

On the Problems and Countermeasures of Physics Teaching from the Perspective of Culture

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Abstract: Physics is science as well as culture. The goal of physics teaching is to promote students' physical literacy and comprehensive quality. After studying physics teaching from the perspective of culture, we can understand the value of cultural education in physics teaching more clearly, which is the practical need of the innovation and development of physics teaching. This paper introduces the cultural attributes of physics, analyzes the superiority of physics teaching from the perspective of culture, points out the corresponding problems existing in physics teaching, and puts forward relevant countermeasures for reference.

1. Introduction

Physics is science as well as culture. In the long history of physics, a complete scientific system of physical theory, concept and laws has been gradually constructed, and a cultural system of thinking mode, research method and value concept has also been formed. In the physics curriculum standard, it is clearly proposed that “physics is an important part of human science and culture”. Therefore, the analysis of physical teaching from the perspective of culture is of positive significance to promote the development of physical teaching and the overall improvement of students' physical literacy and comprehensive quality.

2. The Cultural Attribute of Physics

Physics is a science in people's common understanding. Hence, many people will find it difficult to understand the idea that physics is also a kind of culture with profound cultural attributes. In fact, the word “physics” itself contains the meaning of nature. Therefore, physics is the subject of exploring the mysteries of nature. According to this view, physics, along with philosophy, art and history, are all produced in the process of people's exploring the surroundings they live in. They all have obvious motivations and are the inheritance and evolution of human culture. Thus, physics, as a basic discipline of modern science, is also an important part of human culture with a sound cultural value system and profound scientific and cultural foundation, which is embodied in the following three aspects:

First, physics has scientific motivation. The scientific motive of physics is the endless pursuit of truth, which means the awe of nature and the true love for truth. As the epitaph written by Kepler, a famous physicist, for himself, said, “I measured the skies, now the shadows I measure”. It is the hard work of countless scientists of all times that makes physics shine brightly in human history.

Second, physics is the inevitable result of the development of human culture. Since Galileo Galen laid the foundation, modern physics has developed for 500 years. This is a process of theoretical verification and theoretical development, and it never ends. This is not a logical necessity, and its essence is the result of the development of human culture, which profoundly reflects human's curiosity, query and exploration for the inherent laws of nature, which is also the ideological basis and emotional power to promote the continuous progress in physics.

Third, physics has inherent aesthetic characteristics. Physics has six characteristics of truth, harmony and unity, simplicity, symmetry, predictability and refinement, which are embodied in the beauty of laws, methods and thinking of Physics. All above are very beautiful in themselves. As physicist Yang Zhenning said in *Appreciation of the Beauty and Wonder of Science*: “Newton's

equation of motion, Maxwell equation, Einstein's special relativity equation, Dirac equation, Heisenberg equation All these have abstracted the essence of experimental work and phenomenological theory for several centuries and reached the highest level of scientific research. Thanks to them, the basic structures in the physical world could be written in extremely condensed mathematical language. Certainly, they are the beautiful poems of the creator. “

3. The Superiority of Physics Teaching from the Perspective of Culture

(1) It is helpful to arouse students' interest in physics. To improve the quality of physics teaching, it is necessary to know that teaching and learning are mutually beneficial. Good teaching can't be realized without the active participation of students. However, because most of the physics knowledge is abstract, it is usually hard for students to understand, which often makes them feel bored, so their interest in physics is not much. Physical teaching from the perspective of culture can connect abstract knowledge with cultural aesthetics, and explain knowledge through interesting cultural expressions, which will greatly stimulate students' interest. For example, when we explain something about spectrum, we can quote the poem “The sunlit Censer Peak exhales incense-like cloud”. The beautiful poem contains the principle of spectrum, so teaching then becomes lively, and students' would naturally be more interested in it.

(2) It is conducive to the overall development of students' thinking ability. To learn physics well, apart from good understanding and memory ability, students also need good imagination and thinking ability. Physical teaching from the perspective of culture effectively highlights its aesthetic value, which makes the left and right brain of students develop synchronously, and the abstract thinking and visual thinking develop in a balanced way. This is of great significance for students' lifelong learning. In fact, Einstein, as a physical giant, he is also an excellent violinist, which is the best proof.

(3) It is beneficial to exert the moral function of physics. Physics is not just about knowledge imparting but also is the nurture of quality. In the history of physics, numerous outstanding physicists make history with their academic achievements. More importantly, with great personality charm, they also influence and inspire several generations to devote themselves to physics. Their adherence to the truth, dedication to the cause and many other good qualities are effective resources for moral education in physical teaching.

4. Problems in Physics Teaching from the Perspective of Culture

(1) Not paying attention to the students' experience. In the current physics classes, teachers are the absolute authority, for which the knowledge they teach is the truth. Students can only listen and remember passively, and seldom think and question actively. In the long run, a rigid teaching mode has been formed. Consequently, Students' subjective activity has not been brought into play, and the efficiency and quality of teaching are not satisfactory.

(2) No emphasis has been laid to the practicality of the discipline. Physics is a subject which highly combines theory with practice. In physics teaching, practice should be a very important teaching content. However, in the current physics classes, the thought of exam-oriented education still hovers. The teaching focus are all on the examinations, only emphasizing the theory explanation and recitation. Even in the physics experiment class, only a limited number of experiments can be carried out according to the requirements of examinations. Students have little opportunities to practice and explore, which seriously restrict the progress of their imagination and creativity.

5. Countermeasures to Improve the Quality of Physics Teaching from the Perspective of Culture

(1) Add the history of physics in teaching. The history of physics equals to the constant records of scientific exploration and struggle with traditional ideas. While teaching, adding the history of

physics can help students build up their reverence and persistence for the truth, and provide a solid ideological foundation and subjective motivation for them to learn physics well.

(2) Focus on the teaching of physical thinking methods. Physics teaching is not only about imparting knowledge, but also the training of scientific thinking mode, which is more important. In practice, teachers should not only teach students knowledge but also instruct them to explore its essence. Taking the specific teaching content and the actual situation of the students into consideration, teachers should present students the complete process of knowledge formation such as physical laws and definitions through flexible and diverse teaching forms, so that the students can experience various physical thinking methods such as hypothesis and reasoning, analogy, equivalent substitution, variables control, and gradually form a scientific way of thinking. Such kind of learning process is beneficial to students in their study of physics.

(3) Strengthen practical teaching. Practice is an important way to learn physics well. When it comes to strengthening practical teaching, on the one hand, we should improve the quality of physical experiment class through paying attention to the observation, experience and operation of each student in the class, and developing their correct attitude and method of physical experiment. On the other hand, teachers should encourage and guide their students to independently do practical activities, such as making them choose experimental supplies in person and do physical experiments in combination with their daily life; as for the same knowledge, encouraging them to do various forms of experiments to get inspiration after mutual comparison; and guiding students to complete experimental reports independently and write experimental experience so that they can combine the theory with practice, and cultivate good scientific research quality.

(4) Develop school-based courses and special activities that embody physical culture. To deeply explore physical teaching from the perspective of culture, we should extend the space of physical teaching out of the classroom. Considering curriculum system construction and characteristic activity development, the school should highlight the cultural aspect of physics and constantly innovate forms and channels as follows: establishing small physics laboratories for students to freely participate in, organizing physical culture salon, holding some special activities like inviting physicists into the campus, science and technology production competition and other activities. Actually, the school should create a strong physical culture atmosphere and guide students to participate in physical learning.

6. Conclusion

Improving teachers' humanistic quality and optimizing the evaluation system of physics teaching are both effective measures to improve the quality of physics teaching from the perspective of culture. Our physics teaching is not aimed to let every student become a physicist, but to let students form a scientific way of thinking, develop necessary physical literacy, and then promote their comprehensive quality. Therefore, we should respect the subjectivity of students in teaching, establishing a modern education concept that advocates science as the basis and humanity as the value orientation in the hope of further promoting the progress of physics teaching.

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