An Empirical Study on Influencing Factors of Online Effective Teaching in Mixed Teaching Mode

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Abstract. This study employs both quantitative and qualitative methods to investigate the influencing factors of online teaching within a blended learning environment. The research encompasses three distinct types of universities, ensuring a diverse sample. Data is gathered via questionnaires and interviews, followed by statistical and thematic analysis. The findings reveal that curriculum design, resource development, and platform selection are pivotal. Recommendations include establishing clear learning objectives, developing high-quality resources, designing interactive exercises, and opting for platforms that are easy to use and support mobile learning. This research offers guidance for enhancing the effectiveness of online teaching and establishes a foundation for future studies.

Keywords: Blended learning, Effective teaching, Online education assistance.

1 Introduction

Higher education self-study examination is an open education system that combines individual self-study, social assistance, and national examinations. Social assistance, as an important component of higher education self-study exams (hereinafter referred to as "self-study exams"), has been improved and innovated in form and means with the development and transformation of self-study exams. With the rapid development of information technology, blended learning has become an important trend in the field of education. Blended learning combines the advantages of traditional face-to-face teaching and online learning, aiming to provide a more flexible and efficient teaching experience. However, how to achieve effective online teaching in a blended learning environment is still an urgent problem to be solved. This study aims to explore the key factors that affect the effectiveness of online teaching under blended learning mode, including course content design, teaching resource development, technology platform selection, and teaching evaluation methods. Through empirical research, we hope to provide educators with scientific evidence to optimize teaching strategies and enhance students' learning outcomes.

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2 Review of Domestic and Foreign Research

The rapid development of information technology has promoted the construction of online education and digital curriculum resources, becoming a hot topic in educational research. Cai Zongmo (2024)Technological progress, industrial drive, and educational innovation are driving the deep integration of digital technology and education [1]. Yu Fanglin (2019) pointed out that e-learning is the development direction of self-taught examination, which is in line with the trend of "Internet plus education". Tang, W (2024) proposed that the integration of self-study exams and MOOCs can provide high-quality educational services[2]. Ounejjar, L (2024) emphasizes the importance of teaching collaboration[3]. Luo Yinghong (2019) advocates for the deep integration of modern information technology and teaching[4]. Liu Hui et al. (2020) believe that blended learning will become the norm in higher education. In terms of practice, Luo Yinghong (2019) conducted blended learning practice based on the smart education platform[5]. Zhang Kuihua (2020) emphasizes the use of online platform advantages. Cao Haiyan (2021) formed a diversified evaluation system through blended learning[6]. Despite progress, there is still controversy over how to apply MOOCs to self-study exam online learning, and in the context of digital course resource construction, research on educational paths, content construction, evaluation reform, personalized resource support, and sustainable development still needs to be further explored.Research Design and Methods.

This study aims to explore the influencing factors of effective online teaching in blended learning mode, using a combination of quantitative and qualitative research methods to ensure the comprehensiveness and reliability of the data. The research subjects cover students and teachers from three different types of universities, including comprehensive universities, science and engineering universities, and teacher training colleges, to ensure sample diversity and representativeness. Specifically, 200 students were randomly selected from each university, totaling 600 students, including undergraduate and graduate students, as well as 10 teachers participating in online teaching, totaling 30 students with different disciplinary backgrounds and online teaching experience(see Table 1).

Table 1. Research Basic Information.

Project	Describe
Research objective:	To explore the influencing factors of effective online teaching under blended learning mode
research method	Combining quantitative and qualitative methods
Research subjects	Students and teachers from three different types of universities
Sample size	600 students, 30 teachers
Sample types	comprehensive universities, science and engineering universities, normal universities
Background of participants	including undergraduate and graduate students, teachers from different disciplinary backgrounds, and online teaching experience

The data collection tools include student questionnaires and teacher questionnaires, both of which are scored using the Likert five point scale, covering dimensions such as course content design, teaching resource quality, technology platform usage experience, and learning outcomes evaluation. In addition, through semi-structured interviews, in-depth interviews were conducted with some students and teachers to obtain detailed feedback and insights. The interview questions revolved around the specific challenges, improvement measures, personal experiences, and suggestions of online teaching(see Table 2).

Table 2. Survey Results.

Dimension	Description	Scale/Scoring Method
Course Content Design	Learning objectives, module division, learning path	Likert five point scale
Teaching Resource Quality	Multimedia Materials, Interactive Exercises, Resource Integration Strategies	Likert five point scale
Technical Platform User Experience	Platform Function Comparison, User Experience Considerations, Security and Stability	Likert five point scale
Assessment of Learning Achievements	A Method for Evaluating Learning Achievements	Likert five point scale

The data collection process is conducted through an online questionnaire platform, ensuring anonymity and convenience. Prior to the investigation, participants were provided with a detailed introduction to the research objectives and confidentiality agreement, and informed consent was obtained. The interviews will be conducted in person or via video conference, with each session lasting approximately 30 minutes. The recordings will be transcribed and analyzed(see Table 3).

Table 3. Interview Results.

Interview content	Description	Participant type	interview duration
Online teaching challenges	exploring specific challenges of online teaching	students and teachers	about 30 minutes
Improvement measures	discussing improvement measures for online teaching	students and teachers	
Personal experience and advice	collect personal experience and advice	students and teacher	

The data analysis methods include descriptive statistical analysis, correlation analysis, analysis of variance (ANOVA), and thematic analysis. Descriptive statistical analysis is used to understand the basic situation of various indicators; Correlation analysis explores the relationship between variables through Pearson correlation coef-

ficient; Variance analysis compares the differences in key indicators among different groups; Theme analysis extracts the main themes and patterns from interview data.

In terms of ethical considerations, all participants will be informed of the research purpose, methods, potential risks and benefits, and obtain written consent before data collection. All data will be anonymized and stored on encrypted secure servers, accessible only to researchers. Through the above research design and methods, this study aims to systematically explore the key influencing factors of effective online teaching in blended learning mode, and provide valuable references for educational practice.

3 Digital Course Construction

The construction of digital courses is crucial for blended learning models, involving course design, resource development, and platform selection. Course design should clarify learning objectives, follow the SMART principle, divide modules, and design flexible learning paths to meet students' needs. The development of teaching resources should focus on the high quality, diversity, and interactivity of multimedia materials, such as online quizzes and interactive simulations, while integrating open educational resources, establishing resource libraries, and ensuring the timeliness and accuracy of content.

The choice of technology platform should support mobile learning, have data analysis capabilities, and be easy to use. User experience is key, with considerations including usability, responsiveness, compatibility, and technical support. At the same time, platform security and stability are also important, involving data security, system stability, and privacy protection.

4 Online Effectiveness Teaching Evaluation

Online effectiveness teaching evaluation is crucial for blended learning models, as it helps teachers understand students' learning progress and provide feedback on course improvement. The evaluation core includes students' learning outcomes and the quality of the teaching process. Student learning outcomes are assessed through performance evaluations, self-report questionnaires, and peer assessments, covering knowledge mastery and learning motivation. The evaluation of teaching process quality focuses on classroom participation and teacher feedback mechanisms, such as forum activity and personalized tutoring, to improve teaching quality. Learning management system data analysis provides insights into student behavior and performance, helping teachers intervene in a timely manner. These evaluation methods provide a basis for teaching improvement and enhance teaching effectiveness. Future research can explore more innovative evaluation tools to adapt to changes in educational needs. By implementing these evaluation methods, the effectiveness of online teaching under blended learning mode can be comprehensively improved, promoting the all-round development of students.

5 Empirical Analysis

Through questionnaire and interview, this study conducted an empirical analysis of the influencing factors of online teaching under the mixed teaching mode. The sample included 600 students and 30 teachers, covering three universities: comprehensive university, university of science and engineering, and normal college to ensure the diversity and representativeness of the sample.

6 Questionnaire Structure and Interview Questions

6.1 Questionnaire Structure

Student questionnaire survey mainly includes: (1) Course content design: includes questions about the clarity, organization and relevance of course content. (2) Quality of teaching resources: Evaluate the quality, diversity and interactivity of multimedia materials. (3) Technology platform experience: evaluate the ease of use, response speed and compatibility of the platform. (4) Assessment of learning outcomes: involving academic performance, knowledge mastery and personal satisfaction. (5) Likert five-point scale: rating from "strongly disagree" to "strongly agree".

Teacher questionnaire mainly includes (1) Course design: it involves course goal setting, module division and learning path design. (2) Instructional resource development: Evaluate strategies for the development and integration of multimedia materials.Technical support: Evaluate the technical support and service quality of the platform. (3) Evaluation of teaching strategies and effects: Explore the effectiveness of teaching methods and the feedback mechanism of students. (4) Likert five-point scale: rating from "strongly disagree" to "strongly agree".

6.2 Interview Questions

- Student interviews include: (1) What are the main challenges encountered in the online learning process? (2) What factors do you think can best enhance your online learning experience? (3) What are the specific suggestions for improving online teaching?
- Teacher interviews mainly include: (1) What are the main teaching strategies you use in online teaching? (2) How do you evaluate the effect of students' online learning? (3) What are the specific suggestions for improving the effect of online teaching?

6.3 Statistical Techniques

Descriptive statistical analysis: Calculate the mean, standard deviation and frequency distribution of each indicator to understand the underlying characteristics.

Correlation analysis: Pearson Correlation Coefficient was used to analyze the correlation between variables.

Analysis of Variance (ANOVA): Comparing differences in key indicators between students from different subject backgrounds.

- Topic analysis: Encode and extract the interview data to identify major themes and paterns.

6.4 Results

Descriptive statistical analysis reveals the mean and standard deviation of key indicators (see Fig 1). Correlation analysis showed that there was a significant positive correlation between course content satisfaction and learning outcome evaluation ($r = 0.65$, $p < 0.01$), indicating that high quality course content is crucial to learning effect. Analysis of Variance (ANOVA) found that science students scored higher on the assessment of learning outcomes than liberal arts students ($F(2, 597) = 4.56$, $p < 0.05$)(see Fig 2). The thematic analysis highlights the influence of the effectiveness of teacher feedback and the stability of technology platform on the effectiveness of online teaching.

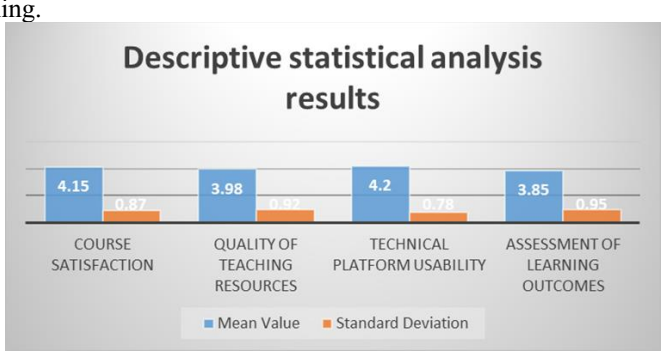

Fig. 1. Descriptive statistical analysis results

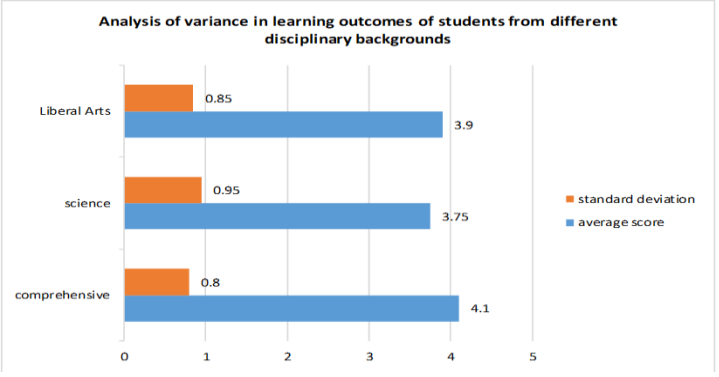

Fig. 2. Assessment scores of learning outcomes for students from different disciplinary backgrounds

6.5 Comparison with Existing Literature

The results of this study are consistent with many findings in the existing literature. For example, high-quality course content and interactive exercises can significantly enhance online learning. [Garrison & Vaughan, 2020] emphasized the importance of clear learning objectives, while [Chen, 2020] pointed out the role of multimedia materials in improving students' interest and comprehension. In addition, the study of [Graham et al., 2021] also found that the ease of use of technology platform and data analysis function are the key factors affecting the effect of online teaching.

However, the unique contribution of this study is to explore in detail the impact of different disciplinary contexts on student learning outcomes and to provide a more comprehensive perspective through a combination of quantitative and qualitative approaches. In particular, we found that science students outperformed liberal arts students on assessments of learning outcomes, possibly because science courses are more focused on hands-on operations and problem solving, skills that can be better cultivated through online interaction and virtual experimentation.

6.6 Research Limitations and Challenges

In the process of data collection and analysis, we encountered some potential biases and challenges. First, although the sample covers different types of colleges and universities, the sample size is limited and may not be fully representative of all colleges and universities. Second, there may be self-report bias in the questionnaire, and the responses of students and teachers may be affected by subjective factors. In addition, differences in the culture and teaching environment of different types of universities may also have an impact on the results. Future studies could further expand the sample size and employ more data sources to improve the external validity and reliability of the study.

In summary, through detailed questionnaire structure, interview questions and statistical techniques, this study reveals the important impacts of course design, resource quality and platform ease of use on online teaching results, and finds significant differences in subject background on learning outcomes. These findings provide an important reference for optimizing mixed teaching model and provide a basis for further research.

7 Results Discussion

Empirical analysis shows that satisfaction with course content is positively correlated with learning outcomes, emphasizing the importance of high-quality course design. Modular courses, clear learning objectives, and interactive activities can enhance student engagement and understanding. Multimedia teaching resources such as videos and animations enhance the learning experience. The usability and stability of technology platforms are crucial for the effectiveness of online teaching. Easy to use platforms and technical support reduce learning barriers and improve efficiency.

Analysis of variance reveals that subject background affects learning outcomes, with science students performing better, possibly due to better cultivation of practical operation and problem-solving skills in online environments. Interview analysis indicates that teacher feedback and platform stability are key factors in the effectiveness of online teaching. Timely feedback to help students correct mistakes, stabilize the platform to ensure the learning process.

These findings provide reference for optimizing blended learning models, and future research can explore personalized teaching strategies and innovative evaluation tools to adapt to changes in educational needs. Implementing these suggestions can improve the effectiveness of online teaching and promote students' comprehensive development.

8 Conclusion

This study explores the influencing factors of effective online teaching under blended learning mode through questionnaires, interviews, and data analysis. Research has found that high-quality curriculum design, high-quality teaching resources, appropriate technology platforms, timely teacher feedback, and awareness of subject differences are crucial for improving learning outcomes. It is suggested that the course design should be modular, with clear learning objectives and increased interactive elements such as forums and group projects to enhance participation. Teaching resources should be diversified, including multimedia and open educational resources, and interactive exercises should be provided to adapt to different learning styles. The technology platform should be user-friendly, stable, and ensure data security. Establish an effective teacher feedback mechanism to encourage student feedback and improve teaching. Develop personalized teaching strategies based on the characteristics of the discipline, emphasizing the cultivation of practical operation and problem-solving abilities, and establish a multidimensional evaluation system. Continuous improvement is the key to improving teaching quality. Regularly evaluate course effectiveness and adjust teaching methods and content based on feedback and data analysis. Through these measures, the effectiveness of online teaching under blended learning mode can be improved, and students' comprehensive development can be promoted. Future research should explore innovative evaluation tools and methods to adapt to changes in educational needs and provide scientific guidance for educators.

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