

Study on the Problem Based Learning Approach on the Electromechanical Talent Cultivation

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Abstract. This paper studied the application of Problem Based Learning (PBL) approach on the electromechanical talent cultivation based on the theory of the constructivism. The application of the PBL approach can stimulate the students' enthusiasm for independent learning and lifelong learning. PBL approach can be adopted in electromechanical talent cultivation according to the actual situation of Chinese students to improve the teaching quality. And, the advantages of PBL approach in the interdisciplinary area were studied to promote the development of "Emerging Engineering" education in the electromechanical area.

Introduction

The theory basis of PBL approach is the theory of constructivism. Based on the constructivism theory, PBL approach focuses on the study of the spontaneity construction of the student's knowledge system. The study of the PBL approach application on the electromechanical talent cultivation was carried out mainly from two aspects: firstly, how the constructivism theory is adopted in PBL practice of learning and teaching to stimulate the students' enthusiasm for independent learning and lifelong learning? Secondly, can PBL approach provide a theoretical basis and practical solutions for the establishment and development of new academic fields (such as "Emerging Engineering") with innovative, interdisciplinary and sustainable development characteristics?

Interviews

Firstly, according to the plan, the interviews were carried out to deeply study the principle, the application and the effects of PBL approach on the electromechanical talent cultivation in Aalborg University in Denmark. Interview method was adopted in this project. The interviews were carried out according to the method proposed by Kvale and Brinkmann's (2009)^[1].

In order to study the motivation in PBL approach, the questions such as "Do you find interesting things in the course?" are designed. The questions about the real need and life goal in the future job and life of the students were also asked to deeply study that how the PBL approach can inspire so much enthusiasm of students.

In order to study the principle and practice of PBL method, these questions such as "What is your opinion about "learn by doing"?" were asked to the students. To compare with the mainly method used in China, these questions such as " What are the advantages of this method relative to "learn by watching, listening or reading "?" were asked to the students. To compare with the learning process with a lot of individual competitions which were widely used in China, these questions such as "What are the advantages and disadvantages of this method relative to the method of "doing by myself"?" were asked to the students. To compare with the teacher-centered learning method which was used in China, these questions such as "What role do you think teachers play in your study?" were asked to the students.

In order to study the effect of PBL method, these questions "Can you cultivate enough ability to your work in the future by doing the project in the electromechanical aera?" were asked to the students.

Secondly, in order to know the students before entering to the university, the objects of the interviews in this study also includes the students from the primary schools, high schools, technical schools and universities. This is important to understand the differences between the PBL method application in Denmark and the application in China. In order to promote the application of PBL approach in China, we should consider the differences between Chinese students and Danish students, and make a corresponding program to the application of PBL approach in China.

The purpose of this study was explained beforehand when we began the interviews. So, the students were aware that their answers would be not used to evaluate themselves or their teachers but rather to study and analysis the PBL method. It should be useful for the development of learning and teaching method and enhance the validity of this study.

Observation

Many literatures proposed the observation method to study the learning effects^[2-5]. In order to study the PBL practice in electromechanical area, the observation on-site is adopted. The observation was carried out in the classrooms, labs, and the student discussion places. We objectively observe from the perspective of a third party. We observed the students and teachers from several aspects, mainly including:

(1)The learning environment, including:

Is the atmosphere of the class was relaxed, friendly and encouraging?

Are there some learning tools in the class to make the theory connect with the practice?

(2)The practices of the PBL approach, including:

How to design a problem-based project with real problems?

What work should do to prepare the course?

(3)The role and effect of the teachers, including:

If the students asked questions from time to time, how to control the teaching progress?

When all the students went to their group to do their discussion, what can the teacher do if they had problems or conflicts?

Discussions

The “PBL” method was discussed from three aspects, as follows:

Firstly, we discuss the effect of the method of “learning by doing”. From our observation, when we visited kinds of schools in Denmark, a primary school, a high school, a technical school and a university, we found that the students in all these schools learn something mainly by doing. We found that it is a very good way to obtain experience and ability with interest, enthusiasm, and happiness. Through interviewing several students in all these kinds of schools, we find the evaluations of the students to the schools are all positive, such as: “we like to go to school”, “It is funny”, “we can do a lot of interesting things in the school”, and so on. So, for the students, they are really motivated by doing the projects which contain the real problems in the modern society. In PBL approach, doing these projects is really useful for their future work and to solve the real problems they will meet in their own work.

Secondly, we discuss the effect of the method of “group learning”. We found the importance of the discussion and cooperation in our project work. When the problems appear, or the opinions of the group members are different, the discussion will be carried out. Sometimes the discussion is complementary, but sometimes their opinions are opposite. After all, the discussion is very useful to formula a plan and promotes the work. Through our experience in studying this project, we think that the students will be happy in the group learning. Because, if one member is good at something but not good at another thing, and another is good at another thing, when any problems appear, the problems may be solved by the cooperation. Cooperation is the strength then. So everyone of the group will not feel lonely or scared in doing the project. Perhaps anyone can not finish the project alone, but the group members can solve the problem together. That is encouraging. It can also cultivate the ability and habit of social study.

Thirdly, we discuss the application of PBL method in China. When we used the PBL method, we should notice that: the students in our university and the ones in PBL are different. The Danish students are familiar with “learning by doing” and “group learning” from primary school, high school to the university. But Chinese students are familiar with remembering an only correct answer for everything from the primary school to high school. When doing something with real problems, it is difficult to find out an only correct answer. So, many of Chinese students may be afraid of doing, discussing and presentation. They are familiar with remembering something, and they hope that everything should have an only correct answer according to the theory. When the method of “remembering” did not work, some students may doubt the “learning” itself, so they may give up the “learning”.

So, we must create an inspiring and tolerant learning environment to Chinese students. We will tell them the experience in PBL and encourage them: do not be afraid of saying wrong things; do not be care of the only correct answer, just to do it. “Do not be afraid” is a strong belief in doing anything, including PBL method. If we can really carry out PBL method, we can find out that it is a real motivated, exciting method both for the students and the teachers.,

Conclusion

This paper shows that PBL approach is an effective and efficiency method. “Learning by doing” and “group learning” are the core features of PBL approach. This method can ensure that students play a more active role in acquiring and creating knowledge in the electromechanical area. And, students define and analyze problems within an interdisciplinary framework. The students plan, manage and complete the projects set up to solve the problems in groups. Through the study, we can find the advantages of PBL approach in the interdisciplinary area, and promote the development of “Emerging Engineering” education, such as “intelligent manufacturing”, “robot”, and so on.

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