

EFFECTS OF BLENDED LEARNING INTEGRATED WITH OBE USING MOOCS IN A SWIMMING COURSE ON STUDENT ACHIEVEMENT AT GUANGXI TRANSPORT VOCATIONAL AND TECHNICAL COLLEGE*

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Abstract

This study is a quasi-experimental research project designed to 1) develop a blended learning model integrated with Outcome-Based Education (OBE) using MOOCs for a swimming course. 2) compare the effects of this blended learning model on student achievement before the intervention, after 4 weeks, and after 8 weeks. 3) study student learning satisfaction regarding the blended learning model. The sample consists of 34 male students selected via random sampling, who will undergo a breaststroke skill test. The intervention lasted eight weeks and combined 45-minute online MOOC-based learning sessions with 90-minute face-to-face practical instruction each week. Data were collected at three time points (pre-test, mid-test, and post-test) using the Breaststroke Knowledge and Skill Assessment, while learning satisfaction was assessed at the end of the

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intervention. Data were analyzed using descriptive statistics and repeated-measures ANOVA.

The results indicated that: 1) The blended learning model was highly appropriate, with expert validation scores ranging from 0.60 to 0.80. 2) Students showed significant improvements ($p < .05$) in breaststroke knowledge (from 16.95 to 26.59) and practical skills (from 38.15 to 61.68) across three measurements. 3) Students reported high learning satisfaction ($M = 4.25$). These findings indicate that the MOOC-based blended learning model integrated with OBE effectively enhances learning achievement and provides a positive learning experience for vocational students.

Keywords: Blended Learning, Outcome-Based Education, MOOCs, Swimming

Introduction

Driven by China's Internet + Education national strategy (State Council of China, 2015), the integration of information technology into education has accelerated the transformation from traditional teacher-centered instruction to learner-centered pedagogies, particularly in physical education (PE).

However, swimming instruction in Chinese higher vocational colleges continues to face several challenges, including the separation of theoretical learning from practical application, limited access to swimming facilities, large class sizes, and insufficient opportunities for individualized instruction. Conventional lecture–demonstration–practice approaches often result in poor retention of swimming techniques and safety knowledge, thereby reducing learning effectiveness and increasing safety risks (Wang et al., 2022).

Outcome-Based Education (OBE) emphasizes the design of curricula, teaching strategies, and assessment based on clearly defined learning outcomes (Harden, 2007). Blended learning, which integrates online and face-to-face instruction (Sannicandro et al., 2021), provides an effective approach for

implementing OBE. In particular, Massive Open Online Courses (MOOCs) enable students to acquire theoretical knowledge flexibly while allowing classroom time to focus on practical skill development and interactive learning. Although previous studies have demonstrated the effectiveness of blended learning in physical education (Wang et al., 2022; Wang et al., 2023), limited research has examined the integration of MOOC-based blended learning with the OBE framework in higher vocational swimming education. Therefore, this study aims to address this research gap by developing and evaluating an integrated MOOC-based blended learning model grounded in OBE principles.

Objectives

1. Develop of a blended learning integrated with outcome-based education using MOOCs in a swimming course on student achievement at Guangxi Transport Vocational and Technical College.
2. Compare the effects of blended learning integrated with outcome-based education using MOOCs in a swimming course on student achievement at Guangxi Transport Vocational and Technical College before, after 4 weeks and 8 weeks.
3. Study the learning satisfaction of blended learning integrated with outcome-based education using MOOCs in a swimming course on student achievement at Guangxi Transport Vocational and Technical College.

Literature Review

1. Blended Learning

Blended learning integrates face-to-face instruction with online learning to provide flexible and learner-centered educational experiences (Sannicandro et al., 2021). In skill-based disciplines such as swimming, online learning supports the acquisition of theoretical knowledge and technique demonstration, while

face-to-face sessions focus on practical application, feedback, and skill refinement (Garrison & Vaughan, 2008). A course is generally considered blended when at least 25% of its content is delivered online (Alsowayegh et al., 2019).

Massive Open Online Courses (MOOCs) have become an important platform for blended learning by providing scalable, high-quality learning resources that students can access at their own pace (Alkasasbeh et al., 2024). In swimming education, MOOCs facilitate visual learning through instructional videos, reinforce theoretical understanding, and maximize limited pool time by shifting knowledge acquisition to the online environment (Chen & Song, 2024).

2. Outcome-Based Education (OBE)

Outcome-Based Education (OBE) is a learner-centred approach that designs curriculum, teaching, and assessment around clearly defined learning outcomes (Spady, 1994; Harden, 2007). Unlike traditional teacher-centred instruction, OBE emphasizes demonstrated competencies, making it particularly suitable for practical and skill-oriented courses.

Recent studies have shown that OBE enhances teaching effectiveness in vocational physical education by improving instructional consistency and students' practical performance in swimming (Zhao et al., 2024). The integration of MOOCs with OBE further strengthens this approach by aligning online learning activities with predefined learning outcomes. Moreover, learning analytics generated through MOOC platforms support continuous assessment and feedback, enabling evidence-based instructional improvement and promoting students' self-efficacy and learning achievement (Alkasasbeh et al., 2024; Liu, 2024).

3. Breaststroke and Assessment

Contemporary swimming assessment emphasizes competency-based evaluation rather than relying solely on performance outcomes such as completion time or distance. Comprehensive assessment frameworks evaluate

technical proficiency, movement coordination, endurance, and practical performance, consistent with the principles of OBE (Harden, 2007; Zhao et al., 2024). Such multidimensional assessment provides more accurate evidence of students' learning progress and helps instructors identify common technical deficiencies (Wang et al., 2022).

Within a MOOC-supported blended learning environment, assessment becomes more comprehensive through the integration of formative learning analytics and summative practical evaluation. Online learning records, including video engagement and quiz performance, complement offline skill assessment and support continuous competency development. Empirical studies have reported that students receiving standardized MOOC-supported swimming instruction demonstrate significantly greater improvement in breaststroke technique than those receiving conventional instruction (Chen & Song, 2024).

4. Relevant Research

Recent empirical evidence further supports the effectiveness of integrating MOOCs with OBE in blended swimming education. Longitudinal, quasi-experimental, and meta-analytic studies consistently indicate that this integrated approach enhances students' technical performance, learning self-efficacy, and knowledge retention while reducing performance disparities among learners with different prior skill levels (Alkasasbeh et al., 2024; Chen et al., 2023). These improvements are primarily attributed to the combination of flexible online learning, continuous formative assessment through learning analytics, and individualized offline feedback, which together establish a continuous learning and improvement cycle consistent with OBE principles. Furthermore, OBE-oriented blended learning frameworks incorporating structured MOOC activities have been shown to produce greater gains in breaststroke technique than conventional instructional approaches (Reyes & Santos, 2022).

Methodology

The research steps are as follows:

1. Population and Sample

The target population consisted of 340 second-year students from 10 classes majoring in Automobile Maintenance who were enrolled in a swimming course at Guangxi Transport Vocational and Technical College.

The study sample comprised 34 students selected through simple random sampling from the target population. All selected participants completed the breaststroke skill assessment before participating in the intervention.

The criteria for selecting the sample groups are as follows:

Inclusion Criteria:

1. Male second-year students majoring in Automobile Maintenance at Guangxi Transport Vocational and Technical College, aged between 19 and 21 years.

2. No prior formal or systematic swimming instruction; however, participants must have completed the college's standardized swimming safety training and be eligible to participate in the regular swimming course.

3. Good physical health, with no history of serious aquatic sports injuries or recent major medical conditions that could interfere with swimming practice.

Exclusion Criteria:

1. A history of severe injuries to the knees, ankles, or shoulders that could adversely affect swimming performance.

2. Current illnesses or injuries (e.g., skin diseases, fractures, or other medical conditions) requiring rehabilitation or medication that would prevent participation in water-based activities.

3. Unable to attend the scheduled online + offline blended learning and examination arrangements within the 8-week study period due to special reasons such as leave of absence.

2. Research Instruments

Three research instruments were employed in this study.

1. Blended Learning Instructional Plan: a MOOC-based blended learning instructional plan integrated with Outcome-Based Education (OBE) was developed by the researchers. The intervention was implemented over eight weeks, with two sessions per week. Each session consisted of 45 minutes of online learning and 90 minutes of face-to-face instruction. The online component included learning materials on swimming safety, breaststroke techniques, instructional videos, and online feedback activities, while the face-to-face component emphasized practical skill training, error correction, group practice, and individualized coaching. The instructional design followed the OBE framework by aligning learning outcomes, instructional activities, and assessment. Content validity was established through evaluation by five experts using the Item-Objective Congruence (IOC) technique. The IOC values ranged from 0.60 to 0.80, exceeding the acceptable criterion of 0.50, indicating satisfactory content validity.

2. The Breaststroke Knowledge Test was used to assess students' knowledge before the intervention, as well as after weeks 4 and 8. The test consisted of 30 points evaluating theoretical knowledge in swimming safety, breaststroke principles, and self-rescue techniques.

The IOC values ranged from 0.60 to 0.80, exceeding the acceptable criterion of 0.50, indicating satisfactory content validity. The Cronbach's alpha for the reliability analysis was 0.79, based on data from forty sophomore students who were similar to the research subjects but did not participate in the formal experiment. The objectivity was 0.87. The Discrimination is 0.33-0.52. The difficulty is 0.29-0.78.

3. Learning Satisfaction Scale was measured using a 20-item questionnaire adapted from previous studies (Zeng et al., 2025). The instrument consisted of four dimensions: (1) online learning resources, (2) teaching model, (3) perceived

learning outcomes, and (4) teaching support. Responses were rated on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The content validity was evaluated by five experts using the Content Validity Index (CVI). All items achieved an Item-Level CVI (I-CVI) of 1.00, indicating excellent content validity. Internal consistency reliability was satisfactory, with a Cronbach's alpha coefficient of 0.83.

3. Data Collection

Prior to data collection, permission to conduct the study was obtained from Guangxi Transport Vocational and Technical College, and ethical approval was granted by the institutional Research Ethics Committee. Eligible participants were informed of the study objectives and procedures, and written informed consent was obtained before participation.

A pre-test was administered to the 34 participants using the Breaststroke Knowledge and Skill Assessment to determine their baseline level of knowledge and performance. The intervention was then implemented over an eight-week period using a MOOC-based blended learning model integrated with Outcome-Based Education (OBE). Instruction was delivered twice weekly, consisting of 45 minutes of online learning and 90 minutes of face-to-face practical training. The online component emphasized theoretical knowledge and self-directed learning, whereas the face-to-face sessions focused on skill practice, error correction, group activities, and individualized feedback.

Participants were assessed at three time points: before the intervention (Week 0), at the midpoint (Week 4), and after the intervention (Week 8) using the same Breaststroke Knowledge and Skill Assessment. The Learning Satisfaction Scale was administered at Weeks 4 and 8 to evaluate students' perceptions of the blended learning experience.

Upon completion of data collection, all responses were reviewed for completeness and accuracy. Missing or inconsistent data were verified where

necessary before the dataset was finalized for statistical analysis

4. Data Analysis

1. To compare the mean (M) and standard deviation (S.D.) of breaststroke knowledge scores and breaststroke skill performance before learning, after week 4, and after week 8 using a One-way repeated measures analysis.

2. To calculate the mean (M) and standard deviation (S.D.) of students' learning satisfaction completing the course.

Results

1. An 8-week detailed teaching plan.

Each instructional week consisted of a 45-minute MOOC-based online session and a 90-minute face-to-face practical swimming session. The instructional plan demonstrated satisfactory content validity, as confirmed by five experts, with Item-Objective Congruence (IOC) values ranging from 0.60 to 0.80. The progressive structure of the eight-week instructional plan is presented in Table 1.

Table 1 Item-Objective Congruence (IOC) Values from Expert Validation of the 8-Week Breaststroke Swimming Course Lesson Plan (N = 5 Experts)

Week	Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	IOC
Week 1	1. Online	+1	+1	0	+1	+1	0.80
	2. Offline						
	-Warm up						
	-Core practice	+1	0	+1	+1	+1	0.80
	-Summary & feedback						
	3. Objectives	+1	+1	+1	0	+1	0.80

	4. Assessment	+1	0	+1	+1	0	0.60
	1. Online	+1	+1	0	+1	+1	0.80
Week	2. Offline	0	+1	+1	+1	+1	0.80
2	3. Objectives	+1	+1	+1	+1	0	0.80
	4. Assessment	+1	0	+1	+1	+1	0.80
	1. Online	+1	+1	+1	0	+1	0.80
Week	2. Offline	+1	0	+1	+1	+1	0.80
3	3. Objectives	+1	+1	0	+1	+1	0.80
	4. Assessment	0	+1	+1	+1	+1	0.80
	1. Online	+1	+1	+1	+1	0	0.80
Week	2. Offline	+1	0	+1	+1	+1	0.80
4	3. Objectives	+1	+1	+1	0	+1	0.80
	4. Assessment	+1	+1	0	+1	+1	0.80
	1. Online	+1	+1	0	+1	+1	0.80
Week	2. Offline	+1	+1	+1	0	+1	0.80
5	3. Objectives	0	+1	+1	+1	+1	0.80
	4. Assessment	+1	0	+1	+1	+1	0.80
	1. Online	+1	+1	+1	+1	0	0.80
Week	2. Offline	+1	0	+1	+1	+1	0.80
6	3. Objectives	+1	+1	0	+1	+1	0.80
	4. Assessment	+1	+1	+1	0	+1	0.80
	1. Online	+1	+1	+1	0	+1	0.80
Week	2. Offline	+1	+1	0	+1	+1	0.80
7	3. Objectives	+1	0	+1	+1	+1	0.80
	4. Assessment	0	+1	+1	+1	+1	0.80
	1. Online	+1	+1	+1	+1	0	0.80
Week	2. Offline	+1	0	+1	+1	+1	0.80
8	3. Objectives	+1	+1	0	+1	+1	0.80

4. Assessment	+1	+1	+1	0	+1	0.80
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Note. The assessment results from five experts in the field of physical education and sports science ranged from 0.60 to 0.80, exceeding the acceptable criterion of 0.50, indicating satisfactory content validity.

The instructional plan demonstrated satisfactory content validity, as confirmed by three experts. As shown in Table 1, the Item-Objective Congruence (IOC) values ranged from 0.60 to 0.80, which meets the criterion for acceptable validity ($IOC \geq 0.60$).

Table 2 One-Way Repeated Measures Analysis of Variance (ANOVA) for Students' Swimming Knowledge (N = 34, Total Score = 30)

Source of Variation	SS	df	MS	F	p-value
Between Subjects	419.54	33	12.71	10.99*	0.00
Training Duration	1584.19	2	792.10	684.56*	0.00
Error	76.37	66	1.16	-	-

Note. *Significant at the .05 level

According to Table 2, one-way repeated-measures ANOVA results show that students' breaststroke knowledge scores differed significantly across pre-test, Week 4, and Week 8 ($p < 0.05$). Therefore, Bonferroni post hoc comparisons were conducted, as shown in Table 18.

Table 3 Pairwise Comparison of Students' Breaststroke Knowledge Across Different Training Durations

Time Points	Mean	Pretest	Post-test (Week 4)	Post-test (Week 8)
Pretest	16.95	-	0.72*	0.68*
Post-test (Week 4)	21.41	0.72*	-	0.76*
Post-test (Week 8)	26.60	0.68*	0.76*	-

Note. *Significant at the .05 level

As shown in Table 3, students' breaststroke knowledge scores at Week 4 and Week 8 were significantly different from those in the pretest. Meanwhile, the difference between Week 8 and Week 4 was also statistically significant ($p < 0.05$).

Table 4 One-Way Repeated-Measures ANOVA of Students' Breaststroke Skills (N = 34)

Source of Variation	SS	df	MS	F	p-value
Experimental Group	328.67	33	9.96	7.82	0.003
Training Duration	1842.35	2	921.18	851.54	0.007
Error	84.19	66	1.27	-	-

As shown in Table 4, students' breaststroke skill scores differed extremely significantly across pre-test, Week 4, and Week 8 ($p < 0.05$). The teaching intervention had an outstanding effect on skill improvement.

To further clarify differences in skill scores across stages, Bonferroni post hoc comparisons were conducted, as shown in Table 5.

Table 5 Pairwise Comparison of Students' Breaststroke Skill Across Different Training Durations

Time Points	Mean	Pretest	Post-test (Week 4)	Post-test (Week 8)
Pretest	38.15	-	0.74*	0.75*
Post-test (Week 4)	50.46	0.74*	-	0.82*
Post-test (Week 8)	61.68	0.75*	0.82*	-

Note. *Significant at the .05 level

As shown in Table 5, after Bonferroni correction, pairwise differences in breaststroke skill scores across the three time points were all extremely significant ($p < 0.001$). The difference between pretest and Week 8 was the most prominent, indicating that after 8 weeks of teaching, students' breaststroke skill level achieved a qualitative leap. The difference between Week 4 and Week 8 was also significant, showing that the later skill consolidation and strengthening were effective. Students' movement standardization and coherence continued to be optimized, and skill mastery was constantly deepened.

3. Student Learning Satisfaction

At the end of the 8-week intervention, students reported a high level of satisfaction with the MOOC-based blended learning integrated with OBE model ($M = 4.25$, $SD = 0.37$), falling within the "satisfied" range. Satisfaction scores increased significantly from Week 4 ($M = 3.82$, $SD = 0.41$) to Week 8 ($M = 4.25$, $SD = 0.37$), as confirmed by a paired-samples t-test, $t(33) = 6.89$, $p < .001$, with a large effect size (Cohen's $d = 1.18$). Among the satisfaction dimensions at Week 8, the highest-rated aspect was the practicality of online resources, followed by

perceived learning outcomes. Although the adaptability of the teaching model received the lowest score, it remained at a “satisfied” level, indicating generally positive student perceptions with minor areas for improvement.

Table 6 Student Learning Satisfaction at Different Stages (n=34)

Dimension	After 4 weeks (M, SD)	After 8 weeks (M, SD)
Practicality of Online Resources	3.79 (0.43)	4.38 (0.39)
Adaptability of Teaching Mode	3.68 (0.45)	4.17 (0.42)
Perception of Learning Effects	3.92 (0.40)	4.32 (0.35)
Satisfaction with Teaching Support	3.75 (0.44)	4.13 (0.45)
Total Satisfaction Score	3.82 (0.41)	4.25 (0.37)

Note. Scale: 3.50–4.49 = Satisfied.

Discussion

The effectiveness of the proposed MOOC-based blended learning model integrated with Outcome-Based Education (OBE) is supported by satisfactory content validity (IOC = 0.60–0.80), reflecting a coherent alignment between instructional design and learning objectives. This alignment is grounded in Khan’s Octagonal Framework for blended learning combined with the backward design principle of OBE, in which learning outcomes are first defined and instructional activities are subsequently structured to ensure goal attainment through both online (MOOC-based theoretical learning) and offline (practical skill training) components.

The significant and continuous improvement in students' knowledge and skill performance can be attributed not merely to increased instructional exposure, but to the structured OBE-MOOC closed-loop system, which integrates cognitive preparation (online learning), practical application (offline training), and iterative feedback. The staged assessment approach (pre-test, Week 4, and Week 8) further strengthened learning progression by providing clear performance benchmarks and promoting learner motivation. The observed reduction in score variability also reflects the inclusive nature of OBE, which emphasizes ensuring minimum competency achievement for all learners rather than only high-performing students. These findings are consistent with previous studies reporting positive effects of OBE-supported blended learning on skill-based learning outcomes in physical education contexts (Chen & Song, 2024; Alkasasbeh et al., 2024).

Regarding learning satisfaction, the high overall score ($M = 4.25$) indicates strong acceptance of the instructional model. The highest-rated dimension, "Practicality of Online Resources," highlights the value of MOOC flexibility, particularly the ability to repeatedly access and review instructional videos. The "Perception of Learning Effects" dimension further suggests that students were able to recognize their own learning progress within the OBE framework. These findings are consistent with the Technology Acceptance Model (Davis, 1989), which emphasizes perceived usefulness and ease of use as key determinants of satisfaction. In addition, the significant increase in satisfaction from Week 4 to Week 8 suggests that familiarity with the blended learning environment and staged assessment system enhances student engagement and acceptance, in line with recent research on blended learning adaptation and student engagement (Zidi et al., 2025).

Recommendations

1. Recommendations for Practice

Vocational colleges are encouraged to adopt the MOOC-based blended learning model integrated with OBE for swimming and other skill-based physical education courses. Adequate institutional support should be provided for digital platform maintenance, video production, and access to practical training facilities. In addition, a reusable repository of short (5–10 minutes) MOOC videos covering core swimming skills (e.g., leg kick, arm stroke, and breathing coordination) should be developed to enhance teaching efficiency and reduce instructional workload.

Teachers are advised to strengthen their digital competencies in developing online learning materials, managing MOOC platforms, and providing timely feedback. Learning analytics derived from staged assessments should be utilized to monitor student progress and adjust face-to-face instruction in accordance with OBE principles.

For assessment systems, a balanced evaluation framework should be implemented by integrating formative assessments (e.g., online engagement, assignments, and weekly skill checks) with summative assessments (e.g., final theoretical test and 25-meter swimming performance test) to ensure comprehensive evaluation of knowledge, skills, and learning attitudes.

2. Recommendations for Future Research

Future studies are recommended to employ more rigorous experimental designs, particularly randomized controlled trials with comparison groups, to strengthen causal inference and minimize threats to internal validity. In addition, research should expand to larger and more diverse populations, including female students, different academic majors, and multi-regional samples. Longitudinal studies are also suggested to examine the long-term retention of knowledge and swimming skills following the intervention.

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