

Research on the teaching reform of Python programming curriculum based on the OBE-CDIO concept

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Abstract: *In order to meet the needs of the talent training goals of applied universities and deepen the integration of industry and education, this paper proposes to design the teaching framework of Python programming courses with “OBE-based concepts”, reconstruct teaching content, and carry out the teaching and practice of Python programming courses with “CDIO-based engineering concepts”. Practice shows that this teaching model can effectively stimulate students' independent learning ability and exploration, and at the same time can improve students' teamwork and communication skills, which is in line with the needs of talent training in applied colleges and universities.*

Keywords: *Applied universities; Industry-Education Integration; OBE; CDIO*

1. Introduction

With the continuous development of China's economic form and new science and technology, the market-oriented demand for talents in all walks of life in society is also constantly changing, resulting in increasing employment pressure on college students, millions of college graduates feel that they have “little future”, and millions of enterprises are facing the “three difficulties” of not being able to find, recruit and retain ^[1]. In the face of new changes and market demand, new requirements have also been put forward for education reform, especially in the field of new engineering, which need to be continuously reformed to meet the needs of society and alleviate the state of “graduation or unemployment” of college students.

College public basic courses play a non-negligible role in the entire university period ^[2], but also the basis of professional courses, and Python programming courses as one of the many basic courses, the teaching object of this course is freshmen, for most students have not received programming courses in the high school stage of learning and training, in school learning is also non-computer or related majors, itself is not very interested in programming design, In addition, many of the IDEs used in Python programming are all English environments, which will also cause many students to feel uncomfortable when they first start learning, so in order to improve students' interest in learning, we need to adjust the teaching mode in the teaching process. In the context of the integration of industry and education, in order to meet the needs of society, so that college students can achieve “zero distance” from teaching to enterprise employment, from graduation to employment seamless docking, to achieve the purpose of “what is needed is what is learned, what is learned is used”, we need to reform the curriculum in college teaching, including teaching objectives, teaching design, teaching implementation and other processes, this paper is based on the concept of OBE-CDIO to carry out Python programming teaching reform.

2. The basic idea of the OBE-CDIO concept

2.1 OBE Concept

The OBE concept is a student-centered, results-oriented curriculum construction concept ^[3], which is a new type of educational concept. Educational features of this concept: taking the learning outcome goal as the starting point, the instructional design is designed in reverse, and then the teaching activities are carried out, so that students can achieve the original learning outcome goals after learning to complete all the teaching activities. The application of the OBE concept in instructional design is mainly: first of all, there must be a clear and clear learning outcome goal, design diversified learning requirements and learning processes according to the learning outcomes, and provide suitable conditions and opportunities

for students to achieve the expected results, so that students can gradually learn, complete learning tasks, and finally feedback the learning outcomes achieved by students to improve the original teaching design. The setting of learning outcome goals should be challenging, in order to encourage students to learn deep learning and learn to dig on their own, but the difficulty should not be too large, so as not to discourage students' enthusiasm, therefore, the setting of learning outcomes should be considered in many ways to guide and promote students to study hard. The teaching process^[4] is designed to be diversified, considering the uneven learning ability of students, and fully ensuring that different students have the opportunity to achieve the expected learning outcome goals in terms of learning resources and time, have the opportunity to show their learning results, and continuously improve according to the learning outcomes achieved by students.

2.2 Basic ideas of CDIO

CDIO is a new type of engineering teaching model, which mainly includes four parts: conception, design, implementation and operation^[5]. As far as our current higher education model is concerned, it is difficult for the college students trained to adapt to the needs of social positions, which leads to difficulties in finding employment for graduates and vacancies. The CDIO education model can effectively solve the problems faced by higher education in China, so it is widely used in the teaching activities of engineering technology majors and courses^[6]. With the development of society, the demand for talents of enterprises is also constantly changing, the development of the new era needs to have strong self-learning ability, organizational communication skills, teamwork ability and leadership ability of talents, in order to cultivate talents to meet social needs, the traditional education model needs to be reformed, and CDIO engineering education model focuses on cultivating the engineering and technical capabilities of students, especially the ability to conceive, design, develop and implement projects, which can well adapt to social needs. In 2006, Shantou University was practiced as the first university in China, and achieved good results^[7].

3. Research on the teaching reform of Python programming curriculum based on the OBE-CDIO concept

3.1 Teaching mode based on the concept OBE-CDIO

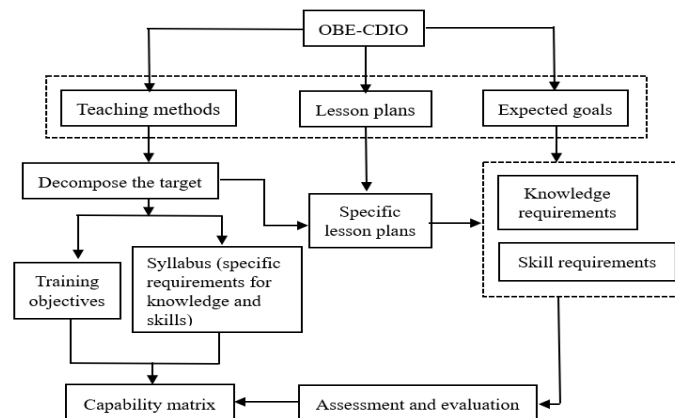


Figure 1: Teaching mode framework based on the OBE-CDIO concept

OBE concept focuses on results, results-oriented, in teaching to give “what kind of people to cultivate”, while CDIO engineering teaching mode focuses on the process, used to give “how to cultivate people”, these two concepts complement each other, in the teaching work, we must pay attention to both the training process of students, but also pay attention to the quality of training. This paper will conduct teaching research on Python programming courses based on the concept of OBE-CDIO, mainly involving three aspects: teaching methods, curriculum plans and expected goals. The first is the teaching method, which is also a key step in the implementation of our curriculum reform, which applies the plan and objectives, and the teaching method is mainly determined according to the syllabus and talent development goals. The course plan should be combined with the specific course arrangement, taking into account the degree of demand for this course in the advanced course and subsequent courses. The setting of the expected goal should not only consider the student's mastery of knowledge, but also

consider some of the skills requirements for the student. The framework of the teaching mode based on the OBE-CDIO concept is shown in Figure 1.

3.2 Teaching reform path based on the OBE-CDIO concept

OBE concept is student-centered, focusing on whether students can achieve the required ability and goal at the end of a course or graduation, so teachers are required to anticipate the expected goal at the beginning of teaching, and then reverse design the teaching process to ensure that the expected goal can be achieved, while the CDIO engineering teaching mode is based on basic ability, providing students with learning from the whole process of conception, design, realization to operation, combining the OBE concept and cdio engineering education mode. It can effectively improve the theoretical knowledge level and practical operation ability of students, and at the same time, it is also of great help to students' personal professional ability, teamwork and communication ability. In this paper, under the guidance of the OBE concept and talent training program, the computational thinking ability, programming design and implementation ability, algorithm design and analysis ability that need to be mastered in the practical teaching of python programming course are formulated as the ability training goals, and then the practical teaching activities are designed in reverse, the theoretical knowledge is integrated into the relevant practical links, the CDIO mode is used for practical teaching, and the evaluation feedback and continuous improvement are carried out according to the output results at different teaching stages in the teaching process. Achieve sustainable development of capacity-building goals and practical teaching activities. The reform path of Python programming teaching based on the OBE-CDIO concept is shown in Figure 2.

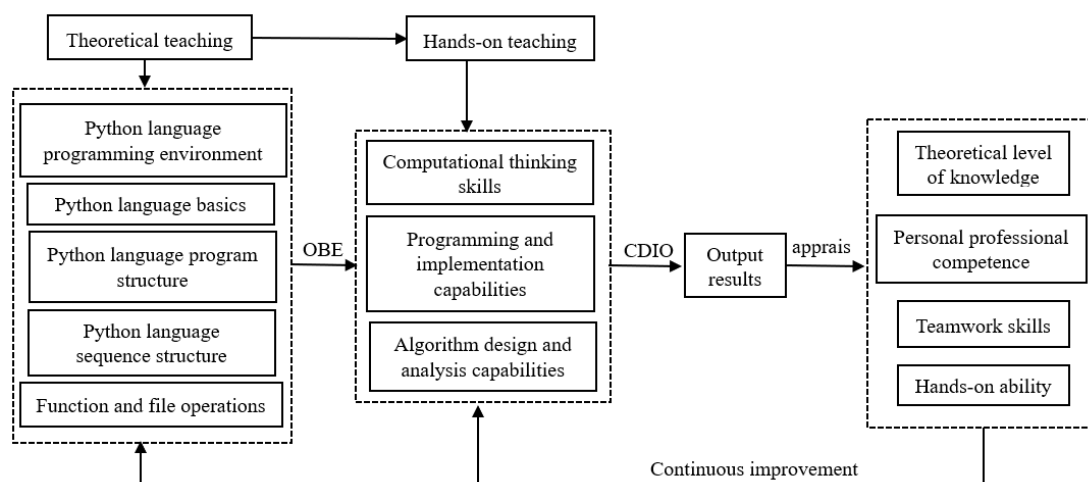


Figure 2: Teaching reform path of Python programming based on OBE-CDIO

3.3 Teaching implementation based on the OBE-CDIO concept

Combined with the different characteristics of THE two concepts of OBE and CDIO, this paper uses the case-driven method to divide the teaching process of Python programming practice into four links: conception, design, implementation and operation, so as to ensure that students can achieve the ability to master computational thinking ability, algorithm design and analysis ability and programming and realization ability. The specific teaching content is as follows:

1) Ideation

According to the training objectives, the teacher selects the appropriate program case and releases the teaching task to the students, which should include the procedure case, requirements and planning arrangements to be completed; Students become familiar with and understand after receiving the teaching task.

2) Design

Under the guidance of the teacher, the students are grouped into the algorithm design of the program case, and each group needs to sort out the target decomposition, task division, implementation plan, etc. according to the cases arranged by the teaching task, and at the same time analyze the key and difficult problems that may be encountered in the design, and form an algorithm design document to facilitate the

teacher to answer questions and explain.

3) Implementation

Students work together according to the algorithm design documents formed in the design process to realize the coding of the program. The program in the coding process is likely to cause the entire program to part ways with the expected goal because of a small problem, so in the coding process must communicate with the teacher at any time, and verify the step-by-step goals of each process, and must achieve the step-by-step goal before proceeding to the next stage.

4) Operation

Students explain and practice the results of the program, evaluate according to the setting of content assessment, including student self-evaluation, team mutual evaluation and guidance of teachers, etc., evaluate and examine whether students have reached the expected goal of ability training, in order to test the practical effect, and according to the practice process, continuously improve the ability training goals and practical process links.

4 Conclusion

Under the guidance of the OBE concept, this paper puts forward the three major ability training goals of computational thinking ability, algorithm design and analysis ability and programming and realization ability, and according to the CDIO engineering education model, practical teaching reform is carried out in the four major links of conception, design, realization and operation, and the Python programming teaching practice mode based on the OBE-CDIO concept is constructed. Through practice, it has been shown that this teaching model is conducive to the all-round development of students and is in line with the training model of compound talents in the new era.

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