

Probe of Differential Teaching Strategy for the Course of Fluid Mechanics and Pump and Fan

Huiliang Lian, Xian Dong, Fusheng Peng, Xu Han, Qiwei Wang

PLA University of Science and Technology, Nanjing, 210007, China

email: lianlion@gmail.com

Keywords: Fluid Mechanics and Pump and Fan; teaching reform; differentiation

Abstract. Fluid Mechanics Pump and Fan is a course with strong theory. Differential teaching strategy is proposed in this paper to teaching students in accordance with their aptitude according to different majors' own characteristics. With continual summarization during the teaching reform process, we've obtained good teaching effects.

Background of the Teaching Reform

Teaching is the main position and main channel of training of personnel. Want to in the teaching of the full implementation of quality education and innovation education, embodies the transformation of education and elite education thoughts, we must reform the old teaching mode, accelerate the transformation of construction. To students' ability of comprehensive quality training as the core, the reform teaching method, improve the quality of teaching to culture the students comprehensive ability quality benefits.

For a long time, we used to according to our idea or observed students to teach, even if already know students are in class, or but we tend to take method to minimize the differences, looking at the middle, at both ends. Is in this spirit under the guidance of the teaching result is: learning difficulty students didn't get the real help, they can only be felt more study harder, learn more and more don't understand; And best students always just waiting for the others, learning enthusiasm and interest in learning the lack of challenge perhaps away [1]. In order to develop students' ability of autonomous learning, highlighting inspire students thinking, efforts to improve the students' ability of analyze and solve problems, let different students have different development, must want to consider the differences of students in teaching.

The Content of the Teaching Reform

Course group aimed forces of talent demand, according to the requirement of the transformation of school education and elite education, through learning readiness level of student achievement, learning methods, learning styles, interests and learning purpose survey, many ways, such as curriculum reform mainly from the optimization of teaching content, explore the reform of teaching mode and practice teaching in three aspects.

A. To adapt to the training target, optimize teaching content

Fluid mechanics is mainly to introduce fluid balance and movement laws. The regulation of this major in the heat supply, air cooling, dust removal, etc., are based on the fluid as working medium, through the role of the various physical fluid, the fluid flow effectively organize to implement. Only conclusion of regularity, so for some appropriate supplement related content, help students more effectively understand these rules, convenient application in the professional course in the future.

According to current situation of students and professional requirements, reduced relatively, far, content, such as the balance of fluid and plane irrotational flow, gas dynamics, etc., combined with the energy equation of the fluid dynamics increased energy loss calculation of relevant content.

B. Around the teaching effect, the reform of teaching methods

In order to develop students' ability of autonomous learning, inspire students thinking, efforts to improve the students' ability of analyze and solve problems, combined with the teaching content,

according to the different preparation level, learning style of students decided to take the differentiation method of teaching and learning way.

Differential teaching refers to the teachers in the teaching according to students' learning needs, to design different learning tasks, encourage students to become successful learners. Differentiation is the standpoint of teaching students' individual differences, the overall design idea is not to the same standards require students, meet the needs of the students different learning styles, interests, etc.; Suited to the characteristics of the students, teaching methods, teaching content, teaching process and teaching evaluation mechanism; Differences in teaching is the combination of the whole class, group and individual teaching. Its ultimate goal is to promote each student on the basis of the original to get the biggest development, promote self education.

Differentiating teaching general procedure is: class analysis, differences in teaching design, difference teaching, difference teaching supplement (tutorial).

Class analysis, refers to the overall analysis of students, including the type of learning style, temperament, subjects, etc. Learn many differences: such as way to learn, someone is good at theoretical analysis, someone more like actual operation; Differences in organizational forms, such as some people tend to independent learning, some people tend to group learning. Before the start of teaching work, there is a questionnaire survey of the object. Questionnaire content including: students academic achievement, learning objective, past course of master degree, like learning styles and classroom mode, preview and review situation, and hope to master the course. According to the questionnaire, divided the students into A, B, C three types, preparing for initial differences in teaching, then in the subsequent teaching according to students' performance and the division of different study habits and so on to adapt to different teaching contents.

Differences in teaching design, according to the analysis of situation and students before class performance at ordinary times, teachers understand the students' personality and knowledge learning. According to these situations, when teaching need divided students into several classes or groups, can be a homogeneous group (the mastery of the knowledge learning styles similar or similar, can keep the same schedule), may also be heterogeneous teams (different learning styles or grasp things are good there, can produce learning complement each other, so that students in communication between). Grouping is flexible, dynamic, homogeneity and heterogeneity group combination, flexible adjustment, so that you can avoid homogenous group label effect may be produced, and heterogeneous group makes part of the students role fixation.

Differences in teaching, there are so few steps: commonly focused teaching, group learning, task test report (or results).

Focused teaching: generally is the content of the common that is all students need to master the content of the teaching. This link until the difference at the time of teaching time.

Group work: is when the part of students have yet to grasp the knowledge or skills, but another part of the students can learn the new content or the content of the more difficult, at this time, if still stay in "focuses on teaching" in this stage, sure there will be a part of the students did not understand or another part of the students feel boring. When grouping teaching, can be designed for different groups of different learning tasks (learning difficulty), for different groups are challenges.

Poor students to learn, good at discovering their sparkle, and give more encouragement, let them feel the joy of success, to the greatest extent to stimulate interest in learning. Moderate encouragement in learning the digging their own potential, and improve the effect of the contents of the course requirements to master learning. And encourage the better toward a higher goal.

Group learning should pay attention to the problem:

1. Number can be different, three to five people is most appropriate, facilitate cooperation and exchange in the group, according to circumstances can increase or decrease in the number, sometimes even can be separate into one group. Homogeneous grouping is advantageous to the communication between teachers and students, heterogeneous groups to multiply.

2. Task is challenging. Different groups of students have felt after completing a challenging task, are full of the enthusiasm of learning.

Task test report (or results): can be the first team finished learning to accept testing or report to

the faculty, all after the group learning can stay focused for inspection or results to share.

Teaching, group learning, tasks, test report (or results) the three links, and not every class to complete, sometimes may only focus on teaching, sometimes within a lesson, sometimes needs several lessons to complete, depending on the teaching content and the difficulty of the task.

Sometimes, although the teachers in the teaching design is fully expected the students' differences, but the students learning situation, and the characteristics of the dynamic generation of the learning process, there will always be some unexpected situation in faculty. This requires teachers to have certain teaching wit, organize the teaching.

In the teaching process, sometimes also can choose appropriate content to divide the students into heterogeneous group, team members of the division of labor cooperation in lessons. By a faculty member, take a set, the team chose a student representative group to carry on the teaching, the other groups in the process of listening to lectures can according to their own lessons on asking questions, let students speak out, speak his thoughts out. Teachers listen to their ideas, not casually or early to conclusions.

Talking about resistance to flow and power loss, for example, this chapter, a faculty member at the outset requires students to prepare, at the end of this chapter content will be made by students on the platform to introduce the measures for decreasing the resistance. After task arrangement, students more serious in class, each group prepares for full, sometimes go to the library to refer to the relevant data, most specifically the courseware, teaching students in the clear, distinct, in place.

Students took to the podium, from the "learning" to "teach", that is to increase the teaching activities to a higher level of teaching, inspire the students learning initiative and enthusiasm. Excavates the potential of different students, such as active thinking of students at ordinary times in preparation for the team to provide a lot of novel ideas, study hard at ordinary times hobby is read books, refer to a large number of data provides abundant material for the lectures, and the expression ability of the students at ordinary times came to lecture on behalf of the group, make the team carefully prepared better presents.

Faculty will consider homework differences. Layered operation designed to make the students can get development on the basis of the original, let different levels of students can be successful experience, and strengthen their confidence of study. Problem sets can design two levels. Level 1: basic exercises, refers to the basic, one-way, with imitative exercises, purpose is to let students have good basic knowledge, require each student to do. The second level: application to improve practice for students learning ability of students to choose to do or team composed of complete. After learning the content of the energy equation, for example, homework, including basic practice, let students deepen the understanding of energy equation, familiar with problem-solving steps; At the same time asked you familiar with "banana ball" of football and table tennis "curling", let the learning ability of students to analyze its principle, and according to the actual analysis conclusions enumerate some of the other example. Through such a choice on the one hand to solve the problem. Through such as a problem to make this part of the students on a higher understanding of energy equation, on the other hand increases the other students learning interest in fluid mechanics.

Differences in teaching supplement (tutorial) after class

Tutorial is differentiated teaching remedial measures. On the one hand, the teacher through tutoring to students, don't let into the next teaching students knowledge defects. On the other hand, through the study for the spare capacity of counseling trainees, let them learn more knowledge.

C. Innovation practice, improve the effect of practice

Practice is an important link in teaching, classroom teaching to make students grasp basic knowledge and basic theory, and practice the purpose is to through the actual operation will be learned knowledge into practice, deepen the students' perceptual knowledge, theory with practice. Practice teaching is mainly composed of experiment and the visit of two parts.

Experiment: Teachers lead students to visit a couple of days before the experiment related test bench, when visiting faculty do not do introduction, questions by students themselves, and go back to the team for unit tests, finally prepared according to your plan to experiment, to write test report. Such by students themselves, make for experimental purposes, steps, has a profound understanding,

the phenomenon and reason of classroom learning also had the further understanding.

Visit: In the teaching of pump and fan parts, in order to deepen students' perceptual knowledge, solve the problem of "how to use" knowledge, teachers arranged visit trainee.

Such as water pump factory to visit apprentice, teaching faculty "is with rich practical experience of engineers, in equipment material or mode, with the examples of engineering application, to strengthen the students perceptual knowledge of knowledge, improve the students' practical ability.

D. Perfect evaluation method, pay attention to process control

In the mode of examination, in addition to paper and pencil test scores, students in the classroom of language expression, group discussion, experiment operation action and so on can be a faculty evaluation of students on the basis of [2]. That is one-off, summative examination on multiple stages and multiple forms of assessment and final exam, namely process control assessment method. So on the one hand, beneficial to stimulate the learning enthusiasm of students, also facilitate faculty to find the deficiency of the teaching in time and improved, on the other hand, can strengthen the students usually learn to urge, guide the students reduce the utilitarian learning, promote students the formation of good quality, at the same time also can Omni-directional, multi-angle to reflect a real achievement and comprehensive ability of students, achieve the unity of the students' learning process and learning result [3].

Teaching Reform Effect

At the end of the course, surveyed the students, the students said: "this kind of method to give full play to the subjective initiative of students, make students actively into the curriculum."

In the teaching process, teachers also have experience greatly, the initiative of students, can better learning course content, more in-depth thinking. Such as some students studying the capillarity and then put forward the capillary phenomenon could be used to promote liquid, make its flow to high automatically? And candidates according to their content with "automatic drip irrigation system based on solar road green belts" took part in the "excellence cup" innovation competition, at present through the college examination into the college selection process.

Compared with the previous equipment professional students, the students final inspection by 12.4 points above the average, all students through the inspection, good rate from 30% to 60%.

Summary

Curriculum group of Fluid Mechanics and Pump and Fan traction on the needs of students for jobs, actively explore to adapt to the transformation of university education teaching way, initially formed basic core curriculum of differentiated teaching method. To improve the pertinence and effectiveness of classroom teaching and practice teaching, cultivating students' independent learning ability, inspire students thinking, efforts to improve the students' ability of analyze and solve problems. Form the achievements of teaching reform for relevant professional undergraduate course teaching has important guiding significance, as well as the transformation of the teaching reform, especially the reform of the professional course has important reference value.

References

- [1] Songyi Liu. Differentiated Instruction in the multi-disciplinary skills in the classroom. BeiJing: China Light Industry Press, 2003.
- [2] Yajuan Shi, Guodong Hua. The differences in teaching and education fair. Education Research, 2007, (1).
- [3] Huibing Zhu. Engineering fluid mechanics research of inquiry teaching mode. Journal of Ningbo University, 2010, (6).