

# On the Necessity of the History of Physics Being Integrated into Physics Teaching in Middle School

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## Abstract

With the continuous innovation and development of teaching reform, not only the people-oriented teaching concept has been recognized by the public, but also various modes of education and teaching reform have developed vigorously. In this paper, according to the actual situation of the current physics classroom teaching, the interest of middle school students in learning physics and their understanding of physics history are preliminarily investigated and counted, and some basic conclusions are drawn: some extremely bad phenomena and problems exist in the current physics teaching, such as the students' interest in learning is not high, the students' knowledge of the history of physics is especially poor, and the teachers' evaluation of students is not scientific. Interest is the best teacher to teach learning. The history of physics has rich educational value, and the evaluation of education plays a very good role in promoting students' learning interest and learning effect. In this paper, the necessity and application of the history of physics in physics teaching in middle school are put forward based on the new physics curriculum standard and the research results of pedagogy and psychology.

## Keywords

Curriculum standard teaching material, History of physics, Physics teaching, Learning interest.

## 1. INTRODUCTION

At present, the society is entering a new period. A large number of professional technology and responsible talents are necessary factors to realize the great rejuvenation of the Chinese nation. Only those senior talents who have real scientific knowledge and humanistic knowledge can play a huge role in the development of the country and the rejuvenation of the nation. The fact that the development of science and technology is inseparable from the spirit of humanity has been clearly recognized. In today's science and technology society, the urgent tasks include the dissemination of scientific culture, the integration of science and humanities, and the promotion and transformation of humanistic spirit. In the process of teaching, to improve students' mastery of these two spirits by guiding them to learn more scientific knowledge and cultural knowledge has become the main topic in the field of education at present.

In human history and culture, scientific spirit and humanistic spirit are very important [1]. Scientific spirit, created by human beings in the process of pursuing truth in life, is manifested in methodology and world outlook. The so-called humanistic spirit mainly refers to the outlook on life and values that regulate and constrain people's activities, which is formed in the process of human self-development and improvement in life. Scientific spirit can promote the realization of humanistic spirit, and humanistic spirit can guarantee the correct direction of scientific spirit. As a basic subject, physics is not purely abstract and mathematical, but a lively and interesting subject. Physics should be the combination of humanistic spirit and scientific spirit. However, the education mode of attaching importance to science but not to humanity has been formed in China. As a popular education mode that transcends the traditional mode, it has

serious disadvantages. For a long time, China's basic education only pays more attention to the teaching of physical knowledge, but seldom to the cultural level of the physical discipline, so that its humanistic value is ignored and there is an extreme development tendency of "see nothing but people". In China, the lack of understanding of humanistic education for a long time makes students simply understand the development of physics. As the deepest humanistic spirit of physics can not be embodied, the teaching goal of physics teaching deviates from the direction of socialism aimed at cultivating scientific spirit. In order to make students establish a strict physical logic system, physics teachers spend a lot of time and energy to teach students conceptual physics and knowledge physics. However, the facts are not satisfactory. In fact, what most students need is curiosity and passion for science, understanding and criticism of science and technology and human life, and actively exploring the essence and value of human existence from the relationship between human beings, society and nature, rather than a very profound knowledge base.

## **2. THE THEORETICAL BASIS OF PHYSICS HISTORY BEING INTEGRATED INTO PHYSICS TEACHING IN MIDDLE SCHOOL**

Cognitive structure, cognitive development preparation and cognitive style are the main cognitive factors of students. Teachers should first consider the existing cognitive structure of students when teaching physics. In the process of learning, students' mastery of new concepts and laws is also a process from scratch to have and from less to more. "Scientific difficulties that are difficult to be tackled in the history of scientific development are often difficult points in teaching. The key breakthrough in the history of scientific development and the essence of the great contributions of the great masters of physics are the key points in teaching [2]." In the actual physics teaching process, teachers usually follow the arrangement of teaching materials to present the cognitive results of physicists on the physical world directly to students. Under the influence of traditional teaching, the cognitive process which needs students to establish actively has become a passive acceptance process, which is obviously contrary to the cognitive law of students.

## **3. THE EDUCATIONAL FUNCTION OF THE HISTORY OF PHYSICS**

In addition to helping students understand physics knowledge, properly introducing the relevant history of physics in physics class can broaden students' thinking of solving problems. The teaching of physics in middle school makes students understand the law of physics and learn how to use it. The history of physics is a process of recording human's seeking and mastering the physical truth. Only when the generation, evolution and formation of each basic idea, formula and method in physics are understood, can their practical significance be understood and applied. In addition to teaching the basic knowledge of physics, physics teaching should also introduce the relevant background to students. For example, because there is no state of no force in nature, it is difficult for students to imagine the corresponding physical situation in their mind when learning Newton's First law of Motion, so their understanding is very fuzzy [3]. If the different viewpoints in history, from Aristotle to Galileo to Newton, are shown in teaching so that students can fully understand the formation process of this physical thought, their wrong understanding can be naturally excluded. Only when the accurate physical image replaces the fuzzy point of view, can students really master the law of inertia. In real life, it is often controversial in physics that students have difficulties in learning. Therefore, teachers should tell students how physicists know the world in the corresponding teaching, which is conducive to promoting students' real understanding of this series of problems.

Introducing the history of physics into the teaching of physics is of great help to broaden students' vision and literacy. Not only can students' scientific and cultural literacy be improved in the process of middle school education objectives, but also physics class can play an important role. The purpose of physics teaching in middle school should not be limited by the specific physical knowledge, but should pay more attention to the improvement of students' quality. The history of physics will play a subtle role in this process [4]. By introducing the history of physics into physics class, the way that physicists understand the world runs through the teaching and restores the original face of scientific discovery.

By introducing the history of physics, students' scientific attitude can be promoted to develop quickly. The infiltration of the history of physics in physics teaching elaborately expounds the formation process of physics knowledge through a series of wonderful examples to tell students that every little progress in physics in history is hard work of predecessors. Thus, students can look at physics from the perspective of development, develop a scientific attitude of daring to doubt and criticize, and then form the ability of independent thinking and judgment, stimulate the desire to learn, and make full use of their personality when learning physics. Finally, the introduction of the history of physics can help students master the effective methods of learning. Compared with simply mastering the subject knowledge, mastering the effective method of learning is much more important, which is also the focus of the current education and teaching reform and research. The effective learning method mentioned here does not simply refer to the "problem-solving method" of how to solve problems, but the method of finding, proposing and solving problems, which is the basic method of scientific discovery. There are a lot of materials in the history of physics worth digging. Good use of these materials can make students be influenced by scientific spirit and trained by scientific thinking in the process of learning physics, which is conducive to the improvement of students' scientific literacy.

## **4. THE FUSION OF THE HISTORY OF PHYSICS IN TEACHING**

### **4.1. The History of Development Has Become the Main Thread in Teaching**

The history of physics is the history of human exploration of the unknown world. Every new discovery in physics will bring new knowledge [5]. In addition to enabling students to master physical knowledge, physics teachers can also make students interested in explaining the discovery process of relevant knowledge when teaching physical knowledge.

#### **4.1.1. Scientists Become Role Models for Students to Study and Seek Knowledge**

The development of physics, as the result of the hard work of numerous scientists, the personality charm of scientists in the process of exploring the unknown world, and a good example of students' life, requires teachers to teach physics knowledge in the teaching process and explain the scientific spirit of relevant scientists in the exploration of knowledge one by one, so that students' quality can be comprehensively improved. It is because Kepler did not ignore the deviation of the 8-point angle of the research data that Kepler's law were obtained, which gave a more correct description of the planetary motion. Faraday finally discovered the phenomenon of electromagnetic induction and summed up the law of electromagnetic induction after numerous failures; Although Einstein achieved a lot in his life, he was never satisfied with the status quo. In addition to studying the frontier of science, his unremitting efforts to unify field theory are very good proof. Teaching the personality charm of scientists can not only teach the teaching knowledge, but also let students understand how scientists work hard to become great people and how to overcome difficulties and dangers and finally get the truth.

#### **4.1.2. The Integration of Scientific Methods Can Improve Students' Ability and Open Their Wisdom**

Scientific methods play an important role in the acquisition of physical knowledge. It is also a very important aspect for physics teachers to acquire knowledge methods when teaching knowledge.

Compared with the knowledge of physics, the methods accumulated in the development of physics are much more important. Only when students learn to study actively, can their self-study ability be improved and the goal of learning without teachers be realized.

#### **4.1.3. Students' Interest in Learning Physics Can Be Better Stimulated By Integrating the Beauty of the History of Physics Into Teaching**

Human life is a process of continuous improvement. In terms of knowledge itself, physics is also a process of continuous perfection in the process of development. If physics teachers can fully present the beauty of physics knowledge to students in the teaching process, it will play a good role in students' interest in learning physics. Interest is the best teacher. After students have interest in physics learning, they will overcome physics, so that teachers can take physics teaching to a higher level [6]. Language should be concise, and physics concepts and laws should be concise and rigorous. Although the concepts and laws are summarized by physicists, they reflect the beauty of natural simplicity and the beauty of generalization of knowledge structure. The knowledge structure of physics is highly generalized. Physics, as a science of studying the laws of the existence, structure, movement and mutual transformation of natural substances, is quite complex. However, the description of physics on the existence, structure, movement and the law of mutual transformation of matter in nature is very general and concise. There is symmetry beauty in physics knowledge. Symmetry plays an important role in the development of physics. For example, the charge is divided into positive pole and negative pole, and the magnet is divided into S and N. The harmonious beauty of physics knowledge is embodied in the fact that there is no contradiction between different theories. Theory is mutually inclusive. The knowledge system of physics is integrated and becomes a perfect knowledge system.

The integration of the history of physics in teaching requires teachers to master the relevant contents that may be involved in the physics teaching in middle school according to the above aspects, so that the history of physics can be properly integrated into the teaching and the good promotion of the history of physics to the teaching can be realized.

#### **4.2. The Way of Integrating Physics History Into Physics Teaching in Middle School**

The reason why physics history education is carried out is to stimulate students' interest in learning physics, improve their cognitive structure, and improve their ability to analyze and solve problems [7]. In addition to being effectively implemented, the implementation of physics history teaching can not increase students' learning pressure. Therefore, the history of physics must be combined with teaching knowledge. Generally speaking, there is no professional syllabus and textbook in physics teaching in middle school, so physics education should be interspersed and organized in teaching knowledge. The so-called "combination" is to gradually carry out the education of the history of physics in combination with the teaching of the basic knowledge and skills of physics. In teaching, teachers should permeate the content of physics history at any time, so that students can be educated imperceptibly. The advantage of this method is that it not only does not need to occupy the spare time, but also can carry out effective teaching without increasing the burden of students' homework. As an effective way to carry out the education of the history of physics, classroom infiltration is an important way of the education of the history of physics. The teaching of the history of physics in middle school should be based on classroom infiltration, supplemented by special lectures [8].

## 5. CONCLUSIONS

In a word, infiltrating the history of physics purposefully in physics teaching in middle school is not only necessary but also feasible. However, in view of the tense learning in middle school, it is not recommended to set up the course of physics history alone, but to integrate physics history into classroom teaching, so that students' interest in learning can be inspired imperceptibly. In addition to helping students understand the importance of scientific thinking and scientific research methods, to let students experience the great course of scientists is also conducive to the cultivation of students' innovation awareness and ability, and to affect students' spirit of pursuing truth and never flinching for scientific dedication since childhood.

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