

Teaching Design and Reform Based on Learning Output

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Abstract: By adopting the education mode of engineering learning output and combining with the training mode of CDIO engineering, the course of designing mechanics is systematically designed and students are trained from the knowledge ability and quality to improve the students' engineering ability and engineering quality, and the various teaching methods based on autonomous learning are adopted to change the evaluation model from the learning process to the study. In order to train the students' ability to apply their knowledge to solve practical engineering problems in the field of professional engineering, the results of students' study are evaluated in a full range, and the professional talents with professional engineering quality, engineering application ability and engineering innovation ability are trained.

1. Introduction

Educational output based on learning output first appeared in the basic education reform in the United States and Australia [1]. From the 80s to the early 90s of last century, learning output is a very popular term in the American educational world [2]. In an in-depth study of this model, American scholar Pardi defines the learning output as the experience of ensuring that the students gain substantial success in the future life, and that the learning output has realized the transformation of the educational paradigm [3]. In this education mode, what students learn is much more important than how to learn and when to learn.

The Australian Education Department defines learning output as an educational process based on the realization of student specific learning output [4]. Education structure and curriculum are regarded as means rather than ends. If they fail to contribute to the development of specific abilities of students, they will be rebuilt, and student output will drive the operation of the education system [5]. Learning output is a structure and system of learning output driving the whole curriculum activity and student learning output evaluation.

Learning output (learning achievement) represents a kind of ability structure, which is realized mainly through curriculum teaching. There should be a clear mapping relationship between the ability structure and the curriculum. Each course has a definite contribution to the realization of the ability structure. It requires the students to have the expected ability structure after the study of each course.

2. Reform Content

According to the training objectives, a new syllabus should be drawn up and teaching contents should be arranged reasonably. The new teaching syllabus should have the knowledge integrity of the theoretical course, in order to train the engineering ability and improve the quality of the engineering as the teaching goal, to refine and decompose the engineering ability, to clarify the requirements for the training of the teaching knowledge points to the related abilities and the students' ability to achieve, and to adopt the characteristics of the various teaching knowledge points and adopt the characteristics of the teaching knowledge points. With the same teaching method, the goal and the way of implementation should be set up, the teaching content should be expanded, and the goal of

training students' engineering ability should be achieved. Based on knowledge, ability and quality, the engineering comprehensive ability of mechanics course is shown in Figure 1.

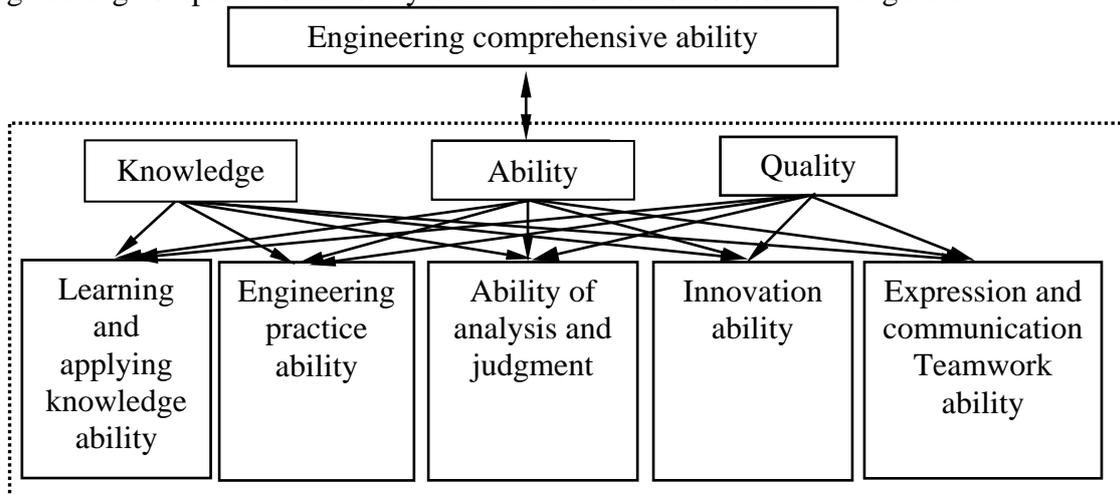


Figure 2. The goal of engineering ability training

Benchmarking standards for education accreditation and reform of teaching content focus on training students' comprehensive quality, innovation ability and engineering practice ability. According to the requirements of the expected learning output for the engineering ability, the content of the courses required for each class is determined and the students' degree of mastering the content of the course is delineated. Specifically, the specific knowledge points for each class should be first defined, and then the content of each lesson should be designed according to the objectives of each course to ensure that students can achieve the desired goal of "learning output" through these courses.

At the professional level, the realization of the expected learning output depends on the completion of the course layer in the face of the expected goal. After the target and course content of the course level is determined, the most efficient teaching method is needed to realize the teaching of the course content and the realization of the course goal. The learning output especially emphasizes what the students have learned rather than what the teachers teach, especially emphasizing the output of the teaching process rather than its input, especially emphasizing the research teaching mode rather than the instillation model. Teachers should use different teaching modes to organize curriculum teaching in different teaching stages, aiming at different teaching objectives and teaching contents.

Teaching evaluation of learning output focuses on learning outcomes, not on teaching content, learning time and learning style. The goal of curriculum evaluation should be based on training goals and graduation requirements as the basis for establishing corresponding evaluation criteria. At the same time, the evaluation of students' ability and quality should be paid attention to in the evaluation. In the teaching evaluation, we should not only pay attention to the evaluation of the theoretical knowledge of books, but also examine the students' self-learning ability, practice ability and innovation ability. In order to realize the ability, the traditional examination methods should be reformed, the assessment and evaluation of the students' acquisition ability should be paid attention to, and corresponding operating standards for different types of abilities should be formulated.

In the course of teaching, we should pay attention to the training of students' ability, in order to strengthen the quality education as the direction of reform, and to cultivate every teaching link in the training of the students' engineering ability and comprehensive ability, and to improve the teaching effect and the quality of talent training in a real sense.

3. The Significance of the Reform

The traditional teaching mode focuses on the teaching of knowledge based on knowledge and lacks initiative and hinders the cultivation of students' creative spirit and the development of creative thinking. The transformation of educational ideas should be based on cultivating students'

autonomous learning ability, application ability and innovative ability, so that students can become masters of learning.

Teaching assessment system focuses on learning outcomes rather than teaching content. According to the multifaceted evaluation criteria and the degree of completion of the educational requirements, each student can be given a different grade of evaluation. Curriculum examination highlights the evaluation of engineering application ability and innovation ability. In order to cultivate advanced engineering professionals with high comprehensive quality to meet the needs of society and to think and solve various practical engineering problems independently, it is necessary to abandon a single test paper assessment method which only weighs the scores but light the ability and set up a new examination method. It is important to evaluate students' learning process, learning attitude, innovative consciousness, problem solving and so on.

4. The Design of Teaching Content

The idea of "knowledge system and engineering application project" was established to integrate knowledge imparting and ability training together to rearrange curriculum contents. A lot of engineering problems and examples are introduced into the course content, the teaching content is "Engineering", and the practical application of engineering basic theory is used to set up an experimental project which is in line with the actual project. To optimize the teaching content, the relationship between the theoretical teaching and the practical engineering problems is strengthened, and it can solve the practical engineering problems, analyze the problems, solve the problems and expand the application to other projects. In the whole process of teaching, the engineering features are fully embodied, the practice is highlighted, the application is strengthened, the main consciousness of the engineering education is highlighted, and the engineering technology education and engineering practice training are equal, and the problems of penetration and integration of the theory teaching and engineering practice teaching are solved. Training students' engineering consciousness and engineering thinking mode can increase engineering factors and engineering contents in teaching.

4.1 The project of teaching content

According to the project capability index, the project design of the teaching content is carried out. After teaching the basic theoretical knowledge, the students can find the practical examples from the engineering examples around them, guide the students to analyze, simplify, analyze the results, and make the experiments on the basis of the calculation. The results were verified by experiment. It can also be considered at the end of the course to set up a comprehensive operation, to give or let the students find a practical result from the project, to guide and help students to establish the principle, to compare the results with the actual situation, so that the students can analyze the difference between the theoretical calculation and the actual situation. Through the project design of the teaching content of the electronic technology, the students' understanding and mastery of the teaching content can be deepened and the corresponding requirements of the engineering education can be realized.

4.2 Combination of various teaching methods

In the course of teaching, a new teaching model with students as the main body and teacher oriented should be set up. It is necessary to raise some questions to students, stimulate students' interest in learning, inspire students to think, and change the status of learning passively, mechanically and rote. Through students' thinking, classroom discussion and analysis are finished to train students' thinking, to cultivate students' ability to acquire new knowledge, to think independently and to solve problems, and to further cultivate the students' innovative ability in engineering application by obtaining more comprehensive knowledge.

In the classroom teaching model, teachers guide students to think, provide or discuss a thinking framework, to establish the basic theory, and to further establish models to solve problems. If the

result of the discussion meets the actual requirements, the problem will be solved, otherwise the students will continue to guide the thinking of the students, to reanalyze the definition of the thinking frame and the rationality of the creative thinking, to achieve the purpose of solving the problem through the trial and error method, to answer the doubts of the students, and to make the students themselves to analyze the learners' understanding.

The course teaching is based on problem and project by learning and inquiry teaching with the core of the real and complex problems such as "project" or "problem" in the project. Guiding students to express their views fully by group discussion, expressing their ideas or methods and solving the problems, it can arouse the students to explore research and practice of interest, enthusiasm and creativity, and develop students' learning knowledge and the ability to solve problems.

It is difficult for students to master the key and difficult points of knowledge, using the form of network teaching, recording micro video courseware, asking students to watch video before class, answering students' doubts and applying knowledge points in class, reducing formula theory deduction time in class, increasing students' discussion and explaining time, and raising students self study ability, problem analysis and problem solving ability.

A trinity training mode based on curriculum teaching and competition project as carrier and ability training as the means should be established. Taking participation in extracurricular scientific and technological activities and design competition as an opportunity to stimulate students' interest in innovative consciousness, the comprehensive abilities increase in all aspects. Each year, the students can study and implement the program according to the requirements of the activities, use the electrical knowledge they have learned, free team, design independently, prepare concrete materials for the production of physical works, and write product design instructions.

5. Summary

The core concept of the learning output education model is the education based on the students' learning results, so it is a crucial link to determine the students' expected learning results. The learning results are divided into knowledge, ability and quality. A reasonable study result can help students improve their self-learning awareness in the process of learning, and at the same time, they can also fully grasp the knowledge and skills needed for social development.

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