Initial Discussion About the Classroom Teaching Process Reform of Solar Thermal Powder Technology

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ABSTRACT

Solar Thermal Powder Technology is a compulsory course of New Energy Science and Engineering major. However, students are short of enthusiasm for learning this cause, due to the lack of related teaching materials, news reports, research papers and so on. To arouse their enthusiasm of learning and improve teaching results, we adopt the method of reforming the classroom teaching process for this course. In this paper, we have taken the knowledge point of “Stirling cycle” as an example to show the reformed classroom teaching process which contains three aspects: teaching content, teaching methods and teaching effect feedback. Expository methods-domain and videos view-assisted is adopted as the teaching method. In addition, we pay attention to train students self-operational ability and have taken the making of an Stirling device by students as an effective method to check the results of teaching and learning.

INTRODUCTION

New Energy Science and Engineering, short for New Energy, is an undergraduate major authorized to set up by Ministry of Education of the People’s Republic of China in 2011, the content of which involves with fields like wind power, solar energy, biomass energy, nuclear energy, etc[1].

Solar Thermal Powder Technology is a significant course of New Energy major. Nonetheless, at present students are short of enthusiasm for learning this cause. There are two reasons for students’ being short of enthusiasm for learning. First, there is little

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related information and references to finding out. In the view of the development situation at home and abroad, solar thermal power technology is still in the early stages of development, causing its related reports is not abundant. For this, the resources of instructional materials and textbooks in paper or electronic form of this cause are scarce. In addition, in business circles, industrialists generally show no interest in solar thermal power projects, due to the absence of policies support. So the employment prospect of this industry is not very good. Second, for the teaching schedule, the course is set up in the spring semesters of the third year of college. During this time, parts of students are busy in working on part-time jobs to gain working experience or preparing the entrance exams for postgraduate schools. So, they haven't put much effort into learning this course.

To arouse students enthusiasm of learning and improve teaching results, the classroom teaching process should be reformed [2]. While, the popular teaching methods, such as open course, MOOC, would not fit [3-5], due to the teaching content of this course being with strong professional and pertinence. So, we adopt the teaching method of expository methods-domain and videos view-assisted. In addition, we also pay attention to train students self-operational ability which could be taken as an effective way to check the results of teaching and learning. Considering that, “Stirling cycle” is one of the core parts of solar thermal dynamic power system. So, in this paper, we take the knowledge point of “Stirling cycle” as an example to show the reformed classroom teaching process by three ways: teaching content, teaching methods and teaching effect feedback.

REFORMED CLASSROOM TEACHING PROCESS

The reform of teaching content and teaching method

The teaching content and method both are important links to ensure the quality of teaching[6]. In textbooks, “Stirling cycle” is introduced without any description of the system composition and working principle, which makes students difficult to accept this knowledge point. To change this situation, the teaching contents of “Stirling cycle” are designed into three stages in turn, which are thermodynamic devices, thermodynamic processes, and the thermodynamic cycle.

For thermodynamic devices, we try to show the model of Stirling machine and tell history stories about the invention of Stirling engine. Then, we introduce several interesting practical applications of Stirling machine by exemplification. For example, in Sweden and Japan, Stirling machines have been used in nuclear submarine for its advantage of low noise and high efficiency, and Stirling machine is also utilized in cooling integrated high-power chips in computers. Though these applications are not directly correlated with solar thermal power generation, they still give students a better intuitive feeling.

For the working principle of thermodynamic processes, we adopt expository method to introduce the change of the pressure, temperature, heat and work in the process. In addition, in the process of teaching, we should pay attention to use an exquisite blackboard design to strengthen the classroom instruction.
For the thermodynamic cycle, we try to play a short video showing the hand-made making process of a simple Stirling machine made of ring-pull cans and common materials. By watching the video, students’ attention is gripped and the images of the special devices are deeply remained in their memory. Then, we timely introduce the thermodynamic cycle, referring to that making process in video.

The reform of teaching effect feedback

Teaching effect examination is an indispensable important link in teaching process, and it can test teaching effect and students’ status of grasping courses, which provides basis for teaching reform[6]. The working principle and thermodynamic processes of “Stirling cycle” is an important content that the students should grasp. So, we assign making a handcrafted Stirling device as one homework. Beyond that, they should show his/her handcrafted Stirling machine in class, and introduce the making processing in detail and then run it. By this way, we could check the results of teaching and learning.

CONCLUSION

To arouse students’ enthusiasm of learning and improve teaching results, we take the knowledge point of “Stirling cycle” as an example to show the reformed classroom teaching process by three ways: teaching content, teaching methods and teaching effect feedback. For the teaching contents, we design three stages in turn, which are thermodynamic device, thermodynamic process, and thermodynamic cycle. For the teaching methods, we adopt the teaching method of expository methods-domain and videos view-assisted. In addition, we pay attention to train students’ self-operational ability and have taken the making of a Stirling device by students as an effective method to check the results of teaching and learning. We believe that students’ enthusiasm can be fully mobilized and the capacity for solving problems by hand is trained, along with such reformed teaching process.

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