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Analysis of the Integration of Physics History in the New Middle School Physics Textbooks

Zhichao Chen

Harbin Normal University, Harbin, Heilongjiang, 150025, China

Abstract: *This paper takes the integration of physics history in the new middle school physics textbooks as the theme, and discusses the form and function of physics history in the new textbooks. The research finds that the new textbooks have been improved in content, structure, teaching methods and other aspects, and pay more attention to the integration of physics history, which helps improve students' learning interest and innovation ability. This paper will start from the perspective of physics history, discuss how to integrate physics history into the new middle school physics textbooks and put forward some suggestions, in order to provide reference for further improving teaching materials and improving the quality of physics education.*

Keywords: *physics history, middle school, physics new textbook, integration analysis*

1. Introduction

As an important part of physics, physics history is of great significance for cultivating students' scientific literacy, stimulating learning interest and cultivating innovation ability. In recent years, China's middle school physics textbooks have been reformed continuously. The new textbooks have been improved in content, structure, teaching methods and other aspects, and pay more attention to the integration of physics history. The integration of physics history can help students better understand the development process of physics, understand the basic concepts and principles of physics, so as to better grasp the knowledge of physics.

2. The importance of introducing physics history

The history of physics is the development process of physics, which records the process of human understanding and exploration of the natural world. The study of the history of physics can help us understand the basic concepts and principles of physics, and grasp the essence and connotation of physics knowledge. At the same time, the history of physics is also an important part of the history of human civilization, which reflects the development process of human society and the progress of science and technology. Therefore, in the middle school physics education, it is very necessary to integrate the history of physics.[1]

3. The role of the history of physics in the new textbook

Stimulate students' interest in learning. The integration of the history of physics makes physics knowledge more vivid and interesting, which helps to stimulate students' interest in learning and improve learning effect. Take the seventh chapter of universal gravity and spaceflight as an example. At the beginning of the content, the textbook describes the exploration of the starry sky from ancient times to the maturity of the space industry in the 21st century. Through such a short narrative, students will have a strong interest in learning this chapter in the process of learning. At the same time, they can use the theoretical knowledge learned in the previous chapter to participate in the derivation process of this chapter, which to a large extent cultivates students' practical application ability.[2]

Cultivate students' scientific literacy. Through the study of the history of physics, students can understand the exploration spirit and scientific methods of scientists, and cultivate their scientific literacy. Take the free falling movement in the fourth section of chapter two as an example, the textbook introduces the movement of objects, discusses the principle of the falling process of objects with different weights, analyzes the views of Aristotle and Galileo. Teachers can guide students to think

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of themselves as ancient scientists, actively participate in thinking and discussion, and learn from scientists' scientific experiment methods, so as to achieve the purpose of cultivating students' innovative consciousness and thinking.[3]

Enhance students' national pride. In the development process of physics, the contributions of ancient Chinese scientists are countless, which are also introduced in the textbook. For example, in the lesson of Charge in Chapter 9 of the textbook, it is mentioned in the textbook that as early as the first century AD, the Chinese scholar Wang Chong proposed the concept of electricity. By introducing the history of physics, students' patriotism will also be greatly increased. In the teaching process, teachers can introduce the history of physics in a variety of ways, such as introducing the life stories of great scientists, major breakthroughs in physics, etc., and also introduce some historical and cultural relics related to physics according to the actual situation of the local.

Improve students' innovation ability. The integration of the history of physics enables students to better understand the practical application of physics and the exploration spirit of scientists in the learning process, which is conducive to improving their innovation ability. Take Galileo's ideal inclined plane experiment as an example. In the process of teaching the course, teachers can introduce the difficult scientific research conditions to students. In the era of Galileo, timekeeping tools were so crude that Galileo had to rely on his own pulse to time his experiments. Nevertheless, Galileo was still able to provide a theoretical basis for Newton's first law. After class, teachers can encourage students to use common items in life to demonstrate the experimental phenomena brought by physical laws, and improve students' innovation ability.[4]

4. The integration of physical history in the new textbooks

Integration of course content. The new textbook intersperses a lot of physical history knowledge in the course content, such as the life of scientists, the process of scientific discovery, the evolution of scientific theories, etc., so that students can understand the development process of physics while learning physical knowledge.

Integration of teaching cases. The new textbook integrates many examples related to physical history in the teaching cases, such as Galileo's free fall experiment, Newton's three laws, etc., so that students can better understand the practical application and spirit of physics in the learning process.

Integration of teaching activities. The new textbook designs many tasks related to the history of physics in teaching activities, such as making students simulate the experimental process of scientists and discuss the evolution of scientific theories, so that students can experience the development process of physics in practice and cultivate their innovation ability.[5]

5. Ractice of the history of physics in middle school physics education

In middle school physics education, the integration of the history of physics requires teachers to have certain teaching experience and teaching methods. The following are some practical suggestions:

Formulate a reasonable teaching plan When formulating a teaching plan, the integration of the history of physics should be taken into account. For example, arrange some time in the teaching plan to introduce the development process of the history of physics, so that students can understand the basic concepts and principles of physics. And according to the time nodes in the history of physics, the important knowledge points involved should be interspersed and linked by the history of physics. Take the problem of understanding the nature of light as an example. In the 17th century, Newton proposed the particle theory of light, which believed that light was a particle emitted from the luminous body to explain the reflection and refraction of light. At the same time, Huygens proposed the wave theory of light, which believed that light was the propagation of mechanical vibration in the "ether" medium, and successfully explained the phenomenon of light interference, diffraction and polarization, which could not be explained by the particle theory. In the 1860s, Maxwell established the electromagnetic theory of light, realizing that light is an electromagnetic wave, thus completely establishing the theory of light wave.However, from the 19th century to the early 20th century, people discovered a series of new phenomena (such as photoelectric effect, Compton effect, etc.) that could not be explained by the wave of light.Therefore, Einstein proposed the photon theory, which believed that light is composed of photons, perfectly explaining the experimental fact that light and matter interact to show particle nature. Finally, people realized that light has wave-particle duality.Finally, teachers can present the content on

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the blackboard in the form of mind maps.[6]

Adopt a variety of teaching methods. In teaching, a variety of teaching methods should be adopted, such as explanation, experiment, discussion, etc., so that students can better understand the content of the history of physics. For example, when explaining Newton's theory of mechanics, students can understand the basic principles of Newton's theory of mechanics through experiments. Teachers can give full play to multimedia technology, and link Newton's three laws in the form of animation demonstration and classroom explanation.

Guide students to learn independently. In teaching, students should be guided to learn the content of the history of physics independently. For example, students can find relevant information before class to understand the development process of physical history, and invite students to share the information they find in class. Not only can students better understand the basic concepts and principles of physics, but also can create an active classroom atmosphere.

Cultivate students' awareness of innovation. In teaching, students' awareness of innovation should be cultivated. For example, while explaining the history of physics, students can be guided to think about how to apply the knowledge of physical history to practical life, so as to cultivate students' awareness of innovation.[7]

6. Deficiency and improvement suggestions for the integration of physical history in new teaching materials

In the current high school physics teaching materials, the integration of physical history is still insufficient, which has a certain restrictive effect on cultivating students' interest in the subject, broadening their knowledge horizons and cultivating innovative spirit. This section will analyze the deficiencies of the integration of physical history in high school physics teaching materials, and put forward corresponding improvement suggestions.

6.1 Deficiency of the integration of physical history

The content of physical history is scattered and lacks systematicness. In the new high school physics teaching materials, the content of physical history appears in a scattered form, such as briefly introducing Newton's contribution when explaining Newton's laws of motion, or mentioning Faraday's experiment when explaining electromagnetic induction. This scattered way of introduction makes it difficult for students to systematically understand the development of physics history, and is not conducive to students' overall grasp of physics.[8]

Lack of in-depth mining of important figures and events in the history of physics. The introduction of the history of physics in the new textbook often only stays at the name of the scientist and his main achievements, lack of in-depth mining of the scientific exploration process, scientific method and scientific spirit. For example, when introducing Einstein's theory of relativity, the textbook rarely involves how he started from the thinking of daily life, and finally established the theory of relativity by insisting on the principle of invariable speed of light. This way of introduction makes it difficult for students to experience the exploration spirit and innovative thinking of scientists.[9]

Lack of connection between the history of physics and real life. The content of the history of physics in the new textbook is rarely connected with students' real life, making it difficult for students to feel the practical application value of physics. For example, when explaining the satellite movement, the textbook rarely mentions how satellite technology affects the communication and navigation of our daily life, making students' understanding of physics stay at the abstract theoretical level.

Lack of practicality. In the new textbook, the integration of physics history is mainly achieved through simple text narration and picture display, but lacks practical teaching content. This way is difficult for students to apply the knowledge of physics history they have learned to practice, and it is also difficult for students to gain practical experience and skills from it. Therefore, we need to add some practical teaching content of physics history in the new textbook, such as experiments, simulations and other ways to let students apply the knowledge of physics history they have learned to practice, and let students gain practical experience and skills from it.

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6.2 Improvement suggestions

Add an independent unit of physics history. Add an independent unit of physics history in the textbook, and systematically introduce the development process, important figures and events of physics in the form of special topics, which is helpful for students to comprehensively understand the history of physics and stimulate students' interest in physics. In addition, it is also possible to set up physics history knowledge competitions, research-based learning and other activities to let students have a deeper understanding of the history of physics.

Dig deep into the process of scientific exploration and scientific spirit in the history of physics. In the textbook, more attention should be paid to the introduction of the scientific exploration process, scientific methods and scientific spirit of scientists in the history of physics, so that students can experience the exploration spirit and innovative thinking of scientists. For example, when introducing Galileo's free fall experiment, it can be told how he finally overturned Aristotle's wrong viewpoint through precise experimental design and data analysis, thus enlightening students to be brave to question and rigorous and realistic in learning physics.

Strengthen the connection between physics history and real life. In the textbook, it should focus on strengthening the connection between physics history and real life, so that students can feel the practical value of physics. For example, when explaining electromagnetic induction, it can be introduced that the application of electromagnetic induction principle in generators, transformers and other devices, as well as the important role of these devices in daily life. In this way, it can help students to closely link physics history with real life, and improve their understanding and interest in physics.[10]

Incorporate interdisciplinary physics history content. In the textbook, it can be appropriate to integrate physics history content related to other disciplines to broaden students' knowledge horizon. For example, when explaining the atomic structure, it can be introduced that physicists and chemists cooperate to reveal the internal structure of atoms, so that students can understand the mutual influence and penetration of physics and other disciplines.

Introduce excellent physics history education resources at home and abroad. In order to enrich the content of physics history in the textbook, excellent physics history education resources at home and abroad can be introduced, such as famous physics history works, popular science books, documentaries and so on. These resources can help students to understand the history of physics more deeply and stimulate students' interest in the subject.

7. Conclusion

The integration of physics history can help students better understand the development process of physics, understand the basic concepts and principles of physics, so as to better master physics knowledge. In middle school physics education, a variety of teaching methods should be adopted to guide students to learn independently and cultivate students' innovative consciousness, so as to better integrate into physics history.

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