Design and Application of Online and Offline Blended Teaching Based on the 6E Model

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Abstract. With the rapid development of information technology and the continuous updating of educational concepts, traditional teaching models are no longer able to meet the talent cultivation needs of modern society. As a new teaching model, online and offline blended teaching is gradually becoming a hot topic in the field of education. This paper takes the classroom teaching of "Integrated Chart Making" carried out by the course team in recent years as the research object for reform, proposes an online and offline blended teaching design method based on the 6E model, and explores the practical application of this teaching method in the classroom. By introducing six parts: examination, engagement, exploration, experiment, evaluation, and enhancement, an efficient and complete teaching process driven by the 6E teaching model is designed. Through the research and analysis of specific cases, it is verified that this model has significant advantages in improving teaching quality and effectiveness. The study finds that the online and offline blended teaching based on the 6E model can effectively improve students' academic performance, learning attitude, and satisfaction, while promoting the cultivation of students' self-learning ability and critical thinking skills. Future research will continue to explore the application potential of this model in different teaching scenarios and seek ways to further optimize and improve teaching methods and strategies.

Keywords: 6E model; Online and offline blended teaching; Teaching design; Educational reform; Teaching quality

1 Introduction

With the rapid development of information technology and the continuous advancement of educational modernization, traditional teaching models are facing unprecedented challenges. Traditional classroom teaching, due to time and space constraints, often struggles to fully meet the individualized learning needs of students, while relying solely on online teaching may lead to insufficient teacher-student interaction and increased difficulty in learning supervision. Therefore, how to organically combine

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online and offline teaching to give full play to their advantages has become an important issue urgently to be solved in the current field of education.

In recent years, many educators have combined the characteristics of their own teaching teams and used individual lecture courses as research subjects to carry out effective teaching reform research on blended learning of online and offline teaching. Zhao Jia et al. (2021) explored a blended online-offline teaching model (PADQST), flexibly applying it to four teaching stages: pre-class preparation, primary knowledge construction, innovative application of knowledge, and summary reflection evaluation, realizing teaching concepts such as "student-centered," "outcome-oriented," and "curriculum ideology."[1] HASI Qi-mei-ge et al. (2021) based on the current situation of basic chemistry experimental teaching, introduced online resources represented by micro-lessons, chemical virtual simulation experiment platforms, and online course platforms into the process of basic chemistry experimental teaching, forming a mixed experimental teaching model with offline physical experiments as the main part and online network resources as the auxiliary[2]. Zhang Xiaohong et al. (2022) took the "Digital Electronic Technology" course as an example, analyzed the current online and offline teaching models and their problems, and discussed the blended teaching model of online and offline in combination with actual cases of this course in "blended" teaching [3]. ZHANG Yang-yanga et al. (2022) focused on the fifth edition textbook of "General Medicine Overview" published by People's Medical Publishing House, emphasizing how to implement blended teaching design of online and offline, focusing on student-centeredness, combining theory with practice, optimizing the evaluation and assessment system, providing references for further reform of the general medicine teaching model [4]. Xu Chuan et al. (2023) analyzed and discussed the problems existing in traditional university physics experimental teaching, proposed a blended teaching reform plan for "University Physics Experiment" courses based on the concept and advantages of blended teaching, taking the blended teaching idea and its advantages as the basis [5]. This paper aims to explore a design and practical method for online and offline blended teaching based on the 6E model. By introducing six parts: Examination, Engagement, Exploration, Experiment, Evaluation, Enhancement, a complete and efficient teaching process is constructed.

Generally, the purpose is to verify the practical role of the 6E model in improving teaching quality, optimizing teaching effects, and promoting comprehensive student development, and to provide educators with a set of practical and feasible blended teaching design guidance schemes. The significance of the online and offline blended teaching method under the 6E model studied in this article is mainly reflected in the following three aspects: First, through theoretical discussion and empirical analysis of the 6E model, enrich the theoretical research system of online and offline blended teaching, providing new perspectives and methods for related fields of academic research; Second, help educators better integrate online and offline resources in practical teaching, enhance teaching effects and student learning experience; Third, the proposed teaching design and implementation strategy based on the 6E model can provide references for blended teaching in other subjects and educational stages, promoting the in-depth development of educational and teaching reform.

2 Design of Online and Offline Blended Teaching Based on the 6E Model

2.1 Overview of the 6E Model

The 6E model is an innovative teaching model based on empiricism education theory in the current information technology teaching era, consisting of six links: Pre-class Examination, In-Class Engagement, In-Class Exploration, In-class Experiment, In-class Evaluation, and Post-class Enhancement. This model emphasizes stimulating students' learning interest and enthusiasm through diversified teaching activities, promoting deep understanding of knowledge and improvement of application abilities. The core of the 6E model lies in refining the teaching process into multiple interrelated links, each link having clear goals and tasks, and achieving teaching objectives step by step through effective feedback mechanisms.

(1) Pre-class Examination

Ppre-class test is the starting point of the 6E model, aiming to understand students' prior knowledge and learning needs. Through testing, teachers can assess students' knowledge foundation and cognitive level, thereby adjusting teaching content and methods targetedly. Additionally, pre-class tests can also stimulate students' learning interest and motivation, laying a good foundation for subsequent teaching activities.

(2) In-Class Engagement

In-Class Engagement is a key link to guide students into the learning state. Through engaging introductory activities or problem situations, teachers can attract students' attention and stimulate their learning enthusiasm. The purpose of class guidance is to make students develop a strong interest and curiosity about the upcoming content, thereby actively participating in teaching activities.

(3) In-class Exploration

In-class Exploration is an important stage for students' autonomous learning and knowledge construction. In this link, students actively explore and solve problems through reading, discussion, experiments, etc., highlighting student-centered education concepts, with students as the theme and teachers as leaders. The role of teachers is that of guides and assistants who need to provide necessary resources and support for students and encourage them to ask questions, share opinions, and collaborate in learning.

(4) In-class Experiment

In-class Experiment is a practical link to consolidate learned knowledge and skills, continuing to implement student-centered education concepts, allowing students to learn by doing. Through practical operations or simulated experiments, students can apply theoretical knowledge to actual situations and practice repeatedly. This not only helps deepen students' understanding of knowledge and cultivate their application abilities but also helps them discover and correct their own mistakes and deficiencies.

(5) In-class Evaluation

In-class Evaluation is a timely feedback link for the teaching process and student learning outcomes. Through observation, testing, discussion, etc., teachers can understand students' learning situations and mastery levels and adjust teaching strategies and methods based on evaluation results. At the same time, students can also reflect on their

learning processes and outcomes through self-evaluation and peer evaluation, thereby improving learning effects and quality.

(6) Post-class Enhancement

Post-class Enhancement is a further strengthening and expansion link for learned knowledge and skills. In this link, teachers can help students consolidate and deepen learned content through assignments, group discussions, etc., and promote knowledge transfer and application. Meanwhile, teachers can also provide personalized learning support and tutoring according to students' individual differences to meet different students' learning needs and development requirements.

2.2 Overview of Online and Offline Blended Teaching

Online and offline blended teaching is a new teaching model that combines traditional classroom teaching with modern network teaching. It utilizes internet technology and multimedia resources to break through time and space limitations, integrating online self-learning, interactive communication with offline teaching, practical operations into a diversified and three-dimensional teaching method. This teaching model aims to give full play to the flexibility of online teaching and the interactivity of offline teaching to improve teaching quality and effects.

(1) Characteristics

Online and offline blended teaching has four significant characteristics: first, strong flexibility allows students to flexibly choose learning content and methods based on their time arrangements and learning progress; second, good interactivity enables students to have real-time communication and interaction with teachers and other students through online platforms to improve learning effects; third, rich resources mean that online teaching resources can be infinitely expanded and updated, providing more learning opportunities and choices for students; fourth, obvious personalization allows teachers to provide personalized teaching support and tutoring according to students' learning situations and needs, meeting different students' learning needs and development requirements.

(2) Current Application Status

Currently, online and offline blended teaching has been widely applied globally and achieved remarkable results. Many schools and educational institutions have begun to introduce this teaching model into daily teaching and achieved good effects. Meanwhile, with the continuous development and improvement of information technology, the application range and depth of online and offline blended teaching will continue to expand and deepen. However, there are still some problems and challenges in the practical application process, such as the connection between online resources and offline teaching not being close enough, and teachers' adaptability to blended teaching needs to be improved, which requires further research and solutions.

2.3 Design of Online and Offline Blended Teaching Driven by the 6E Model

The design of online and offline blended teaching based on the 6E model should follow the following principles: first, focus on students, emphasizing cultivating students' subjectivity and creativity; second, emphasize practicality, stressing the combination of theory and practice; third, emphasize interactivity, promoting communication and cooperation between teachers and students, among students; fourth, pay attention to personalization, meeting different students' learning needs and development requirements.

(1) Key Steps

The design of online and offline blended teaching based on the 6E model includes the following six steps: first, determine teaching goals and content; second, develop detailed teaching plans and schedules; third, select appropriate online and offline teaching resources; fourth, design specific teaching activities and tasks; fifth, evaluate students' learning effects and feedback; sixth, adjust and optimize teaching design and implementation strategies based on evaluation results.

(2) Main Content

To better illustrate the design method and effect of online and offline blended teaching based on the 6E model, we will analyze the teaching design content using a university undergraduate course as an example. In the teaching design process, the teacher first determined the teaching goals and content, aiming to enable students to use learned knowledge to solve practical mapping problems. Then, a detailed teaching plan and schedule were developed, including weekly course arrangements, teaching content, teaching methods, etc. Next, appropriate online and offline teaching resources such as online video tutorials, programming software, experimental equipment were selected, and specific teaching activities and tasks such as writing programs, debugging code, completing projects were designed. During implementation, teachers adopted various teaching methods and means such as lectures, demonstrations, discussions, experiments, etc., and focused on interacting with students, answering students' questions and confusion in time. Meanwhile, teachers also helped students consolidate and deepen learned content through assigning homework, conducting group discussions, etc., promoting knowledge transfer and application. Finally, teachers evaluated students' learning effects and feedback and adjusted and optimized teaching design and implementation strategies based on evaluation results, such as adding experimental links, strengthening individual tutoring, etc., to improve teaching quality and effects.

3 Case Study Research on Online and Offline Blended Teaching Based on the 6E Model

To deeply explore the actual effect of online and offline blended teaching based on the 6E model, this paper selects the "Integrated Chart Making" course carried out by the teaching team as a case for analysis. This course aims to cultivate students' in-depth understanding of chart compilation and drawing, as well as the ability to design and practice operation plans. Considering the strong theoretical and practical nature of the "Integrated Chart Making" course, the traditional offline teaching model is difficult to

meet students' individualized learning and practical operation needs. Therefore, it is particularly necessary to introduce the 6E model for online and offline blended teaching design.

3.1 Teaching Implementation

(1) Pre-Class Examination

Before formal teaching, teachers released a pre-study test through an online platform to assess students' mastery of basic data structure knowledge. The test covered concepts, terminology, and basic methods of integrated chart making for a specific element (such as islands). Students needed to complete the test within a specified time and submit it. Teachers understood students' prior knowledge levels based on the test results to provide targeted explanations and supplements in subsequent teaching.

(2) In-Class Engagement

At the beginning of the class, teachers introduced the importance of island elements in chart expression through a well-produced short video and their application scenarios in practical applications. The video cases were vivid and interesting, quickly attracting students' attention and stimulating their interest in learning this course. Subsequently, teachers proposed several questions closely related to daily life and future work that students paid special attention to, guiding students to think about the practical application scenarios of island chart expression, initially establishing a teaching link.

(3) In-class Exploration

During the exploration session, teachers divided students into several groups, each group assigned a practical problem, such as designing a simplified shoreline for an island or selecting an island from an archipelago to achieve chart expression of island elements under different scenario requirements. Group members needed to cooperate to complete tasks while teachers provided guidance during rounds, solving problems encountered by students. This process not only exercised students' teamwork abilities but also promoted their deep understanding and advanced application of island chart expression and drawing knowledge.

(4) In-class Experiment

After the exploration session, students entered the practice session. Teachers provided a series of island chart integration topics, including island selection, nature summary, and shape simplification of shorelines, requiring students to use the learned island chart integration knowledge for chart drawing practice. These topics covered various cases such as isolated islands, archipelagos, reef areas, etc. Students completed homework independently and submitted them through the online platform for teachers and other students to review together.

(5) In-class Evaluation

In the evaluation session, firstly, intra-group students conducted intra-group self-assessments, selecting the best results of each group to initially form intra-group exploration-practice-evaluation preliminary results. Then, teachers organized inter-group mutual evaluations to identify errors in island chart integration in time, formulating optimization plans. Finally, teachers comprehensively evaluated based on students' test scores, classroom performance, group exploration results, etc., summarizing specific

operation plans for island chart integration under different scenarios. The evaluation results were fed back to students in the form of scores and comments to help them understand their learning status and shortcomings. Meanwhile, teachers also encouraged students to engage in self-evaluation and peer evaluation to cultivate their self-reflection and critical thinking skills.

(6) Post-class Enhancement

To consolidate learning outcomes, teachers posted additional learning resources on the online platform after class, including analysis of chart elements, digital homework, automation integration, and other related scientific papers. Students could selectively learn these resources according to their interests and needs to further broaden their knowledge and enhance professional literacy. Additionally, teachers regularly organized online Q&A sessions to answer students' doubts encountered during the learning process.

3.2 Case Analysis and Discussion

Through the analysis of the practice case of "Chart Cartographic Generalization" course based on the 6E model of online and offline blended teaching, it can be seen that this teaching model has significant advantages in improving teaching quality and effectiveness.

Firstly, the pre-class examination helped teachers understand students' prior knowledge levels, providing targeted guidance for subsequent teaching;

Secondly, the in-class engagement session stimulated students' learning interest through lively and interesting means;

Thirdly, the in-class exploration and experiment sessions promoted the cultivation of students' practical operation ability and teamwork ability;

Finally, the in-class evaluation and post-class consolidation sessions ensured that students could firmly grasp the learned knowledge and further enhance their professional literacy.

However, there are also some problems and challenges in the practice process, such as some students' lack of self-discipline leading to insufficient pre-class preparation, low participation of some students during group exploration, etc., which require further research and resolution.

4 Conclusions and Prospects

4.1 Conclusions

Based on the research on the design and practice cases of online and offline blended teaching based on the 6E model, the following conclusions can be drawn:

(1) Online and offline blended teaching based on the 6E model can effectively improve teaching quality and effectiveness and promote comprehensive student development.

(2) This teaching model has strong flexibility and adaptability to meet different students' learning needs and development requirements.

(3) Some specific problems and challenges still need to be addressed in the practice process to ensure the smooth achievement of teaching objectives.

4.2 Prospects

Although this study has achieved some preliminary results, many issues still deserve further exploration. Future research directions can be carried out from the following four aspects: First, delve into the integration and innovation of the 6E model with other teaching models to form a more diversified and personalized teaching system; Second, further optimize the design and implementation strategies of online and offline blended teaching to improve teaching quality and effects; Third, strengthen technical support and platform construction to provide more convenient and efficient services for online and offline blended teaching; Fourth, focus on the learning needs and characteristics of different groups to carry out differentiated teaching practices to meet different students' learning needs and development requirements.

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