Research on Information Literacy Instruction in the Blackboard Blended Learning Model: Post-print

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Abstract

[Purpose/Significance] To address the limitations of single-mode online or offline teaching, the Blackboard platform was introduced to explore blended teaching, aiming to provide a better alternative for information literacy instruction models in the library community and enhance students' comprehensive literacy. [Method/Process] The Blackboard course management platform was integrated into information literacy instruction, combined with the small private online course (SPOC) model for teaching; course effectiveness was evaluated using quantitative comparative assessment and post-class qualitative interviews. [Results/Conclusion] Comparative research revealed that the blended learning model based on the Blackboard platform for information literacy education was significantly more effective than traditional teaching models (P=0.000*, <0.05). Qualitative evaluation demonstrated effective improvements in student course participation, teacher-student interaction, and other aspects.

Full Text

Preamble

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Exploratory Study on Information Literacy Instruction Using Blackboard with SPOC Pattern

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Abstract: [Purpose/Significance] To address the limitations of single-mode online or offline instruction, this study introduces the Blackboard platform for blended teaching exploration, aiming to provide a better alternative for information literacy instruction in libraries and promote the comprehensive quality of students. [Method/Process] The Blackboard course management platform was integrated into information literacy instruction, combined with a Small Private Online Course (SPOC) offline teaching model. Course effectiveness was evaluated through quantitative comparative assessment and post-class qualitative interviews. [Result/Conclusion] Comparative research shows that the blended learning model based on the Blackboard platform significantly outperforms traditional teaching models in information literacy education (P=0.000*, <0.05). Qualitative evaluation reveals effective improvements in student engagement and teacher-student interaction.

Keywords: Blackboard; SPOC; Information Literacy; Blended Learning
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With the rapid development of the internet and mobile markets, new types of courses and teaching methods have emerged in the information technology environment. Under the development and promotion of MOOCs and other online courses, many drawbacks of online teaching and learning have been exposed, such as issues with teaching quality assurance, student learning effectiveness, and the timeliness of teacher-student Q&A. While traditional offline classroom teaching ensures student attendance and achieves a certain level of teaching and learning effectiveness, its dull and uninnovative approach fails to meet students' evolving preferences, limiting improvements in learning motivation and teaching quality. To evaluate students and educational quality more objectively and comprehensively, and to enhance student learning outcomes, many universities have explored new pathways by testing and purchasing digital teaching platforms (such as Blackboard, Moodle, Sakai, etc.) and attempting to integrate offline teaching activities. Through the complementary advantages of online and offline blended teaching, these institutions aim to improve student learning motivation, teaching quality, teacher-student interaction, and the development of students' multidimensional competencies.

2. Current Status of Blackboard Platform Application

2.1 Introduction to Blackboard Platform

Blackboard is a network teaching management platform developed by Blackboard Inc. of the United States, delivered via the internet. The platform integrates course creation, resource construction and management, communication and interaction, statistical analysis, assessment and evaluation (such as exams, quizzes, and assignments), and learning spaces. It enables teachers to answer questions and support learning without time or space constraints, and allows students to access learning resources anytime and anywhere, thereby better facilitating teacher-student and peer-to-peer interaction and enabling comprehensive mobile teaching and learning. Blackboard constructs an active learning space for students, promotes a virtuous cycle of the learning ecosystem, makes teaching more efficient and learning more proactive, and helps students develop complex cognitive abilities. It serves as a foundation for teaching quality assurance systems. Currently, over 16,000 institutions in 90 countries with more than 1 million users employ the Blackboard platform for various work and learning activities [1]. After evaluating and testing various teaching platforms, East China Normal University ultimately selected Blackboard as its daily network teaching platform.

2.2 Application and Research Status of Blackboard Platform

2.2.1 Application and Research of Blackboard Platform in University Teaching University faculty both domestically and internationally have conducted in-depth exploration and practice in applying the Blackboard platform. J. Uziak et al. applied Blackboard to university mechanical engineering courses using a blended learning model, finding significant improvements in students' overall academic performance and teacher-student interaction [2]. Students also recommended widespread application of the platform across other disciplines. J. Ali used Blackboard in psycholinguistics teaching and found that students made greater efforts and achieved better academic performance in online learning compared to traditional classroom learning, considering Blackboard a motivating force for their learning [3]. J. Fernandez and A. Mendoza studied the importance of Blackboard in obstetrics and gynecology teaching, concluding that its use promotes better mastery of subject content and improves teaching and learning quality [4]. M. Kent examined the differences between Blackboard discussion boards and Facebook discussion functions in higher education student exploration and interaction, finding that students' use of Facebook discussion functions did not significantly affect their use of Blackboard discussion functions—the two could be integrated for complementary advantages with different emphases [5].

In domestic research, Zhang Xiaogang applied Blackboard to Oracle database courses using SPOC (small private online courses) blended teaching to enhance classroom effectiveness [6]. Sun Yujie studied Blackboard combined with SPOC,

concluding that the platform builds a learning environment for SPOC and provides strong technical support for blended teaching [7]. Li Ning, Li Chunpeng, and Song Nanyang applied blended teaching methods based on Blackboard to multimedia graphic design, organically integrating blended teaching with practical courses to improve teaching quality [8]. Mu Yonghua and Jin Xiaolei relied on Blackboard, adopting blended online learning design concepts to create a Nantong university English education resource sharing network platform, enhancing the possibilities of borderless education [9, 10]. Chen Linlin explored and practiced blended learning models in vocational education using the "Photoshop Image Processing" course as an example, finding that Blackboard-based blended learning effectively improves vocational students' comprehensive skills [11]. Zhao Dongmei and Yin Yi blended teacher-led "task-driven" classroom teaching with student autonomous learning on Blackboard to improve computer operation skills and thinking abilities [12].

Huang Ruhua used Blackboard for information literacy education, providing suggestions on platform content, communication functions, user-friendliness, course management, and peer collaboration [13]. Zhang Daping proposed that using Blackboard for user education is necessary and feasible given the serious teacher-student ratio imbalance facing library education under university expansion [14]. Zhu Weili, Zhou Chun, and Huang Qingshan integrated library resources and services into Blackboard, such as linking information literacy education (one-hour lectures, embedded information literacy education, etc.) [15]. Ye Tian introduced four aspects from a technical perspective—subject construction, key technologies, resource exchange, and virtual services—to build an integrated system of Blackboard and electronic teaching reference systems, organizing teaching reference resources and subject materials from libraries and network resources into databases and then integrating them into the Blackboard learning system [16]. L. Bartnik introduced the application of Blackboard and other distance teaching platforms in teaching and learning at Murray State University, including how libraries and subject librarians use Blackboard to provide personalized consultation and subject resource services [17].

Ru Haitao argued that using Blackboard could improve information retrieval course quality by perfecting teaching systems, strengthening communication and interaction, conducting teaching evaluation, and developing distance teaching [18]. Zhang Xuelian conducted a SWOT analysis of online information literacy education using Blackboard, identifying its advantages and disadvantages, noting that drawbacks include platform cost issues and the inability to achieve face-to-face communication in online education [19]. R. Lenholt, B. Costello, and J. Stryker explored integrating library instruction courses into Blackboard, finding that online courseware instruction was useful and time-saving for students [20]. M. J. Gibeault used Blackboard as a platform for accessing course materials and teaching resources in a learner-centered case study, arguing that librarians, as information organization experts, must continuously adapt to using Blackboard to organize library learning resources for students in e-learning environments [21].

In summary, scholars have explored online or blended teaching models based on university platforms, physical classrooms, and Blackboard to stimulate student enthusiasm, interest, independent exploration, and innovation. Most scholars believe such teaching models achieve good results.

2.2.2 Blackboard + Blended Mode vs. Flipped Classroom Mode In recent years, the flipped classroom model has been widely applied and studied in university library information literacy instruction, with abundant research results from 2016-2017 (peak research period calculated by CNKI annual publication volume). Research on Blackboard platform application in libraries also has a certain foundation. The two teaching models are relatively consistent in teaching resources and philosophy, but differ in teaching methods. The Blackboard + blended model provides students with more learning choices, with teacher and student role allocation based on what most benefits student learning. In terms of support platforms and communication, Blackboard is technologically mature with rich institutional and university usage experience, uniformly purchased and coordinated by universities. With all courses (including library courses) on the same platform, it facilitates student learning experiences, interdisciplinary communication, and collaborative learning more than using different platforms for different courses. Self-developed websites are time-consuming and labor-intensive for teaching and platform maintenance, while professional teaching platforms can better utilize user manuals for teacher-student platform training [13]. Overall, the Blackboard + blended model has technological and pedagogical advantages over the flipped classroom model. Additionally, Long Qian [27] verified the excellent effect of flipped classroom in improving students' objective achievement through comparative research, while this study also incorporates traditional classroom teaching and Blackboard + blended model teaching in instructional design to verify differences in effectiveness between the two models.

Through the above analysis, the author finds that domestic and international library information literacy instruction rarely uses the Blackboard platform for blended model teaching, with limited related research. The importance of information literacy for improving students' comprehensive quality is self-evident. With advancing internet technology, information literacy learning relies more on network platform operation practice than other courses. Based on scholars' recognition of Blackboard's blended learning model, the author believes it is highly necessary to explore and verify the blended teaching model based on the Blackboard platform in information literacy education to achieve better teaching results and improve student learning efficiency.

3. Course Exploration Based on Blackboard Platform

This section explores the teaching and learning effects and evaluation quality that can be achieved by using the Blackboard platform for information literacy education at the author's university.

3.1 Teaching Model Selection Based on Blackboard Platform

The university's information literacy courses typically enroll about 30 students, mainly using small-class teaching. Therefore, the SPOC blended teaching model [28] was selected—a Small Private Online Course pattern combined with offline courses conducted simultaneously online and offline. The SPOC teaching model is widely applied in innovative university teaching models. With smaller class sizes, it facilitates classroom management and promotes student engagement and learning effectiveness. As S. Uijl, R. Filius, and O. T. Cate stated: the SPOC teaching model provides a paradigm for the growing number of higher education online courses, helping students engage in online learning and improving their interactive and social abilities [29]. This study adopts the SPOC blended teaching model, incorporating micro-video training inside and outside the classroom [13].

3.2 Course Design

3.2.1 Blackboard Platform Course Design The undergraduate information literacy course "Social Science Literature Information Retrieval and Utilization in Network Environment" was integrated into the Blackboard platform. The platform includes course syllabus, courseware, announcement sections, group collaboration sections, Q&A sections, and micro-videos.

3.2.2 Physical Course Instructional Design and Implementation The course adopts a human-computer interaction model combining lectures with practice. Eight courseware modules, micro-videos, and previous group presentation results were uploaded to the platform before class, allowing students to preview and study independently anytime, anywhere. Each 90-minute session is divided into two 40-minute segments (approximately 30 minutes of lecture time with about 10 minutes of in-class exercises interspersed, supplemented by similar case videos uploaded to Blackboard for immediate practice, with free movement for teacher-student communication). The course consists of eight sessions: the first four use traditional teaching with conventional exercises; the last four use online-offline blended teaching with exercises based on current events and group collaboration projects closely related to course content. In-class exercises are designed as group collaboration exercises, individual exercises, or teacher-student interactive Q&A based on knowledge point differences. Students are organized in groups of 3-4, seated by group. Final assessment combines group project presentations with computer-based exams.

3.3 Course Effectiveness Evaluation Methods and Data Processing

3.3.1 Evaluation Methods and Indicators Course teaching and learning quality were primarily evaluated through quantitative assessment, including Blackboard usage frequency by students. A comparative experimental research method analyzed overall course effectiveness between traditional and SPOC teaching models, examining specific effects of indicators at each level.

Indicator selection considered differences in teaching platforms, course participation methods, and teaching resource allocation between traditional teaching and Blackboard blended models. Subsequent random student interviews investigated platform teaching and learning advantages and disadvantages regarding learning convenience, effectiveness, and communication. These two evaluation modes complemented each other to improve research results. Two small-scale classes were investigated, totaling 60 participants. Specific evaluation indicators are shown in Table 2 .

3.3.2 Data Processing After students used the Blackboard platform, usage frequency data was obtained from the platform. The remaining four quantitative indicators were scored on a 10-point scale each, with students providing objective scores based on learning effectiveness. A total of 58 valid evaluations were obtained, excluding 2 invalid evaluations, for an effective rate of 96.7%. Basic statistical characteristics of each indicator's data were analyzed, and normality was tested. Based on normality test results, non-parametric tests were selected for further analysis of data differences.

4. Research Results

4.1 Quantitative Course Evaluation Analysis and Results

(1) Blackboard Usage. The Blackboard platform manages various student usage data, such as usage frequency. Fifty-eight students used the platform 4,955 times total (for an 18-session semester), averaging approximately 4.75 times per session per student. Blackboard offers greater dynamic tracking than traditional classrooms, enabling timely understanding of each student's learning progress, assignment completion, and problem feedback, facilitating teaching and consultation using multiple quantitative indicators.

(2) Course Evaluation Indicator Analysis. Table 3 shows that under the traditional teaching model, the mean score was 24.14706 out of 40 points, while the Blackboard SPOC blended model scored 33.87931. Overall, students preferred the latter model. Traditional model sub-indicators scored in the 5-7 range, while SPOC model sub-indicators scored above 8. Student evaluations showed greater divergence on "no micro-video" and "traditional exercises" indicators.

Analysis of two classes' evaluations revealed that Class 1 scored higher than the mean and Class 2 on both models, but both classes rated the Blackboard SPOC blended model higher, particularly for the "Blackboard synchronous practice" indicator, where both classes gave consistent evaluations (see Figure 1 [Figure 1: see original paper]). Overall, traditional classroom theory occupied too much time with insufficient hands-on practice. The new model enables more reasonable allocation of lecture and practice time, giving students more adequate operation opportunities.

(3) Difference Testing and Analysis. Both classes experienced traditional and Blackboard SPOC blended models. Normality tests showed data was gener-

ally non-normally distributed at the 0.05 significance level. Therefore, the Sign Test (2 samples) for related samples was used to test differences between the two models and sub-indicators, as shown in Table 4 .

Results show the blended model's integration of Blackboard advantages differs significantly from traditional classroom teaching. Figure 2 [Figure 2: see original paper] shows the difference distribution is completely positive—student evaluations of the blended model are significantly higher than traditional teaching. Difference tests on four sub-indicators also show significant differences between models. Figure 3 [Figure 3: see original paper] reveals that in the first three indicator comparisons (micro-video teaching, hot topic exercises, and synchronous practice), positive differences number around 50 with only single-digit negative differences, indicating students gave significantly higher ratings to these three indicators under the blended model. Additionally, all students gave significantly higher ratings to Blackboard group collaboration compared to traditional collaboration.

4.2 Qualitative Course Evaluation Analysis and Results

Students provided written evaluations of the Blackboard SPOC blended model regarding learning convenience, effectiveness, and communication. Text analysis revealed satisfaction levels across three indicators (see Table 5). Positive and negative feedback are summarized below:

(1) Learning Convenience.
Positive: All resources can be repeatedly downloaded and read; convenient access; videos are very helpful; convenient for preview; facilitates note-taking after class and listening during class; assignments and courseware are accessible through the platform, solving the problem of forgetting assignments and facilitating review.
Negative: Platform often fails to log in when using VPN off-campus; mobile APP functions need improvement; hopes for WeChat integration for learning reminders.

(2) Learning Effectiveness.
Positive: Platform learning improves autonomy and targeting; micro-videos increase learning interest; significantly improves search accuracy after course learning; masters paper formatting skills through short videos; assignments and exams on the platform improve efficiency, effectively supervising learning and saving time.
Negative: While Blackboard is good, it can only be an extracurricular aid—still hopes for in-class teacher explanation; sometimes difficult to log in after class, requiring campus network for assignments, affecting after-class progress.

(3) Communication Effectiveness.
Positive: More diverse teacher-student interaction through forums and discussion boards; novel platform increases communication methods; can post questions for help; sharing book resources helps find like-minded readers.

Negative: Platform not smooth off-campus; suggests adding Zhihu private messages, WeChat, etc.; hopes for more hot topics; finds discussion area operation inconvenient; feels embarrassed asking teachers questions; feels lost when discussing in forums.

5. Summary and Discussion

This one-year teaching study using Blackboard analyzed student evaluations and comments on both teaching models. Overall, students rated the SPOC model very highly, showing significant improvements in learning effectiveness and teacher-student/peer interaction compared to traditional classrooms. Students also gave positive feedback on platform convenience and user-friendliness. The author summarizes and reflects on four aspects:

(1) Balanced teacher-student role allocation facilitates learning. Different learning preferences, independent learning abilities, and self-control lead to varying learning outcomes. Among 58 interviewees, only 11 preferred self-study, while others liked reasonable lecture time from teachers. Additionally, some teachers and students lack systematic pedagogical theory and learning methods training. The balanced role allocation of Blackboard + blended learning proves more effective than flipped classroom models.

(2) Teacher and student IT application abilities require pre-class training. Course resources, collaboration, and assessments are all Blackboard-based. While East China Normal University's Teaching Development Center regularly conducts platform workshops for teachers, students' platform application abilities vary, creating efficiency obstacles. Huang Ruhua created "Student Effective Participation Guide," "Student Online Communication Etiquette," and "Course Content Navigation" Word documents [13], but benefited limited students. The author recommends that universities with purchased platforms should have academic affairs offices, graduate schools, and other institutions coordinate timely platform training for students, regularly hold platform learning workshops, and collaborate with professional teachers for targeted training to improve overall student platform skills.

(3) Information literacy courses should be shared to maximize effect. Quantitative and qualitative results show that while the new model significantly improves interaction, problems remain. Beyond platform smoothness issues, teachers should attend to student personality traits and needs. The real-name system in discussion forums makes some students passive—anonymity improves this. Teachers should communicate more with students to adjust strategies. Although the current Blackboard + blended model works well, beneficiary numbers are limited. With university enrollment expansion and imbalanced teacher-student ratios, library information literacy courses as general electives face even more severe ratio imbalances [14]. The author suggests opening information literacy course sections to all students based on Blackboard characteristics, allowing enrolled students to receive SPOC blended learning while others with

scheduling conflicts can participate in online learning + online/offline Q&A, expanding course sharing to benefit more students.

(4) Blackboard's communication and collaboration functions need improvement. The platform includes group collaboration sections and interactive forums (discussion boards) with a mobile APP, providing multiple communication channels. However, platform access smoothness differs significantly between on-campus and off-campus networks, preventing guaranteed after-class usage. If Blackboard could integrate some functions with WeChat or QQ, or develop features based on instant messaging tools, it could better stimulate teacher-student communication and student collaboration. Additionally, teachers should understand different student personalities, learning characteristics, and communication preferences, regularly assess student communication and collaboration in class, after class, and on the platform, and adjust communication strategies based on assessment results.

The *National Medium and Long-term Education Reform and Development Plan (2010-2020)* states that information technology has a revolutionary impact on education development. Although Blackboard has both advantages and disadvantages, it has been effectively applied in education, providing strong support for improving teaching approaches and environments. Leveraging the platform's technical advantages, combined with better teaching models and strategies like SPOC and continuous exploration, can better promote student learning effectiveness and information literacy improvement, providing more choices for information literacy teaching methods.

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Yang Li: Responsible for course instruction, paper writing, and data analysis.
Fan Shan: Provided suggestions for the paper and conducted content proofreading and revision.
Song Zhenshi: Provided writing guidance.

Note: Figure translations are in progress. See original paper for figures.