

Teaching Mode Innovation of Programming Courses Based on OBE

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Abstract: The supply-side reform of higher education brings opportunities and challenges to the development of higher education, which should be closely combined with the construction of “new engineering” and the certification of engineering education, and attaches importance to the research of professional teaching and the cultivation of high-quality innovative talents. With the aim of improving students' ability to solve "complex engineering problems". we should analyze the current teaching situation of computer, intelligent building and other courses related to program design, conform to the development trend, put forward the “1+5+1” teaching process and characteristic teaching design research, improve the quality of teaching, cultivate students' professional accomplishment and innovative ability.

1. Introduction

The development of higher education is related to the specification of talent cultivation in our country's universities and plays an important role in national construction. With the vigorous development of the new round of scientific and technological and industrial revolution, actively promoting the supply-side reform and implementing a series of national strategies such as supporting service innovation-driven development, "Made in China 2025" and "internet plus", it is necessary to reasonably optimize the supply-side development strategy and redesign the teaching content and teaching mode based on the market demand.

The rapid promotion and widespread popularization of various specialties such as computer, electronic information, and intelligent building electrical designed by programs benefit from the interdisciplinary nature of disciplines. The ability of computer programming is an important guarantee for students to learn professional courses well.

In September 2018, the Ministry of Education issued a notice in which the Ministry of Education called for the improvement of the teaching quality of undergraduate education by eliminating "muddle courses" and creating "golden courses". The notice clearly requires "all colleges and universities should carefully find out the outstanding problems and weak links in classroom construction and management, strictly control and grasp the teaching order, formulate rectification measures, raise the quality of classroom teaching." At the same time, it is urgent to comprehensively sort out the teaching contents of various courses, eliminate "muddle courses" and create "gold courses", and effectively improve the teaching quality of courses. "More attention should be paid to the student-centered teaching reform.[1]

However, there are some drawbacks in the teaching of traditional programming courses, which lead to low interest in learning and unsatisfactory teaching results. Therefore, this paper aims to analyze the problems encountered in the teaching of such courses, and propose improvement plans in the teaching process, to strengthen the interaction between teaching and learning, put forward the “1+5+1” teaching process, by means of a special teaching design study, which enhances the interaction between teaching and learning, It is easy to stimulate students' interest in learning, promote the development of teaching and improve the quality of teaching.

2. Results-oriented Engineering Education Model

Outcomes-Based Education (OBE) was established in the United States in the 1980s. It is an education model based on results, organization, implementation and evaluation. OBE model adapts to the needs of society, especially the enterprises, for talents, that is, students' skills and abilities can be observed, measured and applied. Unlike traditional teaching model, teachers pay more attention to students' learning results under OBE concept.

OBE education mode has realized the change of education paradigm from "content-oriented" to "result-oriented". The teaching objectives (expected results of students, outcome) exist before the teaching contents. The curriculum setting, teaching and learning methods, and student management should all be developed around the expected results. The OBE concept emphasizes the implementation of results-oriented education for engineering education majors. Emphasis is placed on student development as the center, and through systematic education system construction, graduates will have theoretical knowledge, analytical methods and practical ability to solve complex engineering problems. This requires a new teaching design and teaching evaluation.[2]

3. Teaching Status of Programming Courses

Programming courses are very practical courses, most of teachers are mainly based on classroom theoretical teaching, supplemented by practical experimental teaching. We analyze the current situation of traditional teaching and summarize it into the following aspects.

3.1. The Course Study is Blind

The students did not deeply understand the learning purpose and significance of the course. In the aspect of teaching, there is no systematic study of practical application cases, so even if students master theoretical knowledge, once they practice, they do not know where to start, which makes students feel frustrated in learning and leads to lack of learning initiative. students lack professional knowledge of this kind of courses, and they do not attach importance to it and are blind, which leads to poor learning effect of this course.

3.2. Learning Methods and Attitude Wrong

Some students have a bad attitude towards learning, are absent-minded in class, play with mobile phones, plagiarize homework after class, cannot study calmly, only master conceptual knowledge, do not understand the important and difficult points thoroughly, do not "ask for a good understanding" of knowledge points, lack the spirit of study, and have weak practical ability and do not take the initiative to practice.

3.3. Monotonous Teaching Contents and Methods

It is mainly based on theoretical teaching and does not attach importance to the training of students' code realization ability. The final examination is excellent, but the practical ability is poor. Most students can't realize the algorithm at all, resulting in students becoming so-called computer "theoretical" talents. The reason is that too much emphasis is placed on the dominant position of teachers in teaching, ignoring the central position of students, turning the precious classroom into a place for students to watch teachers' work and performances, , which directly leads to the students' poor programming and algorithm design ability, the students' hands-on ability not being trained, and finally losing their professional identity. [3]

3.4. Lack of Comprehensiveness in Cultivating Students' Abilities

Nowadays, teaching in colleges and universities places more emphasis on theory than practice. Logic knowledge has not been successfully converted into experimental codes. There is a serious lack of innovative and comprehensive teaching practice in the existing practice links, which cannot effectively set corresponding teaching contents for different professional needs. In addition, pure theory study is boring, which greatly reduces students' interest and effect in learning and cannot further improve students' professional quality and innovation ability. In terms of students' ability

cultivation, the lack of comprehensive practical ability and the cultivation of computational thinking make the teaching effect somewhat restrictive.

3.5. The Assessment Method is not Comprehensive Enough

The most common examination method in colleges and universities is the final examination paper, which cannot reflect the students' achievements in the process of learning. When reviewing papers, teachers can only look at the general situation of the program design topics. The content of the examination is mostly basic knowledge of the course, with memorizing topics as the main topic, resulting in students cramming for the exam, making surprise attacks before the exam, and memorizing to cope with the exam. In the experimental part, the examination is mainly based on the submitted experimental report. However, such examination and evaluation methods are not sufficient to fully reflect the students' theoretical mastery and practical application. Therefore, the teaching reform should pay attention to the training of students' dynamic ability.

4. Improvement of Teaching Process

The education mode based on learning output is the core concept of engineering education, and is also an important standard throughout the professional certification of engineering education. The OBE core connotation of "student-centered teaching and learning" is deeply understood, and teaching is improved. After long-term practice, we have summarized the following "1+5+1" forms of classroom organization, the numbers correspond to the main points of the class before, during and after class.

(1) Questions before class: Grasp the idea of schedule adjustment and grasp the rhythm.

Set up a question session before class. You can set up a question session of 5 to 10 minutes before each class. The teacher asked the students questions in order to understand the students' mastery of the contents of the last lesson and adjust the teaching ideas based on this. At the same time, students should also be encouraged to ask questions to teachers, so that students can actively participate in the teaching process. At the same time, it can also train students' psychological quality and improve students' expression ability. Through this form of interaction, good teaching results can be achieved and the distance between teachers and students can be shortened.

(2) Creating situations and introducing courses: stimulating problems and promoting thinking.

The course uses case introduction. Before explaining the content of this lesson, the case introduction of relevant knowledge points should be carried out first. The case introduction should be closely linked with the actual situation, and the problem situation should be created from the situations, facts and objects that students are easy to accept and familiar with in real life.

(3) Asking Questions, Leading by Theory: Laying the Foundation.

List several relevant cases in actual engineering environment, raise questions and guide students to be proactive

Analyze and discuss the solutions to the problems in the case, and then lead to the teaching content of this lesson. Take the course of data structure as an example: the teaching content of "finding the shortest path problem" can be drawn from the city highway network, which is based on the actual need to find the shortest distance between two points; How to find a way out in the maze, how to draw out the application of stack, how to place the books in the library, and how to help students find them. The concept of lookup table and related algorithms are introduced.

(4) Deepen the problem and explore independently:

Through the explanation of the knowledge points in this lesson, students are guided to solve the problems in the case step by step, so that they can have a deeper understanding and grasp of the content of this lesson, and at the same time, their ability to analyze and solve problems can be improved. During this period, the teacher's explanation is combined with the teaching method of group discussion, this method is beneficial to cultivate students' ability to design and carry out experiments and comprehensively analyze problems, and also to improve students' team cooperation ability. At the same time, through the participation of teachers in each group, the purpose of understanding the teaching effect is achieved.

(5) Summarize and reflect, and continuously grow up.

Teaching reflection is a useful thinking activity and relearning method, which includes not only a summary of the course content, but also a summary of the students' learning status and the achievement of the course objectives in the teaching process, so as to continuously improve the teaching effect from both teaching and learning aspects. This teaching method is conducive to the cultivation of students' ability to analyze problems, propose solutions, evaluate and make decisions, and is also conducive to the cultivation of innovative thinking.

(6) Application migration in-depth ability training.

The application of theory in practice is extremely extensive, to "generalize" the knowledge and experience obtained in the classroom situation and apply it to another situation, students should learn to think and generalize. Therefore, different scenes can be selected from the front lines of disciplines, hot spots of programming, scientific research projects and innovation competitions to guide students to transfer and divergent thinking, to further and comprehensively cultivate students' programming ability, to fully mobilize the learning enthusiasm of students with different abilities, and to enhance their practical ability.

(7) Autonomous online learning after class.

Make full use of all kinds of provincial, national quality courses, mooc website and other online resources for course learning, set up QQ group or WeChat group for learning and discussing data structure courses, and introduce relevant thinking questions, subject front issues or relevant scientific research issues of key and difficult contents of external courses outside class for students to discuss, or invite other relevant experts to participate in the discussion.

5. Research on Teaching Methods

As programming courses contain many abstract theories and algorithms, we mainly adopt the following teaching methods: after several years of teaching practice, the students' programming ability has been greatly improved and the teaching effect is obvious.

(1) Case teaching method.

The whole teaching process is task-driven case teaching. It is necessary to create working situations, explore solutions, theoretical teaching and practical application, teacher demonstration and interaction with students' computer operation training, students' questions and teachers' answers, so that students can improve their agile abstract thinking ability and rigorous logical thinking ability in the process of "teaching" and "learning". In the teaching process, it should be based on strengthening the cultivation of students' practical operation ability, adopting project teaching, leading to improve students' learning interest and stimulating students' achievement motivation with work tasks.

(2) Popularization of abstract theory.

Data structure course contains many profound theories. How to explain these profound theories into contents that students can understand and remember is one of the greatest challenges teachers face. Teachers can usually adopt analogy method, association method, case method, etc., and use various popular metaphors to effectively inspire students to transition from image thinking to abstract thinking, thus mastering the regularity of knowledge, forming a scientific theoretical system, and transforming abstract concepts from short-term memory to long-term memory, and uses visual analysis as much as possible to help students understand the essence of algorithm thought and the process of its realization.

(3) The inspires of the dynamic thinking.

With the use of animation, video and other multimedia means, will explain into a dynamic, image demonstration process. Compared with simple theoretical narration and blackboard writing, dynamic demonstration can often achieve twice the result with half the effort, which greatly reduced the difficulty of understanding after the abstract algorithm was dynamically demonstrated by using the abstract algorithm.

(4) Content logic diagramming.

The teaching resources such as wall charts, multimedia, projection and demonstration, which assist teaching and run through the whole teaching process. The diagram can intuitively show the

problem to students, visualize the solution of the problem and algorithm, be clear at a glance, and show the content logic, and vividly show the problem solving process of data structure abstraction, deepen students' mastery of relevant knowledge [4].

(5) The algorithm is programmed.

Only when we have a thorough understanding of the principle of the algorithm can we design and implement the algorithm with computer language. Computer experiments not only deepen students' understanding of data structure concepts and algorithms, but also sublimate from theory to reality. During the experiment, the program was combined with dynamic demonstration, and the window was used for synchronous alternation for each step of the program.

In the process of program design, it is necessary to pay attention to the background and correlation of basic principles and algorithms, to integrate the knowledge points and methods involved, to clearly explain the transformation from algorithm idea to program realization, to provide students with an environment for independent thinking and innovation through visual demonstration, and to pay attention to promoting students to master the important principles and basic algorithms they have learned. [4]

(6) All-round Cultivation of Morality and Cultivation of People Centered.

Adhere to the organic integration of value guidance, ability training and knowledge teaching, take socialist core values as the soul and main line, take professional skills and knowledge as the carrier, dig deeply into the ideological and political education resources contained in the curriculum, and integrate ideological and political education into the whole process of curriculum teaching. For example, the "queue" structure with the first-in-first-out feature, the most typical example is the supermarket's queue shopping, which guides the standardization of students' rules and regulations, laws and regulations, etc., and is the system guarantee to realize freedom, equality, fairness and justice. [5]

6. Assessment Management and Evaluation

We should comprehensively assess and evaluate the students' theoretical mastery and practical application, follow up the students' learning progress in this course, change the final exam "final decision", and strengthen the process of teaching and assessment. Carry out comprehensive assessment and evaluation, and promote learning through the guidance of assessment management mechanism. The course assessment method can consider the combination of process teaching conditions, such as: usual performance (including classroom attendance, discussion of course content, usual homework, etc.), online performance, project practice and final examination, etc., and flexibly allocate different weights according to the nature of different courses.

Class attendance assessment, which students could check in through APP scanning codes, and questions and answers can also be published through APP group building. This saves time and facilitates timely statistics of results. Group performance evaluation is mainly based on group lectures and comprehensive project defense. Students are allowed to participate in the team and are evaluated according to task division and task completion quality.

Online performance is evaluated by online learning duration, online learning report submission and report quality, forum discussion participation and online test results, which fully reflects the effect of online learning.

The key point of the project practice lies in the examination of the experimental process, and the comprehensive evaluation is made according to the difficulty of the topic, the design idea, the program function, the operation result and the quality of the experimental report.

Finally, the final examination will increase the examination of comprehensive application-oriented topics and pay attention to the examination content of algorithmic thinking design under the condition that the basic knowledge is covered. [6]

7. Conclusion

In order to meet the needs of the society and conform to the trend of the times, we should speed up the educational reform of various specialties. Colleges and universities should combine their own undergraduate professional development and personnel training practice, strengthen top-level design and make overall plans. Teachers should update teaching concepts, continue teaching research, improve teaching methods, promote interaction between teachers and students, improve students' professional quality and innovation ability, promote teaching work and improve teaching quality, and contribute to the construction of a powerful country in higher engineering education.

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