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Research on the design of a multi-dimensional evaluation system for blended learning effects from the perspective of collaborative education

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Abstract: This paper explores blended learning models from the perspective of collaborative education. It uses multi-subject, multi-dimensional and diversified evaluation methods and tools to explore effective pathways for reasonably and comprehensively evaluating students' blended learning effects. It aims to support the promotion of collaborative education and the optimization of educational teaching methods. The research results show that the adoption of blended teaching models can improve students' autonomous learning abilities, enhance teaching quality, strengthen the interaction between teachers and students as well as promote students' personalized growth.

Keywords: blended learning; collaborative education; multi-dimensional evaluation

1 Introduction

In recent years, China's higher education informatization has developed rapidly. According to the 54th *Statistical Report on Internet Development* in China released by the China Internet Network Information Center (CNNIC) in 2024, as of June 2024, the number of netizens in China was nearly 1.1 billion, with an internet penetration rate of 78.0%. With the vigorous development of internet technology and the popularity and convenience of online teaching models, traditional classroom teaching models centered on in-class instruction, characterized by "explanation-acceptance" and relying on on-site lectures and blackboard writing have undergone rapid transformation [1].

Online teaching, with its flexible learning methods and massive digital resources, has opened up a free and autonomous learning space for learners. However, learners cannot engage in practical or experimental operations, and the online environment can easily distract attention. In contrast, traditional face-to-face classrooms are relatively single and fixed in teaching methods, which is not conducive to cultivating innovative thinking. Blended teaching models, which effectively combine the advantages of online and offline learning, have gradually become the mainstream direction in the development of educational informatization. Through systematic resource integration, we can effectively cultivate students' critical thinking and innovative abilities, enhance their learning outcomes and promote the deep integration and innovation of information technology with education and teaching.

Blended learning combines traditional classroom teaching with online teaching, leveraging the strengths of both to provide students with more choices in learning methods. Collaborative education is an educational concept that emphasizes the joint participation of multiple stakeholders such as schools, families and society in the educational process, with the goal of promoting students' comprehensive development. Current evaluations of blended learning effects are relatively

one-dimensional, making it difficult to comprehensively and objectively assess the actual outcomes of blended learning on student cultivation in a collaborative education environment [2]. Therefore, constructing a scientific and reasonable multi-dimensional evaluation system has significant practical significance.

2 Overview

2.1 Blended learning

Blended learning integrates traditional face-to-face classroom teaching with online learning. It aims to provide students with a more flexible and personalized learning experience by leveraging the strengths of both teaching methods, thereby improving teaching effectiveness and learning efficiency. Blended learning retains the advantages of offline face-to-face teaching while utilizing the advantages of online teaching such as rich resources and flexibility. It has the characters of flexibility, interactivity, personalization and resource richness [3].

2.2 The concept of collaborative education

Collaborative education is an educational philosophy that emphasizes multi-party cooperation and multi-dimensional coordination in the educational process to cultivate students comprehensively. This concept holds that education is not only the responsibility of schools but also requires the participation of families, communities, society and other parties to jointly support and guide the growth of students. Through the integration and coordination of resources from families, schools, society and other parties, a combined educational force is formed to promote the comprehensive improvement of students' overall qualities. Collaborative education is characterized by multi-party cooperation, comprehensive development, personalization, practice orientation and sustainable development.

2.3 The educational mechanism

The concept of collaborative education provides a broader practical background and value orientation for blended learning, emphasizing the participation of multiple subjects in the entire process of blended learning. Blended learning, in turn, provides a concrete practical carrier for collaborative education. In collaborative education, teachers play a leading role in implementing blended learning by integrating educational elements expected by different subjects into the blended learning process. Meanwhile, social subjects such as enterprises can provide industry cases, practical projects, and other resources, which can be transformed into online extended materials or offline practical session content for blended learning. This allows various collaborative education subjects to better exert their roles through the carrier of blended learning, collectively influencing students' development.

During collaborative education, all subjects need to continuously communicate and coordinate, develop shared educational plans, and clarify their respective responsibilities and divisions of labor. When parents actively participate in collaborative education, they can supervise students at home to complete online tasks on time and provide timely feedback to teachers which can help teachers to improve their teaching skills. Additionally, the detailed recording and analysis of student learning data during blended learning provide an intuitive reference for all collaborative education subjects, helping schools, families and society to adjust their respective educational strategies and participation methods based on students' actual learning progress, improving the collaborative education mechanism furthermore.

2.4 Deficiencies in existing evaluation systems

The current evaluation systems for blended learning consider dimensions such as online learning behaviors and multi-subject evaluations but lack systematic integration. There are three main issues of traditional standards : First, evaluation dimensions are one-sided, overly relying on traditional indicators such as exam scores and homework tests, neglecting the track of the learning process and evaluation of qualities such as innovative thinking, leading to one-sided assessment content. Secondly, evaluation methods are single, with traditional paper-and-pencil tests accounting for too high a

proportion, lacking diversified means such as project collaboration and practical operations, which limits the stimulation of students' potential. Thirdly, evaluation effectiveness is insufficient, just relying on single-subject evaluations by teachers, making it difficult to reflect students' true qualities and lacking dynamic evaluation mechanisms involving multiple parties. Starting from top-level design, establishing a new evaluation paradigm that emphasizes both process and results, involves multi-subject collaboration which truly achieve an educational ecosystem where evaluation promotes learning and learning integrates with teaching evaluation.

3 Construction of a multi-dimensional evaluation system

3.1 Evaluation objectives

3.1.1 Comprehensive measurement of student development

Evaluating the impact of blended learning on student from multiple dimensions includes knowledge mastery, skill improvement, autonomous learning ability cultivation and the shaping of emotional attitudes and values, avoiding the limitations of single-dimensional evaluation to achieve the goal of comprehensively cultivating students through collaborative education. Students can actively participate in various club activities to exercise their social and talent abilities, engage in social practice to enhance their social awareness and responsibility and focus on moral cultivation, thereby achieving all-round growth in virtue, intelligence, physical fitness, aesthetics and labor to meet the needs of modern society for comprehensive talents.

3.1.2 Promotion of multi-subject collaboration

Teachers can evaluate students' learning outcomes and behavioral performance from a professional educational perspective; students as both the evaluated subjects and the important participants in evaluation, can reflect on their strengths and weaknesses through self-evaluation and improve themselves through peer evaluation; parents play an important role in school-family cooperation from the perspective of moral cultivation and the development of living habits at home; community measure students' performance from the perspective of social integration and responsibility in social practice and community service activities. By clarifying the evaluation responsibilities and focuses of each subject, communication and cooperation are strengthened, forming a combined educational force to jointly promote student learning and development.

3.1.3 Feedback and optimization of the learning process

The evaluation results provide a basis for teachers to adjust the design, content, and methods of blended learning, while helping parents and social subjects better understand students' learning situations to adjust their support strategies accordingly, achieving continuous improvement in the quality of blended learning.

3.2 Evaluation subjects

3.2.1 School teachers

As the main organizers and guides of blended learning, teachers can systematically evaluate students' learning effects from aspects of professional knowledge transmission, classroom interaction, and the assignment and completion of learning tasks, and improve teaching strategies in a timely manner based on evaluation results to optimize the integration of online and offline teaching links.

3.2.2 Students

Students are the main subjects of learning. Through self-evaluation, they reflect on their participation in blended learning, the effectiveness of their learning methods, their mastery of knowledge and skills, and their personal growth, thereby proactively adjusting their learning methods and improving their autonomous learning abilities.

3.2.3 Parents

Parents play an important role in collaborative education. They observe and evaluate students from multiple aspects, including the development of learning habits at home, the utilization of learning time, learning attitudes, and emotional states, providing family-based feedback for school education and assisting teachers in gaining a more comprehensive understanding of students.

3.2.4 Social organizations

During students' participation in practical internships, internship units can evaluate students' abilities to transform theoretical knowledge into practical skills from dimensions such as practical skills, professional qualities, and teamwork, providing a reference for schools in talent cultivation.

3.3 Evaluation dimensions

Evaluation objectives are determined through four aspects: knowledge mastery, skill application, emotional attitudes, and collaboration abilities. Knowledge mastery mainly assesses students' understanding and mastery of the content specified in the curriculum syllabus. Skill application evaluates students' ability to apply skills in practical operations and problem-solving, such as in experimental classes and off-campus practical classes. Emotional attitudes primarily assess students' interest in learning, learning attitudes, and values. Collaboration abilities evaluate students' performance and contributions in team collaboration. From the perspective of collaborative education, evaluations are conducted through four angles: teacher evaluation, student self-evaluation, peer evaluation, and parent evaluation. Evaluation methods include formative evaluation, summative evaluation, interviews, and questionnaires.

The blended teaching evaluation system adopts a three-level structure design, including top-level primary indicators, mid-level secondary indicators, and bottom-level specific observation points. The design of primary indicators should closely integrate multiple factors such as the talent cultivation plan of each major, the curriculum syllabus, the specific teaching objectives of the course (including knowledge, ability, and quality objectives), and the development trends of the industry, while considering the position and role of the course in talent cultivation and quality education. Secondary indicators include process evaluation, summative evaluation and social evaluation. The third-level observation points support the primary and secondary indicators to comprehensively evaluate students' learning effects, classroom teaching quality, and innovation in teaching models. This system emphasizes the completeness of evaluation dimensions, covering both summative evaluations such as final exams and formative evaluations such as daily performance, as well as behavioral indicators reflecting learning initiative such as classroom participation, achieving a comprehensive evaluation of static results and dynamic processes.

3.4 Evaluation methods

3.4.1 Testing and assessment

It includes unified exams, regular assignments and practical assignment assessments during blended learning, using quantitative methods to effectively measure students' abilities in knowledge mastery and skill collaboration.

3.4.2 Questionnaires

Different questionnaires are designed for different evaluation subjects of teachers, students, parents and enterprises, which can collect multi-dimensional feedback and observation results of students' learning effects from various subjects.

3.4.3 Observation and recording

Different subjects observe and record students' behavioral performance from various angles. Teachers can observe during classroom teaching and practical activities while parents observe during home learning supervision. Social organizations record students' learning attitudes and collaborative abilities as evaluation bases during practical internships .

3.5 Learning data analysis

Big data analysis functions provided by blended learning platforms such as Chaoxing and MOOC are utilized to analyze students' learning trajectories, including online learning duration, learning resource clicks, teacher-student Q&A interactions, and trends in answer accuracy, to identify patterns and potential issues in students' learning processes.

3.6 Interviews and communication

One-on-one interviews with students are conducted to understand their experiences, difficulties and gains in blended learning; communication meetings among teachers, parents and social organizations can be organized to share evaluation information and jointly discuss students' learning situations and improvement measures.

4 Conclusion

From the perspective of collaborative education, the study comprehensively considers evaluation objectives such as knowledge, skills, emotions, and collaboration and uses various evaluation methods and tools, aiming to assess the actual effects of blended learning comprehensively. It provides theoretical and practical support for evaluating blended learning effects under the perspective of collaborative education and promotes the application and optimization of blended learning in the field of education. The research has positive significance for promoting mutual improvement between teaching and learning, strengthening school-family-society collaborative education and advancing the high-quality development of blended learning.

Conflicts of interest

The author declares no conflicts of interest regarding the publication of this paper.

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