STUDY THE LEARNING EFFECTS OF BLENDED TEACHING MODE OF APPLICATION OF THE "STUDY PASS+BOPPPS" --- TAKING THE OBJECT-ORIENTED PROGRAMMING COURSE OF SHANDONG UNIVERSITY OF ENGINEERING AND VOCATIONAL TECHNOLOGY AS AN EXAMPLE

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Title:	Study the learning effects of blended teaching mode of application of the "Study Pass+BOPPPS" ---Taking Object-Oriented Programming Course of Shandong Engineering Vocational and Technical College as an Example
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ABSTRACT

This paper aimed to study the learning effects of the blended teaching mode of application of the " Study Pass + BOPPPS " ---Taking Object-Oriented Programming Course of Shandong Engineering Vocational and Technical College as an example, from the perspective of teachers and students, the objectives of the study were: 1) To analyze the current situation of teaching Object-Oriented Programming course; 2) To explore the learning effects of the blended teaching mode of "Study Pass+BOPPPS" in the course of "Object-Oriented Programming."

This paper adopted qualitative research methods to analyze the data from pre- and post-interviews with teachers and students on the use of the blended teaching mode, summarize the current situation of teaching Object-Oriented Programming, and verify that the blended teaching mode of " Study Pass + BOPPPS " has achieved specific teaching effects. This paper took the Object-Oriented Programming course of Shandong Engineering Vocational and Technical University as an example and selected 110 students in the class of 2022 majoring in software technology as the research object.

This paper found that: 1) There were problems in teachers' teaching, such as outdated and single teaching methods, lack of teaching resources, general teaching effect, single teaching evaluation method, and lack of understanding of blended teaching. There were problems in students' learning, such as low interest in education, common initiative, insufficient participation, low self-efficacy, and dissatisfaction with the current teaching methods. 2) " Study Pass + BOPPPS " blended teaching has achieved certain results. Teachers' teaching methods are constantly updated, teaching resources are getting richer and richer, the teaching effect is getting better and better, the teaching evaluation system is getting better and better, and teachers are more clear about the meaning of blended teaching and learning to use the blended teaching mode to carry out teaching; at the same time, it stimulates the student's interest in the learning of the course of "Object-Oriented Programming," improves the students' initiative in

learning, sense of participation and self-efficacy, the students have satisfied attitudes towards the blended teaching. The students were satisfied with the blended teaching. The apparent improvement of the teaching effect provides a basis for the teaching reform of the Object-Oriented Programming course; it will also offer specific reference and guidance for the reform exploration of the teaching of other computer courses.

Keywords: study pass, boppps, blended learning, learning effectiveness, object-oriented programming

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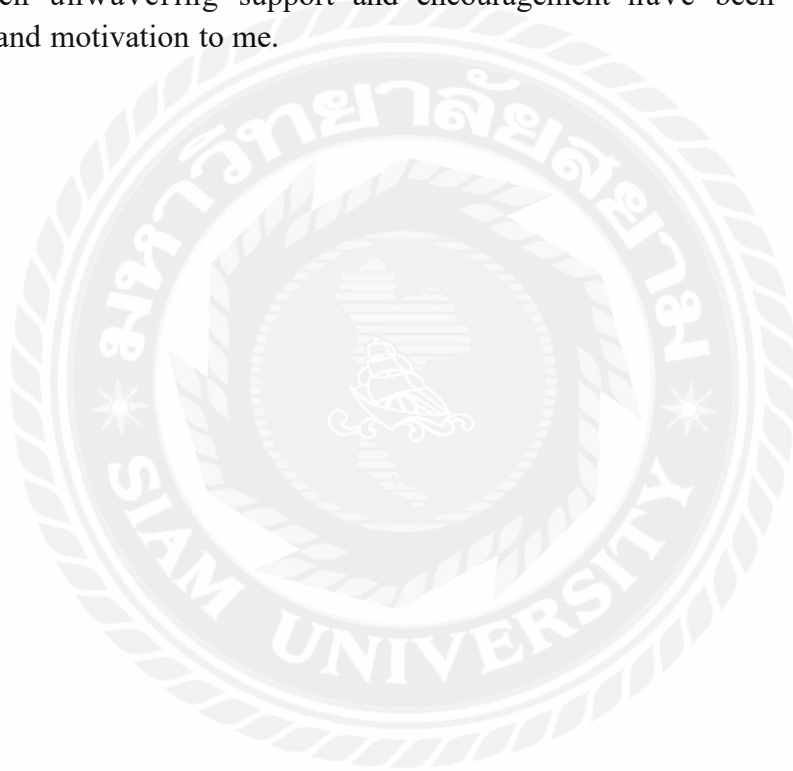
Declaration

I, Han QiFeng, hereby certify that the work embodied in this independent study entitled "Study the learning effects of blended teaching mode of application of the "Study Pass+BOPPPS" ---Taking Object-Oriented Programming Course of Shandong Engineering Vocational and Technical College as an Example"is result of original research and has not been submitted for a higher degree to any other university or institution.
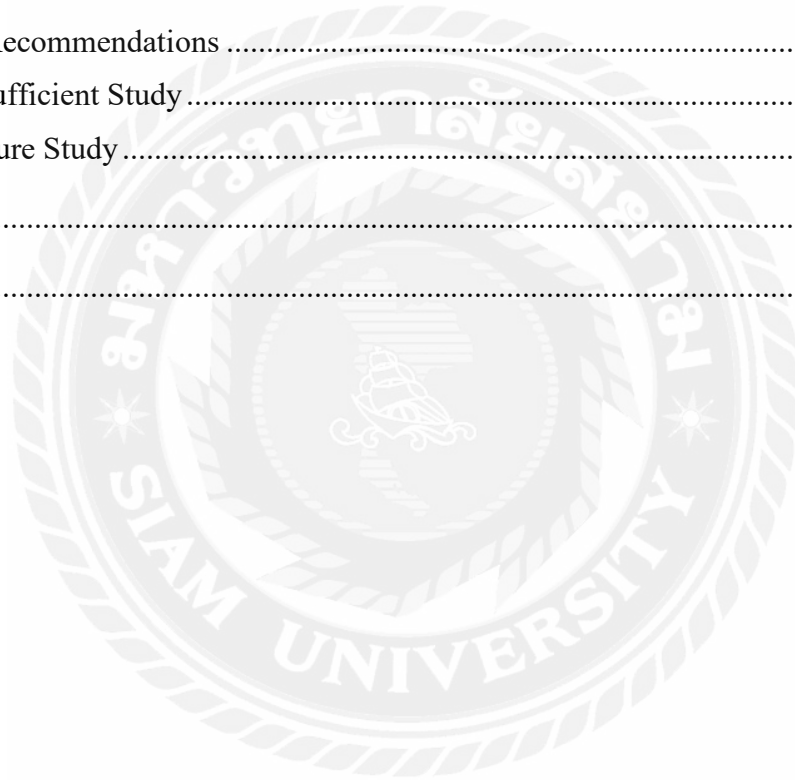
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CONTENTS

TABLE CONTENTS

FIGURE CONTENTS

Chapter 1 Introduction

1.1 Background of the study

Driven by the wave of the "Internet Plus" era, all walks of life are undergoing significant changes, and vocational education is also facing the opportunities and challenges of Informatization. As a result, China has issued several strategic documents to promote the development of vocational Informatization.

For example, in September 2017, the Ministry of Education issued the "Guiding Opinions on Further Advancing the Development of Informatization in Vocational Education" (Teaching Letter (2017) No. 4), which clarifies that "by 2020, online learning spaces will be fully popularized, and online-offline hybrid teaching modes will be widely used" (Ministry of Education of the People's Republic of China, 2017); In March 2019, the Ministry of Education issued the "Key Points of Educational Informatization and Network Security Work in 2019", proposing to accelerate the transformation and upgrading of educational Informatization, actively promote "Internet+Education," adhere to high-quality development, and use educational Informatization to support the development of education. Development, and support and lead the modernization of education with education informatization (Y. et al., 2023).

Presently, the informatization level of some vocational colleges and universities has been significantly improved. Still, due to the characteristics of vocational education itself and the differences in the level of regional economic development, the development of vocational education informatization needs to be solved. First, teachers' informatization literacy could be higher. Most teachers are still at the stage of using multimedia to show slides, have low ability to integrate and develop digital resources, and need more knowledge and awareness of how to use modern information technology more efficiently to guide students to deep learning (Yang, 2017). Second, the level of informatization construction varies significantly among regions and institutions. Informatization construction requires a large amount of funding, which is directly linked to the development of the area and the industry, not only in the degree of intelligence of the classroom, the number and scale of the training room but also in the information literacy of the teachers and students and the professional settings, which in turn, further opens up the development gulf (Ma, 2017). Thirdly, higher vocational colleges and universities face the challenge of digital resource sharing. At present, although they have a certain amount of digital resources, due to the reality of regional development differences, multi-principal operation of vocational education, uneven teacher quality, and multi-level promotion and employment modes, vocational colleges and universities have failed to realize the co-construction and sharing of digital resources and present a fragmented state (H. Li, 2019).

In recent years, many colleges and universities have shifted their traditional offline teaching to online, and higher education has entered a new stage of profound transformation of information. According to a survey of 180,000 teachers conducted by the Chinese Academy of Educational Sciences in March, 48.96% of the teachers thought that the effect of online education was average, which accounted for the most significant proportion of teachers (Research Group of the Institute of International and Comparative Education of the Chinese Academy of Educational Sciences, 2020). Online teaching also has its limitations, requiring higher autonomy, learning power, and self-control from students, and the lack of companionship from classmates, guidance and discipline from teachers can easily lead to inefficient learning and a sense of isolation (W. Fu, 2020).

With the advancement of education informatization, blended teaching, which integrates online network resources and offline face-to-face advantages, enters the classroom. The teaching mode based on blended learning breaks through the limitations of traditional offline gives full play to the benefits of both online and face-to-face classrooms. It injects new vitality into the reform of the higher vocational classroom teaching mode (Qian, 2018).

As of December 2022, the size of China's Internet users reached 1.067 billion, an increase of 35.49 million compared with December 2021, and the Internet penetration rate reached 75.6%. The number of online education users was 352 million, accounting for 38.6% of the total number of Internet users; the Internet access rate of primary and secondary schools was 100% (China et al. Center, 2023), which provided the primary conditions for blended teaching.

During the 2020 school closure period, Learning Access ranked first in the overall average. Therefore, it shows that the Learning Access platform is popular and used by most people. The development of blended learning requires the integration of advanced teaching models into a high-quality platform. The BOPPPS teaching model can quickly provide intensive teaching practice training to improve teachers' teaching skills. The BOPPPS teaching model comprises six elements: classroom introduction, teaching objectives, pre-testing, participatory learning, post-testing, and classroom summarization. The advantages of the BOPPPS teaching model are in three aspects: the educational input is directly proportional to the effect, and it is student-centered. It meets the needs of students, and it can achieve the expected educational impact. Meet students' needs and achieve the desired educational outcomes(J. Li, 2022).

Based on the above research background, the author tries to use the Learning Channel platform as the network teaching platform for this research; with the help of Learning Channel, the advantages of the BOPPPS teaching mode can be fully released in the online teaching and offline classroom, and according to the content of the chapter of the course "Object-Oriented Programming," the development of learning resources

and teaching activities in line with the students' cognition. On this basis, two classes of software technology majors in Shandong Engineering Vocational and Technical University (SEVTU) 2022 were selected to carry out learning effect practice, aiming at exploring the application effect of blended teaching mode based on "Study Pass+BOPPPS" in the course of "Object-Oriented Programming," expecting to provide some references to carry out blended teaching in the computer professional courses in vocational colleges and universities. The purpose of this study is to explore the application effect of the blended teaching mode based on " Study Pass+BOPPPS " in the course of "Object-Oriented Programming."(Q. Zhang, 2021)

1.2 Research Problems

There are problems in the Object-Oriented Programming course, such as outdated and single teaching methods, lack of teaching resources, general teaching effect, single teaching evaluation method, and teachers' lack of understanding of blended teaching.

At present, the problems in the teaching of Object-Oriented Programming are as follows: in the use of teaching methods, teachers favor the traditional teaching methods, and the lecture method and the teacher-student question-and-answer method are the most used teaching methods in computer education, and they seldom use other new and interactive teaching methods. Teachers use a limited variety of teaching resources regarding the provision of teaching resources. Teachers provide more teaching resources such as textbooks and PPT courseware, which are less compatible with the actual work in the computer industry and challenging to meet the learning needs of students; teachers do not often provide teaching resources other than textbooks and PPT courseware, which leads to the low satisfaction of students with the teaching resources. Regarding the teaching effect, the student's mastery of relevant theoretical knowledge is weak, and their mastery of professional practice ability is lacking, so the teaching effect is average. Teachers use teaching evaluation in midterm and final examinations, which must be more comprehensive. Most teachers need to learn about blended teaching and apply it.

Currently, students in the Object-Oriented Programming course need more interest in learning, low initiative, insufficient participation, low self-efficacy, and dissatisfaction with the current teaching methods.

Students' problems in learning Object-Oriented Programming are as follows: the student's learning situation is poor, and the learning status needs to be improved urgently. Regarding learning participation, students could be more active in classroom learning activities, and there is still much sleep in class. Regarding learning efficacy, students still need to concentrate enough, devote themselves to classroom learning, and think that their mastery of the knowledge points of the course still needs to be improved. Their sense of self-efficacy is relatively low.

1.3 Objective of the study

The objective of the study in this paper is:

(1) To analyze the current situation of teaching Object-Oriented Programming courses from the perspective of teachers and students.

(2) To explore the learning effects of the blended teaching mode of "Study Pass+BOPPPS" in the course of "Object-Oriented Programming" from the perspective of teachers and students.

1.4 Scope of the study

In this study, 110 students in the class of Software Technology of Grade 2022 were selected as the research subjects for a semester-long teaching experiment in Object-Oriented Programming at Shandong Engineering Vocational and Technical University. In the middle of the semester, the course instructor interviewed two teachers engaged in teaching the class and 20 students who participated in the study. Through the interviews, the current status of teaching Object-Oriented Programming and the current status of student learning were clarified. At the end of the semester, interviews were again conducted with the two teachers engaged in teaching the class and the 20 students participating in the study. By analyzing the data from teachers' and students' interviews, we verified the learning effect of the blended teaching of " Study Pass + BOPPPS. "

1.5 Study Significance

(1)Theoretical significance

The continuous development of higher education informatization has promoted the development and innovation of education and teaching modes. Blended teaching mode combines the advantages of traditional face-to-face and online education modes, deeply integrating information technology into the education industry, which has attracted extensive attention from the academic community. However, the existing research of scholars mainly focuses on a particular discipline and a certain course, and by the influence and impact of the new crown epidemic, blended teaching is gradually and widely used in various fields; therefore, analyzing the impact of blended teaching mode on students' learning effect, analyzing its problems and putting forward targeted recommendations can provide cases and empirical evidence for the implementation and process of classroom teaching under the blended teaching mode, and give the theoretical logic of the blended teaching mode. The theoretical sense of the blended teaching mode provides empirical support but also can promote the learning effect of blended learning for college students and promote the better development of blended teaching(L. Li, 2022).

(2)Practical significance

This study is based on the blended teaching model design of " Study Pass + BOPPPS" and applies it to the classroom teaching of higher vocational computer science majors. Through interviewing teachers and students and collecting interview data, we analyzed the effectiveness of blended education and proposed corresponding improvement measures. For the students, the feedback from the interview data can help to promote the students' understanding of their learning ability and reflection on their learning; for the teachers, the practical application of the blended teaching model of " Study Pass + BOPPPS" can provide some references for the teachers of higher vocational computer majors to carry out teaching reforms, and also promote the teachers to pay attention to new and high-quality classroom teaching. At the same time, it can also encourage teachers to pay attention to new and high-quality mobile teaching platforms and apply blended instruction to the practical teaching of other courses in tourism. For the school, it is conducive to promoting the reform of its teaching mode and improving the quality of eduction and the level of information teaching. In conclusion, this study can provide targeted advice to enhance the blended learning effect of college students and provide some help and reference for implementing blended teaching model courses in the later stage(Zou, 2023).
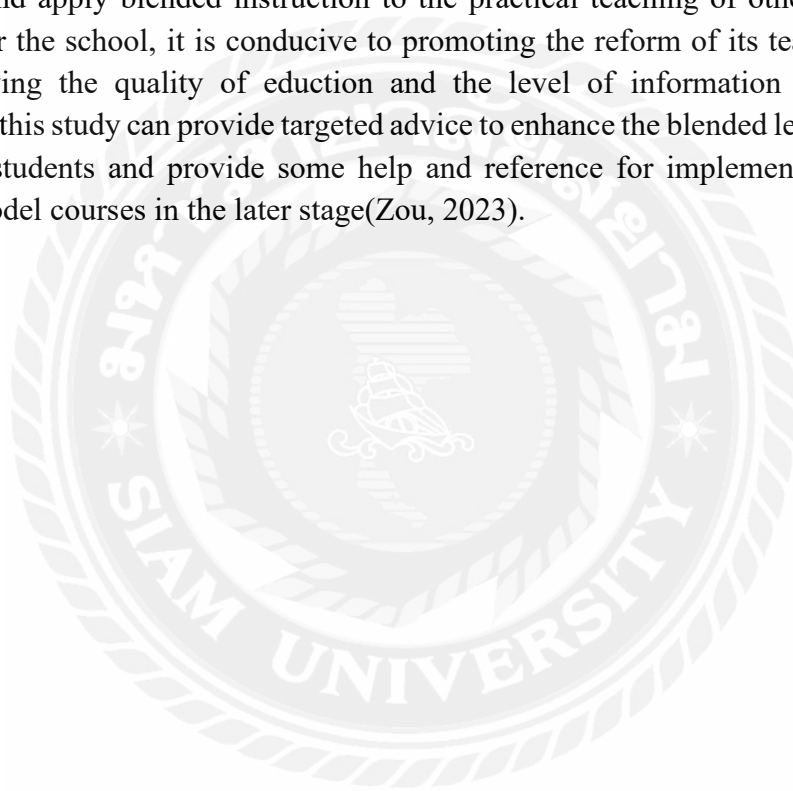
Chapter 2 Literature Review

2.1 Introduction

Through literature review, this paper analyzes and summarizes domestic and foreign scholars' research on the Learning Channel platform, BOPPPS teaching mode, blended teaching, learning effect, etc. and carries out the analysis of "Study Pass + BOPPPS" blended teaching mode by taking the course of "Object-Oriented Programming" in Shandong Engineering Vocational and Technical University as an example—the study of learning effect. In the following, we will introduce the keywords of "Study Pass Platform," "BOPPPS," "Blended Teaching," "Learning Effect," "Shandong University of Vocational Engineering," and "Object-Oriented Programming" one by one.

2.2 "Study Pass" Platform

The Study Pass platform entered people's learning and life in 2016 and passed the record of China's Ministry of Education in 2019. The primary development concept of the Learning Tong platform is "resource + platform + service," with blended teaching and ubiquitous teaching as the core idea and the integration of the three through the computer network technology, to provide users with a learning space for users.

Feng Hongrui mentioned that the platform has massive educational resources and integrates complete teaching functions and course interaction plug-ins, realizing mobile teaching, live classroom broadcasting, multi-screen interaction and synchronous classroom(H. Feng, 2023). Zhu Fengli pointed out that Study Pass is a professional mobile learning platform for smartphones and tablet PCs. It is a modern and comprehensive mobile service terminal integrating reading, research, learning, communication, and management, and it is also a favorable platform for teachers and students of colleges and universities to carry out blended teaching in recent years(Zhu, 2021).

Teachers can use the Study Pass platform to build courses, upload resources, organize teaching, answer questions online, correct assignments, manage information, and issue notices. Students can use it to support their learning through independent study, resource sharing, online interaction, and completion of assignments. The Study Pass platform provides powerful hardware support for developing a blended teaching mode. Integrating the required course resources establishes a bridge between offline teaching and online classroom, breaks the limitations of space and time, meets students' personalized learning needs, stimulates the initiative of students to learn, and brings diversified learning experiences to students(Zhu, 2021).

Study Pass platform includes both the teacher's and student's sides. Its functions are mainly manifested in 4 aspects as a professional teaching platform.

(1) Course Construction

Teachers can create courses and share the course portal with students in the form of invitation codes, QR codes or links so that students can quickly enter the system and join their respective classes; they can edit the course chapter directory and enrich the teaching content by adding audio/video, chapter quizzes, discussions, pictures, documents, links, live broadcasts, etc., to achieve personalized teaching; they can also improve the course materials and upload the courseware, tools, materials, templates, and extension exercises to the library, so that students can download and use them at any time and any place, templates, extension exercises, etc., can be uploaded to the database, so that students can download and use them anytime and anywhere(Zhu, 2021).

(2) Teacher-student interaction

Teachers and students can carry out a variety of forms of interaction and communication activities, such as signing in, voting, quizzing, and thematic discussions. Fixed, random, face-to-face, etc., can be used to establish a group to complete the group task. Through the teacher's evaluation, intra-group mutual evaluation, inter-group mutual evaluation, self-assessment and other ways of assessment can also be initiated with curriculum-related topics to start the discussion(H. Feng, 2023).

(3) Assignments and exams

Teachers can use self-built and imported methods to generate different questions in the question bank, automatically create assignments and test papers in a specified and randomized manner, and publish them(Y. Zhang et al., 2023).

(4) Learning statistics

 Teachers can always view the number of students' chapter learning, the number of times they participate in various classroom activities, the completeness of the video, homework and quiz scores, and other related data detailed records, and generate personal learning reports; you can also set conditions for data filtering, to facilitate the monitoring of students' learning results, timely adjustments to the teaching of the corresponding adjustment, and according to the situation of the relevant students promptly to the issuance of teaching warnings; Students can also view the homework, tests and other personal achievements, to find their deficiencies in their usual learning, to stimulate the desire to learn actively(Y. Zhang et al., 2023).
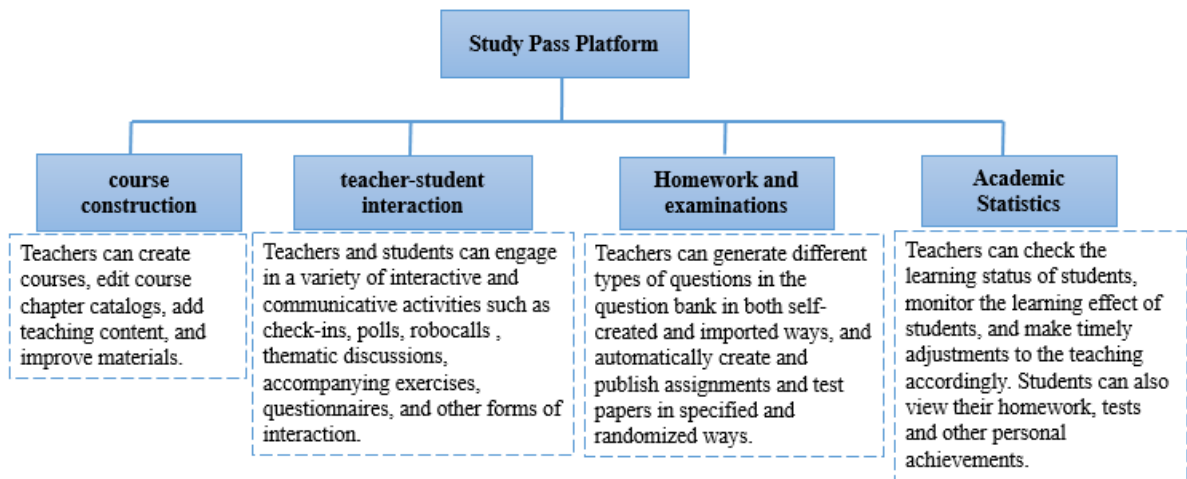
Figure 2.1 Study Pass Platform Main Functions Interface Diagram

2.3 BOPPPS Model

The BOPPPS teaching model originated from the Canadian Institute for the Skills Training of Teachers (ISW) and was created by Douglas Kerr's team at the University of Vancouver to train teachers in education through a hands-on approach. The BOPPPS teaching model is based on "student-centeredness," oriented to teaching objectives and centered on participatory teaching. It has been adopted by more than 100 universities and training institutions in more than 33 countries and is widely recognized for its effectiveness(L. Li, 2022)

BOPPPS model is one of the teaching models introduced and implemented in mainland China in recent years. Which is based on constructivist learning theory and humanistic learning theory, emphasizes student-centeredness in the teaching process and effectively improves students' participation in classroom teaching (Xie, 2021).

The BOPPPS instructional model consists of six modules: Introduction (B: Bridge-in), Objective (O: Objective), Pre-assessment (P: Pre-assessment), Participatory Learning (P: Participatory Learning), Post-assessment (P: Post-assessment), and Summarization (S: Summary). These six modules build a coherent, effective, and complete instructional process (X. et al., 2021). The following is the flow chart of the BOPPPS teaching model.

Figure 2.2 BOPPPS Model Instructional Model Flowchart

B (Bridge-in) course introduction

That is, the introduction part before entering the classroom teaching; a good start is half of success. A short introduction to the teaching content and explain its importance, focusing on the coherence of the classroom content, the content of the upcoming study, and the students already have the basis of organic linkage, forming a hook. Strategies that can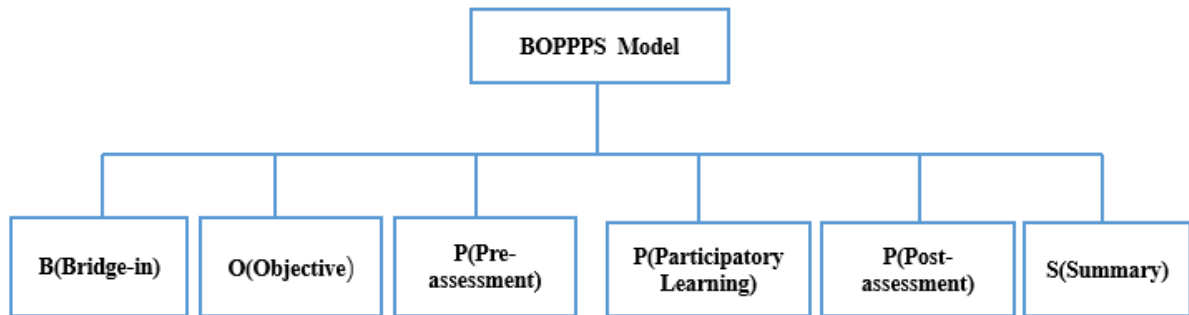 be used in the introduction include letting students watch exciting videos, pictures, examples of relevant information, etc.; a short introduction to the content of the course and its importance; a demonstration by the teacher; and a beautiful song can also immerse students in it. At this stage, teachers use various methods to introduce the content and attract students' attention(Q. Zhang, 2021).

O(Objective)Learning Objectives

That is, the students, through classroom learning, to achieve the expected results, the objectives must have operability and clarity. Teachers should be clear and concise about the three-dimensional teaching objectives of knowledge, ability, and emotion. They should make the objectives have the functions of guidance, motivation, control, and evaluation. Clear learning objectives are the basis for teaching and learning, are the starting point for students to learn and the landing point, but also help the teacher combine the learning characteristics of students to design, evaluate, reflect and revision of the corresponding teaching methods and teaching process(B. Wang, 2020).

P(Pre-assessment) Pre-test

That is, mapping the current learning situation of students before class is an essential prerequisite for teachers to carry out classroom teaching effectively. Pre-testing can be done by asking questions about homework, exams, discussions, questionnaires and other ways to feel the bottom; the purpose is to grasp the student's pre-study situation, knowledge reserves, interest in learning, and learning initiative. At the same time, the pre-test can help teachers more according to the student's condition, and the needs of the course objectives to adjust the pace of teaching promptly; for the students, the pre-test helps to detect their pre-study effect on the subsequent content of the knowledge to make the pavement, which can convey to the teacher of the student's desire to learn and the basic essential, not only for the students to learn the learning

situation and the power of the mapping but also for the teachers to map out the effect of the previous teaching(Q. Zhang, 2021).

P (Participatory Learning)

That is, teachers and students, students and students engage in interactive learning and participatory interactive teaching. Teachers design several teaching activities according to the teaching objectives so that students can actively participate; the link is the core of BOPPPS teaching, emphasizing student-centeredness, mobilizing students to participate in classroom learning, active classroom atmosphere, and the interaction to help students complete the learning objectives. It can create a classroom teaching atmosphere of participatory learning, promote interactive understanding between teachers and students, and make students' learning more sustainable and deeper(Q. Zhang, 2021).

P(Post-assessment)

An assessment or test is carried out to assess whether students have achieved the teaching objectives. Teachers can reflect on their teaching based on the test results and improve their teaching design to improve teaching quality. In addition, different courses need to adopt different assessment methods. For theoretical knowledge courses, judgment questions, multiple-choice questions, quiz questions, and other forms are more suitable; for the application of analytical teaching content, it is necessary to apply the operation of the actual situation with the theory of real life, create a problem and then analyze the application of the idea; for the essential and critical knowledge points, you can let the students draw a mind map, teach others, and restate the generalization of the way(Lv, 2021).

S(Summary)

That is, it summarizes what has been learned. Sorting out the structure of the course and the key issues, the teacher assigns after-class homework, integrates the key points, and provides students and teachers with the opportunity to reflect; at the same time, it is also the introduction to the content of the next class and puts forward the requirements for the related materials or assignments that need to be prepared by students for the next class. Teachers and students can summarize; on the one hand, the teacher summarizes the key points and difficulties, analyzes the completion of the teaching objectives, and puts forward the expectations and requirements for the next class; on the other hand, students can be guided to summarize their learning gains, evaluation of their performance in the class, etc., which is conducive to their post-lesson reflection and review, and through the summary of the output of their knowledge, gains, and insights can further enhance the teaching effectiveness of the classroom. Enhance the teaching effect of the school (Y. Fu, 2021).

The connotations of each link in the BOPPPS teaching model are summarized in the following table.

Table2.1 Connotations of the various components of the BOPPPS instructional model

Segment (of annelid worms)	Element	Goal
Bridge-in	Introduction section: Introduce the learning content of this course through case studies before the class starts.	Arouse the curiosity of learners.
Objective	Establish classroom learning objectives and expected classroom teaching outcomes.	Enable learners to understand the learning requirements and level of knowledge (skills) required for this lesson.
Pre-assessment	Before class, take a quiz or a thorough test.	Enable both learners and teachers to understand their current knowledge mastery.
Participatory Learning	Realize interactive learning of classroom teaching content through effective interaction between teachers and students.	Enable learners to participate in classroom teaching through diverse learning strategies.
Post-assessment	Evaluate or verify learners promptly before the end of this classroom teaching.	Check the learners' grasp of the theoretical knowledge learned in the current classroom.
Summary	Summarize, reflect, identify and fill in gaps.	Check whether learners have effectively achieved the previously set learning goals.

An efficient and complete classroom teaching process is formed by linking the above six modules. The six elements of BOPPPS teaching are designed to promote the achievement of teaching goals and focus on interactive learning between teachers and students so that the BOPPPS teaching model can be adapted to the teaching of different disciplines. The purpose of the BOPPPS teaching model is to improve the effectiveness of education and to achieve the goals of the learning. (Z. Wang et al., 2016).

2.4 Blended Learning

In the 1990s, foreign scholars began to explore blended teaching, and Blended Learning was developed from E-Learning (online teaching). There is a broad and recognized concept of Blended Learning, "the mixture of face-to-face teaching and

online learning ." It is a blended teaching method that combines the advantages of online and offline after in-depth research and reflection on online teaching in the Internet environment. Blended teaching was first mentioned clearly in the "White Paper on Educational Technology in the United States" in 2000. Since then, other countries have been paying great attention to the research on blended teaching. After more than two decades of development, the connotation of blended teaching has gradually become clear. According to Feng Xiaoying, blended teaching is divided into three stages: the technology application stage, the technology integration stage, and the "Internet+" stage (X. et al., 2018).

In China, Blended Learning was proposed by Prof. He Kexiang at the 7th Global Chinese Computer Education Application Conference, advocating the application of Blended Learning in classroom teaching. Zhao Wenjie and other scholars proposed that the design of Blended Learning should start from the practicality and flexibility of the curriculum and emphasize the role of "teacher-led" in "classroom teaching" and "student-led" in "online teaching." The blended teaching model should be designed from the practicality and flexibility of the course, highlighting the role of "teacher-led" in "classroom teaching" and "student-led" in "online teaching" and the integration of teaching concepts(W. et al., 2019). Cui Ning and other scholars constructed a "new three-stage" teaching process in the electromechanical professional course "Microcontroller Application," i.e., teaching new knowledge with the network before class, combining face-to-face classroom and the web to make breakthroughs in the key points, and consolidating online review with the network after class(Cui & Liu, 2019). Cheng Lu mentioned in the study of blended teaching reform of "Java Programming" based on Study Pass that blended teaching should emphasize student-centered, offline classroom teaching, the teacher imparts knowledge, effectively guides and supervises the students' classroom learning process, and online use of information technology means to design flexible and diverse teaching activities to stimulate students' participation, motivation and autonomy. Information technology's online use means planning flexible and various teaching activities to encourage students' participation, enthusiasm, and independence. The blended teaching mode can improve the teaching experience and learning effect(Cheng, 2023).

The theory of blended learning refers to the rational selection and optimal combination of the components of the teaching and learning process to achieve the goal of teaching and learning and achieve the optimal learning effect. Blended learning theory advocates the integration of "teaching" and "learning," which not only includes the combination of teaching methods but also includes the optimal combination of the learning environment, teaching media, teaching theories, teaching modes, and other elements, and fully combines their respective advantages to achieve exemplary teaching results. The idea of blended learning contains three aspects: the blending of learning methods, the blending of learning styles, and the blending of learning information resources. Mixed learning methods refer to the use of different learning methods in the

learning process, which can be completed independently by the learner or can be used in a group collaborative inquiry method, according to the actual learning content to guide the students to use the appropriate learning methods, student-centered, to ensure that the student's leading position in the learning. Mixed learning resources refer to various learning resources that can be used for education, can be teacher-made learning resources, and can also be quoted from other people's excellent learning resources; the Internet background makes it possible to share learning resources. Mixed learning mode refers to combining online learning and traditional face-to-face classroom, combining the advantages of the two learning modes to improve the learning effect(Chen, 2022).

Blended teaching mode is an "online" + "offline" teaching mode that combines the advantages of online learning and traditional teaching based on the teaching platform. That is, before class, students log on to the online learning platform to learn the course knowledge points, feedback and exchange of knowledge difficulties, and complete the tasks assigned by the teacher; in class, teachers combine with the platform to collect the pre-course student learning to carry out offline teaching activities; after class, students log on the online learning platform to complete the post-course development, testing, evaluation, and teacher-student exchanges and interactions. Blended teaching mode of the entire teaching process so that students "learn to understand" before the class students through online video, documents, animation, online questionnaires, and other learning activities know the learning objectives; teachers "teach several," the teacher can through the pre-course student activities on the platform data, understand the student's learning situation before the class. Teachers "teach with numbers," teachers can understand the student's learning situation through the data of student's activities on the platform before the class, thus adjusting the teaching activities and gradually leading students' learning from shallow to deep to deep learning and ultimately realizing the enhancement of learning effect and teaching effect. Under the hybrid teaching mode, the time and space of traditional teaching are expanded, making teachers' "teaching" and students' "learning" more flexible, convenient and efficient, and teachers can also evaluate and reflect on the teaching process through the technical means of the platform, to optimize teaching. Programs s(Zhu, 2021).

2.5 Learning Effect

With the continuous expansion of the scale of higher education, the issue of higher education quality has always been a critical concern of scholars at home and abroad. During the "13th Five-Year Plan" period, China's higher education has achieved breakthrough progress, and the gross enrollment rate of higher education has been increasing, reaching 54.4% in 2020. Moreover, higher education has entered a new stage of popularization and development. The core of the quality of higher education is the quality of talent cultivation, and an essential indicator for testing the quality of talent cultivation is students' learning effect. In guaranteeing the quality of higher education, more and more attention is paid to the status of college students as the main body of

learning and assessment. Student-centeredness and attention to students' studies have become an essential orientation of talent cultivation and quality assurance. For this reason, it is necessary to shift the early assessment of higher education quality from emphasizing the amount of resource input to focusing on assessing students' learning outcomes and paying more attention to evaluating students' learning effects. Student learning outcomes (STUDENT LEARNING OUTCOMES), as a specialized term in education, arose in the process of many scholars' research and discussion on how the purpose of education should be defined and expressed(Huang, 2010).

In 1979, Eisner, an American scholar, first proposed the concept of "learning outcomes," which he considered essentially the results obtained by students after some form of participation, whether intentional or unintentional (Venkatesh, Morris, Davis, & Davis, 2003). Since then, research on the definition of learning outcomes in educational evaluation has been gradually carried out in the American academic community, and the Joint Committee on Standards for Educational Evaluation defines learning outcomes as the expectations of students after completing a specific study, i.e., the extent to which students gain knowledge and understanding, practical skills, attitudes and values, and individual behaviors as they go through a course of study, a major, or earn a degree (Gullickson, 2003). In Quality Assurance and Accreditation: A Glossary of Basis Terms and Definitions, published by UNESCO in 2007, learning outcomes are defined as the outcomes that learners are expected to know, understand and be able to demonstrate as a result of a period of study and the completion of a unit of study, course or module. A description of what learners are expected to know, understand and be able to demonstrate after a period of study and completion of a unit of research, course or module.

In domestic research, the definition of the learning effect is not very clear, and many scholars use "learning effectiveness," "learning outcomes," "learning gains," and so on to refer to the learning effect. Bai Hua, a scholar in China, believes that the learning effect is "the development of students in the dimensions of knowledge, skills, and values that can be proved after completing a series of classroom learning" (Bai & Zhou, 2018).

Through literature combing, the author found that the current academic definition of learning effectiveness has two points in common: one focuses on student-centered and emphasizes the developmental performance of the learner, and the other is that they both reflect the enhancement of knowledge, skills, and emotions that students obtain after a period of the learning experience. By summarizing the literature and combining the understandings of experts and scholars at home and abroad, this study defines blended learning effectiveness as improving students' learning interest, learning initiative, learning engagement, and self-efficacy after a learning experience.

2.6 Shandong Engineering Vocational and Technical College

Shandong Engineering Vocational and Technical University (SEVTU) is an undergraduate-level vocational and technical university approved by the Ministry of Education with the qualification of independently awarding academic degrees and is one of the first 15 undergraduate-level vocational education pilot institutions in China. The university is located in Jinan, the capital of Shandong Province, known as a famous historical and cultural city and a nationally civilized city. It has two campuses, the main campus (Zhangqiu) and the north campus (Shanghe), with nearly 23,000 students and a building area of almost 700,000 square meters, and consists of the College of Intelligent Manufacturing, the College of Artificial Intelligence, the College of Architecture and Engineering, the College of Transportation, the College of Digital Finance and Economics, the School of Business, the College of Modern Art, the College of Marxism, the College of Medical Technology, the College of Applied Technology, and the College of Basic Teaching. College of Applied Technology and Department of Basic Teaching. The library has a rich collection of books, with 1,021,500 paper books and 1,943,000 e-books(B. Li, 2022).

For more than 30 years, the university has always adhered to the Party's education policy, implemented the fundamental task of cultivating people with moral character, adhered to the core of education quality, the purpose of service development, and the orientation of promoting employment; adhered to the direction of running a school of "new engineering, integration, and vocational," and adhered to the integration of industry and education and the path of school-enterprise cooperation, and stepped out of the road of vocational and technical university development that "highlights the characteristics of engineering, and focuses on the connotation of the construction."

The College of Artificial Intelligence is one of the oldest colleges in the university and is also the core critical construction college of the university. The college has six undergraduate enrollment majors, 11 higher vocational enrollment majors, and the software technology major is the essential construction major at the university level.

The college faculty is of high quality, reasonable structure, and rich experience. There are two professional Shandong Province teaching teams and two Huang Danian-style teaching teams, and there are 23 on-campus laboratories. In recent years, the achievements have been outstanding. The teacher team published over 120 papers, including 10 SCI (EI), Chinese core 3, published "for the national college students electronic design competition series of textbooks" 7, the rest of the textbooks 18. Team members presided over or participated in 22 provincial textbook research projects, 15 authorized patents, and more than 40 software copyrights, of which three students' had scientific and technological innovation achievements. The teaching teams responsible for constructing electronic information engineering technology and software technology specialties have become Shandong Province teaching teams. Teachers' groups guided students to participate in various competitions. They won more than 200

awards above the provincial level, training a large number of "solid basic theory, strong practical ability, high overall quality" of science and technology talents (B. Li, 2022).

2.7 Object-Oriented Programming

Object-oriented programming is a compulsory course for Software Technology, Computer Application Technology, Computer Network Technology, and Big Data Technology. It is the precursor course to Database Development Technology and JAVA Programming. It is mainly used to cultivate students' understanding of computer language and programming, to master using computers to deal with problems, and to develop teamwork and collaboration through project development(X. Wang, 2020).

Through the teaching of this course, students should have a firm grasp of the basic data types, composite data types, basic control structures, functions, and basic concepts of object-oriented programming such as classes and objects, inheritance, polymorphism, etc.; master the class genus mechanism, C++ input and output mechanisms, program assertions, exception handling and other advanced mechanisms; object-oriented program construction methods, abstract data types, software reuse ideas, different programming styles, and other object-oriented programming languages. The course also provides an understanding of object-oriented program construction methods, abstract data types, software reuse ideas, different programming styles, and other object-oriented programming languages.

The course also emphasizes the fundamental and practical, suitable for cultivating students' basic knowledge and laying a good foundation for future study, and at the same time, the course is also ideal for the current market demand for talent, and further analysis of the C++ language can be competent in the development of games and hardware-based software systems(X. Wang, 2020).

This course is employment-oriented, starting from the requirements of highly skilled personnel training, and constructs the theoretical and practical teaching systems with the main line of strengthening the cultivation of technical application ability. In terms of teaching content, according to the principle of higher vocational education, theoretical knowledge is enough, according to the knowledgeability of students, the ability requirements of enterprise positions, weakened the content of no application or weak application, strengthened the knowledge commonly used in the engineering project, and constructed a teaching unit based on the necessity in software development (X. Wang, 2020).

Chapter 3 Study Methodology

3.1 Introduction

This paper adopts a qualitative research method; in the middle of the semester, at the end of the semester, two teachers engaged in the class teaching, and 20 students participated in the study of interviews. From the perspective of teachers and students, the author first analyzed the teaching status of Object-Oriented Programming and the learning status of students, pointed out the existing problems, and explored the reasons for these problems, which provided the basis for the construction and implementation of " Study Pass + BOPPPS " blended teaching. Secondly, based on the research questions, we designed a realistic interview outline and interviewed teachers and students. Finally, through the interviews, the current situation of the teaching of Object-Oriented Programming courses, the current status of student learning, and the effect of blended instruction were clarified, thus realizing the research purpose of this paper.

3.2 Sampling and Sample Size

In this paper, 110 students majoring in software technology in the class of 2022 at Shandong Engineering Vocational and Technical University were selected as the research object for a semester-long teaching experiment. To better understand the status quo of the teaching of Object Oriented Programming course and the status quo of students' learning, in the middle of the semester, the teacher of the course interviewed two teachers engaged in the teaching of the class and 20 students who participated in the study. Through the interviews, the current situation of teaching Object-Oriented Programming and the current status of student learning were clarified. At the end of the semester, interviews were again conducted with the two teachers engaged in teaching the class and the 20 students participating in the study. The learning effect of the blended teaching of " Study Pass + BOPPPS" was verified by analyzing the data from the teachers' and students' interviews.

3.3 Research Design

To have a more comprehensive and objective picture of the problems in the existing teaching model and the changes in teaching effectiveness after using the blended teaching model. This study followed the principles of objectivity and science in designing the interview outline. From the perspective of teachers and students, we carefully analyzed and studied the problems in the existing teaching mode, scientifically set up the interview outline, constructed the " Study Pass+BOPPPS " blended teaching mode, and carried out the " Study Pass+BOPPPS " blended teaching practice. We will analyze the changes in teaching effect after the course of blended teaching.

3.3.1 Teacher Teaching Interview Syllabus Design

To better understand the current situation of teachers' teaching and the teaching effect brought about by using the blended teaching mode. I interviewed two teachers engaged in classroom teaching in the middle of the semester and at the end. The primary indicator of teacher teaching interview is the teacher's teaching situation. The secondary hands are carried out according to the five dimensions of teaching methods, teaching resources, teaching effects, teaching evaluation, and blended teaching, and the outline design of the teacher-teaching interviews is shown in Table 3.1.

Table3.1 Teacher Teaching Interview Syllabus Design

Interview Dimension Segmentation	Interviews
Teaching methods	What teaching methods do you use regularly, and how effective are they?
Teaching resource	What types of teaching resources are commonly used by you when teaching?
	Which type of teaching resource works better?
Teaching effect	Are you satisfied with your current classroom instruction?
	What do you expect your students to achieve through their specialized courses?
Evaluation of Teaching and Learning	What type of evaluation do you primarily use? How effective are they?
Blended learning	Your knowledge of blended learning and willingness to use it.

3.3.2 Outline Design for Student Learning Effectiveness Interviews

To better understand the current situation of students' learning and the change in students' learning effect after using the blended teaching mode. I interviewed 20 students in the class in the middle of the semester and at the end. The primary indicator of the interview is the learning effect. The secondary indicators are developed according to a total of five dimensions: interest in learning, initiative in education, participation in

education, sense of efficacy in education, and satisfaction with current teaching, and the design of the outline of the interview on students' learning effect is shown in Table 3.2.

Table3.2 Outline Design for Student Learning Effectiveness Interviews

Interview Dimension Segmentation	Interviews
Interest in learning	Has the current teaching model increased your interest in learning? If so, in what ways?
Learning Initiative	Do you do early prep and post-class review in the Object-Oriented Programming course?
Learning engagement	Has the current instructional model increased your participation in the classroom? If so, in what ways?
Learning effectiveness	Has the current teaching model improved your ability to learn on your own? If so, please tell us about the changes you have made.
Satisfaction with current teaching	Do you like the way teaching is done now?
	Are you comfortable with applying current teaching styles to the teaching of other courses?

This paper centers on the research problem, designing a realistic interview outline, and designing the interview outline from the aspects of teachers' teaching and students' learning effects. Through the analysis and design of the above interview outline, we can more deeply analyze the status quo of the education of Object Oriented Programming courses, the status quo of students' learning, and the changes in teachers' teaching and learning effects after using the blended teaching mode. This provides a favorable guarantee for the smooth progress of the research.

3.4 Data Collection

This study used CNKI to search and collect relevant literature and conducted offline in-depth interviews with two teachers engaged in teaching the class and 20 students participating in the study. To ensure the accuracy of the interview data, it was recorded using the recorder function of the cell phone, and the transcripts were made available for subsequent use.

3.5 Data Analysis

This paper adopts a qualitative research method through a literature review and interviews with two teachers teaching the class and 20 students participating in the study in the middle and end of the semester. Teachers' teaching interviews can be analyzed from five aspects: teaching methods, teaching resources, teaching effects, teaching evaluation, and teachers' knowledge of blended teaching. Student learning effect interviews can be analyzed from five aspects: learning interest, learning initiative, participation, self-efficacy, and whether they are satisfied with the current teaching methods. Through in-depth interviews with teachers and students, as well as organizing and analyzing the interview data, the current status of course teaching and the effects brought by the blended teaching mode are clarified from the perspectives of both teachers and students.

Chapter 4 Findings and Conclusions

4.1 Current Status of Teaching Object-Oriented Programming Course

4.1.1 Teachers' teaching status

(1) Teaching Methods

From the teachers' interviews, teachers mainly use traditional teaching methods such as lecture and teacher-student question-and-answer methods. Teachers with more than ten years of teaching experience said that they could achieve the expected teaching effect by using traditional teaching methods and were not ready to try blended teaching; young teachers thought that traditional teaching methods could not fulfill the teaching task well and expressed their great willingness to apply blended teaching methods in computer teaching, hoping to revitalize the classroom atmosphere by adding new elements.

(2) Teaching resources

From the teachers' interviews, we can see that teachers' teaching resources still need to be rich, mainly focusing on more textbooks, courseware, and after-school exercise books. The current teaching resources still need to be more compatible with the actual work in the computer industry.

(3) Teaching Effectiveness

From the teachers' interviews, it is clear that the young teachers are not too satisfied with the classroom teaching effect and think the student's learning status could be better overall. On the other hand, the older teachers were generally happy with the effectiveness of the classroom; however, they also indicated that the student's learning status could have been better; they believed that the students could have done more in the school to keep the teaching progress going.

(4) Teaching Evaluation

The interviews with teachers show that both young teachers and teachers with long teaching experience use the summative evaluation of regular grades and final grades as their evaluation method. However, the teachers also pointed out that the scope of process evaluation is limited. It is difficult to quantify, and the teachers will have specific subjective components when they conduct process evaluation, which makes it difficult to evaluate each student objectively.

(5) Blended Teaching

From the teachers' interviews, it can be seen that most teachers know something about blended teaching. However, their understanding of blended teaching is only considered to be using online educational platforms for offline teaching. Among them, the young teachers said they were very willing to try blended teaching; the teachers with

more extended teaching experience said that although blended teaching had fun and interactivity, the students' self-control ability was weak, so they were less willing to try it.

Through the literature review and interviews with two teachers engaged in teaching the class on the current status of teaching Object-Oriented Programming, it is concluded that the current problems of teachers in teaching Object-Oriented Programming are as follows: regarding the use of teaching methods, teachers favor the use of traditional teaching methods, lecture and teacher-student question-and-answer methods are the most used teaching methods, and other new types of new teaching methods are seldom used, interactive teaching methods are less frequently used. Regarding the provision of teaching resources, teachers do not use a wide variety of teaching resources. Teachers mainly provide teaching materials and PPT courseware, which are less compatible with the actual work in the industry and challenging to meet the learning needs of students; teachers do not often provide teaching resources other than teaching materials and PPT courseware, which also leads to the low satisfaction of students with the teaching resources. Regarding the teaching effect, students' mastery of relevant theoretical knowledge is weak, their mastery of professional practice ability is lacking, and their sense of self-efficacy is low. Young teachers were less satisfied with the classroom teaching effect and had higher expectations of students; the opposite was true for older teachers, who expressed essential satisfaction with the classroom effect and had slightly lower expectations of students. Regarding the teaching evaluation methods, the summative evaluation based on written test scores made it challenging to mobilize students' motivation and participation, and most of the teachers indicated that they needed to learn more about blended teaching.

4.1.2 Current status of student learning

(1) Learning Interests

From the students' interviews, it can be seen that nearly half of the students indicated that the Object-Oriented Programming course failed to stimulate their interest in learning. As a specialized course, if students cannot keep up with the pace of the teacher's lectures, students' interest in education will gradually decrease.

(2) Learning Initiative

From the students' interviews, most of the students do not take the initiative to do pre-study before class and review after class due to their lack of motivation to study. This requires teachers to take the industry to supervise and repeatedly reinforce to help senior computer science students develop good learning habits of active pre-study and review.

(3) Learning Participation

From the student interviews, only 20% of the students were actively involved in the teaching and learning activities. In comparison the remaining 80% were passive or even unwilling to participate in the classroom activities actively.

(4) Learning Efficacy

It is clear from the student interviews that most students have a low level of confidence in their mastery of knowledge, i.e., low self-efficacy.

(5) Satisfaction with Current Teaching and Learning

From the students' interviews, it is clear that most students do not like the current teaching style and are even less willing to apply it to other courses.

Through literature review and interviews with 20 students on the teaching status of Object-Oriented Programming, the following problems exist in students' learning of "Object-Oriented Programming": regarding the interest in education, nearly half of the students said that "Object-Oriented Programming" failed to stimulate their interest in education; regarding the initiative in education, most of the students, due to the lack of motivation, were less likely to take the industry to complete the pre-study and review work; regarding the sense of learning participation, students were less active in classroom learning activities and still slept in class; regarding the importance of learning efficacy, students believed that their knowledge of "Object-Oriented Programming" knowledge points was less than what was required. Most of the students are less active in completing the pre-study and review work; regarding the sense of participation in learning, students are less involved in the classroom learning activities, and there is still much sleeping in the class. Regarding the importance of learning efficacy, the students think that their mastery of the knowledge of "Object-Oriented Programming" is still lacking, and their sense of self-efficacy is relatively low. The majority of the students do not like the current teaching method, and are even more reluctant to apply the existing teaching method to other courses.

4.2 The learning effect of "Study Pass + BOPPPS" blended teaching
4.2.1 Teachers' Effectiveness in Conducting Blended Instruction
(1) Teaching method

From the teachers' interviews, it can be seen that teachers try to use new teaching methods such as " Study Pass + BOPPPS " in teaching and add new elements to enliven the classroom atmosphere in the process of education. Most of the students have a high degree of satisfaction with the teachers' application of the " Study Pass + BOPPPS " blended teaching method.

(2) Teaching resources

The interviews with the teachers show that the teaching resources provided by the teachers in the blended teaching of " Study Pass + BOPPPS " are diversified, rich in content, and close to the job requirements. Most of the students were satisfied with the teaching resources provided by teachers in the blended teaching.

(3) Teaching Effect

From the teachers' interviews, it can be seen that " Study Pass + BOPPPS" blended teaching can deepen the students' understanding of theoretical knowledge and improve their practical ability in computer specialties. The students' professionalism has been improved, so it can be seen that the effect of blended teaching is good.

(4) Teaching evaluation

The teachers' interviews show that the teachers adopt the process evaluation system in the " Study Pass + BOPPPS " blended teaching mode. The evaluation system includes multiple dimensions such as students' regular grades, final grades, classroom performance, number of discussions, completion of assignments, etc., which is a more comprehensive and objective evaluation of students.

(5) Blended Instruction

The teachers' interviews clearly show that through the "Study Pass + BOPPPS " blended teaching model, teachers have clarified the meaning of blended teaching and know how to use the Study Pass platform and the BOPPPS model to carry out blended teaching. Teachers recognized the effects of blended teaching. Therefore, teachers are more willing to apply blended teaching to the teaching of other courses.

It can be seen that " Study Pass + BOPPPS " blended teaching can guide teachers to try new teaching methods and add new elements to enliven the classroom atmosphere in the process of teaching; the teaching resources are diversified and rich in content, close to the needs of the job; the blended teaching is effective; teachers adopt the process evaluation system. The evaluation system includes multiple dimensions such as students' regular grades, final grades, classroom performance, number of discussions, completion of assignments, etc., which is a more comprehensive and objective evaluation of the students; teachers have clarified the meaning of blended teaching, and know how to use the Study Pass platform and the BOPPPS model to carry out blended teaching. Teachers recognized the effects of blended teaching.

4.2.2 Students' Learning Effectiveness after Participating in Blended Instruction
(1) Students' Interest in Learning

From the student interviews, more than half of the students said that the blended learning of "Study Pass+BOPPPS" could increase students' interest in education. The function of pre-study before class is innovative for students, allowing them to know

what they have learned in advance and mobilizing their interest in education. Teachers can use the Learning Link cast screen to display the pre-study situation, praise students who pre-study on time, and stimulate students' healthy competition. In the classroom, students said they were more willing to communicate with their classmates and teachers. Random number shaking added fun and tension to the school, and the answering of pre-tests and post-tests allowed all students to participate and to know their mastery of what they had learned promptly.

(2) Learning Initiative

From the student interviews, it is known that after participating in blended teaching and learning, 70% of the students will pre-study in advance and review after class, and a few students are in the state of a passive review or no review. Firstly, it helps to urge students to do pre-study before class. Teachers release courseware and pre-study requirements through Learning Pass, and students can check the courseware through their cell phones to understand the course content and teacher's needs. Secondly, it improves the completion and quality of the homework under the class; the teacher releases the task under the category, the learning pass students can submit the assignment by taking pictures, typing, and so on, and the teacher comments on the task for each student, the students can see the teacher's comments in time, and the students indicate that they are more willing to complete the homework, they will be more serious about achieving it. Overall, the blended teaching model can improve the majority of students' initiative for learning.

(3) Learning Participation

From the student interviews, most students indicated that the classroom atmosphere of blended teaching was more active than that of the traditional classroom, and the students were more willing to participate in the classroom learning. For example, teachers set up discussion questions in class to increase students' motivation to discuss a certain issue. They set up multiple-choice or fill-in-the-blank question-and-answer sessions in class to increase students' participation.

(4) Learning Efficacy

From the student interviews, more than half of the students think the"Study Pass+BOPPPS" blended teaching mode has improved their self-learning ability. Students said that part of the motivation for pre-study comes from the teacher's praise in class, which gradually makes them take the initiative to open the books to understand the content of the next lesson; the grading of the test questions allows students to appreciate their mastery of the course content, and at the same time stimulates the students' sense of victory, which is conducive to the healthy competition among students, and they are willing to study more carefully to answer the following question correctly; as for the class assignments, most of the students said that they would like to complete them better and hope to get a good score. Most students said

they wanted to do better and hoped to get higher scores and be shown by the teacher in class, which could further enhance their sense of self-efficacy.

(5) Satisfaction with Current Teaching and Learning

From the student interviews, most of the students indicated that they were very willing to engage in blended learning and would like to apply the blended teaching model of "Study Pass + BOPPPS" to other courses.

It can be seen that "Study Pass+BOPPPS" blended teaching can stimulate students' interest in learning Object-Oriented Programming, improve students' learning initiative, learning participation, and self-efficacy, and then cultivate the ability of higher vocational computer science majors to think independently and learn through cooperation and inquiry.

4.3 Conclusion

This paper adopts a qualitative research method and selects 110 students in the software technology major of the class of 2022 as the research object. Based on analyzing and summarizing the relevant studies on blended teaching, BOPPPS teaching mode, and Study Pass, the survey of the learning effect of "Study Pass+BOPPPS" blended teaching mode is carried out on the example of the "Object-Oriented Programming" course of Shandong Engineering Vocational and Technical University.

By analyzing the data from the interviews with teachers and students before and after the use of the hybrid teaching mode, we summarize the current situation of the teaching of the Object-Oriented Programming course and verify that the mixed teaching mode of " Study Pass+BOPPPS " has achieved specific teaching effects. The apparent improvement of the teaching effect provides a basis for the teaching reform of Object-Oriented Programming and will also offer specific reference and guidance for the reform exploration of the teaching of other computer courses. Through analyzing the current situation of course teaching and the practice and effect of blended instruction of "Study Pass+BOPPPS," the following research conclusions are drawn.

4.3.1 Status of Teachers' Instruction and Students' Learning in Object-Oriented Programming Courses

In the middle of the semester, through the analysis of data from interviews with teachers and students, it was concluded that, on the one hand, the teacher lecture method and teacher-student question-and-answer method are the standard methods of traditional classroom teaching, which are challenging to attract students' attention; teachers seldom provide teaching resources other than the textbook, the post-course exercise booklet, and the PPT classroom materials, i.e., the abundance of teaching resources is low; the course teaching effect is general; the course evaluation methods are mainly summative

evaluations of mid-term and final grades; the current course teaching effect is general; most teachers do not know enough about blended mode, let alone using blended method in the course. Summative evaluation, which is difficult to objectively and comprehensively reflect the process of students' learning; the current teaching effect of the course is average; most teachers need to learn more about blended and using blended teaching mode in their studies. On the other hand, students need more interest in learning; there are phenomena such as sleeping, eating, and chatting in class, fewer students can actively participate in classroom activities, complete the pre-study and review work, and most students have a low sense of self-efficacy. Because of the problems of teachers' teaching and learning, both teachers and students of computer science majors hope to make changes. Therefore, applying the blended teaching mode of "Study Pass + BOPPPS" in the higher vocational "Object-Oriented Programming" course is necessary.

To summarize, there are problems in teachers' teaching, such as outdated and single teaching methods, lack of teaching resources, general teaching effect, single teaching evaluation method, and teachers' lack of understanding of blended teaching. There are problems in students' learning, such as low interest in education, low initiative, insufficient participation, low self-efficacy, and dissatisfaction with the current teaching methods.

4.3.2 Changes in teachers' teaching and students' learning after using the blended teaching model of " Study Pass + BOPPPS"

At the end of the semester, through teachers' and students' interviews, it was concluded that, on the one hand, under the blended teaching mode of " Study Pass+BOPPPS, "teachers' teaching methods are constantly updated, and new elements are added to liven up the classroom atmosphere in the process of teaching and learning; teaching resources are diversified and rich in content, close to the job requirements; the effect of blended teaching is good; teachers Adopting the process evaluation system, the evaluation system includes the students' usual grades, final grades, classroom performance, number of discussions, completion of assignments and other dimensions, which is more comprehensive and objective in evaluating the students; Teachers are clear about the meaning of blended teaching and know how to use the Study Pass platform and the BOPPPS model to carry out blended teaching. On the other hand, after participating in blended teaching, students are more willing to communicate with teachers and classmates. They are willing to complete learning tasks and participate in classroom activities. Most of the students said that the blended teaching mode of "Study Pass+BOPPPS" can increase their interest, initiative, participation, and effectiveness in learning, and they hope that this mode can be applied to the teaching of other courses of computer science majors. Therefore, the blended teaching mode of "Study Pass + BOPPPS" has a good effect on teaching "Object-Oriented Programming."

To summarize, "Study Pass + BOPPPS"blended teaching teachers' teaching methods are constantly updated, teaching resources are getting richer and richer, teaching effects are getting better and better, the teaching evaluation system is getting more and more perfect, teachers are more clear about the meaning of blended teaching and learn to use the blended mode of teaching to carry out teaching; at the same time, it has stimulated the students' interest in the learning of the course of "Object-Oriented Programming," and improved the students' initiative in learning, sense of participation and understanding of self-efficacy, and the students have a satisfactory attitude towards blended teaching.

Chapter 5 Recommendations

The current education informatization reform has become a hotspot in the field of education, the new crown epidemic has accelerated the development of online education, and the blended teaching mode has received widespread attention. The functions of the current Study Pass platform are constantly improving, such as Study Pass, Rain Classroom, Nail, etc. More teachers and students will recognize and use the blended teaching based on Study Pass.

This paper adopts a qualitative research method and selects 110 students in the software technology major of the class of 2022 as the research object. Based on analyzing and summarizing the relevant studies on blended teaching, BOPPPS teaching mode, and Study Pass, the survey of the learning effect of "Study Pass+BOPPPS" blended teaching mode is carried out on the example of the "Object-Oriented Programming" course of Shandong Engineering Vocational and Technical University. By analyzing the data from interviews with teachers and students before and after the use of the hybrid teaching mode, we summarize the current situation of the teaching of the Object-Oriented Programming course and verify that the hybrid teaching mode of " Study Pass+BOPPPS " has achieved specific teaching effects.

5.1 Insufficient Study

In this paper, the study on the learning effect of " Study Pass+BOPPPS " blended teaching mode in the application of higher vocational "Object-oriented Programming" course, although specific results have been achieved, there are still some deficiencies, specifically in the following aspects:

(1) Limitations of the research sample
This study takes 110 students in the software technology professional class of Shandong Engineering Vocational and Technical University as the research object. The sample selection range is limited, and there is no large-sample survey research to argue the impact of blended teaching mode on students' learning effect.

(2) Short research cycle.
Due to the limited research period, the experimental data and results have a certain degree of subjectivity. If conditions permit, it would be more meaningful for the study to increase the length of teaching practice when appropriate.

(3) The study has a single professional background
The teaching practice in this study is only carried out in one major; the professional background is single, the scope of teaching practice is limited, the representativeness is not strong, the statistical results of the data do not represent the whole, the analysis of

the teaching effect is not scientific and full, it is necessary to expand the scope of the teaching practice, and to form a standardized and quantifiable teaching evaluation.

(4) Limited personal capacity

In this teaching practice, due to the limited personal capacity, the specific links in the design of the teaching process are not perfect, and the research on " Study Pass + BOPPPS " blended teaching is not deep enough, and there are some loopholes and deficiencies in the practice.

5.2 Future Study

In this paper, we study the learning effect of the " Study Pass + BOPPPS " blended teaching mode in applying for higher vocational "Object Oriented Programming" courses; although we have achieved specific results, we still need to conduct in-depth research from the following two aspects.

(1) There are still no uniform standards for how the "Study Pass + BOPPPS" blended teaching model should be blended and what kind of teaching model framework should be adopted in actual teaching.

At present, researchers have constructed different blended teaching models according to different teaching needs to adapt to the needs of diverse learners and the characteristics of the corresponding disciplines. In this study, we only designed a blended teaching model based on "Study Pass + BOPPPS" for the course "Object-Oriented Programming" for senior computer science majors. We need to conduct further research on other classes for senior computer science majors in the future to promote the application of blended teaching in other computer science courses and even in different professional courses.

(2) With the continuous advancement of education informatization reform, the application scenarios of the blended teaching model based on " Study Pass + BOPPPS" will be further expanded.

Students of other majors in higher vocational education can also carry out blended learning in the classroom with the help of smart devices other than cell phones, to improve the informatization level of classroom teaching. Therefore, I will accumulate experience in teaching in the future, keep abreast of the times, update my knowledge structure, and contribute to applying the "Study Pass + BOPPPS" blended teaching model in the secondary classroom.

With the rapid change of the information age, the educational concepts, educational methods, and teaching modes of college teachers have to be constantly adapted to the development of the times. College teachers have to improve their

informatization ability, update their teaching modes, and combine with the needs of their positions to cultivate new people of the times. How to innovate the teaching mode and improve the efficiency of classroom teaching needs to be explored by scholars from all over the world.

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Appendix

Appendix A: Outline of Teacher Teaching Interviews

I. Teaching methods

1. what teaching methods do you use regularly, and how effective are they?

II.Teaching Resources

2. What types of teaching resources are frequently used by you when teaching?

3. What type of teaching resources are more effective?
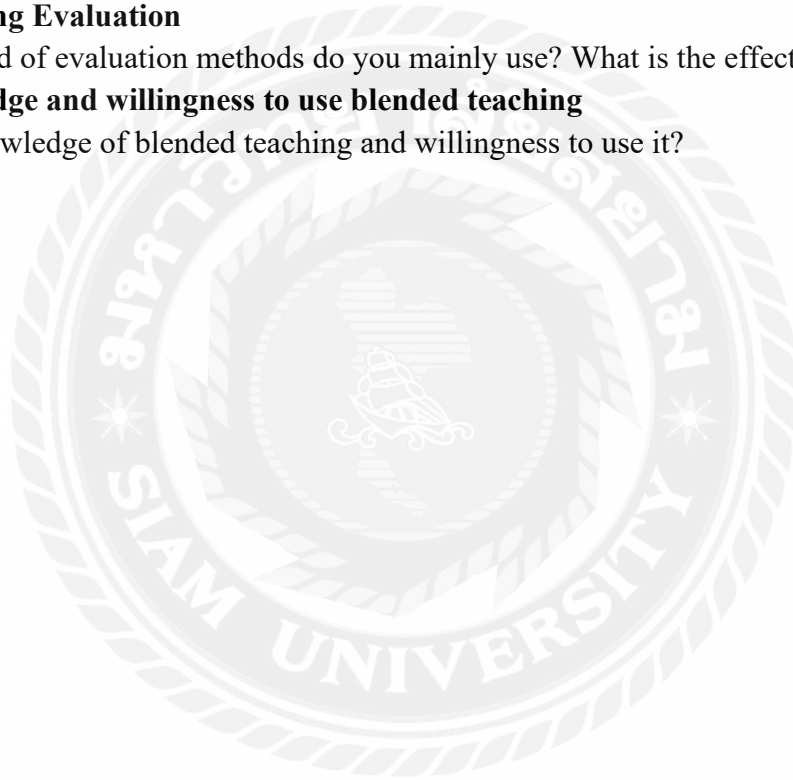
III. Teaching Effectiveness

4. Are you satisfied with the current classroom teaching effect?

5. What effect do you expect students to achieve through the professional course?

IV. Teaching Evaluation

6. What kind of evaluation methods do you mainly use? What is the effect?

V. Knowledge and willingness to use blended teaching

7. Your knowledge of blended teaching and willingness to use it?

Appendix B: Outline of Student Learning Effectiveness Interviews

I. Aspects of students' interest in learning

1. Has the current teaching mode increased your interest in learning? If yes, in what ways?

II. Learning Initiative

2. Do you do advance study and review after class during Object-Oriented Programming?

III. Learning Participation

3. Does the current teaching mode improve your participation and motivation in class? If so, in what ways?

IV.Learning Efficacy

4. Does the current teaching mode improve your self-learning ability? If yes, please tell us about the changes you have experienced.

V. Awareness of blended and willingness to use it

5. Do you prefer traditional classroom face-to-face learning or blended learning, and please tell us why?

6. You are happy to accept applying the current teaching method in other courses.