

## Suggestions for Graduate Curriculum Reform

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**Abstract**—Reform of graduate education has been focus of education sector in recent years. A universal problem needed to be faced is that graduates usually have strong theoretical ability but weak application ability of solving practical problems. In order to solve the problems, teaching method is needed to be improved, changing the "passive learning mode" into the "active learning mode". This paper analyzes the differences between graduate and undergraduate students, then on basis of a graduate course: computer control technology put forward some suggestions about interactive teaching of graduate students. The method presented has achieved good results in practice, and students' practical ability has been improved, too.

**Keywords**- Graduate students; Undergraduate students; Suggestions; Curriculum reform

### I. COMPARISON OF GRADUATE AND UNDERGRADUATE STUDENTS

Education of graduate and undergraduate students can be divided into two distinct but interrelated periods. When compared with each other, graduate period can be seen the further education of undergraduate period while undergraduate period is the basis of the former. The differences of them can be concluded as the following three items:

(1) Generally speaking, undergraduate students are receiving knowledge in class while graduate students are creating knowledge. This creation may be large or small, but the knowledge is new in that field, which makes contribution to current knowledge system. Changing from receiving knowledge to creating it can be seen as an obvious feature for graduate students.

(2) Undergraduate students are learning what the teacher teaches, and the relationship between them is completely "teachers and students". In class, students are more like containers, waiting for teachers pouring knowledge into them [1]. However, to most graduate students, class is only a small part of study, and plenty of their time is spending on practice and summary.

(3) As undergraduate students lay emphasis on basic education, they need to learn widely so that they have the basis of learning further in the future. But graduate students usually have a focus when choosing their courses. In order to finish their project successfully in the future, they must have a deep understanding of their subjects and make breakthrough in related fields.

### II. MOBILIZE THE ENTHUSIASM OF INDEPENDENT STUDY

Different characteristics of graduate and undergraduate students determine that their educational methods are different with each other. Here are some suggestions of the author:

#### A. Determine the role of teachers scientifically and try to encourage students' enthusiasm

An American scholar has said that the relationship between teachers and students should not be knowledgeable teachers and ignorant students, but a group which studies the subject and makes progress together [2]. In traditional ways, students do what teachers want. It's mainly because teachers are in dominant position while students in a passive one. As a result, graduate education should make breakthroughs to change such situation. An ideal relationship between teachers and students should be supporters and participants. The following factors should be taken into consideration: Firstly, encourage students to practice all by themselves. Secondly, develop their problem-solving skills and innovation ability. Thirdly, help them achieve the transition from a student to a learner.

Specifically, teachers should play the following three roles very well. Firstly, teachers should act as leaders of their students, teaching them to learn how to study, not only giving them a fish, but teaching them how to fish. Secondly, teachers should be an excellent solver to students. Take a graduate cause computer control technology for example. As the students are from different departments, teachers are required to answer all kinds of questions unexpected and to make students to discuss. In a word, graduate education is not the same as undergraduate education any more; teachers' roles have changed a lot. Only by mobilizing the enthusiasm of students and helping them form the ability of independent study can the graduate education be reformed successfully.

#### B. Allocate time for teaching and discussing reasonably, let students make full use of spare time to practice

The abilities of innovation and the skills of solving practical problems are the most important factors of graduate students. Both of them should be formed and developed in practice. In the course computer control technology, all aspects of engineering practice can be simulated so students have the environment to practice. In

order to get good learning results in the class, all classes are divided into two parts according to each project: the teaching part and the discussing part. In teaching part, teachers only explain the most important or difficult parts to students, leaving them enough time to discuss the problems they meet in practice. In discussing part, students report what they come across during their practice, show their work and answer questions of others. During the teaching part and discussing part, students need to spend a lot of time in exploring a good way to solve the problem. It is most important for them to have a further understanding of the question and form the ability of solving problems alone.

### C. *Animate atmosphere in class and encourage the enthusiasm of students*

Current teaching methods mainly focus either on teaching or on discussing, ignoring or paying little attention to practice [3, 4]. In fact, these three parts are connecting with each other closely. By practicing, students can form the ability of analyzing and solving problems independently. And by discussing, students can exchange their experiences and solutions to solve the problem so they will have a better understanding of the problems.

In practice, teachers can divide all classes into theory part and discussing part according to the content. In discussing part, class is not teaching or learning any more. When a report is finished, every student has the chance to ask questions to make problems much clearer. Meanwhile, teachers should animate the atmosphere to insure a good effect in class.

## III. IN CLASS

### A. *Subjects for discussing and reporting*

Choosing a subject for discussing and reporting determines whether the class can achieve the former desired aims [5]. Generally speaking, the subject should be neither too difficult nor too easy to work out. The best one is that students can finish the work all by themselves by consulting related books, and at the same time they have the room to develop their potential and creativity. In some ways, teachers can specify the subject, and, certainly, students can choose what they interest as their subjects. Besides, important articles in related fields and summery of the course can also be discussed in class. Teachers can choose some good articles for students to read after class and ask them to report in class, encourage others to ask questions actively. For example, when coming with the PID algorithm in the course computer control, teacher can ask students to summarize the shortcomings and improved methods of traditional PID control algorithms.

### B. *Create a good, discussion oriented atmosphere*

When in discussion, teacher always is a participant to study, just the same as other students. But the teacher also plays a very important role in creating a good atmosphere [6]. When students are in fuzzy or could not explain the problem clearly, teacher should lead them to discuss the

question and ensure the effect of the class. When the class is in total silence, the teacher can even pipe up questions first to encourage other students. When class is over, the teacher concludes the performance of every reporters and give some suggests for further improvement. As long as the teacher is earnest during the discussion, students will be infected and fulfill the task with high-quality.

### C. *About exam*

Assessment should conclude not only theory, but also the abilities of self-learning ability, analyzing and solving the problem all by oneself, innovation ability, practical ability, cooperation spirit and written skills, etc. So the mode of exam is needed to be improved too[7, 8]. The paper introduces "1 +1 +1" method, i.e. paper, practical work and subject report. Among it, the paper places emphasis on understanding of basic theory, practical work lay importance on practical ability and subject report is seen as the performance of the students in class. As a result, students' abilities have improved a lot by using the method above,

## IV. CONCLUSION

The paper analyzes the different characteristics of graduate and undergraduate students. Then combining with a graduate course, it puts forward several reflections about interactive teaching method to enhance students' self-learning ability and innovation ability. Results show that the new teaching mode has a potential use in developing graduate students' ability of independent thinking and problem-solving skills.

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