

## The Influence of Optimized Blended Learning Mode on Learning Effectiveness for Higher Vocational College Students: A Quasi-Experimental Study in Higher Vocational College

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### ABSTRACT

Higher vocational education is developing vigorously, it is urgent to improve the teaching effect. In order to verify whether an optimized blended learning mode has a significant positive impact on the learning presence, learning attitude and motivation of vocational students, 92 vocational students from two teaching classes were taken as research objects to conduct a 3-month quasi-experimental study. Covariate analysis and paired sample T-test were used to process the pre-and post-test data, and it was found that the influence on the sense of presence was  $F=4.335$ ,  $P=0.000<0.001$ , and the influence on learning attitude and motivation was  $F=3.957$ ,  $P=0.000<0.05$ , both of which reached a significant level. It is concluded that the optimized blended learning model and simple blended learning model have significant positive effects on the learning presence, learning attitude and motivation of vocational students. Vocational colleges should vigorously promote blended learning optimized according to different courses, especially after the COVID-19 pandemic, which should become the new normal.

**Keywords:** Higher Vocational Education, Blended Learning, Learning Presence, Motivation

### INTRODUCTION

In recent years, the rapid development of information and communication technology and the highly developed Internet have promoted the self-innovation of all walks of life and given birth to new industry forms. In the era of Internet + (Yu, 2012), people's living patterns and habits are also changing quietly. Correspondingly, the emerging information and communication technology and the new thinking of Internet + bring new opportunities and challenges to the reform of education and teaching (Becker, et al., 2018), which gradually breaks the traditional single face-to-face teaching method and forms a variety of teaching and learning modes, such as the combination of online and offline, the integration of in-class and off-class, and the cooperation between individuals and groups.

In mainland China, with the support of ICT technology, especially modern Internet technology, education and teaching reform is also in full swing, and corresponding ideas, methods, forms and models have also emerged, such as micro course (short and precise teaching videos), MOOCs (large open online courses platform), SPOC (small private online courses, Also known as private courses), blended learning, Internet + education and so on. Blended learning, in particular, has attracted much attention from researchers, educational authorities, educational institutions, teachers and students. Blended teaching reflects the development of educational technology theory, embodies the characteristics of the information age, and returns to the origin of learning. It will have a profound impact on the integration of information technology and curriculum (He, 2004). Blended teaching conforms to the law of learning and teaching, is suitable for China's national conditions, and has practical significance for the construction and deepening of education informatization (Nan, 2010). In the past five years, the domestic MOOCs platforms have mushroomed. The well-known comprehensive MOOCs platforms include China University Moocs, Good University Online and Xuetang Online, etc. These platforms have gathered a large number of famous teachers and a large number of course resources. In addition, various educational institutions (colleges and trade education associations) also have their own online course platforms, which lay the foundation for educational institutions and teachers and students to implement blended learning, and promote the development of new blended learning under the background of the Internet.

In the era of "Internet Plus", blended teaching is becoming the "new normal" of future teaching. The sudden outbreak of COVID-19 has accelerated the process. During the COVID-19 pandemic, online teaching effectively supported the implementation of the Ministry of Education's "school suspension without suspension" measure (Feng, Wu, Pang, & Cao, 2021). In recent years, blended teaching reform has been vigorously promoted in every school section. Blended teaching in the era of "Internet +" is no longer a simple combination of online and offline learning, but a new teaching paradigm that fully integrates online learning, mobile learning and offline learning, bringing about changes in teaching mode and teaching design (Feng, & Wang, 2019). Blended teaching is a new teaching method, which cannot simply copy the traditional classroom teaching. Blended teaching is a kind of

teaching reform and innovation, which leverages the fundamental change of teachers' role positioning, as well as the reform of teaching mode and concept, and puts forward new requirements for teachers, who must possess the knowledge and ability of such specialized teaching method to successfully carry out blended teaching (Feng, Sun, & Cao, 2019). Existing studies have shown that the promotion of blended teaching reform requires three different levels of preparation from institutions, teachers and students, among which the preparation of teachers is the most critical (Graham, Woodfield, & Harrison, 2013; Feng, Wang, & Wu, 2018).

## LITERATURE REVIEW

### Blended learning

Blended Learning (BL) has become an important feature of the teaching model of higher education in the recent 30 years. Blended learning models are vaguely defined, but also flexible and evolving (Graham, 2006). Blended learning is a teaching model that effectively integrates face-to-face teaching and computer-assisted online learning, and creates courses through carefully designed physical activities and virtual performance parts (Graham, 2006; Graham, Woodfield, & Harrison, 2013). Since the late 1990s, the concept of blended learning has evolved and become clearer: Technology application stage from late 1990s to 2006, technology integration stage from 2007 to 2013, and "Internet +" era stage from 2013 to now (Feng, Wang, & Wu, 2018). With the passage of time, more and more scholars believe that blended learning is not only a simple mixture of education and technology, but also a learning experience that can truly be highly involved, personalized and collective (Smith, 2017).

### Blended learning based on SPOC

SPOC (Small Private Online Course) means "small limited online course" (Fox, 2013). It is a form of learning resources such as courseware, videos and materials on the MOOCs platform and online learning processes such as quizzes, assignments, discussions and evaluations (interactive) applied to elective courses by small groups of students. It is a blended learning mode that includes two main components of online learning and offline face-to-face learning (Huang, Ma, Zheng, & Zhang, 2009; Garrison, & Kanuka, 2004). Small and Private in SPOC are different from Massive and Open in MOOCs. "Small" refers to the small size of students, while "Private" refers to the restrictive requirements and admission conditions for students to apply for courses (Zhu, & Liu, 2014). MOOCs and SPOC are not fungible, but parallel. MOOCs are suitable for non-campus, large-scale sharing of educational resources, based on the concept of educational equity. SPOC is a special mode of campus education. MOOCs are suitable for basic theoretical education, while SPOC are suitable for professional skills education. MOOCs are more suitable for people with self-learning ability (Guo, 2017). When the MOOCs craze fades, SPOC is likely to become a more popular mode of learning. Because the blended learning environment created by SPOC not only has the advantages of MOOCs, but also makes up for the shortcomings of traditional classroom, the two complement each other perfectly (Kang, 2014). In 2013, Harvard University carried out SPOC education experiment based on three courses: Copyright Law, National Security, Strategy and Major Challenges Facing the Media in the United States, and Architectural Hypothesis. The results were well received and further expanded (Paul, 2012). The University of California at Berkeley offers its brand course "Software Engineering" on the edX platform, which is lectured by Professor Fox and taught by SPOC mode to students on the Berkeley campus. The automatic scoring results of the system show that the on-campus students receiving SPOC mode score higher than the off-campus students learning by non-SPOC mode. They have a high degree of understanding knowledge and mastering skills (Fox, et al, 2014).

### Blended learning and learning presence

Community of Inquiry (COI) theory model is a theoretical framework, which focuses on promoting meaningful learning experiences through three kinds of presence: cognitive presence, social presence, and instructional presence (Fiock, 2020). The community of inquiry theory model is a process of measuring and developing a meaningful and deep learning experience and educational experience through three interacting factors (Garrison et al., 1999). Based on the theory of social constructivism, Garrison et al. constructed the community of inquiry theory model. Through research and analysis, they believe that social presence, instructional presence and cognitive presence are the three key elements that affect blended learning effect. Effective learning occurs when all three senses of presence are at a high level and in dynamic balance with each other (Garrison, Anderson, & Archer, 2001). In blended learning, instructional presence has a significant impact on the prediction of academic performance. In addition, instructional presence is significantly positively correlated with cognitive presence and social presence. In addition, both cognitive and social presence are positively correlated with academic performance. Self-efficacy plays a regulatory role in the relationship between instructional presence, cognitive presence, and social presence, respectively (Yin, & Yuan, 2022). In blended learning, instructional, social, and cognitive presence are interrelated, and social and cognitive presence are highly correlated. In addition, students' motivation to learn professional English is activated during the blended learning process (Zhang, 2020). Learning communities are a result of blended learning interactions. The development model of K-12 blended learning communities is recommended to inform teachers of the pedagogical approach to professional development and the

construction of practical supported learning communities in an environment where blended learning may continue to flourish (Villanueva, Redmond, Galligan, & Eacersall, 2023). Student perceptions of CoI may be helpful in identifying differences in student blended learning experiences. This may help students determine whether blended courses are suitable for their learning. The perceived differences in blended learning experiences vary from subject to subject, and may be the result of differences between students, such as their age or differences between teachers (Wicks, Craft, Mason, Gritter, & Bolding, 2015).

### **Learning attitude and motivation**

A major source of motivation is intrinsic motivation, which derives from personal aspects such as interest, curiosity, need, and enjoyment (Woolfolk, 2001). Learning motivation is the process of stimulating and maintaining goal oriented activities, which is reflected in personal investment and cognitive, emotional, and behavioral participation in learning activities. Motivation is an important factor in completing online and classroom learning activities (Geng, Law, & Niu, Koballa defines a learning attitude as a persistent and stable performance in which the change of attitude is caused by external causes. The formation of attitudes, behaviors and changes is influenced by factors such as personality, experience, learning style and external environment (Koballa, 1988). Attitudes are individuals' thoughts about specific mental objects, which generate emotions and behaviors (Baron, & Byrne, 1977). The 2004 definition of learning performance by the Association for Educational Communication and Technology defines learning performance as a learner's ability to apply newly acquired knowledge or skills. In essence, learning performance involves not only the basic knowledge and skills learned, but also the ability to apply them, and there are many factors that affect learning performance (Broadbent, 2017). The effectiveness of blended learning lies not only in academic performance, but also in promoting cooperation and thinking among students. At the same time, it can change students' learning attitude and teacher-student interaction (Karabulut, Jaramillo Cherez, Jahren, 2018). The teaching comparison between blended learning and traditional face-to-face teaching shows that this method can improve students' grasp of curriculum concepts (Mcvey, 2009) and generate more favorable attitudes (Ward, 2004).

### **Vocational blended learning.**

At present, in the courses of higher vocational colleges, the program design course is practical and contains a lot of abstract theories and concepts, so the students have some difficulties in learning. The understanding of theoretical knowledge directly affects students' performance in practice and their learning motivation (Alammary, 2012). In vocational education, there is a gap between the specific requirements of the syllabus of course teaching and the actual teaching, because in the practical teaching, vocational colleges are oriented by practical teaching, leading to a relatively insufficient exploration of professional content and depth of knowledge in vocational education, which directly affects the teaching effect of some theoretical courses and basic courses (Wu, 2022). SPOC is suitable for professional skills education, suitable for students with weak self-control ability (Guo, 2017). SPOC blended learning mode ADAPTS to the learning characteristics and individual needs of vocational students, is conducive to the acquisition and mastery of technical skills, and improves the teaching effect of vocational courses (Xie, & Chen, 2021). The curriculum of higher vocational colleges basically follows the curriculum structure of undergraduate colleges, the curriculum design is not reasonable, its content and difficulty level and the cognition and ability level of students in higher vocational colleges have a certain deviation. SPOC blended learning is not a panacea, and specific application scenarios need to be considered. Further analysis and design are needed under the overall framework of online, online and offline combination, otherwise, it may backfire (Shi, & Zhuge, 2019).

## **METHODOLOGY**

### **Research background**

This study was conducted in a higher vocational college where the researcher works, and the subjects were students from our college, which is one of the first "double high" construction colleges (equivalent to the "double first-class" construction universities of undergraduate colleges) of the Chinese National Ministry of Education. According to the school documents, all students in this college are required to study the three common courses of "Fundamentals of Information Technology", "College English" and "Advanced Mathematics" in the first semester of their freshman year. In September 2019, the college implemented the SPOC blended learning mode for the three public courses of "Fundamentals of Information Technology", "College English" and "Advanced Mathematics". In other words, these three courses are taught and learned in the way of SPOC blended learning. The college provides a public SPOC network platform, which has rich curriculum resources and supports flexible and diverse interactive activities. At the same time, teachers are encouraged to use SPOC blended learning model in the teaching of professional courses, but it is not mandatory.

### **Participant**

The researcher will choose a professional two parallel class, the experimental group and control group. The

experimental group must be using the optimized online blended teaching strategy, while in the control group, there is no use to optimize online blended teaching strategy. Among the classes taught by the researcher, two classes will be selected. They will be students majoring in information technology. A total of 92 students from the researcher's schools will be selected for the study, ranging in age from 18 to 21, with an average age of 19. The participants are vocational students, they have online and offline learning experience, and they all need to have a better learning experience, willing to be the participants, and express their voices at the same time. They will be randomly divided into classes when they entered the college. Before the quasi-experiment, the academic performance of the students in the two classes should be generally consistent. The first class of information technology is an experimental group with 47 students, and the optimized online and offline blended teaching strategy is implemented. The second class of information technology is the control group with 45 students, and the teaching is carried out according to the original class mode. The whole experiment lasted for three months. In order to avoid Hawthorne effect and John Henry effect, students in the experimental group and control group were informed that experimental teaching was taking place during the quasi-experimental period, but not the group.

**Instrument**

The questionnaire was adapted from the maturity scale in relevant literature and presented in Chinese. We will ask the English professor to translate the original English scale into Chinese, and then ask another English professor to check whether the translation is appropriate. The expert director of Educational technology in vocational colleges is invited to review the questionnaire to ensure that the main content of the questionnaire can reflect the current vocational education philosophy. The questionnaire content dimensions include learning attitude and motivation ATT-MOT (Pintrich, & de Groot, 1990; Weinstein, Taylor, & Palmer, 2020), TP (Garrison, Cleveland-Innes, & Fung, 2010; Lan, et al.,2018), Cognitive presence CP (Garrison, Cleveland-Innes, & Fung, 2010; Lan, et al., 2018), Social presence SP (Garrison, Cleveland-Innes, & Fung, 2010; Lan, et al., 2018). Motivation and learning attitude have 6 questions each, a total of 12 questions. There are 8 questions of instructional presence, 8 questions of cognitive presence, and 6 questions of social presence. We have 34 problems in five dimensions. Likert's five-point scale designed questionnaire options ranging from "strongly disagree" (denoted by "(1)") to "strongly agree" (denoted by "(5)"), and asked respondents to complete the survey anonymously.

**Instructional design**

Take the "structure" knowledge and skill point of "C Language Programming" as an example. The blended teaching strategy of online and offline will be optimized, and the optimized strategy will have three more steps than the original one. The optimized blended online and offline teaching strategy has three more activities. One is to do several multiple-choice questions for online videos before class to consolidate the effect of viewing online videos. Second is to show group's works each group offline display face-to-face, which can stimulate the learning motivation, complete works better, and at the same time, it also exercises the learning communication ability. Third, in order to consolidation knowledge and skills from learning online and offline, need to complete certain difficult tasks after-school. Some optimized online and offline blended teaching strategies will be proposed, as shown in table 1, Among them, activities 2, 3, and 6 are newly added learning activities after optimized blended learning, and The experiment lasted three months.

Table 1 Optimized blended learning processes and activities implemented in the experimental group

| No. | Online or Offline | Teaching activity                              | Specific teaching activities   |
|-----|-------------------|--|--|
| 1   | Online            | Student watch video.                           | Watch a learning video titled "Basic Concepts of Structure" on the online course platform (Learning Link). Video based concept new content, short and pithy. The video is about 12 minutes long, and the content includes what is "structure", examples of life, the composition of "structure", how to define, expression and so on. The goal is for students to learn the basics of structure. |
| 2   | Online            | Complete the multiple choice questions online. | Like watching a video, as one of the task points, complete 5 multiple choice questions based on the content of the video on the online course platform. The goal is to see how well students have mastered the basic knowledge through videos.   |

|   |         |  |  |
|---|---------|--|--|
| 3 | Offline | Offline face-to-face questioning, teacher-student interaction. | For the questions with the same difficulty as above, the online video learning and multiple choice questions will be analyzed. For the questions with low accuracy, the video will be reviewed and the focus will be discussed and analyzed. Basic input and output of structure elements; The sum and size of the memory space occupied by the elements of the structure. |
| 4 | Offline | Ask questions, explain, introduce and improve knowledge.       | The teacher throws out the task, and the task follows the content of the previous three steps. Students write the structure including the four elements of name, age, major and achievement, input three records, find the average score and the highest score, and output.  |
| 5 | Offline | Group discussion, give full play to the subjective initiative. | To complete the task in a group, there can be division of labor within the group, such as filling in the task list, writing the core code, and operating Visual Studio C language platform. You can also do it individually, and finally discuss and optimize together.  |
| 6 | Offline | Some group representatives show, teacher comments.             | In each group, let the team members with good performance on the platform, show their team's works (complete the teacher's task on "structure") to the class, show the link, recognize the division of labor within the group, play ppt, dictate, answer questions and supplement.   |
| 7 | Online  | A task that is similar in difficulty to the offline task.      | You can complete the task alone or in a group. Fill in the task list and upload it to the online course platform -- "Learning Pass".   |
| 8 | Online  | Watch the next video.  | Watch a 10-minute video on the online course platform, which is the basis for the next class.  |

### Data collection and analysis

Pre-test data were obtained at the beginning of the experiment and post-test data were obtained at the end of the experiment. Both questionnaire distribution and collection were conducted offline. For the collected data, the pre-test data of the experimental group and the control group are judged whether they are homogenous. Under the condition of homogeneity, the "single variable" in the command "General Linear Model" is used to select the full model ("class \* pre-test" model) to detect whether the interaction influence is significant. If not, Follow the same steps, then conduct Covariance Analysis (a statistical method integrating regression analysis and variance analysis with analysis of variance as the core, Analysis of Covariance, ANCOVA), take the post-test as the dependent variable, group (experimental group and control group, as mentioned above, As a fixed variable, pre-test was a covariable to determine whether there was a significant difference between the experimental group and the control group (Zeng, & Li, 2017). Paired sample T-test was performed on the adjusted post-test data, and longitudinal analysis was conducted on the experimental group and the control group respectively to verify whether there was a significant difference between the pre and post test. The flow chart of data analysis is shown in Figure 1.

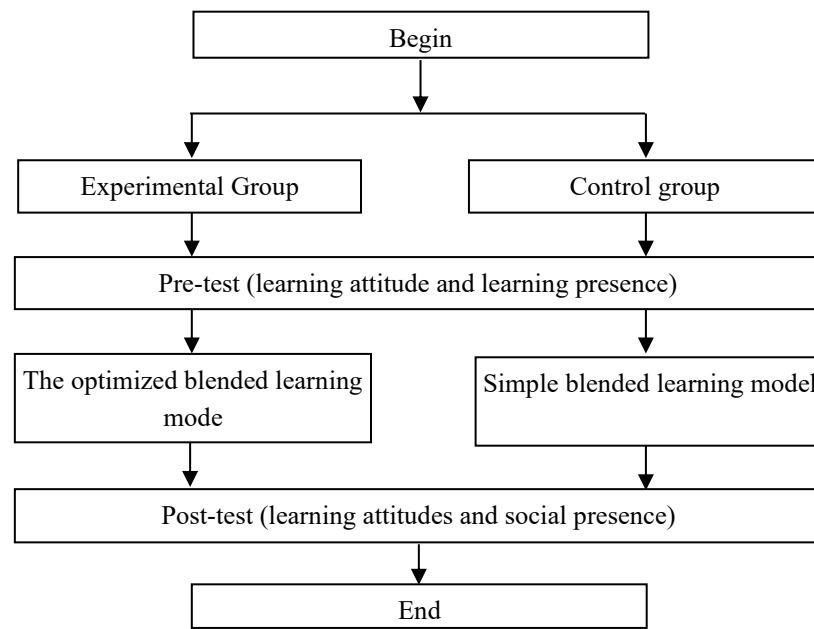


Figure 1. Data analysis flow chart

**RESULT AND DISCUSSION**

The influence of optimized blended learning mode on students' learning attitude and motivation

To test whether the "pre-test \* class" of learning attitude and motivation has interactive influence, the result is  $F=1.219, P=0.106 > 0.05$ , indicating that the regression line slope of the experimental group and the control group is the same, there is no significant interaction between the pre-test data of learning attitude and motivation between the groups, which can be used for ANCOVA analysis. The analysis results are shown in Table 2.

Table 2 ANCOVA analysis of learning motivation in experimental group and control group

| Source                       | Mean sum of squares | Degree of freedom | Average sum of squares | F-value | P-value |
|------------------------------|---------------------|-------------------|------------------------|---------|---------|
| Covariable (pre-test)        | 4.219               | 1                 | 4.219                  | 18.261  | 0.000   |
| Intergroup (teaching method) | 0.253               | 1                 | 0.253                  | 4.335   | 0.000   |
| In-group (error)             | 4.351               | 89                | 0.216                  |         |         |
| Total                        | 312.605             | 92                |                        |         |         |

The results showed that  $F=4.335, P=0.000 < 0.001$ , reaching a significant level. It indicates that the subjects' learning attitude and motivation will be different due to different blended learning modes, that is, the optimized blended learning mode has a significant positive impact on learning attitude and motivation.

Paired sample t test was performed for the pre and post measurements of each group to detect whether the experimental group and the control group had made progress respectively, and whether there was a statistically significant difference. The results are shown in Table 3.

Table 3 Paired T-test for learning attitude and motivation in each group

| Matching item                    | group              | Mean difference between the pre-test and post-test | Freedom | t-value | P-value |
|----------------------------------|--------------------|--|---------|---------|---------|
| Learning attitude and motivation | Experimental group | -1.315   | 46      | -3.91   | 0.000   |
|                                  | Control group      | -0.952   | 44      | -2.13   | 0.001   |

The results show that the paired sample T-test results of the experimental group are:  $t=-3.91$ ,  $P=0.000<0.05$ , reaching a significant level, indicating that the optimized blended learning mode has a significant difference before and after the experiment. The results of paired sample T-test in the control group were:  $t=-2.13$ ,  $P=0.001<0.05$ , indicating that the simple blended learning mode had a significant difference before and after the experiment. Both the experimental group and the experimental group showed significantly better learning attitude and motivation after the experiment than before.

To sum up, it can be concluded as follows:

In the comparison between the experimental group and the control group, ANCOVA analysis showed that there was a significant difference between the experimental group and the control group in terms of learning attitude and motivation, and the experimental group was significantly higher than the control group.

In the in-group comparison between the experimental group and the control group, the paired sample T-test showed that the average score of the post-test of learning attitude and motivation of the experimental group was significantly higher than that of the control group, and the experimental group was higher than the control group. That is, both the experimental group and the control group made progress in learning attitude and motivation, and the experimental group made more progress than the control group.

**The influence of the optimized blended learning mode on the learning presence**

The homogeneity test was performed on the "pre-test\*class" of cognitive presence, instructional presence and social presence (hereinafter collectively referred to as the sense of presence) (in SPSS24.0, check the multiple boxes of homogeneity test in the option command) to judge whether it had interactive influence. The result was  $F=2.087$ ,  $P=0.218>0.05$ . This indicates that the regression line slope on presence of the experimental group and the control group is the same, and the pre-test data of presence of the two groups do not have significant interaction, which can be used for ANCOVA analysis. The analysis results are shown in Table 4.

Table 4 Summary of AVCOVA analysis of presence in experimental group and control group

| Source                       | Mean sum of squares | Degree of freedom | Average sum of squares | F-value | P-value |
|------------------------------|---------------------|-------------------|------------------------|---------|---------|
| Covariable (pre-test)        | 3.937               | 1                 | 3.937                  | 36.138  | 0.000   |
| Intergroup (teaching method) | 0.416               | 1                 | 0.416                  | 3.957   | 0.000   |
| In-group (error)             | 4.903               | 89                | 0.193                  |         |         |
| Total                        | 632.163             | 92                |                        |         |         |

The results showed that  $F=3.957$ ,  $P=0.000<0.05$ , reaching a significant level. It indicates that the subjects' sense of presence will be different due to different blended learning modes, that is, the optimized blended learning mode has a significant positive impact on the sense of presence.

Paired sample t test was performed for the pre and post-tests of the experimental group and the control group to detect whether there was a statistically significant difference, and whether the experimental group and the control group made progress in their sense of presence. The results are shown in Table 5.

Table 5 The paired T-test of presence was performed on the respective groups

| Matching item     | group              | Mean difference between the pre-test and post-test | Freedom | t-value | P-value |
|-------------------|--------------------|--|---------|---------|---------|
| Learning presence | Experimental group | -1.812   | 46      | -3.78   | 0.000   |
|                   | Control group      | -1.052   | 44      | -2.24   | 0.001   |

The results show that the paired sample T-test results of the experimental group are:  $t=-3.78$ ,  $P=0.000<0.05$ , reaching a significant level, indicating that the optimized blended learning mode has a significant difference before and after the experiment. The results of paired sample T-test in the control group were:  $t=-2.24$ ,  $P=0.001<0.05$ , indicating that the simple blended learning mode had a significant difference before and after the experiment. In both experimental and experimental groups, the sense of presence was significantly better after the experiment than before.

**To sum up, it can be concluded as follows:**

In the comparison between the experimental group and the control group, ANCOVA analysis showed that there was a statistically significant difference between the experimental group and the control group in the sense of presence, and the scores of the experimental group were significantly higher than those of the control group.

In the in-group comparison between the experimental group and the control group, the paired sample T-test showed that there was a significant difference between the average score of the experimental group and the average score of the control group in terms of presence, and the experimental group was higher than the control group. In other words, compared with the pre-test, both the experimental group and the control group improved in the post-test, and the experimental group students improved more than the control group students.

## CONCLUSION

In order to stimulate the learning enthusiasm of higher vocational students and reduce their learning difficulties, this study makes full use of the Internet and online course resources (SPOC) to design a set of blended learning activities summarized in practice. In order to test whether the optimized blended learning mode has a significant positive impact on the curriculum learning of higher vocational students, a 3-month quasi-experimental study was carried out with 92 vocational students as the research objects and the "C language programming" course as the carrier. The quasi-experimental research process was standardized and the data analysis was scientific. According to the research purpose and results, the following conclusions are drawn.

### **The optimized blended learning mode can improve the learning presence of higher vocational students**

Through empirical verification, this study finds that vocational college students are willing to accept the series of activities of improved blended learning in the learning of programming courses, and are significantly better than the series of activities of simple blended learning in the sense of instructional presence, cognitive presence and social presence. The creation of instructional presence includes direct instruction, teaching management and building understanding (Stenbom, 2018). The creation of cognitive presence includes trigger event, exploration, integration and solution (Gorges, & Kandler, 2012). The creation of social presence includes emotional expression, open communication and group expression (Garrison, Anderson, & Archer, 2010). In the optimized blended learning series activities, objective topics corresponding to videos in online courses are added, which can timely detect the learning effect of students watching videos. The system automatically reviews the videos, and instantaneous feedback can be obtained, which increases the cognitive presence of students. In the series of optimized blended learning activities, students are also added to solve problems independently in groups. There are not only internal discussion of problem analysis and problem solving, but also group representatives sharing the results of group discussion with the class. Intra-group cooperation, intergroup competition and class cooperation greatly increase students' sense of social presence and instructional presence. It also ADAPTS to the learning habits of vocational students.

### **The optimized blended learning mode can improve the learning attitude and motivation of higher vocational students**

Through the quasi-experimental study, it is found that the series of blended learning activities designed in this study can improve the learning attitude and motivation, and the optimized blended learning mode has a significant promoting effect on the learning attitude and motivation of higher vocational students. Higher vocational students have their own characteristics of learning behavior, such as strong hands-on ability and willingness to show (Sun, 2021). In the optimized series of blended learning activities, a series of activities are added, such as multiple choice questions for timely evaluation and feedback, group discussion, group presentation and other activities, which fully mobilize the learning enthusiasm of higher vocational students, let them learn in an environment where they can get help, and help students overcome difficulties. Let them learn through communication with their partners, support each other, and gradually reap the benefits of learning. Higher vocational colleges should vigorously promote the blended learning model based on online courses, and optimize the blended learning process according to different course categories in order to improve the learning effect.

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