effectively applied through analysis and reorganization even when encountering new problem situations.

(2) Searching for implicit connections in physics knowledge: The compilation of physics textbooks follows a certain order, and many previously learned physics knowledge serve as a proof basis for future physics studies. Based on this, teachers can use previously learned knowledge to help students understand the formation process of current physics concepts, explore the implicit components of current knowledge, and enable students to establish connections between the physics knowledge they have learned, forming a solid knowledge network.

Emphasize the dissemination of tacit knowledge within the group: Through group interaction, students can articulate their understanding of physics knowledge, transforming their inherent tacit knowledge into explicit knowledge. At the same time, after reflecting on and analyzing others' perspectives, students can improve their understanding of physics knowledge and transform explicit knowledge into tacit knowledge. And some teachers find that students always have incomplete knowledge mastery or incorrect understanding after teaching, which is caused by the lack of attention to group communication. On the contrary, when teachers use various methods to create a good learning atmosphere for students, their understanding efficiency of physics knowledge will significantly improve.

3.1.2. Theoretical Methods of Physics Teaching

To stimulate students' enthusiasm for learning and cultivate a good educational atmosphere, the creation of classroom teaching environment and knowledge scenarios is particularly important [2]

Constructivism holds that the learning process is an active and constructive process by educators, rather than passively receiving external information. It involves actively and selectively perceiving external information based on existing cognitive structures to construct the meaning of perceived things. Similarly, in physics teaching, attention should be paid to the learning process, and students should not be solely required to remember these physics knowledge. Instead, students should be encouraged to actively apply their existing physics knowledge to new physics concepts through exploration. Therefore, in the process of teaching, teachers should not simply teach physics knowledge from textbooks to students. Instead, they should actively create different physics scenarios for different teaching contents, so that students can have a full sensory understanding of the physics knowledge they will learn, and then guide them to connect new knowledge through existing knowledge and experience, allowing students to naturally accept the content they are learning.

Because the existing knowledge and experience of middle school students have differences and uniqueness, the new knowledge constructed by students based on their existing cognitive experience is also unique. Similarly, in the process of teaching physics knowledge, teachers should not simply impart their understanding and analysis of physics knowledge to students. Instead, they should act as guides for students to connect the new knowledge contained in physics scenarios with the knowledge they have previously learned and mastered, allowing students to explore independently. Only in this way can their own knowledge network be formed in their brains.

At the same time, because each student has a different understanding of the physics knowledge they have learned, the knowledge structure formed when learning new knowledge is different. Therefore, there will inevitably be deviations in students' understanding of physics knowledge. When the deviation is large, there will be misunderstandings. If teachers do not discover it in a timely manner, this erroneous understanding will remain in students' knowledge framework, which not only has no effect on the extraction and application of physics knowledge, but also hinders students' future learning. Therefore, what we advocate for students to learn on their own is not only to require teachers to create good scenarios in the teaching process and guide students to use existing knowledge to learn new knowledge, but also to ensure the correctness of learning outcomes. Constructivism believes that the construction of knowledge scenarios is not arbitrary, but should be discussed with others, including students and teachers, students and students, to ultimately reach a consensus, and constantly adjust and modify on this basis, in order to construct a correct knowledge network that belongs to oneself. Meanwhile, social and cultural factors will also have a certain impact on knowledge construction during this process. For example, due to the long-term exam oriented education in China, both teachers and students have become accustomed to the extensive accumulation of various knowledge, which is obviously unfavorable for knowledge construction. However, strengthening the application of knowledge in the teaching process and allowing students to understand the connotation of physics knowledge is undoubtedly beneficial for knowledge construction. Therefore, in the process of teaching new physics knowledge to students, we also need to strengthen the application of physics knowledge, which will be beneficial for the construction of students' knowledge structure system.

4. Applied Knowledge Teaching and Ability Cultivation

4.1. Building Physical Scenarios to Acquire Physical Knowledge

With the continuous reform and updating of China's education system, physics, as an important subject in science education, should change its traditional knowledge-based teaching approach, abandon the teaching method of simply imparting knowledge in the teaching process, and transform teaching ideas. Integrating science education with modern teaching, cultivating students' innovative spirit and practical ability, enhancing students' interest in exploration, and improving their overall learning quality [3]

A large number of universal and extensive examples have proven that it is necessary for students to gain indirect experience through textbook learning when they first come into contact with a certain physics knowledge. However, teachers should avoid directly imparting knowledge from textbooks to students, because this teaching method makes it difficult for students to have a deep understanding of physics knowledge, making newly learned knowledge easily fade away. At the same time, it does not demonstrate the unique charm of physics in the teaching process. If physics class is taught as a Chinese class, students will lose interest in learning physics and feel bored with it over time. If teachers can introduce real-life phenomena that reflect this physics knowledge into the teaching process and create suitable contexts for students to explore the process of knowledge formation on their own, this can not only stimulate students' curiosity and enhance their interest in learning physics, but also exercise their ability to observe and analyze phenomena, laying a solid foundation for knowledge acquisition.

When learning about factors that affect kinetic energy, the magnitude of kinetic energy can be determined by converting it from other forms of energy, allowing students to distinguish differences in kinetic energy magnitude based on the knowledge they have already learned. You can use the knowledge you have learned to create the following scenario: Group four small balls in pairs, with two balls of equal mass in each group, and let them fall freely from different heights. In another group, two small balls of different masses fell from the same height. Compare the kinetic energy of the small balls in the two experimental groups when they land, and determine the factors that affect kinetic energy. In this scenario, only kinetic energy does work, and gravitational potential energy is converted into kinetic energy. Therefore, the relative magnitude of the kinetic energy of the ball when it falls to the ground can be obtained based on the relative magnitude of the original gravitational potential energy of the ball. While learning new knowledge, it is also beneficial to review and apply existing knowledge, which is conducive to cultivating students' ability to apply physics knowledge. Or create the following scenario in relation to daily life: for the same electric bike, when a person rides on it, the speed of electricity consumption is positively correlated with the speed of cycling. And when the electric vehicle maintains the same speed but takes one more person, the consumption rate of electricity will definitely be faster than when one person is riding. In this scenario, the common kinetic energy of the electric vehicle and passengers can be intuitively observed from the consumption rate of electric vehicle power, deepening students' understanding of the factors affecting kinetic energy. After creating these two scenarios, let students conduct independent research to form a unique understanding of the factors influencing kinetic energy. Then, let students discuss and analyze with each other to obtain correct and individualized conclusions. At the same time, after obtaining the conclusion, students' comprehensive application ability of knowledge can be further cultivated. For example, teachers can ask students which phenomena in their lives can reflect the influencing factors of kinetic energy. Are there any other experimental plans that can be used to study? Further deepen students' understanding of knowledge.

Teachers can also attract students' attention through demonstration experiments before the start of classroom teaching, stimulate their motivation to explore physics knowledge through experimental phenomena, and then use demonstration experiments to encourage students to actively participate in the physics teaching process. By generating experimental phenomena through autonomous operation, students can have a clearer perception of the process of phenomenon generation, which helps to explore the causes of phenomena and enable students to acquire physics knowledge through independent thinking. This teaching method can effectively achieve the teaching objectives of "cultivating and improving students' observation ability, experimental ability, thinking ability, analytical and problem-solving ability, self-development and knowledge acquisition ability" in the new curriculum outline.

4.2. Cultivation of Physics Knowledge Application Ability

A large number of classroom teaching examples indicate that in order to cultivate students' ability to apply physics knowledge, it is necessary to start from the period when students acquire new physics knowledge based on their existing cognitive experience, further improve their physics knowledge structure, and continuously use existing physics knowledge to solve applied problems to exercise their physics knowledge application skills.

4.2.1. Analysis of Physical Problem Types

In the process of learning physics knowledge, various physics problems arise, and applying physics knowledge to solve physics problems is a necessary way to cultivate application ability. According to the characteristics of the physics discipline, physics problems can be divided into three types.

1. Conventional physics problems and unconventional physics problems. The characteristic of conventional physics problems is that they can be solved through existing cognitive experience, requiring only mental recall without the need for cognitive innovation. The characteristic of unconventional physics problems is that they are problems encountered for the first time and cannot be solved through existing cognitive experience. They require the formation of new cognitive structures through independent thinking based on existing cognitive experience to create solutions. Therefore, solving unconventional physics problems can effectively exercise students' ability to think independently.

2. Restricted and unrestricted issues. The problem of restrictive conditions refers to having clear and complete established states and target states, as well as clear and known pathways to reach the target state. The characteristic of non restrictive conditions is having an undefined established state, a desired ultimate goal, and an unrestricted solution path. The solution to such problems not only requires exploring unknown established conditions, but also requires students to have an open mind and boldly come up with solutions based on known conditions. Students' thinking needs to be creative.

3. Issues of integrative thinking and divergent thinking. The characteristic of amplitude dependent thinking problems is that there is only one final answer. The characteristic of divergent thinking problems is that they have an indefinite number of answers, so students are required to carefully analyze the problem and obtain as many results as possible when solving divergent thinking problems. In the process of

learning physics knowledge, students need to constantly apply and restructure existing physics knowledge, actively think, and innovate in order to analyze and solve problems with unconventional, non restrictive, and divergent thinking characteristics. In this process, students' ability to apply physics knowledge is also constantly improving.

4.2.2. Analysis of Exercise Questions in Physics Classroom

The traditional classroom teaching mode mainly involves teachers explaining and transmitting physics knowledge, allowing students to acquire systematic and complete physics knowledge. However, before students have a deep understanding of physics knowledge, they begin to consolidate and practice knowledge. Although this can achieve high grades, it neglects the cultivation of students' ability to apply physics knowledge [4] After extensive investigation and research, this article divides practice questions into two types based on whether they can effectively exercise students' ability to apply physics knowledge: conventional physics questions and applied physics questions. The essential difference between the two lies in whether they have practical life backgrounds and meanings.

Conventional physics problems have the characteristics of being patterned, abstract, and idealized. They are generally abstracted and simplified from practical problems or have no practical significance, only for the purpose of using physics knowledge. This type of question often deals with physics problems that students have already solved, and presents physics concepts in a familiar way in the question stem, with clear and complete expressions of the known conditions, solution process, and ultimate goal of the problem. Because students are familiar with this type of problem, they usually directly use the formulas and physics knowledge they have learned to obtain results. In this process, the proportion of students thinking is relatively low, and ordinary logical thinking is mainly used. Generally, applying known conditions directly to formulas can obtain correct results. After students finish learning Newton's second law, teachers usually arrange in class to calculate the acceleration a of an object given its mass m and the external force F acting on it, or to calculate F with m and a, and then calculate m with F and a. By repeatedly practicing around the formula and the physical quantities it contains, they can achieve the goal of flexibly using Newton's second law. However, students do not have a real purpose in this practice process, only to be able to derive results based on physical conditions and proficiently use formulas, without truly understanding physics. Although continuous practice has enabled students to accumulate physics knowledge and improve their proficiency in general skills, it has not effectively enhanced their ability to apply physics knowledge to solve problems. However, this type of question is commonly used in exam content due to its patterned, idealized, and abstract characteristics, which make it easy to test physics knowledge points. At the same time, conventional physics problems have clear problem-solving routines that can be mastered and automated through extensive practice. Therefore, teachers often use the "sea of questions" tactic in the teaching process to help students achieve higher grades. Obviously, proficiency in skills does not necessarily represent an improvement in abilities. Long term use of conventional physics questions to train and apply students' physics knowledge can lead to the formation of rigid thinking. From this, it can be seen that the traditional conventional teaching mode hinders the development of students' ability to apply knowledge learned in one field to other fields, making it difficult for students to transfer during the learning process.

Applied physics problems generally originate from various phenomena in daily life and have practical production significance. Its characteristic is that it is generally presented as a physical problem in daily life, and the known conditions contained in the problem are generally not fully presented. Some solutions and ultimate goals of the problem are uncertain and not unique to a certain extent. Therefore, solving such problems requires students to connect their existing cognitive experience with real life, explore unknown conditions in the problem, restructure knowledge structure, boldly guess, reasonably argue, and combine ordinary logical thinking with dialectical logical thinking. Students need to creatively and flexibly apply their cognitive experience. The process of solving this type of problem is to coordinate existing knowledge and experience to form a new cognitive module, which can not only enable students to form a clearer understanding of the existing physics knowledge structure, but also achieve the transformation from declarative knowledge to strategic knowledge. Compared to conventional questions, the long-term use of applied knowledge in the teaching process is beneficial for the development of students' application abilities and facilitates the generation of transfer in the learning process.

Physics originated in life, and nature must also be applied to life. Students often tend to directly rely on their life experience to provide answers when solving practical problems, without considering the physics knowledge involved, resulting in empirical errors. In the teaching process, teachers closely link basic physics knowledge and theory with practical life, so that students must base their thinking and problem-solving on physics theory. This is conducive to students forming the habit of observing physical phenomena around them in daily life, thinking in conjunction with physics knowledge, constantly learning physics applications, and improving their ability to apply physics knowledge to analyze and solve practical problems [5]

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