International Journal of Research in Engineering and Science (IJRES)
ISSN (Online): 2320-9364, ISSN (Print): 2320-9356
www.ijres.org Volume 12 Issue 6 ǁ June 2024 ǁ PP. 26-30

[1] Python Programming Design in BOPPPS Teaching Mode and Classroom Participatory Learning Design

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Abstract*—This article comprehensively explores the limitations and improvement plans of the traditional Python programming classroom teaching mode, and focuses on the application of the BOPPPS teaching mode in Python programming classroom teaching. The traditional model is teacher centered, with a single learning approach, emphasis on imparting basic knowledge, and a lack of flexibility and personalization, which restricts the effectiveness of teaching. The BOPPPS model is student-centered, with diverse learning methods, emphasis on practical operation and application abilities, as well as flexibility and personalization, providing new ideas for teaching improvement. By analyzing the advantages and practical cases of the BOPPPS model, this article emphasizes the promoting effect of this model on students' learning interest, learning effectiveness, and self-learning ability. Therefore, adopting the BOPPPS teaching model can effectively improve the quality of Python programming classroom teaching and provide useful reference for educational reform..*

Keywords*—Teaching Mode, BOPPPS, Python Programming, Participatory Learning, Application Ability*

Date of Submission: 25-05-2024 Date of acceptance: 05-06-2024

INTRODUCTION

With the continuous updating of educational concepts and the continuous innovation of teaching models, more and more educators are paying attention to how to improve the teaching effectiveness and learning experience of Python programming classrooms. The traditional Python programming classroom teaching model often focuses on teachers, emphasizing knowledge transmission and listening to explanations. The participation and enthusiasm of students are limited, making it difficult to stimulate their learning interest and improve learning effectiveness. Therefore, finding a teaching model that can promote student participation, stimulate learning enthusiasm, and improve learning effectiveness has become crucial.

In this context, the BOPPPS teaching model has emerged. The BOPPPS teaching model is a student-centered teaching model that guides students to actively participate in learning, improve their learning effectiveness and self-directed learning ability by setting clear learning objectives, introducing knowledge, explaining concepts, demonstrating skills, applying practical operations, and summarizing. This teaching model has been widely applied in different disciplines and fields, and has achieved significant teaching results.

Based on the teaching characteristics and student needs of Python programming, the BOPPPS teaching mode is introduced into Python programming classroom teaching, and a participatory learning plan that is in line with the actual situation is designed. This helps to enhance students' learning interest and motivation, promote their language communication and comprehensive application abilities, and provide a feasible way to improve the quality of Python programming classroom teaching. Therefore, this study aims to explore the application of BOPPPS teaching mode in Python programming classrooms, and design a participatory learning plan based on this mode, providing theoretical and practical support for the reform and improvement of Python programming classroom teaching.

OVERVIEW OF BOPPPS TEACHING MODE

The BOPPPS teaching model is a student-centered teaching model that guides students to actively participate in learning, improve their learning effectiveness and self-directed learning ability by setting clear learning objectives, introducing knowledge, explaining concepts, demonstrating skills, applying practical operations, summarizing and summarizing, and applying stages. In the Python programming classroom, the application of BOPPPS teaching mode can stimulate students' interest in learning and promote the comprehensive improvement of language ability.

In Python programming teaching, using the BOPPPS teaching model is a student-centered teaching method. This mode consists of seven stages: target (B), import (O), explanation (P1), demonstration (P2), operation (P3), summary (P4), and application (S). Firstly, in the goal section, the teacher clearly sets learning objectives to stimulate students' learning motivation and clarify their learning direction. Next, in the introduction stage, the teacher stimulates students' interest by introducing relevant topics, pictures, videos, and other methods, laying the foundation for the development of learning content.

In the explanation stage, the teacher introduces the learning content of this lesson to students, explains relevant language knowledge and skills, and provides necessary background information and knowledge points for students to understand and master. Subsequently, in the demonstration section, the teacher showcases the practical application of Python language to students through demonstrations, demonstrations, stories, and other methods, allowing students to experience the vividness and practicality of the language. Then, in the operational stage, students participate in the learning process through role-playing, group discussions, case analysis, and other methods, practice the knowledge and skills learned, and improve their language application abilities. In the summary section, the teacher reviews and summarizes the learning content of this lesson, emphasizes the key points, clarifies doubts, helps students integrate and summarize the knowledge learned, and deepens their impression. Finally, in the application stage, students apply the Python language knowledge and skills they have learned to practical situations, improving their language proficiency and practical application level. Through the design and implementation of the above steps, the BOPPPS teaching model can effectively promote participatory learning in Python programming classrooms, improve student learning enthusiasm and effectiveness, and provide strong support for teaching improvement and enhancement.

The BOPPPS teaching mode has obvious characteristics in Python programming teaching. Firstly, this model emphasizes student active participation, with a student-centered approach, encouraging active participation in the teaching process and enhancing their learning motivation and interest. By setting clear learning goals and introducing knowledge, it stimulates students' curiosity and thinking, making the learning process more vivid and interesting. Secondly, the BOPPPS model breaks down the teaching process into different stages, each with clear tasks and requirements, making the teaching process more orderly and standardized. This helps students better understand and master the learning content, and improves learning effectiveness.

In addition, the BOPPPS teaching model emphasizes the cultivation of students' practical operation and knowledge application abilities. In the demonstration and operation stages, students participate in the learning process through practical operation, practice, and discussion, deepening their understanding and mastery of knowledge. Finally, in the summary and application section, students apply the knowledge they have learned to practical situations through summarization and practical application, promoting the consolidation and improvement of learning outcomes. In summary, the BOPPPS teaching model in Python programming teaching has the characteristics of strong student participation, orderly and standardized teaching process, and emphasis on cultivating students' practical operation and knowledge application abilities, which helps to improve their learning effectiveness and self-learning ability.

The BOPPPS teaching model has multiple advantages, making it widely used in Python programming teaching. Firstly, the BOPPPS model emphasizes the participation and initiative of students, which helps to stimulate their interest and enthusiasm in learning. By involving students in the teaching process, they can become more focused and engaged, improving learning outcomes. Secondly, the BOPPPS model breaks down the teaching process into multiple stages, each with clear tasks and goals. This orderly teaching design helps teachers better organize teaching content, making the teaching process clearer and more effective. In addition, the BOPPPS model focuses on cultivating students' practical operation and knowledge application abilities. Through demonstrations and operational activities, students can hands-on practice the knowledge and skills they have learned, improving the effectiveness and practicality of their learning. In addition, the BOPPPS model emphasizes the application and extension of knowledge, cultivating students' comprehensive and innovative thinking abilities in the summary and application process. This helps students apply the knowledge they have learned to practical problems and cultivate problem-solving abilities. Finally, the BOPPPS model has flexible and diverse characteristics, which can be adjusted and adapted according to the different learning styles and ability levels of students, improving the personalization and differentiation level of teaching.

THE LIMITATIONS OF TRADITIONAL PYTHON PROGRAMMING TEACHING MODE

A.Traditional Python Programming Teaching Model

In the traditional Python programming teaching model, teachers often play a leading role. Teachers are usually knowledge transmitters and authoritative representatives, who develop curriculum outlines and teaching plans, and are responsible for classroom explanations and guidance. In this mode, students are often passively receiving information, and their roles are more like receivers and listeners of knowledge, lacking sufficient opportunities for active participation and thinking. Teachers usually impart knowledge to students through explanations, demonstrations, lecture notes, and other means, while students play the role of receivers in the classroom. Students mainly receive and digest the knowledge conveyed by the teacher during class, but lack opportunities for interaction and communication. This one-way teaching model makes students' thinking activities relatively passive, lacking the exercise of independent thinking and creative thinking. In addition, in traditional modes, teachers are often the sole authority in the classroom, and students often have a high level of trust in the teacher's words and opinions, with less critical thinking and questioning. This teaching model may lead to a lack of autonomy and independence among students, as well as a lack of understanding and application ability of knowledge.

B.Single Learning Methods

Traditional teaching methods often focus on lectures, which have certain limitations in meeting the diverse learning needs and styles of students. Students have different learning styles and preferences. Some students prefer to learn through listening to explanations, while others prefer to learn through practice and interaction. However, traditional teaching methods often cannot meet the learning needs of all students, leading to some students feeling unable to adapt or having poor learning outcomes. At the same time, this single teaching method also leads to a lack of interaction and participation in the classroom, and students receive knowledge in a passive receiving information state, lacking opportunities for interaction and communication, thereby affecting the depth and breadth of learning. To address this issue, educators and instructional designers need to consider how to meet the learning needs and styles of different students through diverse teaching methods and strategies. For example, group discussions, case studies, practical operations, role-playing, and other methods can be used to enrich teaching content, stimulate students' interest and participation in learning, thereby improving teaching effectiveness and student learning experience.

C.Emphasis on Imparting Basic Knowledge

Under traditional teaching methods, it is common to focus on imparting basic knowledge. Teachers usually invest a lot of time and energy in introducing basic knowledge such as grammar rules and language structures to students. This approach helps students establish a foundation for language learning and master necessary language elements, but it also has certain limitations. Firstly, the transmission of basic knowledge under traditional teaching methods often remains at the theoretical level, lacking the cultivation of practical language application abilities. The knowledge learned by students in the classroom is often isolated and one-sided, making it difficult to flexibly apply in practical language communication. Therefore, the knowledge they master is often difficult to apply to practical life, leading to limited improvement in language ability. Secondly, excessive emphasis on imparting basic knowledge may lead to fragmented and unrealistic teaching content. Students may fall into a state of rote learning, neglecting the practical use of language and the cultivation of communication skills. In this situation, students may find language learning boring, lacking motivation and interest.

D.Lack of Flexibility and Personalization

The traditional teaching model often focuses on fixed teaching content and forms, lacking flexibility and personalization. In this rigid teaching method, teachers often impart knowledge step by step, and students are passive recipients of passive receiving information, lacking opportunities for participation and self-directed learning. This situation leads to a lack of flexibility in the teaching process, which cannot fully consider the individual learning needs and styles of students. Due to the relatively fixed teaching content and format, students may feel bored and lack motivation and interest in learning. Their learning process lacks personalized experiences, which cannot stimulate their initiative and creativity in learning. Therefore, this rigid teaching method is difficult to stimulate students' interest and creativity in learning, which affects the improvement of teaching effectiveness.

E.Low Student Engagement

In the traditional teaching mode of Python programming, student participation and enthusiasm are often limited. This phenomenon may have multiple reasons. Firstly, the classroom environment has an impact

on student engagement. In large classrooms, students often find it difficult to integrate into discussions because time is limited and teachers find it difficult to have in-depth interaction with each student. In addition, traditional teaching methods, such as one-way explanations, may make students feel dull and lacking in attractiveness. Secondly, the subject content itself may also affect student engagement. If students are unable to connect their learned knowledge with real-life situations, they may lose motivation to learn.

PYTHON PROGRAMMING DESIGN PARTICIPATORY LEARNING DESIGN SCHEME IN BOPPPS TEACHING MODE

A.Student Centered

The BOPPPS model adopts a student-centered teaching philosophy, aiming to stimulate students' interest and enthusiasm in learning, making them the main body and participants of teaching. Guided by this philosophy, teachers stimulate students' curiosity and thinking by setting clear learning goals and engaging introduction processes, transforming them from passive reception of information to active participation and thinking. In various stages of teaching, teachers focus on encouraging students to express their opinions, raise questions, and share experiences, providing students with rich and diverse learning opportunities and space for independent learning. Through diverse teaching activities and flexible teaching methods, teachers stimulate students' interest and motivation in learning, enabling them to actively participate in the teaching process, thereby achieving student-centered teaching goals. This teaching philosophy can not only improve the learning effectiveness and satisfaction of students, but also cultivate their self-learning ability and awareness of lifelong learning, laying a solid foundation for their future learning and development.

B.Diversified Learning Methods

The design of BOPPPS mode fully embodies the concept of diversified learning methods, by decomposing the teaching process into multiple stages, such as explanation, demonstration, operation, summary, and application, to meet the learning needs and styles of different students. In the explanatory section, teachers can introduce new knowledge and concepts to students through clear explanations and textbook guidance. In the demonstration phase, teachers can use multimedia technology, case analysis, and other methods to demonstrate the practical application and scenarios of knowledge to students, stimulating their interest in learning. In the operational stage, students have the opportunity to hands-on experience, deepen their understanding and mastery of the knowledge they have learned through practical operations, group cooperation, and other means, thereby improving the effectiveness and practicality of their learning. In the summary section, students are encouraged to summarize and share their learning experiences, promoting their understanding and mastery of knowledge.

C. Emphasis on Practical Operation and Application Ability

The BOPPPS mode focuses on cultivating students' practical operation and knowledge application abilities in the demonstration and operation stages, which is particularly important in language learning. Through practical operation, practice, and discussion, students are able to deeply participate in the learning process, transitioning from a passive receiving information state to an active learning and practice state. In the demonstration phase, the teacher demonstrates the practical application of language knowledge and skills to students through demonstration, case analysis, and other methods, stimulating their interest and motivation in learning. In the operational stage, students have the opportunity to hands-on experience, deepen their understanding and mastery of the learned knowledge through practical operations, group cooperation, and other methods, and improve their practical application level of language ability. In this process, students are not only able to apply the knowledge and skills they have learned to specific situations, but also able to communicate and discuss with classmates, solve problems together, and deepen their understanding and mastery of knowledge. Through this practical learning approach, students can not only improve their practical language proficiency, but also cultivate problem-solving and collaborative communication skills, laying a solid foundation for their future learning and development. Therefore, the practical operation and application ability cultivation of the BOPPPS model are of great significance for improving students' language ability and comprehensive literacy.

D. Flexibility and Personalization

The design of BOPPPS mode emphasizes flexibility and personalization, providing more possibilities and space for teaching. In this mode, teachers can not only adjust and adapt to different learning styles and abilities of students, but also design flexible teaching according to the needs of teaching content and objectives. This means that teachers can choose different teaching methods, resources, and strategies to meet the learning needs and styles of different students. For example, for students who enjoy listening to explanations, teachers can provide detailed explanations and interpretations; For students who enjoy practical operations, teachers can

design learning tasks and activities with strong practicality; For students who enjoy communicating and discussing with others, teachers can organize interactive activities such as group discussions or role-playing. Through this personalized teaching method, students can better understand and master knowledge, improve learning effectiveness and interest. In addition, the BOPPPS model also encourages students to actively participate in the teaching process, stimulating their creativity and thinking vitality through sharing viewpoints, raising questions, and solving problems. Therefore, the design of the BOPPPS model is flexible and diverse, which can improve the level of personalization and differentiation in teaching, stimulate students' interest and creativity in learning, and lay a solid foundation for their comprehensive development.

E.Improve Student Engagement

Firstly, with clear learning objectives, teachers can arouse students' interest by asking questions, sharing interesting stories, or displaying relevant pictures or videos before the course begins. This helps guide students from other daily affairs to the course content. Using the Outcome approach, students will know what they will learn in this lesson with clear learning objectives. This helps to stimulate students' learning motivation, as they know what skills or knowledge they will acquire. Through the Pre assessment stage, teachers can conduct a brief predictive assessment at the beginning of the course to understand students' level of understanding of the course topic. This helps teachers adjust their teaching strategies to meet the needs of students. Utilizing interactive learning, which is the core component of the BOPPPS model. Teachers should encourage students to actively participate, such as through group discussions, role-playing, case studies, and other methods. In this way, students no longer passively receive information, but become creators and sharers of knowledge.

CONCLUSION

Overall, the BOPPPS teaching model is a student-centered teaching method that promotes students' active participation and self-learning ability through clear learning objectives, engaging introductions, detailed explanations, vivid demonstrations, practical operations, inductive summaries, and practical applications. In Python programming teaching, adopting the BOPPPS teaching mode can stimulate students' interest in learning and promote the comprehensive improvement of language ability. Compared to traditional teaching methods, the BOPPPS model has multiple advantages, such as emphasizing student participation and initiative, providing diverse learning methods, emphasizing practical operation and application abilities, as well as flexibility and personalization. By analyzing the limitations of the traditional Python programming teaching model, it can be seen that the BOPPPS model provides feasible improvement solutions to solve these problems, which can improve teaching effectiveness and student learning experience, and provide theoretical and practical support for the reform and improvement of Python programming teaching.

ACKNOWLEDGMENT

This work is supported by Higher Education Teaching Reform Project of 2023 Guangdong University of Science and Technology "Quality Engineering" (Grant No. GKZLGC2023027).

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