

Exploration of Teaching Reform in Python Programming Fundamentals

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Abstract

In order to improve the teaching quality of the course "Fundamentals of Python Programming" and cultivate students' ability to use Python to solve practical application problems, a teaching reform of the course "Fundamentals of Python Programming" is carried out in response to the current situation and existing problems of the course. Through enriching teaching resources, innovating teaching methods, constructing evaluation systems, and integrating ideological and political elements, theory and practice are combined, Strengthen students' ability to analyze and solve problems, and improve the teaching quality of the course "Fundamentals of Python Programming".

Keywords

Python programming design, Teaching reform, Teaching evaluation, Course ideological and political education.

1. Introduction

With the rapid development of modern information technology, the technological revolution in the "Internet plus" era has made computers widely used in learning, life, work and other fields. Basic computer education in universities is an important component of higher education, responsible for popularizing computer knowledge and technology for college students. "Fundamentals of Python Programming" is a compulsory course for public computer fundamentals, which helps to enhance students' computer literacy and comprehensive abilities.[1]

Python language has elegant, clear, and concise syntax characteristics, and has become an entry-level programming language for non-computer major students. However, for non-computer majors, the class hours allocated to this course are often relatively small, usually 2 credits, and a portion of it is also reserved for computer lessons. For the Python language programming course, how to achieve the course goal of cultivating students' practical abilities within a limited class time is an urgent problem that needs to be solved. Under the guidance of new educational goals, there is an urgent need to explore and reflect on the teaching reform of the Python programming foundation course, in order to enhance the computer application ability of non-computer major students in universities.[2]

"Fundamentals of Python Programming" is a compulsory course for general education offered by Shanghai Second University of Technology. The mastery of this course will directly affect students' ability to analyze and solve problems using computers, and will also have a significant impact on their learning of subsequent computer related courses. However, there are still prominent issues such as poor programming application skills among students, teacher centered classroom teaching, and the inability of students to become the main body of teaching design, resulting in difficulty in mobilizing their learning enthusiasm and the need to improve their self-learning ability. [3]In order to improve the teaching effectiveness of the course "Fundamentals of Python Programming", and to enable students to master programming syntax knowledge within a limited time, and to apply programming language to complete some

practical cases, this article explores "Fundamentals of Python Programming" by enriching teaching resources, innovating teaching methods, constructing evaluation systems, and integrating ideological and political elements Curriculum and teaching reform to improve teaching effectiveness and ensure curriculum quality.[4]

2. Enriching teaching resources

Programming teaching should not only be limited to the grammar level, but also focus on cultivating students' ability to solve practical problems in different fields. Students studying this course not only aim to earn credits through exams, but also to develop the ability to use programming to solve professional problems. Therefore, from the perspective of student professional development and ability enhancement, the course learning objectives are divided into two parts: program design basics and program design applications. Starting from the goal of talent cultivation, this article optimizes the teaching content according to the learning objectives, and divides the course content of "Python Programming Fundamentals" into two parts, namely the basic part and the advanced part. In the basic section, the main focus is to introduce students to basic grammar knowledge, such as common data types, expressions, basic operation statements, functions, program control structures, file operations, and the use of built-in libraries, so that students can master the relevant basic knowledge of Python programming and successfully pass the Computer Level 2 Python subject exam. In the advanced section, the main focus is to introduce students to the installation and use of common third-party libraries, and to combine rich case studies for teaching, so that students can use programming languages to solve professional practical problems and master the basic techniques of Python language in image processing, data analysis, and other fields. Case design should be representative, able to help students strengthen and consolidate their grammar knowledge, stimulate their interest in learning, mobilize their subjective initiative, enable students to naturally understand how theoretical knowledge can be applied to practical problems, realize the importance of this course for their own profession, and significantly improve teaching effectiveness.

In order to ensure the teaching quality of the course "Fundamentals of Python Programming", teachers have updated the existing teaching resources and organized the materials for the class, mainly including editing and recording course videos and constructing updated exercise environments; Actively carry out teaching activities related to online MOOCs and physical classrooms using Chinese university student MOOCs, Chaoxing Xuetong, Tencent, and other online teaching resources and tools. In terms of experimental preparation, due to the limited learning time in the laboratory, while the programming course requires a large amount of programming practice in the programming environment. Therefore, teachers should consider the learning environment and conditions of students, and for some students who are unable to use computer installation programs to design installation packages for practice, search for teaching platforms that support online programming on mobile phones. Students should log in to Python 123 on their mobile phones and download the Python Programming Lion App for relevant program design experimental exercises, organically combine existing teaching resources with the platform, and solve the limitation problem of students lacking computer hardware. In terms of theoretical teaching preparation, the two platforms of Xuetong and Tencent Meeting will be combined. Each physical classroom will record the class content, and then the video will be edited and uploaded to Xuetong through video editing software, establishing an online course platform. In order to fully interact with students, teachers can have face-to-face communication with students and engage in lively discussions; Students can review their questions after class by watching live replays or by asking questions in QQ groups to achieve Q&A. To solve installation or program debugging problems in the experimental

environment, teachers can provide face-to-face demonstrations during the experimental class or use remote control software such as QQ's remote control module to help students solve installation or program operation errors, promoting complete freedom from time and space constraints between teachers and students, and timely learning and communication of knowledge points after class. This facilitates teachers to understand students' mastery of knowledge points through the Q&A process, adjust teaching content and methods in a timely manner, and enable students to have a deeper understanding of the key and difficult points in teaching.

3. Innovating teaching methods

The traditional method of teaching computer programming languages often involves teachers teaching in the classroom and students practicing on the computer. Using traditional teaching methods, there is a certain level of difficulty in completing the teaching within 32 class hours. This requires innovation in teaching methods and means.

In the teaching of Python language programming courses, due to the compression of teaching hours for basic grammar, data types, process control, and other content, this part of the teaching content is recorded as lecture videos and made into digital teaching resources, which are conducted through online self-learning; During offline teaching, project-based teaching methods are adopted to integrate fragmented knowledge points and consolidate students' mastery of basic knowledge through project application. In offline classrooms, teachers can program and implement project content step by step, while also demonstrating common errors and exceptions during the programming process. Through on-site debugging of errors in the program, students can train their programming thinking and reduce their fear of difficulty in writing code.

Each course has its own characteristics and requires a comprehensive analysis based on the characteristics of the "Fundamentals of Python Programming" course, with a focus on case-based teaching and task driven teaching, and the development of new methods for blended learning. In order to motivate students, teaching tasks related to classroom content are set in teaching methods, allowing students to think and explore with questions; The course content should be simple and easy to understand, using the quick answer, talent selection, and in class practice sections of the Learning Pass to create a good classroom atmosphere and encourage students to better engage in it; Teachers give full affirmation and motivation to the answers given by students, and then summarize and emphasize the key points to achieve the goal of consolidating knowledge. Learning theory alone is often not enough for students, what they need to practice more is practical operation. Only by writing simple programs can they flexibly memorize and apply basic grammar elements. In order to further exercise and cultivate students' self-learning ability, teachers assign homework and pre class preview tasks to encourage students to use their imagination, conduct innovative research based on the cases taught in class, submit their homework, and then showcase the excellent works submitted by students in each class, inspiring positive competition and cultivating their divergent thinking and imagination.

In order to understand the learning effectiveness of students in the teaching process and track their learning progress, teachers can publish a questionnaire survey on Xuetong. Based on the feedback from students, teachers can timely understand their mastery of knowledge points and relevant opinions, identify and fill in gaps, revise and adjust the teaching content and methods for the next stage. In short, in teaching, teachers use carefully designed teaching methods as the basis to stimulate students' interests, guide students to quickly grasp key knowledge points through a combination of case-based and task driven teaching methods, obtain teaching feedback through classroom homework and discussion modules in learning software, and

steadily and efficiently explore the application of blended learning in the "Python Programming Fundamentals" course, ensuring teaching quality.

4. Building an evaluation system

Teaching evaluation is the measurement and feedback of the teaching process and results. Traditional classroom teaching evaluation is often achieved through student evaluation and test paper analysis, lacking feedback on problems that arise during the teaching process. Through feedback, teachers can adjust their teaching work in a timely manner, identify deficiencies in teaching methods and organizational processes, and provide a basis for improving teaching quality.

The course assessment and evaluation method is a measure of teaching effectiveness, a summary of teaching practice, and also a feedback on the evaluation of student learning outcomes. In order to cultivate students' computational thinking, it is not enough to simply use a set of final exam papers as the sole criterion to test students' learning performance when formulating assessment standards. This article proposes an exploration and evaluation standard for the teaching reform of the "Python Programming Fundamentals" course under the "3+X" blended learning mode, which measures the mastery of student knowledge. Among them, "3" refers to regular grades, test scores, and final computer-based exam scores, "X" refers to students exploring self-study modules outside of class, requiring students to self-study other third-party libraries, or redesign and complete a new case based on the introduced third-party libraries to test students' divergent thinking ability, self-learning ability, and practical ability.

The student's daily grades include experimental practice performance and classroom performance. A test refers to a test task released by Xuetong, including multiple-choice questions, true/false questions, fill in the blank questions, and short answer questions, with a focus on testing students' mastery of Python programming language grammar. Students can use Python 123 and Python Programming Lion App for experimental exercises, and upload the written program to Learning Platform through screenshots. In the self-learning exploration module, personalized program assignments submitted by students are evaluated using a combination of peer evaluation and teacher evaluation, providing a comprehensive quantitative rating. The final exam adopts a paperless examination mode, using the World Wide Automatic Network Examination Platform for assessment. The question types include multiple-choice questions, multiple-choice questions, true/false questions, fill in the blank questions, and programming questions, covering the knowledge points in the book. Quantitative evaluation scores are given through a combination of machine and manual grading. In the end, multiple assessment modes are used to quantify the weighted sum of scores to obtain the comprehensive evaluation results of students. This evaluation method can comprehensively examine and test the learning effectiveness of students, allowing them to not only master grammar and theoretical knowledge, but also apply what they have learned and have practical application abilities.

5. Integrating ideological and political elements

The responsibility of university teachers is to teach and educate people. In addition to imparting professional knowledge, they also need to carry out education work. Education refers to broad ideological and political education, such as strengthening excellent traditional Chinese culture, socialist core values, morality, intelligence, physical fitness, aesthetics, and labor. Curriculum ideological and political education is a comprehensive educational concept that aims to build a comprehensive and holistic education pattern for all staff, aligning professional courses with ideological and political theory courses, forming a synergistic effect, and making moral education the fundamental task of education. Curriculum ideological and political education is

not a new task, but something that university teachers have been working on for the cultivation and construction of high-level talents in the new era. This article actively constructs the "Python Programming Fundamentals" course ideological and political education teaching model, explores the structure, goals, levels, and approaches of course ideological and political education, reveals the laws of course ideological and political education, and achieves the educational goal of transitioning elements to the system and extending in and out of class.

While ensuring teaching quality, we also attach importance to the integration of ideological and political education in the curriculum with classroom teaching. For example, a pre class computer technology lecture activity can be held, inviting students to share some useful software or advanced computer technologies they have learned in their daily lives in the form of a PPT five minutes before class. This activity has received a positive response from students, and the PPT produced involves the application of QR codes, the development history of programming languages, the application of image recognition technology, and the introduction of various application software. Through this activity, the main goal is to cultivate students' spirit of technological innovation, guide them to love science, establish correct worldviews, outlooks on life, and values, and promote the comprehensive development of morality, intelligence, physical fitness, aesthetics, and labor. In addition, teachers can naturally incorporate ideological and political elements into their teaching when explaining grammar knowledge in class. When introducing string extraction methods, taking "between heaven and earth in life, like a white horse passing through a gap, it suddenly ends" as an example, explain to students how to use the string slicing function to obtain "heaven and earth" and "white horse", so that students can understand the forward and reverse encoding of strings. By incorporating ideological and political elements into the classroom through this simple example, students not only understand the importance of cherishing time, but also have a deep impression of grammar knowledge and a more solid grasp. In response to the powerful third-party library of Python, students are encouraged to download and organize ancient poems created by a certain poet. Using a word segmentation module and a word frequency program, a word cloud is generated to explore and analyze the texts with higher frequency in the ancient poems created by the author. Students are encouraged to display and share their analysis results in experimental classes, which enlivens the classroom atmosphere and enhances their literary literacy and love for poetry unconsciously, Stronger cultural and national confidence.

6. Conclusion

The teaching reform of the Python Programming Fundamentals course has effectively integrated the teaching content of syntax and data structures into the teaching of third-party libraries and frameworks, driving the mastery of basic knowledge through project-based teaching. However, due to lack of experience, the number of students using it is not enough. This teaching reform not only inherits the advantages of traditional offline classroom teaching, but also fully utilizes the rich online resources. Students have truly become the main body of learning, and their self-learning and collaborative learning abilities have been greatly improved. On the other hand, it also faces some new challenges, such as a significant increase in the workload of teachers compared to traditional teaching. There is a lot of work to be completed, including selecting and recording micro video themes, organizing and categorizing preview and stage test questions, designing and assessing group discussion topics, and evaluating project assignment grades. In addition, how to introduce more interesting, practical, and scientific cases and projects in the course to enrich the course content and enhance its attractiveness is also an important content that needs to be explored in the future.

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