Analysis of the hybrid mode in online and offline teaching of computer course under STEAM education concept

Xia Wang[*]

Linyi Vocational College, Linyi, Shandong, 276000, China
[*]*Corresponding author*

Abstract: In the comprehensive promotion of quality education today, the teaching of vocational colleges is no longer just the pursuit of scores, but more attention is paid to the cultivation of professional subject thinking and good learning habits for students, to better cope with the various challenges faced in the process of learning and employment. Therefore, the research on the combination of online and offline teaching methods in vocational colleges is particularly important, especially in computer teaching, which is expected to be widely used and achieve good results. This paper discusses and studies the online and offline hybrid teaching methods of vocational colleges, to improve the enthusiasm of students in vocational colleges and their ability to complete teaching tasks.

1. Introduction

With the continuous development of information technology and the deepening of educational reform, the teaching mode of computer courses in vocational colleges is also constantly changing. Among them, the online and offline hybrid mode of teaching mode has attracted more attention and favour. In this mode, students can use the online platform to learn online or carry out practical operations in the classroom, which not only meets the students' independent learning needs, but also improves the students' practical operation ability. In computer education, the application of Steam education concept is also becoming more popular. The STEAM educational philosophy is to integrate the five fields of science, technology, engineering, art, and mathematics in education to cultivate students' interdisciplinary thinking and ability to solve practical problems. Through Steam education, students can gain a more comprehensive knowledge structure and a broader perspective, to better adapt to the future development of society.

2. The Concept of STEAM Education

STEM education is an educational philosophy that emphasizes the integration of Science, Technology, Engineering, and Mathematics to develop students' interdisciplinary thinking skills and problem-solving skills. At its core, STEAM education is about connecting interdisciplinary knowledge and skills with practical problem solving. By combining with real-life problems, students gain a deeper understanding and application of the knowledge and skills learned, and develop

innovative, collaborative, and critical thinking skills in problem-solving. STEAM education also emphasizes students' practice and experience, through which students can understand and master the knowledge and skills they have learned more deeply. The practice of Steam education can be applied to a variety of different fields and age groups. In schooling, Steam education can be applied to various subjects and courses, such as computer science, engineering, physics, chemistry, etc. In practice, Steam education can employ a variety of different teaching methods and strategies, such as project-based learning, teamwork, science experiments, programming challenges, etc., to encourage students to actively participate, actively explore and practice. In the construction of online and offline hybrid mode of computer courses in vocational colleges, Steam education can be regarded as an important educational concept, which helps to cultivate students' practical ability and innovation ability [1].

3. The Principle of Online and Offline Hybrid Teaching Mode of Computer Courses in Vocational Colleges with the Concept of Steam Education

3.1 Practice-Oriented

Practical project-driven teaching: take practical projects as the core of teaching, and promote the cultivation of students' practical ability and innovation ability by designing practical projects. At the same time, practical projects and course knowledge are combined to enable students to learn, understand and apply course knowledge in practice.

Provide practical opportunities and resources: Provide students with sufficient practical opportunities and resources, such as laboratories, simulators, development platforms, etc., so that students can master and apply course knowledge in practice, and cultivate practical ability and innovation ability.

Guide students to think independently and solve problems: Encourage students to think independently and solve problems by providing specific practical projects and tasks. At the same time, teachers can give full play to the role of guidance and guidance to help students master and apply course knowledge in practice, and improve their problem-solving ability and efficiency.

Promote the integration of curriculum and practical projects: integrate courses and practical projects, and design a series of practical projects to complete course learning and teaching goals. At the same time, practical projects and course knowledge are combined to enable students to learn, understand and apply course knowledge in practice.

Focus on practical results and feedback: Pay attention to practical results and feedback, encourage students to try new ideas and methods in practical projects, and give feedback and improvement according to practical results. At the same time, teachers should also evaluate and feedback the practical results to promote students' continuous improvement of practical ability and innovation ability.

3.2 Encourage Innovation

(1) Vocational colleges provide open-ended projects that encourage students to choose and design projects independently, thereby stimulating their innovative ability and creativity. Students can try out new ideas and techniques in projects, explore and unearth new knowledge and methods. (2) Vocational colleges provide innovative tools and resources, such as programming software, hardware devices, books, journals, etc., so that students have more opportunities to understand the latest technologies and applications, and can independently try to use these tools and resources for innovative practice. (3) Vocational colleges teachers encourage students to participate in innovation competitions and challenges, so that students can continuously improve their innovation ability and competitiveness in competitions and challenges. Students can demonstrate their innovation and

technical skills through competitions and challenges, while also learning the experience and methods of other outstanding players [3]. (4) Vocational colleges provide innovation mentors and team support so that students can be guided and supported in the innovation process. Innovation mentors can provide guidance and advice to students to help avoid duplication and mistakes in innovation practices, and team support allows students to collaborate better and share resources.

3.3 Personalized Learning

Diversified learning resources: By providing diversified learning resources, such as courseware, videos, practice questions, etc., students can choose the most suitable learning style according to their own interests and learning habits.

Strengthen students' independent learning ability: In online and offline hybrid teaching, students' independent learning ability can be strengthened in various ways, such as setting up course forums, providing learning guidance, etc., so that students can organize their own learning time and rhythm. Intelligent learning system: With the help of intelligent learning system, learning resources and learning methods suitable for students can be recommended according to their learning situation, interests and abilities, and further personalized learning can be realized.

Tracking and feedback of learning process: In online and offline hybrid teaching, the learning process and learning results of students can be tracked with the help of learning management system, feedback and guidance can be given in a timely manner to help students adjust learning strategies and progress, to better realize personalized learning.

3.4 Interactive Exchanges

Interactive communication is an important principle under the concept of Steam education, and it should also be fully reflected in the online and offline hybrid teaching of computer courses in vocational colleges. Interactive communication can promote the good relationship between teachers and students, enhance mutual trust and interaction between teachers and students, and stimulate students' enthusiasm and motivation for learning, enhance students' self-confidence and learning effect. In hybrid online and offline teaching, interactive communication can be achieved in a variety of ways. For example, teachers and students can discuss and communicate through online discussion boards or class groups. In addition, teachers can also use the online live broadcast function provided by the online teaching platform to carry out real-time explanations and Q&A interactions. In the offline teaching link, teachers can encourage interaction between students by organizing group discussions or group projects, to improve students' learning effect and creativity. In addition, teachers can also promote interaction and communication between students by guiding students to participate in subject competitions, academic forums, and other activities, and improve students' subject literacy and comprehensive quality. In competitions and forum activities, students can share their research results and experiences, learn from each other, and improve their learning level and innovation ability [2].

3.5 Interdisciplinary Integration

Integrate knowledge from different disciplines: For example, the introduction of elements of art, design, and linguistics into computer courses can enable students to understand the intersection of computers and other disciplines and enhance their understanding and cognition of computer applications.

Unite teachers of different disciplines: Combining teachers of different disciplines to teach and guide students together can promote knowledge exchange and sharing and improve the quality of

teaching.

Design comprehensive projects: Design interdisciplinary comprehensive projects, so that students can solve practical problems across different disciplines, and cultivate interdisciplinary thinking and innovation ability.

4. The Concept of STEAM Education in the Practice of Online and Offline Hybrid Mode of Computer Courses in Vocational Colleges

4.1 Strengthen Students' Practical Ability

Design practical projects: In the course design, practical projects are added, so that students can master relevant theoretical knowledge and skills through practical projects. Practical projects can be individual or group projects and can be practiced inside or outside the school.

Provide laboratory equipment and resources: Provide suitable laboratory equipment and resources for students to practice in the laboratory. Students can gain a deeper understanding of the course knowledge through laboratory operations, and at the same time, they can exercise their practical skills.

Carry out practical lectures and workshops: Invite industry experts and scholars to conduct practical lectures and workshops, so that students can understand the needs and applications in practical work, and at the same time, they can improve students' practical ability through interactive communication.

Guide students to participate in competitions and project practice: guide students to participate in relevant competitions and project practice, so that students can experience and expert relevant knowledge and skills in practice, and enhance students' self-confidence and teamwork ability.

Adopt online and offline hybrid teaching methods: Through online and offline hybrid teaching methods, the theory and practice are combined, so that students can learn relevant knowledge and skills in practice, and at the same time, they can also improve students' interaction and collaboration ability.

4.2 Encourage Students' Ability to Innovate

Provide open projects: Provide students with open projects, encourage students to choose and design projects independently, to stimulate their innovative ability and creativity. Students can try out new ideas and techniques in projects, explore and unearth new knowledge and methods.

Provide innovative tools and resources. For example, programming software, hardware devices, books, journals, etc., so that students have more opportunities to understand the latest technologies and applications, and can independently try to use these tools and resources for innovative practice. Encourage students to participate in innovation competitions and challenges: Encourage students to participate in various innovation competitions and challenges, so that students can continuously improve their innovation ability and competitiveness in competitions and challenges. Students can demonstrate their innovation and technical skills through competitions and challenges, while also learning the experience and methods of other outstanding players [3].

Provide innovation mentors and team support: Provide innovation mentors and team support so that students can receive guidance and support in the innovation process. Innovation mentors can provide guidance and advice to students to help avoid duplication and mistakes in innovation practices, and team support allows students to collaborate better and share resources.

4.3 Optimize Course Teaching Methods

(1) Adopt project-oriented teaching method: for computer courses, adopt project-oriented teaching

methods, so that students can learn and apply knowledge in practice, to improve their interest and motivation in learning. (2) Introduce interactive teaching methods: In online and offline classrooms, interactive teaching methods, such as group discussions, question answers, case studies, etc., are adopted to allow students to participate more actively in the classroom, promote communication and interaction between students, and better understand and apply knowledge. (3) Provide online learning resources: In the online courses, a variety of learning resources are provided, such as videos, literature, case studies, etc., to help students better learn and expert knowledge. At the same time, online platforms can also be used to provide interactive learning content, such as online programming tools, interactive simulations, etc., to help students better understand and apply knowledge. (4) Continuous evaluation and feedback: In the whole course learning process, continue to evaluate and feedback students' learning achievements and progress, correct students' mistakes, and deficiencies in a timely manner, motivate students' learning motivation and confidence, and better improve students' learning effects.

4.4 Provide Personalized Learning Services

Establish student learning files: Collect students' learning data through the online learning platform, including learning progress, academic performance, preferences, etc., establish students' learning files, and provide data support for subsequent personalized services.

Provide personalized learning plans: Based on students' learning data, provide personalized learning plans for each student, including learning content, learning methods, learning resources, etc. At the same time, the learning plan can be dynamically adjusted according to the student's learning progress and achievement.

Personalized learning courses: According to different student needs, personalized learning courses, such as basic courses, advanced courses, practical courses, etc., are set up, so that students can learn within their own learning level and interests.

Provide intelligent learning services: Artificial intelligence technology is used to provide students with intelligent learning services, such as intelligent recommended learning resources, intelligent auxiliary learning, etc., to help students better learn and expert knowledge.

Provide personalized evaluation and feedback: Provide personalized evaluation and feedback based on students' learning data and learning performance, and encourage students to continuously improve and improve in learning [4].

4.5 Strengthen Student Assessment and Feedback

(1) Adopt a variety of assessment methods: In addition to the traditional written test and homework assessment, you can also use a variety of assessment methods such as classroom interactive assessment, project practice evaluation, and oral assessment to fully understand students' learning situation and ability level. (2) Provide timely and effective feedback: Timely and effective feedback can help students find and solve learning problems, and encourage students to continuously improve and improve. Teachers can use online platforms, emails, telephones, and other methods to provide timely and effective feedback. (3) Design personalized assessment indicators: According to the course objectives and students' learning situation, design personalized assessment indicators, not only to examine students' knowledge mastery, but also to examine students' practical ability and innovation ability. (4) Establish a student self-evaluation mechanism: Through the establishment of a student self-evaluation mechanism, students are encouraged to actively participate in the assessment process, understand their own learning and progress, and promote students' cognition and reflection on themselves. (5) Carry out teaching quality assessment: Through teaching quality assessment, collect students' feedback and suggestions, continuously improve, and optimize teaching content and

methods, and improve teaching effect and satisfaction.

4.6 Online Interaction in Offline Teaching

Offline teaching is an indispensable part of education and teaching. In the field of computer science, teaching methods such as group cooperative learning and project practice can better help students explore and practice computer knowledge and skills [5]. The key elements of using group learning and project practice in offline delivery are as follows:

Group cooperative learning: The use of group cooperative learning in the classroom can encourage interaction and cooperation between students, and promote the sharing and exchange of knowledge and experience. Teachers can divide students into small groups and have them work together on class tasks and exercises, such as programming assignments, lab reports, etc. Doing so not only improves students' learning outcomes, but also develops their communication skills and teamwork spirit.

Project practice: The introduction of project practice in the classroom can help students apply theoretical knowledge to practical scenarios and enhance their practical ability and problem-solving ability. Teachers can provide students with a project topic that allows them to design and implement projects in groups [6]. Throughout the process, teachers should provide the necessary guidance and support to help students solve the problems and difficulties they encounter. For example, CS106A at Stanford University is a classic computer science course that uses group cooperative learning and project-based teaching methods. In this course, students work on projects such as Stanford Health & Diet, maze games, and more, learning both programming fundamentals and project management and collaboration skills. In addition, teachers provide students with sufficient self-directed study time and support, giving students sufficient time and opportunities to explore and practice computer knowledge and skills.

5. Conclusions

In summary, teachers should actively follow the pace of the times, adapt to the teaching concepts of the new era, and explore more flexible and diversified teaching methods, such as online and offline teaching modes, to improve the quality of teaching. This method helps to promote students' independent learning and the cultivation of practical ability, to cultivate high-quality and high-skilled talents in line with the needs of the development of the times.

References

[1] Liu Xiaoli, Zhou Deyun. (2016). Exploration of Hybrid Teaching Mode of Basic Courses of Higher Vocational Computer [J]. Forest Area Teaching, 27.

[2] Shen Sen. (2019). Analysis of the Construction of Computer Curriculum in Vocational Schools Based on STEAM Education Concept [J]. Computer Knowledge and Technology: Academic Edition, 154-155.

[3] Zhang Yongliang, Sun Qichang, Yang Weishe. (2018). Design and Analysis of Online and Offline Hybrid Teaching Mode in Vocational Colleges [J]. Journal of Shaanxi Youth Vocational College, 16-19.

[4] Zhang Youchun, Xu Tao, Zhu Lian. (2017). Exploration and Practice of Online and Offline Hybrid Teaching Mode in Vocational Colleges [J]. Journal of Ningde Normal University: Natural Science Edition, 107.

[5] Wu Di, Yuan Zhongguo, (2018), Curriculum Integration and Innovation Based on STEAM Education Concept - Taking Computer Science as an Example [J], Innovative Talent Education, (1), 61-67.

[6] Ji Chunyan (2022), Exploration of Micro Curriculum Activities Based on STEAM Education Concept [J], Reading, Writing, and Computing (05), 52-54.