Journal of International Education and Development
2025, VOL. 9, NO. 10, 308-313
DOI: 10.47297/wspiedWSP2516-250070.20250910

A Study of Blended Learning toward the OBE Framework in the "Mobile Application Development Comprehensive Practice" Course

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ABSTRACT

Against the backdrop of the rapid development of the mobile Internet industry, the demand for mobile application development talents has surged, imposing higher requirements on the quality of talent cultivation in vocational education. The construction of "Double high plan" (National Plan for High-Level Vocational Education) is an important measure to train technical and skilled talents, improve the quality of higher vocational education, and promote reform and innovation in higher vocational education. Against the further promotion of the "post-course-competition-certificate integration" model in vocational education, it is necessary to break through the limitations of traditional teaching. Taking the course "Mobile Application Development Comprehensive Practice" as the research object, this study constructs a blended learning system guided by the Outcome-Based Education (OBE) framework, and integrates digital resources that conform to WorldSkills Competition standards and industry demands. First, the study analyzes the background and challenges of mobile application development talent cultivation, then designs the core structure of the OBE framework for the course. And it elaborates on the implementation of blended learning and quality assurance mechanisms. After a semester of teaching practice, results show that this system significantly improves students' learning enthusiasm and professional capabilities: students have won awards in competitions such as the World Vocational College Skills Competition (WVCSC) and the BRICS Skills Competition. This study provides replicable and promotable experience for the reform of blended learning and digital resource construction in computer-related vocational courses.

KEYWORDS

Outcome-Based Education (OBE); Mobile application development; Blended learning; Post-course-competition-certificate integration

1 Introduction

1.1 Industry background and talent demand

The mobile Internet industry has become a core driver of global digital transformation. Technologies such as 5G, AI, and the IoT continue to innovate, promoting the upgrading of mobile application scenarios. According to the *China Internet Development Report (2023)*, the scale of China's mobile application market reached 2.8 trillion yuan in 2022, with an annual gap of over 1.2 million mobile application developers and a year-on-year growth rate of 20%. Enterprises no longer solely expect talents to master basic development technologies for Android, iOS, or cross-platform but also emphasize comprehensive capabilities such as demand analysis, UI/UX design, project management, and compatibility testing [1].

Against this backdrop, vocational education— the main channel for cultivating technical and skilled talents—faces the challenge of bridging the gap between classroom teaching and industry practice. The "Mobile Application Development Comprehensive Practice" course, a core professional course for computer-related majors, plays a key role in connecting theoretical knowledge and practical skills. However, traditional teaching models struggle to meet industry demands due to outdated resources, single teaching methods, and insufficient practical training.

1.2 Policy guidance and educational reform requirements

China's *Double High-Level Plan for Vocational Education (2020-2035)* clearly proposes to "deepen the reform of 'teachers, teaching materials, and teaching methods' (three-teaching reform), promote the in-depth integration of educational informatization and teaching, and build a high-quality curriculum system aligned with industry standards and competition requirements." Meanwhile, the "1+X Certificate" requires integrating vocational skill standards into teaching content to ensure students' abilities match job requirements.

In 2023, Shanghai Publishing and Printing College was approved as the Chinese Training Base for the "Mobile Application Development" project of the 47th WorldSkills Competition. This qualification imposes higher standards on the course: it must not only meet general talent cultivation needs but also cultivate top-tier competitive talents in line with international competition standards. Thus, reforming the course through the OBE framework and blended learning has become an urgent need to respond to national policies and industry demands [2].

1.3 Limitations of traditional teaching and the value of blended learning

Traditional teaching of "Mobile Application Development Comprehensive Practice" has three major limitations:

(1) Fragmented resources and disconnection from standards: Teaching resources are scattered across PPTs, simple videos, and outdated textbooks, with repeated or missing knowledge points. Most resources do not align with WorldSkills standards or enterprise project processes.

(2) Weak practical links and passive learning: Students mainly practice through simulated small projects, lacking experience in solving complex real-world issues such as user experience optimization and multi-device compatibility.

(3) Single evaluation and lagging updates: Evaluation relies heavily on final exams, ignoring the learning process. Resource updates are slow.

Blended learning, which combines online digital learning and offline in-class interaction, can effectively address these issues. Guided by the OBE framework, this study integrates digital resources to create a "theory-practice-innovation" learning system. This not only meets the personalized needs of students with diverse backgrounds but also aligns with the Double High-Level Plan and WorldSkills standards.

2 OBE framework design for "mobile application development comprehensive practice"

OBE (Outcome-Based Education) is a student-centered educational framework that takes "learning outcomes" as the core, reversing the design of teaching content, activities, and evaluation methods (Spady, 1994). For the "Mobile Application Development Comprehensive Practice" course, the OBE framework is divided into three core links: defining learning outcomes, designing learning activities, and establishing evaluation systems.

2.1 Define learning outcomes

Learning outcomes are defined based on three dimensions—job requirements, competition standards, and "1+X Certificate" requirements—covering knowledge, skills, and quality.

2.1.1 Knowledge dimension

Students should master:

(1) Core theories of mobile application development: operating system principles, cross-platform frameworks, and network protocols (HTTP/HTTPS, WebSocket).

(2) Industry standards: Material Design (Android), Human Interface Guidelines (iOS), and software development lifecycle (SDLC).

(3) Frontier technologies: integration of AI and IoT in mobile applications.

2.1.2 Skill dimension

Students should acquire:

(1) Basic skills: Using development tools (Android Studio, Xcode, VS Code), writing standardized code, and debugging common errors.

(2) Professional skills: Conducting demand analysis (Axure RP), designing UI interfaces (Adobe XD), developing core functions, and performing testing [3].

(3) Competitive/innovative skills: Completing WorldSkills-style project development within a limited time, optimizing application performance, and developing innovative applications.

2.1.3 Quality dimension

Students should develop:

(1) Professional literacy: Adhering to code specifications, taking responsibility for project delivery, and collaborating in teams.

(2) Innovative awareness: Identifying user pain points and proposing creative solutions.

(3) Lifelong learning ability: Tracking technical trends and updating knowledge reserves.

2.2 Design learning activities

Learning activities are designed to achieve the above outcomes, adopting a blended model of online self-directed learning and offline collaborative practice, divided into pre-class, in-class, and post-class stages.

Table 1 Key learning outcomes and their alignment with jobs, competitions, and certificates

Dimen - sion	Key Learning Outcomes	Alignment with Job Roles	Alignment with WorldSkills	Alignment with "1+X Certificate "
Knowl - edge	Master cross-platform development principles	Front-end Developer, Full-Stack Developer	Demand Analysis Module	Mobile Application Development (Intermediate)
Skill	Design UI interfaces meeting Material Design standards	UI/UX Designer, Android Developer	UI/UX Design Module	Mobile Application Development (Intermediate)
Skill	Complete mobile application performance optimization	Performance Tester, Senior Developer	Function Development Module	Mobile Application Development (Advanced)
Quality	Collaborate in teams to complete projects	Project Team Member	Team Collaboration	—

2.2.1 Pre-class: online self-directed learning

(1) Resource access: Students use the intelligent teaching platform to learn digital resources, such as integrated media textbooks and micro-courses.

(2) Task preview: The platform pushes personalized tasks based on students' backgrounds.

(3) Question submission: Students submit pre-class questions via the platform; teachers sort these to focus on key points in class.

2.2.2 In-Class: Offline Collaborative Practice

(1) Problem-solving lectures: Teachers address pre-class questions and explain difficult knowledge.

(2) Project-driven collaboration: Students are divided into teams of 4-5 to complete tasks.

(3) Competition simulation: Regular mini-competitions based on WorldSkills standards are organized to improve students' pressure response.

2.2.3 Post-class: extended practice and innovation

(1) Skill consolidation: Students use the computer to practice complex tasks.

(2) Project expansion: Excellent teams expand in-class projects into enterprise-level prototypes with guidance from enterprise engineers.

(3) Competition preparation: Students interested in competitions access the competition resource pool to learn WorldSkills real questions and participate in mock competitions.

2.3 Establish evaluation system

The evaluation system adopts a multi-dimensional, process-oriented model, combining process evaluation (40%) and summative evaluation (60%), with participation from teachers, enterprise experts, WorldSkills coaches, and students.

2.3.1 Process evaluation (40%)

(1) Online learning performance (10%): Evaluated via platform data, including resource access time, preview task completion rate, and question submission quality.

(2) In-class participation (15%): Assessed by teachers and team members, covering group discussion performance, task contribution, and code quality.

(3) Post-class practice (15%): Evaluated by enterprise experts, focusing on virtual simulation task completion and project expansion results.

2.3.2 Summative evaluation (60%)

(1) Project defense (30%): Teams defend final projects before a panel of teachers, enterprise experts, and WorldSkills coaches. Evaluation criteria: demand analysis (10%), UI design (10%), function realization (40%), performance optimization (20%), and defense expression (20%).

(2) Written test (20%): Assesses theoretical knowledge, including multiple-choice questions, short-answer questions, and case analysis.

(3) Competition/certificate performance (10%): Extra points for competitions or "1+X Certificate".

Total Score = Process Evaluation (40%) + Summative Evaluation (60%)

3 Quality assurance mechanism

Three core mechanisms ensure the effectiveness of the blended learning system and digital resources: school-enterprise collaborative development, dynamic resource update, and comprehensive evaluation.

3.1 School-enterprise collaborative development mechanism

A "dual-teacher" team is formed, including:

(1) School members: Professional course teachers, educational technology experts, and coaches.

(2) Enterprise members: Senior developers, project managers, and UI designers from cooperative enterprises.

The team collaborates through:

(1) Demand investigation: Quarterly surveys of enterprises to collect latest job requirements and technical trends.

(2) Resource development: School teachers integrate educational theory, enterprise experts provide real cases/technical support, and coaches align resources with competition standards.

(3) Two-way exchange: "Teacher-in-enterprise" and "engineer-in-school" programs.

3.2 Comprehensive evaluation mechanism

This mechanism evaluates both resource quality and teaching effectiveness for continuous improvement.

3.2.1 Resource quality evaluation

A four-party team evaluates resources from four dimensions (Table 2).

Table 2 Resource quality evaluation index system

Evaluation Dimension	Evaluation Indicators	Weight	Evaluator
Accuracy	- Consistency with industry standards- Correctness of technical content- No outdated information	30%	Teachers + Enterprise Experts
Practicality	- Alignment with job requirements- Operability of tasks- Value for skill improvement	35%	Enterprise Experts + Students
Innovation	- Integration of frontier technologies- Novelty of case design- Contribution to innovative thinking	20%	WorldSkills Coaches + Enterprise Experts
User Experience	- Clarity of resource expression- Convenience of platform operation- Attractiveness of multimedia elements	15%	Students

3.2.2 Teaching effectiveness evaluation

Evaluation uses quantitative and qualitative methods:

(1) Quantitative indicators: Course pass rate, excellent rate, “1+X Certificate ” acquisition rate, competition award rate, graduate employment rate, and enterprise satisfaction with graduates.

(2) Qualitative indicators: Student course feedback, enterprise interview feedback, and teacher teaching reflection reports [4].

4 Practice results and analysis

4.1 Practice object and period

The practice was conducted in the 2024-2025 academic year, with 120 students from two classes at Shanghai Publishing and Printing College: Class A adopted the OBE-based blended learning system, and Class B used the traditional teaching model. The practice lasted 16 weeks.

4.2 Quantitative result analysis

4.2.1 Course performance

As shown in Table 3, the experimental group outperformed the control group in all indicators: pass rate, excellent rate, and average score. This indicates the blended learning system effectively improves students’ mastery of knowledge and skills.

Table 3 Comparison of course performance between two groups

Indicator	Experimental Group (Class A)	Control Group (Class B)	Difference (Percentage Points)
Pass Rate (⩾60)	96.2% (57/60)	87.9% (52/60)	+8.3
Good Rate (⩾80)	48.3% (29/60)	28.3% (17/60)	+20.0
Excellent Rate (⩾90)	15.3% (9/60)	6.2% (3/60)	+9.1
Average Score	82.5	73.8	+8.7

4.2.2 Employment and enterprise satisfaction

A follow-up survey of 2025 graduates showed the experimental group's employment rate was 100%, 10 percentage points higher than the control group. Among experimental group graduates, 20%were employed by well-known IT enterprises, compared to only 10% in the control group [5].

A survey of 20 cooperative enterprises showed 93% satisfaction with experimental group graduates, while satisfaction with the control group was 75%, with the main complaint being "lack of practical experience" (60%).

4.3 Qualitative result analysis

4.3.1 Student feedback

A post-course questionnaire of the experimental group showed:

(1) 93.7% believed digital resources "effectively improved practical ability."

(2) 88.3% were satisfied with the blended learning model, stating "pre-class micro-courses help preview difficulties, and in-class project collaboration enhances participation."

(3) 91.5%believed the competition resource pool "aroused learning interest" and "improved pressure response ability."

4.3.2 Teacher and enterprise feedback

(1) Teachers: 90% of course teachers believed the OBE framework "clarified teaching objectives," and the blended model "reduced in-class lecturing pressure, focusing more on guiding problem-solving." They also noted the dynamic resource update mechanism "ensured teaching content keeps up with industry trends."

(2) Enterprise Experts: Engineers participating in resource development and project defense stated experimental group students' "code quality is close to that of junior developers" and their "understanding of project processes is more comprehensive than traditional teaching students."

4.4 Problems identified

Two main issues emerged:

(1) Resource access inequality: 15% of students reported "unstable network connections," affecting online learning.

(2) Individualized guidance limitations: With 60 students per class, teachers struggled to provide personalized guidance, especially for students with weak foundations [6].

5 Conclusions and future prospects

5.1 Conclusions

This study constructs an OBE-based blended learning system for the "Mobile Application Development Comprehensive Practice" course, integrating digital resources aligned with the Double High-Level Plan, post-course-competition-certificate integration, and WorldSkills standards. Key conclusions:

(1) The OBE framework—with "learning outcomes" as the core—effectively reverse-designs teaching activities and evaluation systems, ensuring course content aligns with job requirements and competition standards.

(2) The digital resource system addresses the limitations of traditional fragmented resources, providing a comprehensive and progressive learning path.

(3) The blended learning model significantly improves students' learning enthusiasm, practical ability, and employment competitiveness.

(4) The quality assurance mechanism ensures the sustainability and effectiveness of the blended learning system.

5.2 Future Prospects

To address identified problems and improve the system, future work will focus on:

(1) Strengthen intelligent personalized guidance: Introduce AI virtual tutors to the digital resource platform, which analyze students' learning data and provide personalized suggestions.

(2) Deepen resource intelligentization: Develop AR-based resources to enhance UI design immersion.

This study provides a replicable model for vocational education course reform in the digital era. It is expected that continuous optimization will enable the system to better serve the cultivation of high-quality mobile application development talents and contribute to China's vocational education development.

About the Author

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