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The Application Practice of Online and Offline Blended Teaching Mode in Colleges

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Abstract: With the ongoing reform in education and teaching, college instructors are increasingly focused on improving classroom teaching efficiency and effectiveness. In the era of rapid Internet development, the online and offline blended teaching method has garnered widespread attention. This approach leverages the complementary strengths of both online and offline teaching. When applied to the teaching of complex systems and complex networks, it can effectively address the limitations of traditional offline classrooms, helping students grasp abstract concepts more quickly, deepen their theoretical understanding, and enhance classroom efficiency. This paper primarily discusses the concept of blended teaching, its significance, and its value, while exploring practical application strategies for this method. It aims to serve as a reference for relevant educators.

Keywords: Online and offline blended teaching; Higher education; Complex systems and complex networks; Application strategies

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1. Introduction

Complex networks represent the relationships and interactions between various components of a system, abstracting numerous real-world systems such as models of infectious disease transmission and transportation networks. The study of complex systems and networks has been increasingly applied across diverse fields, including physics, sociology, economics, and computer communication [1]. Scholars from various disciplines are interested in exploring complex systems and networks. Blending online and offline teaching methods can significantly foster students' interest in learning and enhance their independent learning capabilities. It provides them with a deeper understanding of complex systems and networks, helping them grasp the fundamental question of what drives the complexity in such systems. However, as a new teaching method, online and offline blended learning also introduces challenges, such as increased teaching steps and more intricate content delivery. To mitigate these challenges, instructors should conduct relevant research, effectively utilize the blended teaching mode, fully understand its connotations, clarify its principles, and experiment with more

efficient teaching strategies. This approach will help reveal the characteristics and nature of complex systems and networks to students, laying a solid foundation for improving both the efficiency and impact of classroom teaching [2].

2. The concept of blended teaching

By combining traditional classroom teaching with online instruction and utilizing intelligent teaching platforms such as MOOCs, Superstar, and micro-courses, blended teaching overcomes the time and space limitations of traditional classrooms. It creates a more flexible and interactive educational environment, integrates a wealth of diverse teaching resources, enhances teaching activities, and is gradually becoming the new normal in college teaching models [3]. This approach allows teachers to fully exercise their guiding role, while leveraging students' active participation, thereby improving their initiative. Under the inspiration and guidance of teachers, students are motivated to complete learning tasks more actively. The online and offline hybrid teaching method integrates information technology and Internet platforms into every aspect of traditional education, combining the strengths of both approaches to provide students with a more efficient and enriching learning experience.

3. The significance of blended teaching

3.1. Enrich teaching resources and stimulate learning interest

In the blended teaching mode that combines online and offline elements, the teaching of complex systems and complex networks in universities can go beyond textbooks by utilizing internet platforms to gather high-quality resources and enrich course content. This approach not only makes classroom teaching more engaging, detailed, and professional but also broadens students' horizons. The thoughtful use of online resources helps students grasp fundamental concepts of complex systems naturally. Moreover, teachers can use online platforms to set specific learning goals, assign innovative tasks, and encourage students to take initiative. By incorporating interactive and collaborative topics, students can develop independent learning abilities, improve interpersonal relationships, enhance communication skills, and be fully motivated to learn.

3.2. Prioritize students' roles and foster individual growth

In traditional classrooms, teachers often follow a set pace, while students engage in passive learning. This model fails to account for individual differences among students, leading to limited interaction and insufficient processing of information. Blended teaching can address these issues by moving away from the "cramming" approach and fostering student autonomy [4,5]. In offline settings, teachers can provide foundational knowledge and use multimedia tools to guide students in asking questions. This approach allows teachers to focus on the issues raised by students, thereby improving classroom efficiency and deepening their understanding of the material. Online platforms enable teachers to assign tailored learning tasks, helping students at different levels improve from their current standing. Additionally, these platforms offer a wide range of learning materials, allowing students to manage their time, choose their preferred learning methods, and pursue subjects of interest. Blended teaching thus fully implements the principle of "teacher-guided, student-centered" learning, promoting individual development.

3.3. Expand teaching methods and cultivate learning habits

Traditional teaching is centered around classroom activities, with learning often ceasing once students complete their assignments. This structure limits the development of good study habits. However, with the blended teaching model, course content is no longer confined to the physical classroom, and the boundaries of teaching space are removed. Leveraging the internet, classroom instruction extends to online platforms, offering students broader learning spaces and more effective review opportunities. Furthermore, blended teaching allows for tracking, recording, and evaluating students' progress through online platforms [6]. This data can be analyzed to uncover issues that may go unnoticed in offline settings, allowing teachers to provide personalized feedback and help students develop better study habits, laying a strong foundation for their future growth.

4. The application strategy of blended teaching

4.1. The use of blended teaching information platforms

Blended teaching, which combines online and offline methods, requires the use of internet platforms to conduct teaching activities, and making full use of these platforms is fundamental to implementing blended teaching. Currently, there are numerous online learning platforms available, such as MOOC, Wisdom Tree, and Superstar Learning. These platforms offer a certain level of interaction, smoothness, and stability, providing teachers and students with a diverse, convenient, and efficient educational environment. Teachers can use the video recording and broadcasting functions of these platforms and on-demand courses to record lessons on complex systems and networks for students. They can also share video lessons from renowned instructors in the field to broaden students' knowledge and perspectives [7,8].

With the widespread use of the internet and smart devices, teaching activities are no longer confined by time and space, allowing students to acquire knowledge more conveniently. Additionally, these online platforms facilitate self-study and preparation before class, supervision of the learning process, teacher-student communication and Q&A, as well as multi-angle testing and evaluation. This compensates for the disadvantages and limitations of traditional offline classrooms. At the same time, it is essential to enhance teachers' online operational skills, encouraging them to upload integrated teaching materials to the platform. Students should be encouraged to use the platform for independent learning, cultivating a habit of engaging with it, thereby maximizing the platform's teaching potential.

Furthermore, the internet can provide the most cutting-edge research on complex systems and networks, ensuring that the teaching content stays up to date. The teaching cases evolve with the times, and the materials remain practical and relevant, guiding students toward future learning directions while clarifying the significance and potential of complex systems and networks. This approach helps keep students engaged and interested, preventing them from becoming fatigued or bored in their studies.

4.2. Mixed teaching mode enriches the teaching content

The course on complex systems and networks combines theoretical and practical aspects. Teachers should expand the content scientifically and reasonably and conduct lessons based on students' actual mastery of the material. For instance, when teaching "The Application of Complex Networks in Urban Transportation Systems," teachers can use online platforms to share theoretical knowledge about complex networks and provide traffic network diagrams of typical cities. This allows students to explore key concepts independently

before class and provide feedback on any questions they encounter. In offline classes, teachers can then address these questions [9].

Due to students' active and sometimes unpredictable thinking, some questions may arise from perspectives that teachers had not previously considered. Teachers can use these questions as entry points for further exploration, enriching the content taught in offline classes. Additionally, with the continuous advancement of academic research and technology, new developments in complex systems and networks emerge, and domestic infrastructure is constantly improving. The outdated theories and transportation networks found in textbooks may no longer meet students' learning needs. Therefore, teachers can incorporate cutting-edge research on complex systems and networks into their teaching. Using tools like Gephi and ArcGIS, they can demonstrate the most up-to-date characteristics of current transportation networks, helping students to better understand complex systems and networks [10,11]. This also enables students to grasp the application logic of complex networks in transportation planning, solidifying their knowledge.

4.3. Blended teaching mode promotes group cooperation

In the teaching of complex systems, group cooperation is an indispensable part of offline classroom activities. Through group work, students can improve their communication and interpersonal skills.

To help students better understand the definitions and concepts of complex networks and systems, teachers can employ group cooperation and online resources in a "flipped classroom" setting. Teachers can prepare global route data for students and assign tasks that involve analyzing the data's nature. Students are then asked to determine the type of complex network the data belongs to, referencing micro-lesson videos shared on the online platform. Students are divided into balanced groups, ensuring a mix of strengths and weaknesses, and allowing everyone to participate in group practice [12].

Through group cooperation, students make use of the course resources available online and field trip data to initially grasp the new course content and later teach it to the class in groups. Throughout this process, teachers need to anticipate potential challenges students may face in the flipped classroom, supplement the students' content where necessary, correct errors, and use the online platform to offer extended knowledge that aligns with students' exploratory learning [13].

This approach allows teachers to maintain their guiding role in the classroom while ensuring that students fully engage as active learners. By promoting independent thinking, cooperative exploration, and offering perspectives that differ from the teacher's own, students can add new layers to the classroom discussion. This fully integrates online platforms with offline classrooms, making blended teaching a reality. It not only improves students' mastery of theoretical knowledge but also enhances their interpersonal skills, ensuring that every student is actively involved in classroom communication and cooperation, thereby perfecting the teaching system.

4.4. Blended teaching mode enhances teaching evaluation

Teaching evaluation is a critical tool for assessing both teachers' effectiveness and students' learning outcomes. Traditional classrooms often rely solely on test scores to evaluate students, with methods that are overly simple, narrow, and rigid. Such approaches do not highlight the central role of students, fail to meet the requirements of modern university curriculums, and do not accurately reflect students' learning progress, which is contrary to the goals of quality education [14,15].

Therefore, online and offline blended teaching should focus more on classroom feedback during lessons

and the information provided by online platforms, conducting timely evaluations. Placing students at the center, it is essential to combine formative and summative assessments and implement diversified evaluation methods, moving away from the single-minded focus on test scores. Multi-angle and multi-subject evaluation principles should be adopted.

By leveraging the data integration capabilities of online platforms, students' daily learning records and performance can be systematically analyzed and presented to both teachers and students. Based on these data, combined with teacher assessments, peer reviews, and self-evaluations, multiple evaluation outcomes can be generated, allowing students to fully understand their learning level. Using big data and online platforms for multi-angle and multi-subject evaluation integrates the strengths of both online and offline teaching, stimulating inquiry and autonomy, and laying a foundation for students' critical thinking, practical ability, cooperation skills, and problem-solving capacity.

5. Conclusion

Online resources ultimately support offline teaching, and the primary goal of integrating online and offline teaching is to focus fully on students' learning and development. As an emerging teaching model, blended teaching not only emphasizes the central role of students in their learning but also encourages active participation and caters to students' individualized development needs. However, in the teaching of complex systems and networks, the application of blended teaching is still in its early stages. Achieving optimal teaching outcomes requires the combined efforts of both teachers and students to address the challenges involved.

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