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Analysis and Reform of College Physics Course

Xingyu Liu

Guangzhou Maritime University, Guangzhou 510000, Guangdong, China

Abstract: With the rapid progress of science and technology in the current era, there is a growing demand for talents in all walks of life. In order to cultivate more excellent talents who are more adaptable to the times, school teaching is also constantly reforming. In this context, the teaching reform of College Physics also needs to be followed up in time to avoid falling behind the tide of the times. College Physics is a compulsory basic course for all science and engineering students. Learning college physics can provide enough basic knowledge for students to learn subsequent professional courses. By learning the experiences of physical characters, it can also lay a research idea for students, learn methodology, and help students to succeed in their subsequent learning life or practice, so that students can find fun in learning and take the initiative to learn, However, the traditional course of College Physics is used to preach the course according to the book and use ppt to tell the content of the textbook. Because the content of the textbook is very fixed, the teaching is also rarely changed. The backward teaching method is difficult to raise students' interest and thirst for knowledge. This teaching method is gradually difficult to keep pace with the times. In addition, the traditional teaching content of college physics is a combination of systematic and complete theoretical knowledge system and practical skills training process. The education of professional ethics and humanistic quality is only inserted into the teaching of relevant physical knowledge and theory in the form of selective learning or self-study, To a certain extent, the "ideological and political" function in the teaching content has been weakened. Therefore, it is imperative to reform the curriculum.

Keywords: College Physics, Content and strategy, Teaching design, Ideological and political construction.

1. Current Situation of College Physics Teaching

1.1. Analysis of college physics curriculum knowledge system

As a basic course, College Physics has many characteristics, such as a wide range of knowledge points, large capacity to understand, high learning difficulty, etc., so there is a certain degree of learning difficulty. As science and engineering students, they need to master learning tools. The complicated knowledge of physics is one of the reasons why students are afraid to learn. The current college physics curriculum is usually divided into mechanics, mechanical waves, optics, heat, electromagnetism, relativity and modern physics. Each part is both connected and independent, and each part is like a new discipline when students learn. For example, the mechanics part will talk about sports, teaching students to analyze various sports and how to transform energy in the process of sports, while heat can draw the laws of thermodynamics through the energy analysis of individual molecular motion, which can be extended to the energy analysis of the overall material according to the statistical laws. This process seems to be related, but when students learn, they will find that mechanics and heat have constructed a underlying logic from their own perspective, Mechanics is a system constructed from position vector, velocity and acceleration as the underlying logic. Thermology is a system constructed from pressure, volume and temperature as the underlying logic. Although the two can be connected by nature, they are two relatively independent learning processes when learning. Only when both are mastered can we further understand the relationship between them. Therefore, to learn college physics well is equivalent to learning seven courses, and students are afraid of difficulties. To solve the students' fear of difficulties has become the top priority in college physics teaching.

1.2. Analysis of students' learning situation

In addition to the problems of the curriculum itself, College Physics, as a public course, has a positioning problem. Although physics is an important tool in science and engineering, it is not used as frequently as mathematics, which is also a basic course. Because of the high use frequency of mathematics, although it is a public course, students can easily realize the importance of learning mathematics. In contrast, students are not easy to realize the importance of learning physics. Especially in the general university curriculum, students systematically learn various public courses in their freshman and sophomore years. Professional courses generally start to contact in their junior years. At this time, physics in public courses rarely has contact with other public courses, As a result, students will think that physics is a useless subject, so they will have a greater chance to reduce the priority of learning physics when dealing with complicated courses.

1.3. Analysis of relevant courses

The course of College Physics usually takes one to two semesters to complete. There are not many class hours in the course, but many learning contents. Many schools will speed up the progress of lectures, thus improving the difficulty of physics learning. At the same time, physics learning is not an independent time, and the lack of good mathematical foundation or the lack of association ability for physical models will make physics learning enter a bottleneck, leading to the occurrence of inability to learn and understand. Therefore, the teaching setup of physics related disciplines is particularly important. For example, higher mathematics and college physics start classes at the same time, or higher mathematics starts classes ahead of time but the teaching progress is slower than college physics. If students have not

mastered calculus, they will be exposed to college physics courses, and naturally cannot learn. The same situation also occurs in the course of college physics experiment. Physics and experiment themselves complement each other. Physics comes from experiments and is assisted by experiments. Experiments can enable students to better understand physics, and physical conclusions can also enable students to make more relevant experiments. Only when they are closely linked in teaching can they stimulate students' endless imagination and thirst for knowledge.

2. Reform Direction of Existing Problems in College Physics Teaching

2.1. Starting from the teaching content, introduce inquiry learning to stimulate students' interest in learning

Physics, as a science to explore various laws in the world, should be a very lively and interesting learning process in essence. However, if teaching is only text symbols of books, physics will become obscure words, so the use of auxiliary teaching aids and the participation of students in the teaching process can greatly stimulate students' interest. For example, when talking about mechanical waves, one of them is standing waves. The principle of standing waves can be described through words and simple animation, but students may soon forget it after learning. At this time, they just need to prepare rope skipping as a teaching aid to let one student pull one end of the rope, and another student shake the rope, changing the shaking frequency constantly, and the rope will gradually move from irregular shaking to standing waves, It is also possible to find that this process can form not only two standing waves, but also three, four or more standing waves. In this process, students naturally think about why standing waves can sometimes be generated, and sometimes not. Different standing wave numbers are caused by different methods they have adopted. When they start to think about these problems, record the data and analyze the conclusions from the small experiment, they must have a good understanding of this knowledge point. The key to stimulate students' interest in physics and learning is to give students a lively small experiment to carry out inquiry learning.

2.2. Starting from students, teaching should be close to life, subject frontier and students' major, and students should be guided to pay attention to

Some scholars believe that the essence of ideological and political education in physics curriculum is the cultivation of physical cognitive (scientific cognition) ability, including the construction of physical cognitive model (how to think), the training of physical methods (how to do things) and the cultivation of physical spirit (how to behave), which is actually the inheritance of physical culture[2]. College physics is a subject with strong theory, application and application. In the teaching process, it is easier to teach in line with the reality of life. To carry out curriculum ideological and political education, we must always accurately grasp the characteristics of the times, cognitive level and growth laws of contemporary college students[3]. For example, when teaching the moment of inertia, we can use the common or frequently played cases such as the balanced gyro and bicycle wheel to create a sense of substitution for students. We will find that there seems to be unexplained phenomena in the phenomena we are used to, and new knowledge points emerge from this. Knowledge that is close to life but different from common sense will produce contradictions in students' minds. We can get profound experience by learning new knowledge to solve the contradictions. In addition, teaching is not only to impart physical knowledge to students, but also to moderately increase frontier and professional related physical dynamics, which can not only expand students' knowledge, but also stimulate students' interest in physical knowledge, enhance students' understanding of the practical value of physics, and truly realize the importance of this discipline. Finally, teaching should be close to students' majors. Public courses are the basis for professional courses. In addition to attracting students to learn through the course itself, students can realize the importance of physics through the combination of lectures with students' subsequent professional courses.

2.3. Starting from the curriculum and combining with relevant courses, consolidate students' knowledge

The traditional college physics curriculum has the color of serving the "specialty and society", and its unique educational function has been ignored. College physics curriculum should assume the educational function, focus on carrying out educational work with knowledge and skills as the carrier, and stimulate students' professional pride and professional self-confidence[4]. In general undergraduate colleges and universities, the most relevant public courses related to college physics are higher mathematics and college physics experiment courses. Among them, mathematics is the basis of physics learning, and experiment is the supplement to physics learning. In addition to the coordination of mathematics and physics in order to enable students to learn better, physics experiment course is also an important supplementary course, Most colleges and universities will set college physics and college physics experiments as two independent courses when setting up courses. However, in actual teaching, they will find that there is a lack of experimental support when learning physics, and students are difficult to learn and understand. When the experiment class was held after the physics course was completed, the students had forgotten a lot of knowledge they had learned. Because of the stereotype of the difficulty of physics, the students were not interested in the experiment, which led to a certain discount in the teaching effect of both courses. The integration of physics and experiment into one course can effectively improve the teaching effect of the two courses. For example, after learning the thermodynamic law, the experiment of measuring the specific heat capacity of metals by the cooling method was started immediately. Through the experiment, it was found that the time taken for different metals to drop the same temperature was different, and it was inferred that the heat change of different metals to drop the same temperature was also different, from which the specific heat capacity was obtained. Through the experiment, the relationship between temperature and energy in the thermodynamic law could be understood in turn.We should make full use of the unique advantages and characteristics of the physics curriculum, strengthen students' autonomy, exploration, communication and participation in classroom teaching, pay attention to the curriculum, teaching plan, content optimization, textbook construction, and deepen the reform and innovation of

teaching methods, teaching methods, and teaching platforms[5].

2.4. Starting from information technology, apply modern information technology and enrich teaching methods

In the class of college physics, the traditional way is basically that teachers always explain, while students rarely ask questions, and there is a lack of interaction between teachers and students. Under the background of rapid development of information technology, teachers should combine traditional teaching methods with information technology to optimize traditional teaching models. For example, the question answering chat box can be opened at the same time of class. If students have questions, they can put them in the chat box, and the teacher can answer according to the situation after seeing them. This will not let students miss the opportunity to solve doubts because they are afraid to stand up and ask questions, and will not interrupt the teacher's teaching because of students' questions.

3. Conclusion

The teaching of college physics is a huge and complicated project. The existing teaching methods lack interaction and connection. With the progress of the times, in addition to teaching textbook knowledge, more teaching methods are needed to stimulate students' interest in learning. Only in this way can we adapt to today's teaching policy and cultivate outstanding talents. Therefore, the teaching reform of physics is imperative.

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