

The Advantages of Ideological and Political Education of Middle School Physics and The Matters Needing Attention in Its Implementation

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Abstract: Physics is one of the compulsory natural science courses in middle school. There are many abstract concepts and formulas in physics curriculum, which requires students to have certain logical thinking, physical image imagination ability, problem analysis ability, etc. These require students to have strong learning ability. The ideological and political education of curriculum is a new requirement of the current middle school education and teaching reform. The core problem of the construction of ideological and political education in physics teaching is to integrate ideological and political education into physics teaching so that the two can complement each other and promote each other. This paper analyzes the advantages of ideological and political education in middle school physics, and gives some precautions for the implementation of ideological and political education. It is suggested to cultivate students' ideological and moral character by virtue of the establishment of laws in physics, the scientific spirit and excellent character of physicists, so as to realize the unity of physics teaching and ideological and political education, and cultivate talents with comprehensive quality required by the times.

Keywords: Ideological and political curriculum, Middle school physics, Moral education, Physics teaching.

1. Introduction

The ideological and political education of the curriculum is an important starting point for our country to implement morality and cultivate people in the new era. Since the 18th National Congress of the CPC, educators all over the country have been thinking about and taking action on a series of issues concerning ideological and political education, including: who should be trained? How to cultivate people? For whom? The National Education Conference held in 2018 emphasized that we educators should adhere to the principle of cultivating moral character, strengthen ideological and political work in schools, and promote educational reform. Meanwhile, we should adhere to the path of socialist education development with Chinese characteristics, and cultivate socialist builders and successors who develop morally, intellectually, physically and aesthetically in an all-round way.

Middle school physics has its unique advantages in ideological and political education. These advantages are reflected in the emphasis on scientific and realistic attitude in physics teaching, the courage to explore, and the promotion of the excellent quality of the Chinese nation's hard work. This paper analyzes the main advantages of ideological and political education in physics in middle schools, and points out the problems that should be paid attention to in the integration of ideological and political education and knowledge teaching.

2. Infiltrate the Attitude of Seeking Truth and Exploring Bravely in The Process of Physics Teaching

In the history of physics, scientists must maintain a realistic and rigorous attitude in the process of exploring the laws of physics. The study of physical knowledge is the exciting point

of the spirit of seeking truth and daring to explore, and also the gathering point of the cultivation of the spirit of seeking truth and daring to explore for middle school students. With the deepening of physical knowledge, the learning difficulty is also increasing. These put forward higher requirements for students' abstract thinking ability and understanding. In the whole process of physics learning and exploration, many students may fear physics. Some middle school students may gradually lose confidence and lead to learning burnout. The direct reason for the above psychology is often the lack of interest in physics learning. Therefore, teachers should appropriately choose the problems and assignments with medium difficulty, so that students can continue to gain successful experience, improve their self-confidence, and thus increase their interest in learning. At the same time, pay attention to guiding students to face failure frankly. Make students realize that the scientific inquiry process of physical knowledge is a process of constant "trial and error", and they should be brave to explore and try. For example, in combination with the teaching content, students were told that Edison invented the electric lamp and tried nearly 1600 materials. After more than 6000 experiments, it was finally successful. Joule did more than 20 years of experiments to study the thermal work equivalent problem. In this process, teachers should give full play to their scientific literacy advantages, correctly guide students to change their wrong judgments about their learning ability, form a correct self-evaluation, and then improve students' learning confidence.

Here we take the experiment of "exploring the relationship between current, voltage and resistance" as an example to illustrate the above viewpoint. The teaching practice shows that students will face many "inquiry" difficulties in the experimental process, which will lead to the decline of students' learning motivation, even self-doubt, and finally lead to giving up the experiment. Teachers can use the above examples of scientists' repeated failures to encourage

students to explore boldly and seek evidence carefully. In fact, Ohm himself has experienced many setbacks in his exploration of Ohm's Law, which lasted for six years (1820-1826). And Ohm faced very simple experimental conditions at that time. For example, he had to design his own galvanometer, because the original galvanometer appeared in 1921. In teaching practice, we found that students generally understand the control variable method, but there are often mistakes in the description of the relationship between voltage, current and resistance, and there are wrong conclusions that "current is proportional to voltage" and "current is inversely proportional to resistance". Here, teachers can use analogical thinking to remind students of the similarities between the concepts of resistance and density. The other is to understand the "simultaneous and homogeneous" problem in the law. Voltage, current and resistance refer to the corresponding physical quantities in the same conductor or circuit section, and they are measured at the same time. It is not allowed to make mistakes. In teaching, we should encourage students not to be afraid of failure. In fact, Ohm got a wrong formula in 1825 and published it on the paper, which caused the scientific community to question him. But Ohm was not depressed, but determined to recover the influence and loss by continuing to explore. We use this knowledge of the history of physics to encourage students and cultivate their spirit of not being afraid of failure.

3. Cultivate Students' Patriotism and Spirit of Hard Struggle Through Physics Teaching

Physicists leave us not only the scientific spirit and scientific methods they embody in the process of seeking truth, but also the noble character, pure heart and other spiritual wealth they show. In the process of seeking physical laws, every physicist embodies various qualities, such as patriotism, sense of historical responsibility, the spirit of hard work, and the style of diligence and simplicity. Teachers should take advantage of the situation and introduce the qualities of those outstanding scientists to students in physics teaching. Using modern multimedia classes, we can show students the great sacrifices made by physicists for the national scientific and technological progress through videos and pictures. Through the materials, we can show the students their dedication spirit of not being afraid of hardship and being willing to be lonely. We should guide middle school students to gradually understand the history of the hard struggle of the Chinese nation, and then teach them to be ready to contribute to the rejuvenation of the country and the nation.

For example, when learning mechanics knowledge such as Newton's law and conservation of momentum, teachers can timely introduce our achievements. Today, China has not only completed the "Chang'e Flying to the Moon" imagined by ancient people, but also become a global aerospace power, and has entered the forefront of the world in the field of space exploration technology. When introducing the outstanding achievements of foreign scientists, teachers should pay attention to showing students the outstanding talents and excellent character of Chinese scientists in the excavation of physical knowledge background. For example, we can introduce the story of Qian Xuesen, a patriotic scientist, who gave up the superior living conditions abroad and returned home after overcoming many difficulties during the difficult

period when New China was relatively backward and a hundred pieces of waste were waiting for development. Let the students know why American soldiers think that one Qian Xuesen is equivalent to five divisions. Teachers can also introduce the story of Deng Jiaxian, who left his wife and children at the age of 34 and went to the desert to develop an atomic bomb. At that time, his daughter was only 4 years old and his son was only 2 years old. From then on, Deng Jiaxian remained anonymous for 28 years and dedicated his life to the cause of atomic bomb in China. He returned as a 61 year old white haired man and a patient with terminal cancer. The researchers of the atomic bomb sacrificed their family happiness and health, but it was the "heavy weapon of a great country" forged by scientists represented by Deng Jiaxian that saved the family resources for China to raise its prestige in the world. Especially today, China's aerospace industry has made a series of impressive achievements, including Shenzhou series spacecraft, Chang'e series lunar probe, space station, Beidou navigation system, etc. Let students understand these achievements can improve their interest in learning physics and stimulate learning motivation. At the same time, we can cultivate their sense of historical responsibility and national pride through these facts.

4. Problems Needing Attention in the Ideological and Political Implementation of Middle School Physics

(1). The starting point for the integration of ideological and political teaching and physical teaching should be reasonable and appropriate. Although the combination of political and ideological education and physical teaching has good advantages, it is difficult to achieve considerable results if the combination is unscientific and too stiff. At the same time, we should also pay attention not to occupy too much time and affect knowledge teaching. It is better to do it in a natural and logical way. Therefore, teachers should prepare classes in advance for this integration, fully explore the ideological and political elements contained in the physical laws and the raw materials of moral education, and conduct appropriate political, ideological and cultural education in combination with physical knowledge points to achieve the set goal of ideological and political education.

(2). The teaching method of combining ideological and political education with physics teaching should be reasonable. Physics is a subject based on experiments, and some physical concepts, basic laws and laws must be scientifically verified according to experiments. Teachers should let students understand and experience dialectics and scientific thinking in ideological education in the process of operation. Guess, analyze, reason and explore the physical laws. After finding the key point of the combination of ideological and political education and physics teaching, teachers should focus on teaching objectives, rely on textbooks and adopt reasonable teaching methods. For example, to stimulate learning interest through experiments, to mobilize students' subjective initiative through clever situational teaching, and to connect knowledge learning with production and life practice, etc. Each of the above methods has its specific scope of application and can be used alone or in combination.

(3). In the integration of ideological and political education and physics teaching, pay attention to layered teaching. The

basic requirement of ideological and political education is to organically combine ideological and political education with physical teaching and comprehensively improve students' comprehensive quality. Therefore, in the actual process of physics teaching, all students should be targeted. There are individual differences among students, and teachers must recognize and respect these differences. In the teaching process, teachers must pay attention to hierarchical teaching and teach students according to the outstanding problems existing in students. For example, some students lack motivation and confidence. Teachers can tell them stories about physicists who are not afraid of difficulties and setbacks. Let them learn to adjust their thinking when they encounter difficulties and face them positively. Some students are not strict enough and careless. For these students, we can talk about some painful experiences in the history of science. For example, the failure of the O-ring, a part of the rocket propeller, led to the explosion of the US space shuttle Challenger 73 seconds after liftoff, killing all seven astronauts. In the history of science, many scholars missed the Nobel Prize because of "carelessness", "taking it for granted", "indifference", and so on. Through these historical lessons, students' rigorous learning attitude was cultivated.

5. Summary

The main task of the current curriculum construction is to combine physics teaching with ideological and political education in middle schools. This requires teachers to have a deep understanding of the advantages of integrating ideological and political education into physics teaching. For teachers, the goal of physics teaching is no longer limited to teaching knowledge and skills, but to reasonably integrate

ideological and political education at an appropriate time to improve the ideological quality of students in an integrated way. This curriculum reform requires teachers to have advanced educational concepts. On this basis, scientific and reasonable teaching should be carried out on the basis of fully exploring the teaching materials and fully understanding the psychological characteristics of students. The reform requires teachers to effectively infiltrate ideological and political education in physics teaching, help students improve their ideological understanding and scientific knowledge, and provide a solid foundation for cultivating talents with excellent ideological and political skills and outstanding professional abilities.

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