

Construction and Practice of the BOPPPS Teaching Model Based on the “Chaoxing Learning” Platform

Mengqin Sun*

School of Cyberspace Security, Guangdong University of Science and Technology, Dongguan, Guangdong, China

**Corresponding Author*

Abstract: Against the backdrop of deeply advancing educational informatization, blended teaching has become an important trend in higher education classroom reform. This paper takes the “Principles and Applications of Databases” course for the 2024 Big Data Undergraduate Class 1 as a practical subject. In response to the prominent issues of abstract theory, strong practicality, and low classroom participation, the paper integrates the technical support of the Chaoxing Learning (Xuexitong) platform with the structured design of the BOPPPS teaching model to construct a blended teaching model of “online autonomous preview before class — offline interactive instruction during class — online consolidation and extension after class.” After one semester of teaching practice with 60 students, the model was systematically evaluated through behavioral data analysis, classroom participation observation, and questionnaire surveys. Results indicate that this model significantly improved student learning motivation and classroom participation, with notable improvements in final exam scores and process-based learning indicators, providing a replicable practical path for teaching reform in similar core computer science courses.

Keywords: Chaoxing Learning (Xuexitong); BOPPPS Teaching Model; Blended Teaching; Principles and Applications of Databases; Teaching Reform

1. Introduction

With the deep integration of information technology and education, the student-centered concept of personalized and interactive teaching has become increasingly prominent in higher education reform. The traditional “spoon-feeding” classroom model can no longer meet the needs

of applied talent cultivation in the new era, and teachers’ roles are gradually shifting from “knowledge transmitters” to “learning facilitators.” How to effectively improve students’ classroom participation and learning outcomes through information platforms has become a practical issue urgently explored by frontline teachers [1].

“Principles and Applications of Databases” is a core foundational course for computer-related majors, playing an irreplaceable role in cultivating talent in Data Science and Big Data Technology [2]. However, the course has a relatively abstract theoretical system (such as relational algebra and normalization theory), and the practical operation components are closely linked to theoretical knowledge. Under traditional teaching models, students often experience a disconnect between knowledge and practice, showing low willingness to participate in class and difficulty ensuring learning outcomes [3,4].

The BOPPPS teaching model originated in Canada and consists of six components: Bridge-in, Objective, Pre-assessment, Participatory Learning, Post-assessment, and Summary. Its core philosophy of “goal orientation, participatory interaction, and timely feedback” makes it a rigorous, student-centered teaching model [5,6]. The Chaoxing Learning platform, recognized by the Ministry of Education as a high-quality online learning platform, supports course resource uploads, classroom interactions, and process data recording, which highly aligns with each component of the BOPPPS teaching model [7].

This paper uses one semester of teaching practice with 60 students as a carrier, deeply integrating the two to construct and verify the effectiveness of the “Xuexitong + BOPPPS” blended teaching model, aiming to provide a reference for teaching reform in similar courses.

2. Theoretical Foundations

2.1 BOPPPS Teaching Model

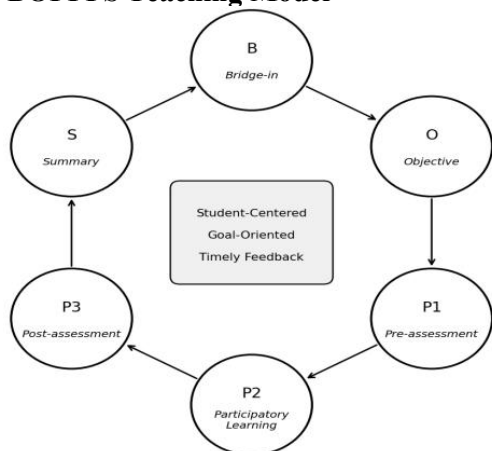


Figure 1. Six Components of the BOPPPS Teaching Model

The BOPPPS teaching model was initially proposed by the University of British Columbia, Canada in the 1970s and later promoted globally by the Canadian Instructional Skills Workshop (ISW) [8]. The model is based on constructivist learning theory and mastery learning theory, emphasizing clear teaching objectives,

interactive student participation, and timely teaching feedback.

The functional positioning of each BOPPPS component is shown in Figure 1.

2.2 Chaoxing Learning (Xuexitong) Platform

Chaoxing Learning (Xuexitong) is a smart teaching platform designed for universities, recognized by the Ministry of Education in 2020 as one of the first 22 recommended mobile learning platforms. Its core functions cover four dimensions: (1) Course Construction; (2) Teacher-Student Interaction; (3) Assignments and Examinations; (4) Learning Analytics — automatically recording study frequency, video viewing rate, interaction count, and assignment scores to support precise teaching decisions [9].

2.3 Compatibility Analysis of BOPPPS and Xuexitong Platform

The Xuexitong platform provides direct technical support for each component of BOPPPS, with high consistency in educational philosophy and implementation paths, as shown in Figure 2.

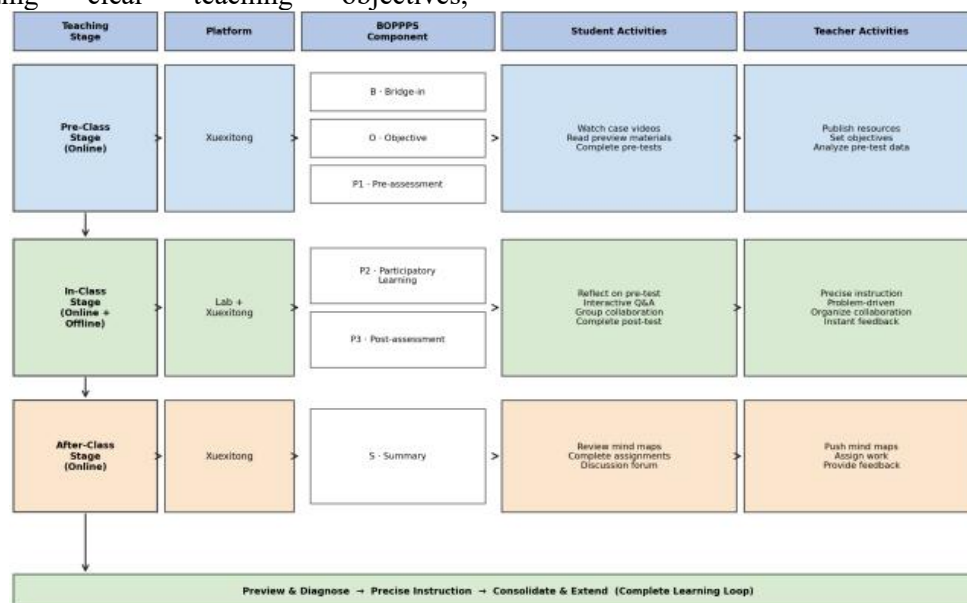


Figure 2. "Xuexitong + BOPPPS" Blended Teaching Model Framework

3. Course Status and Problem Analysis

3.1 Course Characteristics

"Principles and Applications of Databases" totals 144 credit hours (including practical training). Its knowledge structure consists of three modules: basic theory (relational model, relational algebra, SQL language), database design (E-R model, normalization theory), and

database management (transactions, concurrency control, backup and recovery). The course features abstract theoretical content; strong practicality requiring hands-on practice; and strong systematicity where any knowledge gap affects subsequent learning.

3.2 Main Problems in Traditional Teaching

Based on a pre-course questionnaire (60 valid responses) and classroom observation, four main

problems were identified: (1) Low classroom participation — actual rate below 20%; (2) Disconnect between theory and practice — students understand syntax but cannot independently complete comprehensive query tasks; (3) Delayed feedback — teachers cannot promptly diagnose cognitive blind spots; (4) Difficulty accommodating individual differences — uniformly-paced instruction leads to polarization. The root cause is the teacher-centered structure lacking mechanisms to promote students’ active knowledge construction.

4. Construction of the BOPPPS Teaching Model Based on Xuexitong

4.1 Model Design Principles

The model follows three principles: “student-centered” — promoting active learning and deep participation; “goal-oriented” — using measurable objectives to guide the entire process; “data-driven” — utilizing platform process data to support precise teaching interventions.

4.2 Overall Model Framework

The “Xuexitong + BOPPPS” blended teaching model is divided into three stages: before class, during class, and after class. The six components

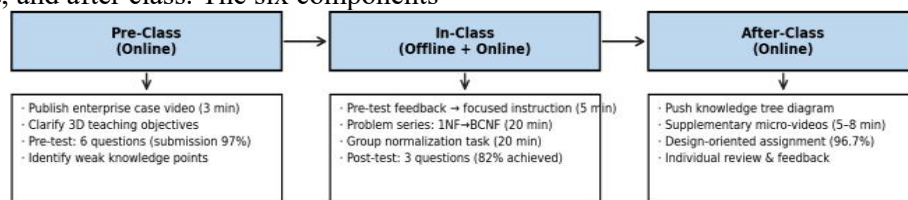


Figure 3. "Relational Database Normalization Theory" Unit Teaching Implementation Process

5. Teaching Effectiveness Evaluation

5.1 Academic Performance Analysis

Using the early-semester diagnostic test and final exam scores as longitudinal comparison references, data is shown in Figure 4. All indicators improved significantly: average score increased by 18.5 points, with pass rate, good rate, and excellent rate up by 23.4, 35.0, and 16.7 percentage points respectively.

5.2 Behavioral Data Analysis from Xuexitong

Full-semester behavioral data from 60 students is shown in Table 1. Results show students’ learning shifted from passive to active. The 98.2% in-class exercise participation rate and 100% group task submission rate strongly corroborate the model’s effectiveness.

form a complete learning loop of “preview and diagnosis — precise instruction — consolidation and extension” [10].

Before class: the teacher publishes guided case resources (Bridge-in), defines three-dimensional teaching objectives (Objective), and releases a preview quiz to identify weak knowledge points (Pre-assessment P1). In class: P2 (Participatory Learning) includes pre-test feedback-driven instruction (~10 min), problem-driven teaching with instant check (~20 min), and group collaboration tasks with peer evaluation (~20 min). P3 (Post-assessment) delivers a mastery test in the final 10 minutes. After class (Summary): knowledge mind maps, micro-videos, and design-oriented assignments with open peer review.

In practice, a 3-minute enterprise case video was used for Bridge-in, followed by 6 pre-test questions (97% submission; 62% error rate on transitive functional dependencies). In class, the 1NF→2NF→3NF→BCNF progression was taught with a group normalization task (post-test average 78.6, 82% achievement rate). After class, 58/60 students submitted assignments with 77.6% meeting quality standards. The unit teaching flow is shown in Figure 3.

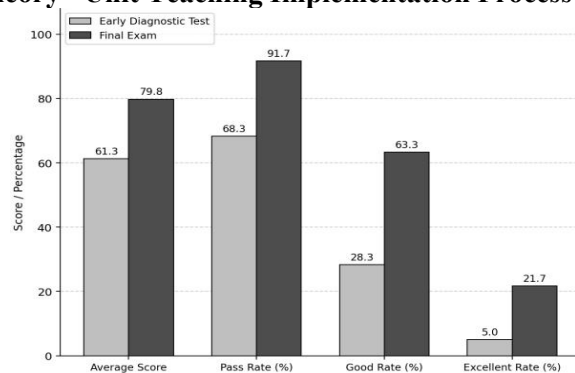


Figure 4. Comparison of Early Diagnostic Test and Final Exam Results

Table 1. Learning Behavior Statistics from Xuexitong Platform

Platform Behavior Indicator	Statistical Result
Average completion rate of pre-class preview resources	91.3%
Average submission rate of pre-tests (per session)	95.8%

Average participation rate in in-class exercises	98.2%
Average submission rate of group tasks	100%
Average posts/replies per student in discussion area	4.2 times/semester
Average submission rate of post-class assignments	96.7%
Average viewing completion rate of video resources	88.5%

5.3 Questionnaire Survey Results

An anonymous questionnaire was conducted among all 60 students (100% valid response rate). As shown in Figure 5, 96.7% of students expressed satisfaction, with all dimension recognition rates exceeding 85%.

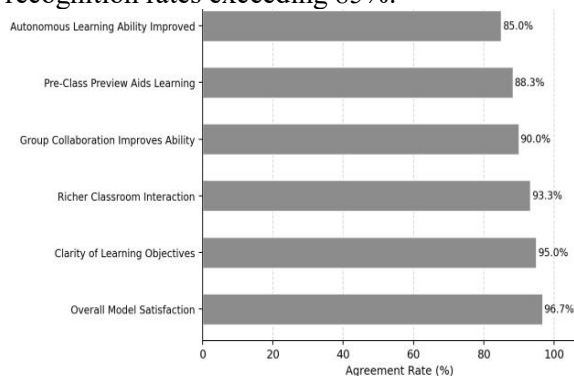


Figure 5. Student Questionnaire Survey Results (N=60)

6. Reflection and Improvement

6.1 Main Achievements

(1) Students' central role was significantly enhanced, achieving the transformation from "passive listening" to "active construction." (2) Teaching feedback is precise and timely. (3) The process-based evaluation system is more comprehensive, incorporating pre-test rates, in-class exercise participation, group task quality, and discussion contributions.

6.2 Existing Problems

(1) Initial adaptation challenges: ~15% of students reported difficulty adapting early in the semester. (2) Large initial investment from teachers in pre-class resource production. (3) "Free-riding" in group tasks: unequal contributions within groups, and the existing peer evaluation mechanism is insufficient for identifying individual contributions.

6.3 Improvement Suggestions

(1) Arrange a "model introduction session" in

the first class with hands-on Xuexitong practice. (2) Collaborate with colleagues to develop shared case libraries and question banks. (3) Introduce intra-group role assignments and self-assessment combined with Xuexitong peer evaluation to more precisely assess group collaboration.

7. Conclusion

This paper integrates the Chaoxing Learning platform with the BOPPPS teaching model, constructing and practicing a full-process blended teaching model with 60 students over one semester. Three key findings emerge: (1) In-class exercise participation reached 98.2% and group task submission 100%. (2) Final exam pass rate increased by over 23 percentage points and good rate by 35 percentage points. (3) Student satisfaction reached 96.7%. The "Xuexitong + BOPPPS" model has significant effectiveness and considerable potential for wider application.

Acknowledgments

This paper is supported by the Educational Teaching Reform Research Project of Guangdong University of Science and Technology (No. GKZLGC2024162) and the Guangdong University of Science and Technology Education and Teaching Reform Research Project (No. GKZLGC2025053).

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