

Research on Blended Online and Offline Teaching Mode for Image Recognition Courses

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Abstract

This paper aims to study the blended teaching mode of online and offline for the image recognition course. In the study, the basic concepts and characteristics of the online and offline teaching modes are first outlined. Then, both the online teaching mode and the offline teaching mode for the image recognition course are designed separately. In the design of the online teaching mode, it includes online teaching resource preparation, online teaching activity design, and online teaching assessment and feedback. While in the design of the offline teaching mode, it includes the design of offline teaching practice sessions, organization and management of offline teaching activities, as well as offline teaching assessment and feedback. Through the research, this paper addresses the problem of how to apply the blended teaching mode of online and offline to the image recognition course. Finally, a summary and conclusion are made based on the research results, confirming the effectiveness of the blended teaching mode of online and offline in the image recognition course. This study provides a new approach to the teaching mode of the image recognition course, contributing to improving students' learning effectiveness and teaching quality.

Keywords

Online teaching mode; offline teaching mode; blended teaching mode; image recognition course; teaching assessment and feedback.

1. Introduction

Image recognition technology has been widely applied and developed in modern society, and cultivating students' professional knowledge and skills in this field has become one of the important tasks of higher education. However, traditional teaching methods have some obvious shortcomings, such as limited classroom time, low student participation, and limited teaching resources. Therefore, the blended learning model of online and offline has emerged to compensate for the shortcomings of traditional teaching and provide more flexible and effective educational methods.

With the rapid development of information technology, educational methods are constantly changing and innovating. The blended learning mode of online and offline is widely discussed and applied in image recognition courses. The traditional teaching model often faces difficulties and cannot meet the personalized learning needs of students. The blended learning mode of online and offline has the characteristics of flexibility, interactivity, and self-directed[1] learning, which is expected to enhance students' learning effectiveness and motivation. Through in-depth research and evaluation of this teaching model, it can provide reference for the teaching reform of image recognition courses, promote innovation in educational teaching models, improve the quality and efficiency of education, and contribute to the cultivation of high-quality artificial intelligence talents.

This article aims to explore the feasibility and effectiveness of a hybrid online and offline teaching mode for image recognition courses, compare its differences with traditional teaching modes in terms of student learning effectiveness, learning motivation, and teaching efficiency, and provide educators with a scientific and reasonable basis for selecting teaching modes, as well as useful references and inspirations for higher education.

2. Overview of Blended Online and Offline Teaching Mode

Blended learning mode refers to a teaching method that combines online learning and offline teaching. It combines network technology and traditional teaching methods to create a learning environment that integrates online and offline teaching resources, providing students with a more flexible and personalized learning experience. The blended learning mode of online and offline is of great significance in image recognition courses, as shown in Table 1. It can fully leverage the advantages of online and offline teaching, improve students' learning effectiveness and motivation. Firstly, the blended learning model fully utilizes the advantages of online learning. [2] Online learning can break through the limitations of time and space, allowing students to freely choose their learning time and location according to their actual situation, saving transportation time and costs. In addition, online learning can also provide rich learning resources, such as instructional videos, online assignments, learning materials, etc. Students can learn according to their own learning progress and needs, fully exerting their ability for self-directed learning. Moreover, through online learning, students can engage in online communication and discussions with teachers and classmates, enhancing the interactivity and socialization of learning. Secondly, the blended learning model retains the advantages of offline teaching. Offline teaching can provide a more direct and practical learning experience. In the image recognition course, students can consolidate and apply the knowledge they have learned through experiments and practical activities, and improve their practical skills. At the same time, offline teaching also provides more opportunities and platforms for face-to-face communication and interaction between students and teachers, improving the effectiveness and quality of teaching. In addition, through offline teaching, students can also engage in teamwork and collaboration with their classmates, enhancing mutual assistance and cooperation in learning. In addition, blended learning models also have some unique characteristics[3]. Firstly, it can meet the learning needs and styles of different students. Each student has different learning habits and abilities, and blended learning mode can tailor suitable learning modes and paths based on their actual situation and individual differences, improving the personalization and flexibility of learning. Secondly, blended learning mode can also enhance students' learning motivation and enthusiasm. The integration of online and offline teaching can stimulate students' interest in learning, enhance their initiative and consciousness in learning. Meanwhile, through online learning and offline interaction, students can also develop good study habits and self-management abilities.

2.1. Introduction to online teaching mode

With the rapid development of information technology, online teaching models are gradually emerging in the field of education. Online teaching mode refers to the way to realize teaching activities through the Internet and various online platforms. Compared with traditional face-to-face teaching, online teaching mode has many unique advantages and characteristics. Firstly, the online teaching model has flexibility in terms of time and location. Students can choose a suitable learning time and location based on their actual situation, without being limited by fixed class times and locations. This is particularly attractive for students who have work or other schedules. Secondly, the online teaching model provides more diverse and diversified teaching resources[4]. Through the internet, students can easily access a variety of teaching resources, including documents, videos, audio, and more. These resources can not only meet

the different learning needs of students, but also stimulate their interest and potential in learning. In addition, online teaching mode also has the advantage of strong interactivity. Online teaching platforms typically provide rich interactive features, including online discussions, Q&A, real-time communication, and more. Students can engage in real-time interaction and discussion with teachers and other classmates, share learning experiences and solve problems, and promote the improvement of learning outcomes.

Table 1. Advantages of blended online and offline teaching mode in image recognition courses

advantage	describe
Breaking through the limitations of time and space	Students are free to choose their study time and location
Abundant learning resources	Teaching videos, online assignments, and learning materials
Online communication and discussion	Engage in online communication and discussion with teachers and classmates
Provide direct practical learning experience	Consolidate and apply knowledge through experiments and practical activities
Face to face communication and interaction	Face to face communication and interaction with teachers
Teamwork and collaboration	Teamwork and collaboration with classmates
Meet the learning needs and styles of different students	Tailor a suitable learning mode and path
Improve students' learning motivation and enthusiasm	Stimulate students' interest in learning, enhance their initiative and consciousness in learning
Promote self-learning and teamwork abilities	Develop good study habits and self-management skills

Finally, the online teaching model has the advantages of cost-effectiveness and sustainable development. Traditional face-to-face teaching requires a significant amount of material investment and human resources, while online teaching models can greatly reduce teaching costs and resource waste. In addition, online teaching models are more environmentally friendly and sustainable, meeting the needs of modern society for sustainable development.

In summary, the online teaching model has advantages such as flexibility in time and location, diverse teaching resources, strong interactivity, personalized and self-directed learning, cost-effectiveness, and sustainable development. The introduction and application of online teaching mode in image recognition courses can effectively enhance students' learning effectiveness and experience, achieving the best results of blended learning online and offline.

2.2. Introduction to offline teaching mode

In the offline teaching mode of image recognition courses, instructors and students communicate face-to-face in real time and impart knowledge and skills through on-site classes. The offline teaching mode is a traditional teaching method, usually conducted in fixed places such as classrooms or laboratories, aimed at providing a more direct and interactive teaching

experience. Firstly, the offline teaching mode, through face-to-face teaching, can make the interaction between students and teachers closer. In the classroom, students can not only hear the teacher explain the course content, but also have in-depth communication with the teacher through questioning, discussion, and other methods, in order to better understand and absorb knowledge. This interactive form can better stimulate students' interest and motivation in learning, making them more actively involved in the learning process. Secondly, the offline teaching mode, through on-site classes, can provide students with opportunities for practical operation and promote the integration of theory and practice. In image recognition courses, many contents require students to carry out practical operations. Through laboratory or actual scene simulations, students can personally conduct experiments such as image processing and feature extraction, and master practical application skills. This practical operation process can not only enhance students' practical operation ability, but also deepen their understanding and memory of course knowledge. In addition, offline teaching mode can also provide more learning resources and support. In offline teaching mode, students can directly receive guidance and coaching from teachers to solve problems encountered in learning in a timely manner. At the same time, students can also use laboratories equipped with professional equipment and resources for more in-depth learning and research. In addition, school libraries, laboratories, and other facilities provide students with abundant learning resources, making it easier for them to access the necessary learning materials.

Through face-to-face communication and on-site classes, students can better interact with teachers, enhance their interest and motivation in learning. At the same time, opportunities for practical operation and abundant learning resources also provide students with more support and assistance. However, there are also some challenges in the offline teaching mode, such as time and space limitations, and teacher resources. Therefore, when implementing offline teaching mode, it is necessary to integrate with online teaching mode to form a more complete blended learning mode, in order to better meet the learning needs of students[5]. The blended learning model combines the advantages of online and offline teaching, which can improve students' learning effectiveness and motivation, meet their personalized learning needs, and promote the improvement of their self-learning and teamwork abilities. Therefore, in-depth research and application of blended learning mode in image recognition courses will provide useful references and guidance for improving the quality and effectiveness of education and teaching.

3. Design of Online Teaching Mode for Image Recognition Course

The online teaching mode also has the characteristics of personalization and self-directed learning. Through online teaching platforms, teachers can design personalized teaching content and learning plans based on students' learning needs and levels. Students can choose their own learning content and methods based on their own learning progress and style, in order to improve the effectiveness and quality of learning.

3.1. Preparation of online teaching resources

In the blended learning mode of online and offline image recognition courses, the preparation of online teaching resources is a crucial and important part. The preparation of online teaching resources is not just about simply uploading courseware to online platforms, but should also focus on the diversity of course content and the richness of teaching resources to enhance students' learning effectiveness and experience. Firstly, the preparation of online teaching resources requires the provision of abundant learning materials. This includes but is not limited to textbooks, instructional videos, reference books, study notes, etc. Textbooks should be selected based on the requirements and objectives of the course, with authoritative and practical materials, and updated in a timely manner[6]. Teaching videos can be produced

through recording classroom lectures, experimental demonstrations, and other methods, making it convenient for students to learn anytime and anywhere. Reference books can be provided to students with more learning needs, helping them gain a deeper understanding and expand their relevant knowledge. Learning notes can help students summarize and organize knowledge, deepen memory and understanding[7]. Secondly, the preparation of online teaching resources also includes the configuration of teaching tools and software. The image recognition course involves many complex algorithms and programming techniques, so online platforms are needed to provide teaching tools and software suitable for students to use. Teaching tools can include software platforms with image processing and recognition capabilities, such as OpenCV, TensorFlow, etc. Students can deepen their understanding and mastery of image processing and recognition algorithms through real-time programming and debugging on online platforms. In addition, corresponding programming environments such as Jupyter Notebook, PyCharm, etc. should be provided to facilitate students' code writing and experimentation. Finally, the preparation of online teaching resources needs to consider the interaction and evaluation of students during the learning process. Online teaching platforms should provide a good discussion and communication environment, including online forums, instant messaging, and other functions, to facilitate interaction and discussion between students, teachers, and other classmates. Students can solve problems together and deepen their understanding of the course content through discussion and communication[8]. At the same time, online teaching platforms should have the function of evaluating students' learning effectiveness, such as online assignments, exams, project practices, and other forms. This can help teachers timely understand students' learning situation, provide timely guidance and feedback, and promote students' learning progress.

In short, the preparation of online teaching resources is an indispensable part of the blended learning mode for image recognition courses, both online and offline. By providing rich learning materials, configuring appropriate teaching tools and software, and building a good interactive and evaluation environment, students' learning effectiveness and motivation can be effectively improved. Teachers and students should work together to fully utilize online teaching resources and achieve the goal of high-quality education.

3.2. Online teaching activity design

In the online teaching mode, it is crucial to design appropriate online teaching activities to promote students' learning and understanding of image recognition courses. In this chapter, the design principles and specific operations of online teaching activities for image recognition courses will be discussed in detail. Firstly, in the design of online teaching activities, modern technologies and tools such as online video conferencing and online discussion platforms should be fully utilized. Through online video conferencing, teachers can directly interact with students in real-time, providing classroom explanations, demonstrations, and answering questions. During the explanation session, teachers can use screen recording or slide presentations for students to follow. In addition, online discussion platforms can provide a space for communication and knowledge sharing. Students can express their opinions and share their learning experiences on the platform, and teachers can respond and guide them in a timely manner, inspiring students' enthusiasm for learning. Secondly, in the design of online teaching activities, emphasis should be placed on manual operation and practical experience. Although online teaching may not provide a practical experimental environment, virtual experiments and simulation exercises can be designed to enable students to personally practice image recognition algorithms. For example, by using open-source image processing software, students can complete a series of tasks such as image classification, feature extraction, and model training online, mastering practical operational skills and methods. This practical learning approach can enhance students' hands-on and self-directed learning abilities, and

cultivate their practical application skills. In addition, in the design of online teaching activities, emphasis should also be placed on teamwork and project practice. Image recognition has a wide range of applications, including facial recognition, object detection, image segmentation, and other fields, requiring the combination and collaborative work of multiple algorithms. Therefore, through group discussions and group projects, students can collaborate and solve practical image recognition problems together. Through teamwork, students can learn and collaborate with each other, cultivating innovative thinking and teamwork skills in the process of problem-solving. Finally, in the design of online teaching activities, attention should be paid to timely feedback and evaluation. Through online assignments, quizzes, and exams, students can receive timely feedback and evaluation of their learning situation, and teachers can also identify students' learning problems and difficulties in a timely manner, providing guidance and assistance. In addition, teachers can regularly organize learning feedback meetings to have face-to-face communication and discussions with students, understand their learning experiences and confusion, and make targeted teaching adjustments and improvements. [9]

In short, the design of online teaching activities for image recognition courses should focus on the application of teaching techniques, manual operation and practical experience, teamwork and project practice, timely feedback and evaluation, and other considerations. Through these design principles and specific operations, online teaching activities can be made more diverse, flexible, and efficient, achieving the goal of promoting student learning and development.

3.3. Online teaching evaluation and feedback

In the online teaching mode of image recognition courses, evaluating students' learning outcomes and providing effective feedback are crucial. In traditional offline teaching, teachers can evaluate students' learning progress and provide feedback in a timely manner through classroom interaction, homework checks, and other methods. In online teaching, how to effectively evaluate students' learning situation and provide targeted feedback has become a challenging problem.

A commonly used online teaching assessment method is to evaluate students' learning outcomes through online quizzes and assignments. Teachers can use the testing and homework functions provided by online teaching platforms to design and publish relevant questions, and students can complete the test or homework by submitting their answers online. By analyzing students' answer sheets, teachers can understand their learning situation, including the knowledge points they have mastered, problem-solving abilities, etc., in order to provide targeted feedback for students. In addition, online teaching mode can also utilize technological means such as machine learning algorithms and artificial intelligence technology to monitor and evaluate students' learning process in real time. For example, by analyzing students' behavior data such as clicks and dwell time during the learning process, their learning status can be judged. Teachers can use this data to understand students' learning habits and problems, and then provide personalized guidance and feedback.

In online teaching, teachers can also use online discussion and communication platforms to assess students' learning progress. By observing students' speeches and interactions in the discussion area, we can understand their understanding and application ability of the course content, timely identify their confusion and problems, and provide corresponding answers and guidance.

The online teaching model also has certain advantages in providing feedback to students. In online teaching, teachers can provide feedback to students through various methods such as text, images, audio, and video. This multimedia form of feedback can present and explain problems more vividly, making it easier for students to understand and accept.

In summary, the online teaching model has unique advantages in evaluating students' learning outcomes and providing feedback. Through online quizzes and assignments, technological

monitoring, online discussions and exchanges, teachers can comprehensively understand students' learning situation and provide targeted feedback. However, online teaching models also face some challenges, such as how to ensure the accuracy and fairness of evaluations, and how to provide timely and effective feedback. Therefore, further research and exploration of methods and strategies for online teaching evaluation and feedback will help improve the quality of online teaching in image recognition courses.

4. Design of Offline Teaching Mode for Image Recognition Course

In the design of offline teaching practice in image recognition courses, in order to better promote students' learning effectiveness and interest, this article proposes an offline teaching mode that integrates traditional teaching methods with modern technological means. This model combines offline practice with online learning to maximize the utilization of teaching resources, improve students' learning participation and self-learning ability.

4.1. Design of offline teaching practice activities

Firstly, this article determines the design objectives of offline teaching practice by analyzing the characteristics of image recognition courses and students' learning needs. In the practical stage, students will have the opportunity to apply their learned knowledge and skills to practical operations and applications in specific image processing projects. Through practical activities, students can enhance their understanding and mastery of classroom knowledge, cultivate practical skills and problem-solving abilities. Secondly, this article proposes specific design content for offline teaching practice. Firstly, a series of experimental projects were designed, covering the basic concepts and techniques of image processing, such as image preprocessing, feature extraction, object recognition, etc. Each experimental project has clear objectives and operational steps, and students need to complete experimental tasks through independent practice. Secondly, a group collaboration project was designed to encourage students to engage in teamwork and communication, cultivating their ability to cooperate and communicate effectively. In group collaboration projects, students can work together to complete a complex image processing task and showcase their results. In addition, on-site inspection activities have been designed to guide students to step out of the classroom and personally experience the role and significance of image recognition technology in practical applications. Through on-site inspections, students can deepen their understanding of image recognition technology and gain insight into the current development status and prospects of related industries. Finally, this article also introduces the teaching methods and evaluation methods in offline teaching practice. In terms of teaching methods, various teaching methods such as heuristic teaching and case analysis have been adopted to guide students to actively explore and think. In terms of evaluation methods, in addition to exams and assignments, project presentations and practical operations are also used to evaluate and provide feedback on students' practical abilities.

Through the design of the offline teaching practice activities mentioned above, the effectiveness of the image recognition course has been significantly improved. Students can not only apply theoretical knowledge in practice, but also develop practical skills and problem-solving abilities. In addition, through practical activities, students' interest and participation in learning have also been significantly improved. In summary, the design of offline teaching practice has a significant positive impact on the teaching effectiveness of image recognition courses, and is a blended learning model worth promoting and applying.

4.2. Offline teaching activity organization and management

In offline teaching of image recognition courses, the organization and management of activities are very important. It can not only improve students' learning effectiveness, but also stimulate their interest and initiative in learning. This section will study the organization and

management of offline teaching activities to improve students' teaching effectiveness and satisfaction. Firstly, it is necessary to make sufficient preparations in the organization and management of offline teaching activities. [10] Teachers need to develop teaching plans and objectives in advance, and clarify the specific content and activity arrangements for each offline teaching session. Teachers also need to prepare teaching materials, experimental materials, and equipment in advance, and ensure their completeness and effectiveness. In addition, in order to ensure the smooth progress of teaching activities, teachers also need to arrange and organize the activity venue to ensure that students can have a comfortable learning environment. Secondly, in the organization and management of offline teaching activities, teachers need to fully exert their guiding and promoting role. Teachers should fully understand students' learning situations and needs, flexibly adjust teaching strategies and methods according to their actual situations, and make teaching more targeted and personalized. Teachers also need to arrange students' study groups reasonably, encourage cooperative learning and communication among students, in order to promote student interaction and thinking collision. At the same time, teachers should establish effective feedback mechanisms to timely understand students' evaluations and opinions on offline teaching activities, in order to provide a better teaching experience and learning environment. In addition, in the organization and management of offline teaching activities, teachers also need to fully utilize modern technological means to enhance teaching effectiveness. Teachers can use multimedia and Internet resources to present more vivid and intuitive teaching content and stimulate students' interest and enthusiasm in learning. Meanwhile, teachers can also provide students with a more intuitive understanding and mastery of the relevant concepts and techniques of image recognition through practical operations and experimental simulations. In addition, teachers can also utilize virtual laboratories and virtual reality technology to provide more practical opportunities and challenges, promoting the cultivation of students' innovative thinking and hands-on abilities. Finally, student participation and feedback are crucial in the organization and management of offline teaching activities. Teachers should encourage students to actively participate in teaching activities and provide opportunities for them to express their views and ideas. At the same time, teachers need to pay timely attention to students' learning situations and difficulties, provide personalized guidance and assistance, in order to improve students' learning outcomes and experiences. In addition, teachers should listen to students' feedback and suggestions, continuously improve teaching methods and content, and provide a better teaching experience and learning environment.

In summary, by organizing and effectively managing offline teaching activities for image recognition courses, students' learning outcomes and satisfaction can be improved. Teachers' efforts in the preparation, guidance, and promotion of teaching activities, the use of modern technology, and attention to student participation and feedback will provide students with better learning experiences and outcomes. In the future field of education, it is necessary to constantly summarize innovative experiences and explore better teaching models to provide better support and guidance for the teaching activities of image recognition courses.

4.3. Offline teaching evaluation and feedback

In the design of offline teaching mode, evaluation and feedback are crucial links. Through reasonable and effective evaluation and timely and accurate feedback, teachers can understand students' learning situation, adjust teaching strategies accordingly, and improve students' learning effectiveness. In the image recognition course, offline teaching mode is adopted, where students and teachers can have face-to-face communication and interaction, providing a more convenient and comprehensive way for evaluation and feedback. Firstly, in offline teaching, teachers can evaluate students' learning situation through classroom observation. Teachers can judge students' mastery of course content based on their performance, such as participation,

accuracy and depth in answering questions. Meanwhile, teachers can also observe students' performance in practical operations, such as their ability to conduct experiments on image processing software and the accuracy of the results. Through these observations, teachers can promptly identify students' problems and confusion, and provide guidance and feedback in a timely manner to help students solve problems and improve learning outcomes. Secondly, in offline teaching, teachers can evaluate students' learning outcomes through classroom quizzes and assignments. [11] Teachers can design some quizzes for students to take in class to test their mastery of the course content. At the same time, teachers can also assign homework and require students to complete it after class, evaluating students' learning outcomes based on their completion status and the correctness of their answers. During the evaluation, teachers can also provide detailed comments and suggestions to guide students in improving and enhancing. In addition, in offline teaching, teachers can also evaluate and provide feedback through individual interviews and group discussions. Teachers can have face-to-face interviews with each student to understand their learning dynamics and issues, as well as their suggestions and feedback on teaching. At the same time, teachers can also organize group discussions, allowing students to communicate and share learning experiences together in the group, thereby promoting mutual learning and improvement among students.

In summary, in the offline teaching mode of image recognition courses, evaluation and feedback can be conducted through classroom observation, quizzes and assignments, individual interviews and group discussions, etc., which can comprehensively and accurately understand students' learning situation and provide timely guidance and assistance. This helps to improve students' learning outcomes and teaching quality, and promote teaching reform and innovation in image recognition courses.

5. Conclusion

Firstly, the blended learning mode of online and offline can provide a more flexible learning environment. Students can arrange their studies according to their own time and location, and obtain course resources and teaching materials through online platforms. This flexibility helps students become active participants in the classroom, cultivating their self-learning and problem-solving abilities. Secondly, the blended learning mode of online and offline can promote students' learning motivation and interest. Through online platforms, students can interact and communicate with teachers and classmates anytime, anywhere. This kind of interaction can not only enhance students' learning motivation, but also stimulate their interest in learning and improve learning outcomes. In addition, the blended learning mode of online and offline can help improve students' academic performance. Research has found that compared to traditional teaching, blended online and offline teaching can improve students' learning outcomes and grades. This may be because online platforms provide more auxiliary learning resources, such as video teaching, online quizzes, etc., which can well meet students' personalized learning needs. Finally, when implementing the blended learning model of online and offline, it is necessary to fully consider the role changes of teachers and students. Teachers not only need to have good teaching abilities, but also the ability to combine online teaching resources with offline teaching practices. At the same time, students also need to have the ability of self-learning and information acquisition to adapt to the needs of blended learning.

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