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Research on the Course Reform of Data Structures (A) in Information and Computing Science Under the Background of New Engineering Course

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Abstract: The construction of new engineering course provides an important opportunity for training diversified and innovative talents. By analyzing the teaching objectives and current teaching situation of the data structure course, this paper puts forward new educational concepts, reforms and innovates teaching models, and renews the teaching contents of the course, to improve teaching methods, reform evaluation methods and student learning evaluation methods, cultivate students 'autonomous learning ability, and promote the comprehensive development of students' knowledge, ability and quality.

Keywords: *Data Structure; New Engineering Coursee; Teaching Mode; Method of Assessment; Autonomous Learning*

Data structures (A) is a basic course between mathematics, computer software and computer hardware. It is the core course of information and computing science. The data structure course not only helps Shandong University of Technology to implement the quality improvement project, but also builds distinctive, high level and well-known Teaching Research University, focusing on the training of applied high-level professionals with social responsibility, innovative spirit, specialized knowledge, practical ability and healthy body and mind, it also provides the necessary professional skill training for the goal of application-oriented talents of information and computing science with "Thick Foundation, heavy theory, broad vision and strong practice" . At the same time, because it occupies the core position in the information class, the computer class and the related specialty, in recent years it has become a compulsory course for each university's computer and the related specialty to take an examination of graduate school, and the content of the data structure course also appears in the information, the computer and the related domain in the job interview written examination with higher and higher probability, the course of data structure has become an important course for the students of information and computing science.

I. Course Objectives

Understand and master various data structures: Linear and non-linear structure (tree, graph) characteristics, master their representation in the computer and the basic operation of the Algorithm. To be able to solve practical problems by applying basic operations of various data structures and to learn to analyze and study the characteristics of the data structures processed by the computer, so as to select the appropriate logical structure, storage structure and corresponding algorithms for the data involved in the application, understand the time and space analysis techniques of the Algorithm. Through the study of this course, students can master the logical structure, storage structure and corresponding operation of all kinds of data that are common in computer programming, can Use the knowledge and skill of data structure to design better algorithm and program according to the data characteristic of computer processing, and further train the basic good program design ability. The students will gradually improve their ability of data abstraction, algorithm design and software development, improve their cognitive ability and research ability, and cultivate their innovative consciousness and ability.

II. Curriculum Development

The data structures (A) course has been under construction since 2000. In 2009, the course was awarded the core course of high quality engineering in undergraduate education in Shandong University of Technology. 2013-2017 supported by the Shandong University of Technology "data structures (A) course leader support program" . 2014-2018 to complete the "Shandong University of Technology Curriculum Comprehensive Reform project-data structures (A) " education reform project, 2020 was approved "Shandong University of Technology first-class undergraduate curriculum construction and cultivation project-data structures (A) " , the provincial open online course "data structures (A) " has been filmed and will be launched on the smart tree website within 2020. In the course of the curriculum reform, the teachers of the course group discuss the revision of the curriculum syllabus and the teaching plan many times, and keep the advancement of the syllabus and the teaching content Periodically, teaching plans, lecture notes, multimedia courseware and other teaching materials are constantly improved and updated in accordance with the actual teaching situation; teaching methods and methods of teaching content organization are constantly improved, and various forms such as lectures and thematic discussions are adopted, it imparts knowledge in a scientific and flexible way, uses the multimedia algorithm dynamic demonstration system, visualizes and vividly the algorithm running process, develops and improves the data structure Question Bank system, consummates the network resources; To continuously explore more reasonable and effective assessment mechanism for students.

III. Current State of the Curriculum

Based on the present situation of the course study and the characteristics of the course, combined with the training goal of the application-oriented talents in our university, the following current situation still exists in the data structure teaching process:

A. The content is much, the concept is abstract

The content of data structure course is much, the concept is abstract, the algorithm is numerous and difficult to understand, but at present the quality of the students is lower than that of the whole before, and some of them are more difficult to learn, especially for the students who do not have a solid grasp of the

basic knowledge of the pre-course (C language and discrete mathematics) , it is more difficult to learn.

B. The practice time in class is not enough

The data structure is a course that pays equal attention to both theory and practice. It is limited by the school hour, and the practice time in class is not enough. It can only accomplish the realization of the basic algorithm in the school hour of theory, unable to fully integrate theory into practice, which is not conducive to the cultivation of students' innovative and comprehensive application ability.

C. Students are not learning effectively and efficiently

In the long-term teaching practice, we found that the teaching method based on "teaching" , the students receive knowledge passively, lack active thinking, the learning effect is not enough, the efficiency is not high, the classroom teacher-student interaction is not enough, the students' internal learning motivation is not enough, it takes time and effort for a teacher to teach and time and effort for a student to learn.

IV. CURRICULUM REFORM

From the angle of course quality and the realization of the training goal, the data structure course needs a comprehensive reform that contains every link of teaching. The construction goal of data structure Course is: Online Small-scale limited Online Course (SPOC), Online-and-offline mixed Online and offline teaching mode. In the course teaching, more attention is paid to the gold content of the course itself and the overall improvement of the students' comprehensive quality, so that the students can feel the charm of knowledge, practice ability and comprehensive quality.

In the process of teaching reform,

1) in the aspect of teaching goal, cultivating students' higher-order thinking ability and questioning innovation ability can realize the organic integration of knowledge, ability and quality, and put an end to the phenomenon of "high score but low ability". The teaching goal is the curriculum guidance plan, entire curriculum all links all around the teaching goal launches. To formulate the teaching objectives of the course, to express them in clear and Operability terms as far as possible, to strengthen the study of the situation, to adapt to the diversity of student groups, to increase the teaching objectives outside the face-to-face teaching around the students' professional literature reading, project design, course paper and so on, and to design and provide stratified teaching objectives for different students.

2) in the aspect of teaching content design, the curriculum content has the depth and the breadth, conforms to the student cognition rule, reflects the discipline development front. In the course content design, the first question. After the questions are put forward, the students are inspired to think about the causes and background of the problems, leading to the analysis of the problems. Through the problem analysis, summarize the path of problem solving, and form a complete knowledge system structure. In this way, students are no longer shown in front of the simple accumulation of knowledge and boring knowledge instillation, but become the natural evolution of three-dimensional knowledge.

3) with regard to the evaluation mechanism, the evaluation of the curriculum is closely related to the learning effect of the students, which not only gives the students a sense of achievement and further stimulates their motivation to study, but also serves as a severe discipline for the students of the Disturb the water and catch a fish, making them turn their study into self-study. The effectiveness of teaching should occupy the main position in the whole evaluation system. From the Teacher's point of view, the teaching effectiveness means that the course teaching follows the course teaching goal and completes the teaching task set by the teaching goal; from the Student's point of view, the teaching effectiveness means that the student realizes the knowledge value-added through the course teaching, and makes their professional skills and comprehensive quality be promoted. The learning effect of students directly determines the effectiveness of teaching. It is more valuable and meaningful to measure the effectiveness of teaching from the perspective of students.

4) in the aspect of teaching methods, we always adhere to the concept of "learning-centered", make full use of information technology, guide students to participate in the teaching process, and attach importance to inspiring students to think with probing, comprehensive and innovative questions, so as to realize the interaction between teachers and students. Through continuous improvement of classroom teaching methods, the classroom is no longer a traditional classroom where teachers simply speak and students sit in rows to listen, but a diversified classroom. The classroom is no longer a classroom where students are silent and quietly watching teachers perform, but a classroom full of dialogue, criticism and debate. The classroom is not a classroom that trains students to be neat and Bookish, but a classroom that trains students to be creative, creative and imaginative, and fosters students' ability to communicate and cooperate.

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