

Construction and Practice of “Internet +” Era Blended Teaching Mode in Database Principle and Application Course

Jiixin Cui, Limei Yan, Jianjun Xu, Haishuang Yin, Yin Jia, Fengcai Huo, Xuesong Chen, Lili Wang, Jiamin Li, Xianbo Han, Tingting Wang, Jianmin Zhao *

School of Electrical Engineering and Information Technology, Northeast Petroleum University, Daqing 163318, China
*Zhaojm@163.com

Abstract: The blended teaching in the “Internet +” era defines the new connotation of students’ learning. Students should not only acquire common standardized knowledge, but also pay attention to the independent construction of personalized knowledge and creative knowledge application. By analyzing the characteristics of students majoring in computer science and technology, this research constructs a blended teaching model based on the learning Platform. To this end, this study takes the needs analysis and conceptual structure design in database design as examples, and expounds the specific implementation process of teaching preparation, knowledge construction, knowledge transfer and teaching reflection. Finally, through quasi-experimental research to verify the teaching effect of the database principle and the application of the blended teaching model, the research results show that the blended teaching model can significantly improve students’ academic performance.

Keywords: Blended Teaching Mode, Learning Platform, Knowledge Construction, Knowledge Transfer.

1. Introduction

Director Wu Yan of the Department of Higher Education pointed out in his report at the National Conference of Higher Education Directors: Curriculum is the carrier of the concept of “student development as the center”, the embodiment of the implementation of the fundamental standard of “cultivating morality and the effectiveness of people”, and the realization of the “integration of five educations”. The path that is fundamentally required for educating people (Ye Chaoliu,2020). The blended teaching in the “Internet +” era is to provide students with a personalized and highly participatory learning. Students not only learn common standardized knowledge, but also pay attention to the independent construction of creative knowledge. Based on the learning Platform, this research constructs a hybrid teaching model of database principles and application courses, which improves students’ initiative and creativity, realizes efficient and effective learning, and enables students to have the ability to solve complex engineering problems in the field of database application after completing this course (Wang Shan,2014).

2. Analysis of the Characteristics of Students

In the first half of 2021, this study took the second-year computer science and technology students of our school as the research objects, and conducted a pre-class questionnaire survey on database principles and application courses. A total of 207 questionnaires were distributed, and 203 valid questionnaires were returned. The questionnaire is investigated from three dimensions: students’ learning characteristics, students’ database knowledge and skills reserves, and students’ attitudes towards implementing blended teaching. The reliability and validity of the returned questionnaires are analyzed by SPSS 22 software to test the reliability of the questionnaires. The following is an analysis

of the results of the questionnaire:

(1) The characteristics of students’ learning: students’ learning concept is not strong, the learning mode is single, and the learning effect is not good. Students’ learning is mainly driven by external motivations, such as end-of-semester examinations, teacher testing, etc. and lack of internal motivations, such as curiosity, motivation, etc.

(2) Students’ knowledge and skills reserve: Students generally understand database content, and some students have project development experience, and can implement independent learning, collaborative inquiry, and personalized learning in the database principle and application course.

(3) Students’ attitude towards the reform of blended teaching: Students are willing to try the implementation of blended teaching, which is conducive to the development of blended teaching.

3. Blended Teaching Reform Based on learning Platform

Blended teaching is the organic combination and complementary advantages of online learning mode and classroom teaching mode. Its purpose is to play the leading role of teachers to guide, inspire and control the teaching process. At the same time, pay attention to the students’ enthusiasm, inquiry and the main position of independent innovation, in order to achieve the optimization of teaching effect.

3.1. Relying on the Learning Platform to Build Learning Resources

The construction of learning resources mainly includes: the construction of curriculum resource database, the construction of test question resource database, the construction of homework resource database, the construction of case resource database and so on. Publish the content of learning resources to the Learning Platform. The course resource library includes teaching PPT, knowledge point

explanation videos, and typical case explanation videos. The test question resource library contains test questions for all the knowledge content of this course. During the knowledge test, use the Learning Platform to randomly select test questions from the existing question bank. The assignment resource library includes knowledge unit learning objectives, discussion questions, and group assignments. The case repository includes verification cases, design cases, and comprehensive cases. Continuously track the access to learning resources through the Learning Platform, count the number of chapters each student has studied, the length of video viewing, the number of tasks completed, and the frequency of participating in discussions. Analyze what questions students have in the learning process, their mastery of knowledge units, and their needs for future knowledge. On this basis, continuously improve the construction of learning resources and optimize learning resources.

3.2. Construction of A Blended Teaching Model Based on the Learning Platform

According to the analysis of students' characteristics and the shortcomings of traditional teaching, the constructed teaching model is shown in Figure 1: teaching is divided into four parts: teaching preparation, knowledge construction, knowledge transfer and teaching evaluation. Teaching preparation is to formulate learning resources and evaluation standards. Knowledge construction is to learn knowledge from shallow to deep and progressively through the three stages of pre-class, in-class and post-class. Knowledge transfer is the practical application on the basis of existing knowledge experience and cognitive structure to cultivate students' high-level abilities.

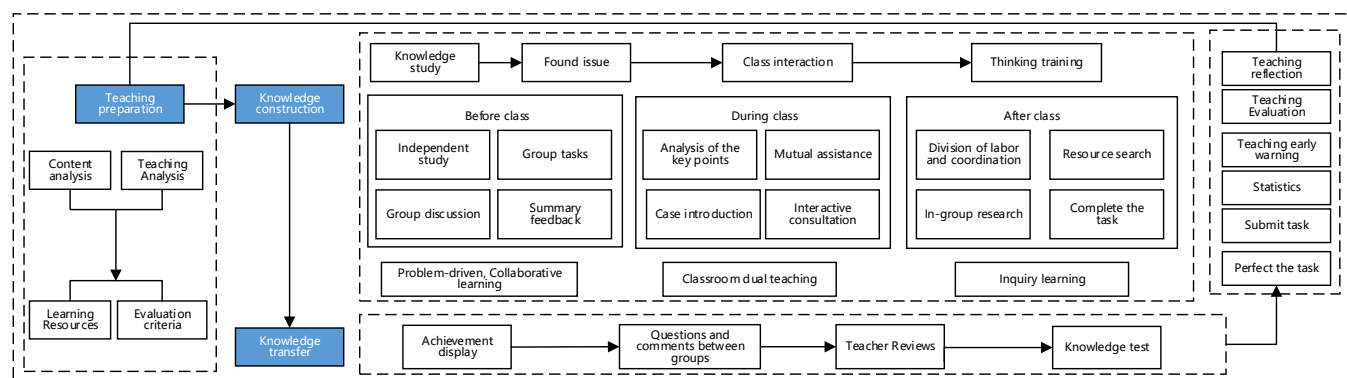


Figure 1. Blended teaching mode based on Learning Platform

3.3. Clarify the Assessment Objectives and Improve the Assessment System

The original grades of the database principle and application course consist of usual grades, experimental grades and final assessment grades, which cannot effectively track the pros and cons of students' learning effects in real time. The main purpose of course evaluation is to achieve the goal of the course and the cultivation of students' ability. Therefore, the evaluation system of the database principle and application course has been reconstructed to monitor and ensure the normal and orderly and quality implementation of each link in the teaching process. Teaching evaluation is a comprehensive evaluation of students' learning performance and task results, which consists of process evaluation and summative evaluation. Process evaluation is refined, quantified, fair and just (Zhang Jing,2020). Firstly, the self-learning effect is evaluated, and the pre-class knowledge unit learning situation and the feedback of the study group are used as the evaluation basis, and the adaptability of the teaching resources provided by the teacher to the teaching content is judged. Secondly, carry out teaching evaluation on the classroom teaching situation, take the answers to questions, interactive performance and task results of each group as the evaluation basis, examine the implementation effect of dual teaching in the classroom, and finally combine the knowledge test results and students' teaching feedback to learn from this stage. The effectiveness of the teaching reform is judged from an overall perspective, and the teaching is adjusted according to the actual situation. The summative evaluation is a comprehensive test of students' mastery of

database principles and application course knowledge at the end of the semester.

4. Blended Teaching Practice Based on Learning Platform

This research takes the needs analysis and conceptual structure design of database design as examples to demonstrate the implementation process of blended teaching. While achieving the learning objectives of the knowledge unit, it also cultivates students' autonomous learning ability, teamwork ability, and communication and expression ability.

4.1. Preparation Stage

In the preparation stage, conduct course content analysis and teaching analysis, share learning resources, and inform students of evaluation standards. Learning resources include teaching PPT, knowledge point explanation videos, typical example questions explanation videos, knowledge unit learning objectives, and learning through Platform to publish discussion questions and group tasks. In the demand analysis stage of database design, the focus of the investigation is "data" and "processing". Design discussion question before the class, using the familiar organizations around the students as the research object, and guide the students to conduct demand analysis from the role of designers and users. Conceptual structure design by making several examples of video before class to explain the process of conceptual structure design, guide students to understand the steps and methods of conceptual structure design. By formulating learning objectives and evaluation criteria of knowledge units,

students' external motivation is stimulated, discussion questions and group tasks are released to generate students' interest in learning and stimulate students' internal motivation (Gao Xiaolan,2020).

4.2. Knowledge Construction

Before class, students carry out self-study with questions after clarifying the objectives of the knowledge unit. After having a certain understanding of needs analysis and conceptual structure design, students discuss difficult problems and group tasks with group members. Completing the initial internalization of the course content through mutual help among group members, feeding back the problems that still exist in the group or the problems that are considered relatively typical to the teacher before class. Teachers formulate teaching content in class based on feedback and implement personalized learning.

In class, a student-centered, teacher-led classroom dual-teaching is implemented. Students complete pre-class autonomous learning and enter the in-class teaching stage. They already have a certain knowledge and cognition. Teachers mainly guide students to conduct interactive learning. The construction of the knowledge context of the former self-learning and the explanation of the difficult problems reported by the students, through the discussion of the system functions proposed by the students in question, and the data involved as the case to teach the important and difficult points in the course content, such as: the storage of the sales inventory statistics system proposed by the students. The function is used as a case to explain the data flow diagram, which connects the student feedback with the content teaching in an interactive way to improve the classroom atmosphere. On the other hand, the teacher introduces the actual project of the vehicle information management subsystem, describes the basic functions of the project, and gives the connection relationship between the project and the course knowledge points. The project demand research is mapped to the demand analysis in the teaching content, and the roles, personnel, The assignment of tasks is mapped to the conceptual structure design in the teaching content, and the ability of students to analyze complex engineering problems in the field of database applications is cultivated through the introduction of practical projects. Finally, after learning in class, new ideas for grouping tasks are generated. The group members discuss the specific ideas of task implementation and negotiate with teachers on the feasibility of grouping task implementation.

After class, according to the subject name and the specific idea of implementation in the group database design, the group divides the tasks and implements the tasks on the

Learning Platform. The group members upload their completed tasks and current problems in the Learning Platform, and other team members give them in time. Feedback, explore the existing problems, use the Learning Platform to track and record the entire task implementation process, and assist the team members to complete the task.

4.3. Knowledge Transfer and Teaching Reflection

After each group completes the group task, the task results will be displayed. Each group will display the task status and degree of completion of each group member, and each group will ask questions and comment on the content of the results. Teachers will comment on the advantages of the results and the areas that need to be improved, so that students can understand that database design is not a one-off process, but a process of continuous iteration and reconstruction, and guide students to improve the database design. Finally, the teacher summarizes the deficiencies of this course according to the data statistics and teaching warning, students' classroom performance, and achievement reports on the Learning Platform, and prepares for the next teaching organization optimization.

5. Analysis of the Effect of Blended Teaching

This research adopts the quasi-experimental research method. After completing the first and second chapters of the database principle and application course, the students are organized by stage testing to ensure that the test content and test time of the experimental group and the control group are the same, and the test is over. The post-test scores are used as the pre-test scores. Classes are taught from the third chapter of the course. Classes 1, 2, and 3 are used as experimental groups, and classes 4, 5, and 6 are used as control groups. At the end of the semester, the whole course of database principles and applications will be tested. The test content and test time of the control group were the same, and the scores after the test were used as post-test scores. SPSS 22 software was used to conduct independent sample T-test on the pre-test and post-test results. The pre-test score $P=0.273>0.05$ indicated that there was no significant difference in the scores of the two groups, and the post-test score $P=0.001<0.01$, indicating that the results based on the Learning Platform were not significantly different. Blended teaching can significantly improve students' academic performance. Table 1 shows the comparison of the pre- and post-test scores of the students in the experimental group and the control group.

Table 1. Comparison of pre- and post-test scores of students in the experimental group and the control group

	Experiment group (n=101) M±SD	Control group (n=106) M±SD	T	P
Pre-test scores	71.770±9.153	71.210±11.725	-1.100	0.273
Post-test scores	74.291±8.026	69.160±12.200	-3.513	0.001

6. Conclusion

The blended teaching in the "Internet +" era has changed the traditional teaching mode. The blended teaching of database principles and application courses organically integrates traditional courses with the Learning Platform.

Through the analysis of the course and the characteristics of the students, a blended teaching model based on the Learning Platform is reasonably constructed. Improve students' participation in the learning process, guide students from the internalization of basic knowledge to the cultivation of advanced ability step by step, effectively stimulate students'

interest in learning. Multiple interactions between teachers and students in teaching activities improve the depth of interaction between teachers and students. This teaching practice has a certain reference value for the mixed teaching design of other courses and has a certain degree of replication and generalizability.

Acknowledgment

This paper is supported by the higher education teaching reform project of Heilongjiang Province (No.SJGY20210111, No.SJGY20210141).

References

- [1] Ye Chaoliu, Li Decai, Tan Ming, Guo Weiguang. The Reform and Practice of “Database Principle and Application” Hybrid teaching Based on MOOC [J]. *Experimental technology and management*,2020,37(07):217-221.
- [2] Wang Shan, SA Shixuan. Introduction to Database System (5th edition)[J]. *China University Teaching*,2014(09):98.
- [3] Chen Chaoying. Research on strategies to improve the effectiveness of blended Teaching Process from the Perspective of Process logic [J]. *China Vocational and Technical Education*,2021(32):42-48.
- [4] Zhang Jing, Yao Jianxin, DING Lin. Construction and Experiment of hybrid Teaching Mode from the perspective of learning progression: A Case study of “College Physics” course [J]. *Modern educational technology*,2020,30(10):65-70.
- [5] Gao Xiaolan, Hu Rui. Hybrid teaching practice based on intelligent education Platform [J]. *China Education Journal*,2020(10):104.