An Investigation Report of Teaching Methods on Science and Engineering Postgraduate Student Major Basic Course

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Abstract. The learning modes of graduate students and the effectiveness of teaching methods should be verified and confirmed. This paper investigated the two fields mentioned above using questionnaires for science and engineering postgraduate student major basic course in two semesters. Based on the investigations, four points were concluded. The authors deem that the deep approach is not adopted by most students up to now; the teachers should improve their teaching methods so as to encourage the learning motivation of students.

Introduction

For science and engineering graduate students, learning major basic knowledge, training abilities of thinking and researching is of great importance. As the study results suggest in reference 1, there are two main learning modes, namely, a deep approach and a surface approach. The purpose of the deep approach is to comprehend thoughts and seek sense. The students using the deep approach love learning and studying intrinsically and hope to get fun in learning process. The students using the surface approach consider learning a compulsory work. They try to meet the demands of the teachers. They want to finish work in the shortest time. In contrast, the deep approach is closely related with high quality learning.

High quality teaching is in great need because the learning period of students in basic course is about one year, which is short apparently. Present researches mainly focus on teaching methods and learning motivation\textsuperscript{[2~14]}, but the study on students learning modes or habits is insufficient. The first goal of this paper is designed to explore: do students, who use the deep approach, want to spend more time on researching more correlative knowledge which isn’t in the text book for examining.

The authors consider that a strong learning motive will inspire the deep approach. Zhang Chunxing pointed out\textsuperscript{[15]}: It is most difficult to train students to establish a learning motive. The teacher should guide students to love learning, which is the first condition to train students to set up learning motives. It is apparent that the teaching methods students like and prefer will help bring more interest in learning. Graduate students have finished their basic studies in formal schooling and they have their own thinking about good teaching methods. So, the second goal of this paper is to find the teaching methods students would like.

The investigation of this paper is done with the course of theories in experimental fluid dynamics. Because the course mainly presents theories, classroom lecture is the teaching method. Which is a better sub-method, blackboard-writing or PPT? We want to know the viewpoints of students on it. The term paper is often used in this course. But we found that it did less help to students. We want to know why?

Our two questionnaires are mixed type, and we provided them at the end of the spring semester and the autumn semester in 2015. There are four same questions in the two questionnaires.
Design of questionnaires

The four questions are as follows:

1. Which is the main learning mode you use in this course?
   (A) Listening and taking notes. (B) Based on the course, searching materials for interest. (C) Based on teacher’s commands, preparing for talk over next class.
   This question is to investigate habits and seek knowledge desire of students. A is passive mode. B is active mode; the student who picks B is of go-aheadism and the deep approach user. C is the characteristic of surface approach.

2. Which segment helps you more?
   (A) Listening and taking notes. (B) Preparing and discussion. (C) Writing equations on the blackboard by students themselves.
   A represents the students who do not like interaction. B indicates the students who like strong interaction. C states clearly the students who are of introversion and silence.

3. Does term paper help you a lot with grasping the course?
   (A) Yes. (B) No. (C) Unclear.
   The term paper or big assignment is the common mode in learning. This question is for us to make sure the thoughts of students about this aspect.

4. Which one do you like more?
   (A) Blackboard-writing. (B) PPT. (C) Others.
   This question can help us know which mode is useful.

Results of first questionnaire

The first investigation was carried out in July of 2015. Five students selected this course. Five questionnaires were issued to them at the end of the class time. And the five were turned back in effectiveness.

The choices of students and analyses are as follows:

Table 1. Results of first questionnaire.

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<th>Question 1</th>
<th>Question 2</th>
<th>Question 3</th>
<th>Question 4</th>
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<td>Student 2</td>
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<tr>
<td>Student 3</td>
<td>A, B, C</td>
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<td>B</td>
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<tr>
<td>Student 4</td>
<td>C</td>
<td>B</td>
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<tr>
<td>Student 5</td>
<td>B</td>
<td>C</td>
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1. As for question 1, more students say they listen, take notes, and prepare questions to answer. This suggests that students just do ‘the basic movements’. They choose answer B less, showing they don’t have active learning.
2. As for question 2, students choose B more, indicating their assent with the method of class questioning and answering. And this agrees with the choice of question 1.
3. As for question 3, only one student chooses A. This choice suggests doing the term paper is not a good practice method.
4. As for question 4, all students choose A. They want to have more blackboard writing. This is reasonable for a theory-focused course. The challenge of how to use modern tools and methods goes after with this question.

As for the answer to question 3, the authors couldn’t understand fully at first. Doing term paper is a frequently used learning mode for courses like this. Why are the students not in favor of it here? After deep thinking and reflecting over the question, we think perhaps the result comes with the situation: the teacher had no interactions with students any more after the term paper was turned in.
So, we decided, in the next semester, the students will be asked to have class report to exchange their ideas and judgments. And at the end of the next semester, the question will be offered again to have their feedback.

**Results of the second questionnaire**

The second investigation was carried out in December of 2015. Nineteen students selected this course. Nineteen questionnaires were issued to them at the end of the class time as the first investigation procedure. And the nineteen were turned back in effectiveness.

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<th>Question 1</th>
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<td>Student 2</td>
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<td>Student 19</td>
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Table 2 presents:

(1) As for question 1, more students choose A and C, suggesting more students can act in concert with class requirements. They choose B less; apparently they are not very active.

(2) As for question 2, 12 of them choose B. This shows that class discussion method is accepted. Nine students choose C. It seems that the students prefer theory derivation and at the same time it indicates that they are shy or more reserved.

(3) As for question 3, most students choose A. This choice suggests doing the term paper is still a good practice method, but good if with more discussion and judgments following.

(4) As for questions 4, most students choose A, showing the importance of blackboard writing for this course. And at the same time, many students also choose PPT, B, suggesting PPT needs to be used appropriately. It must be stated that one student chooses C. The student highly recommends the combined-use of the two methods, and he offers his own opinion and views on how to use PPT effectively and efficiently.
Summary

Although the samples are less and questions are simple in this investigation, four conclusions are brought forward:
(1) Students do have learning desires, but the motivation is less.
(2) The mode of preparing and discussion is favorable.
(3) After the term paper is turned in, feedback is needed.
(4) Blackboard-writing should be adopted in class. Multimedia courseware should be improved more in theory teaching.

References