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Python Programming Teaching: The Dual Drive of OBE and "Programming Tricks"

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Abstract

In order to improve the learning efficiency of computer students in private undergraduate universities in the "Python Programming" course, this paper constructs a teaching mode of "Outcome-Based Education (OBE)" as the guiding ideology of achievement oriented education and the teaching strategy of "programming routine", combining online and offline. This model starts from the curriculum syllabus and talent training program, and aims to help students to master programming skills, and cultivate their ability to create innovative thinking and solve practical problems. Through the implementation of project-driven teaching methods, case analysis and other diversified teaching methods, this model can effectively stimulate students interest in learning, and then improve the overall teaching quality.

Keywords

OBE; Programming routine; Python programming.

1. Introduction

Python As a cross-platform, free, open source and widely supported programming language, it has become an important course for computer and non-computer majors in many universities because of its powerful library and wide application fields, such as big data analysis, artificial intelligence, website development, etc. However, the Python programming course of private undergraduate colleges faces the following problems in the teaching process:

1.Students with a weak theoretical foundation have a weak theoretical foundation and insufficient practical ability

Students theoretical foundation is relatively weak, which is embodied in the solid and comprehensive grasp of the core concepts, basic principles and theoretical system of the discipline. In the process of learning, it is often difficult for them to deeply understand the internal logic and connection of knowledge, which leads to the incomplete construction of the knowledge system. At the same time, due to the lack of theoretical knowledge, students often appear powerless in the practical operation, and the practical ability is obviously insufficient. It is difficult for them to flexibly apply the theoretical knowledge they have learned to solve practical problems, which affects the improvement of learning effect and comprehensive quality.

2.Excessive emphasis on grammar knowledge during the teaching process

In the course of teaching, some teachers overemphasize the teaching of language rules such as grammar knowledge, so that students may fall into the mire of mechanical memory and test-taking skills. Although this approach may improve students test scores in the short term, but in the long run, it limits the cultivation of students language use ability and communication skills. Too much attention to grammar knowledge is easy to ignore the actual application scene and context understanding of language, which makes it difficult for students to freely use the

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language they have learned in practical communication, which affects the depth and breadth of language learning, and can not effectively improve their teamwork ability.

3.In the teaching process, students acceptance ability is not considered, and the strategy of "full room" is implemented

In the course of classroom teaching, some teachers do not fully consider the acceptance ability of students, and blindly adopt the teaching strategy of "full classroom". They often ignore the individual differences between the students, regardless of their understanding and digestive ability, and will instill a lot of knowledge into the students. This practice not only fails to stimulate students interest in learning, but also may lead to students weariness, feel that the Python programming course is difficult, lack of enthusiasm and initiative for this course.

2. Overview of OBE Concept and Its Application in Teaching

2.1. Definition and core idea of OBE idea

OBE (Outcome-Based Education), or achievement-oriented education, is a student-centered and learning-oriented educational philosophy[1,2]. Its core idea is to shift the focus of education from the teaching content and process to the students learning results, and to guide the teaching design and evaluation through clear and specific learning objectives. The OBE concept should be student-centered, so the teaching design should comprehensively and deeply consider the diverse needs, extensive interests and cognitive abilities of different levels, so as to effectively promote the formation of students independent learning habits and the full development of personalized talents. In addition, the teaching design and evaluation work should have clear, specific and measurable learning results, and the teaching activities should be closely planned and implemented around these established learning results. These achievements not only provide a clear guidance for the setting of teaching objectives, but also ensure the pertinacity and effectiveness of the teaching process. Finally, through systematic collection and in-depth analysis of students learning results data, teachers can accurately identify the advantages and disadvantages in teaching, and then continuously optimize the teaching design, continuously improve the teaching effect, and ensure to ensure that teaching activities can more effectively achieve the established course learning objectives[3].

2.2. Application of OBE concept in Python programming teaching

In order to integrate the OBE concept into the Python programming course, this paper will build the course from the following aspects:

1. Clarify the course learning objectives

According to the established course outline and talent training program, formulate a clear and specific learning goals. These goals are designed to ensure that students have a full foundation of the Python language, use programming skills, and develop excellent problem solving skills. Through systematic learning and practice, students will be able to firmly master the relevant knowledge, and lay a solid foundation for the subsequent learning and development.

2. Reverse teaching design

According to the established learning results, adopt the concept of reverse design, and carefully plan the teaching activities and evaluation methods. In this process, it is necessary to ensure that all teaching activities are closely carried out around the learning objectives, and design each teaching link one by one through reverse deduction, so as to ensure the high consistency and accurate docking between teaching activities and learning objectives.

3. Diversify the evaluation methods

In order to comprehensively and accurately evaluate students learning outcomes and ability development, diversified evaluation methods are adopted, including project assignments,

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online testing and case analysis. These evaluation methods complement each other, and together constitute a comprehensive consideration system of students learning effectiveness, aiming to reflect students knowledge mastery degree, practical application ability and problem solving skills from different dimensions and levels.

4.continuous improvement

Through the comprehensive collection and analysis of students learning feedback and various evaluation data, the teaching design is continuously optimized and improved. The move is to further improve the teaching effect, ensure that students can better master knowledge, and at the same time, to improve students overall learning satisfaction and create a more positive and efficient learning atmosphere.

3. "Programming Tricks" and Their Teaching Strategies

3.1. Definition and characteristics of "Programming tricks"

"Programming tricks" is a way to simplify a complex programming problem into a series of actionable steps. By summarizing common programming problems and solutions, we form a set of programming skills and methods that are easy to understand and master. "Programming tricks" can decompose complex programming problems into several sub-problems and solve them one by one. The common programming problems and solutions are summarized to form a set of standardized programming methods. Students can learn and master "Programming tricks", master programming skills more quickly, and improve programming efficiency[4].

3.2. Application strategy of programming routine in Python programming teaching

For common deficiency of private undergraduates in the field of mathematics, and observed in the past teaching practice, most students tend to master the phenomenon of Python programming language through memory, given the rapid development of the current big data technology, students increasing dependence on artificial intelligence, this further weakened their programming skills. This paper aims to propose a programming teaching reform program for private undergraduates, and suggest integrating programming mode training into Python programming teaching. In this way, students are able to encode the same problem multiple times, while simplifying the complexity of the problem, to stimulate the interest in learning, and thus improve their programming ability. Next, this paper will detail how to implement the training of programming mode in Python programming teaching.

1.Integrate into the syllabus

In order to improve students programming ability, "Programming tricks" can be systematically integrated into the course syllabus and regarded as an indispensable and important teaching content, so that students can skillfully use these routines to solve practical problems while mastering the basic knowledge.

2.Case explanation

In the course of teaching, appropriate cases are selected and explained in detail to show the specific application methods and significant effects of "Programming tricks" in actual programming, so as to help students to better understand and absorb these routines.

3.Practice practice

A large number of practical exercises can be arranged to ensure that students can master and apply "Programming tricks", so that students can constantly consolidate what they have learned and improve their programming skills.

4.Feedback and adjustment

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According to students practical performance and learning feedback, maintain a keen insight into teaching strategies and methods, and adjust and optimize them in time to ensure that the teaching of "Programming tricks" is always highly effective and practical.

4. Construction of Teaching Mode Based on OBE Concept and "Programming Tricks"

4.1. Combining online and offline teaching mode

In order to effectively improve the teaching quality and learning effect, this paper designs a teaching mode that integrates modern information technology, which realizes the combination of online teaching and offline practice, so as to give full play to the complementary advantages of the two[5]. In terms of online teaching, it integrates rich teaching resources, covering teaching videos, online test system and interactive discussion platform, which can provide students with flexible learning channels, allowing students to learn independently and consolidate their knowledge. As for offline practice, it covers various forms such as project-oriented learning, case analysis and group discussion, aiming to provide students with a wider range of practical opportunities and communication platform, and then cultivate their practical operation ability and innovative thinking ability[6].

4.2. Adjustment of the teaching syllabus and talent training program

Taking the major of Intelligent Science and Technology in Guangdong University of Science and Technology as an example, this paper rewrite the syllabus of Python programming according to the teaching strategy of OBE concept and "Programming tricks".

1.Clear course learning objectives

Write the Python course learning objectives and course contents according to the graduation requirements in the talent training program, and the correlation between the graduation requirements and the course learning objectives is shown in Table 1.

Table 1. Correlation between graduation requirements and course learning objectives

Graduation requirements program objective	Course Objectives 1 Programming fundamentals and problem-solving capabilities	Curriculum objective 2 **Innovative thinking and computing power**	Course Objectives 3 **Team collaboration ability**	Course Objectives 4 **independent learning ability**
Graduation request 1	H	L	L	M
Graduation request 2	L	H	L	L
Graduation request 3	M	L	H	L
Graduation request 4	L	M	L	H

(Note: H: high correlation; M: moderate correlation; L: low correlation)

2.Optimize the teaching content

Integrate "Programming tricks" into the teaching content to highlight their application methods and effects in practical programming. At the same time, increase the proportion of practical teaching content, improve students practical ability. Taking if statement as a teaching case, this paper first guides students to judge whether the grades of a single student reach the standard,

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and then guides students to write programs independently to judge whether the grades of multiple students are qualified. If the feedback is good, it will be further expanded by allowing students to write programs to evaluate the grades of multiple students. The whole teaching design framework diagram is shown in Fig.1.

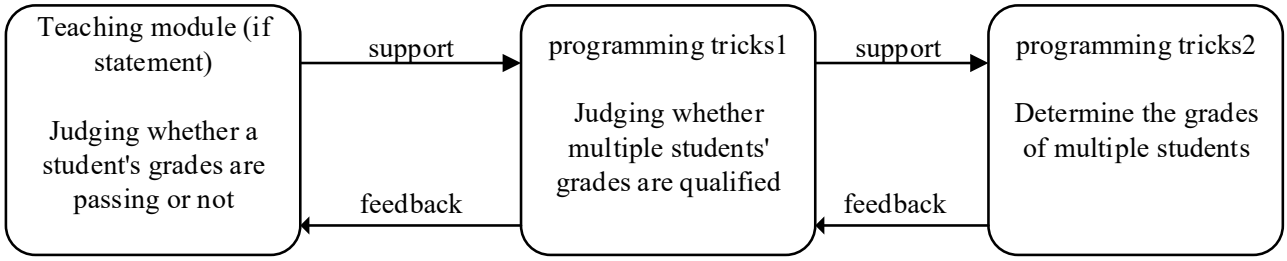

Figure 1. Teaching framework design diagram

3.We will improve the evaluation system

Establish a diversified evaluation system according to the course learning objectives, including project homework, online testing, case analysis, experimental report, discussion and other evaluation methods. The evaluation results are used to reflect students learning outcomes and ability development, and to provide a basis for teaching improvement. The correlation between course learning objectives and evaluation methods is shown in Table 2.

Table 2. Correlation between graduation requirements and course learning objectives

program objective	Evaluation method and proportion are (%)					Achievement ratio (%)
	laboratory report	Project operations	case analysis	discuss	on-line test	
Course Objectives 1	5	0	0	0	10	15
Curriculum objective 2	0	0	10	0	10	20
Course Objectives 3	5	0	0	10	20	35
Course Objectives 4	0	10	0	0	20	30
amount to	10	10	10	10	60	100

4.3. Implementation of diversified teaching methods

Nowadays, teaching methods are endless. For example, project-driven method is used to improve students practical ability. By implementing various projects from basic programming tasks to complex systems, students can gradually acquire programming skills and methods in the practice process, and then cultivate the ability to solve practical problems. At the same time, case analysis method can also be introduced. With the help of classic and practical projects, the methods and results of programming strategies in practical application, so as to deepen students understanding and mastery of programming knowledge and improve students independent learning ability. In addition, the group discussion method is to encourage students to exchange ideas and share experiences by discussing specific topics or problems, so as to promote the development of teamwork and innovative thinking, and further improve students ability to solve problems.

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5. Implementation Effect and Evaluation

5.1. Learning effect evaluation

To evaluate students basic knowledge and Python programming skills, The test provides immediate feedback on learning effectiveness, Help students to find out and make up for the knowledge loopholes in time; Project presentation serves as a means of assessing students practical ability and innovative thinking, Including both individual and team projects, For students to present their programming results and problem-solving strategies during the presentation, So as to obtain the recognition and encouragement of teachers and students; besides, And by means of a questionnaire survey, To extensively collect students feedback and satisfaction information on teaching content, teaching methods and learning difficulty, In order to provide a scientific basis for teaching improvement, Ensure the continuous optimization and improvement of the teaching mode.

5.2. Teaching quality evaluation

At present, teaching quality evaluation includes a variety of ways. This paper selects peer evaluation, student evaluation and teaching effect analysis. The peer evaluation mechanism invites experts in the field to conduct a comprehensive review of teachers teaching process and results, covering multiple dimensions such as teaching content, teaching methods and teaching effects, in order to accurately grasp teachers teaching ability and professional quality, and lay a solid foundation for the subsequent teaching improvement. At the same time, the student evaluation process extensively collects students feedback on teachers teaching activities, also covering teaching content, teaching methods and learning difficulty, etc., aiming to deeply understand students recognition and satisfaction with teaching, and provide an important reference for teaching optimization. In addition, the teaching effect analysis is by comparing the traditional teaching mode and based on achievement oriented education (OBE) concept and programming routine fusion of teaching mode in students academic performance, practical ability and innovation ability, deeply analyze the advantages of teaching mode and to improve, provide scientific basis for the continuous innovation of teaching mode.

6. Summary

Based on the teaching strategy of achievement-oriented education (OBE) concept and programming routine, this paper provides an innovative teaching mode for improving the learning efficiency of computer students in private undergraduate universities in the course of "Python programming". Through the combination of online and offline teaching methods, clear and specific learning goal setting, diversified teaching methods and evaluation methods, as well as continuous teaching improvement and quality evaluation mechanism, the cultivation of students programming skills, innovative thinking and practical problem-solving ability is effectively promoted. Practice shows that this teaching mode not only improves students learning interest and satisfaction, but also significantly improves the teaching quality and learning effectiveness.

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