



Research on the Innovation of Blended Teaching of Aviation Maintenance Management Course Based on CSCL

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Abstract. Aviation maintenance management plays a crucial role in ensuring aviation safety and utilization efficiency. As the core link in cultivating relevant professionals, the Aviation Maintenance Management course has high requirements for practicality and comprehensiveness and is a compulsory main course in various directions of aviation maintenance specialty. To address the pain points in course teaching, the course team adopts the teaching concept of "student-centered, problem-driven, ability-oriented, and continuous improvement". In the blended teaching reform of the course, the theory of Computer Supported Cooperative Learning (CSCL) is introduced. By analyzing the connotation and advantages of CSCL, the CSCL technology is deeply integrated with course teaching to create an autonomous, cooperative, and inquiry-based learning environment for students, realizing the interconnection between online and offline, as well as inside and outside the classroom. It can provide a practical reference path for the teaching reform of similar courses to improve teaching effectiveness and the quality of talent cultivation.

Keywords: CSCL, Blended Teaching, Aviation Maintenance.

1 Introduction

Courses are the intermediary for realizing talent cultivation requirements and teaching activities; they are the key supporting points for the high-quality development of institutions; they are the "last mile" that embodies the concept of "student development-centered"; and they are the concretization, operationalization, and goal-setting of implementing the fundamental task of "fostering virtue through education". As an interdisciplinary research field, CSCL has achieved abundant research results and has good reference value and guiding significance for implementing blended teaching reform. This paper summarizes the innovative research on blended teaching carried out by the teaching team of the Aviation Maintenance Management course in our school under the background of digital transformation, aiming to provide certain reference value for the teaching reform of similar courses.

2 Analysis of CSCL Theory

2.1 Basic Meaning of CSCL

Computer Supported Cooperative Learning (CSCL) utilizes computer technology to assist and support collaborative learning. CSCL emphasizes the construction of a collaborative learning environment with the aid of computer technology. In this environment, students, through mutual communication, cooperation and knowledge sharing, jointly construct their understanding and cognitive system of knowledge, ultimately promoting the improvement of their cognitive level and thinking and logical abilities as well as enhancing the quality and efficiency of learning. Compared with traditional learning theories, it places more emphasis on the sociality and interactivity of learning, integrating individual learning into group collaboration and facilitating the diverse generation and in-depth internalization of knowledge [1].

2.2 Theoretical Basis of CSCL

The theoretical foundations of CSCL mainly include sociocultural theory, activity theory, constructivist learning theory, as well as situated cognition, distributed cognition, and cognitive flexibility theory, etc. Although the focuses of these theories vary, they all agree that learning is a social process rather than merely an individual information processing process [2].

2.3 Unique Advantages of CSCL in Aviation Maintenance Management Teaching

(1) Expanding Learning Space and Time

In the Aviation Maintenance Management course, by using the CSCL platform, students can effectively break through the constraints of classroom time and space, obtaining learning resources and participating in discussion and communication anytime and anywhere. For example, for complex aviation maintenance process flows, students can fully utilize online micro-course, MOOC, and SPOC resources to study repeatedly before or after class and timely communicate and discuss with classmates about the difficult problems encountered in learning.

(2) Stimulating Collective Wisdom and Innovative Thinking

Students come from different professional backgrounds and thinking perspectives. In the collaborative learning process supported by CSCL, they can conduct multi-angle analysis and discussion on difficult problems in aviation maintenance management, such as the overall arrangement of maintenance processes, the optimal allocation of maintenance resources, and the formulation of maintenance quality control plans, inspiring each other and thus generating innovative solutions [3].

(3) Enhancing the Contextuality and Applicability of Knowledge

Through online simulation of aviation maintenance management scenarios and offline group collaborative practice activities, students can apply and test the learned knowledge in real or near-real situations, which can better deepen their understanding

and mastery of knowledge and improve the efficiency of transforming theoretical knowledge into actual maintenance management capabilities [4-5].

3 Development History and Pain Point Analysis of Aviation Maintenance Management Course

The course "Aviation Maintenance Management" has been identified as a professional basic course for various majors in aviation maintenance engineering in our university since the 1960s. In 2023, according to the newly revised talent cultivation plans for various directions of the aviation maintenance major, this course was clearly designated as a compulsory core course, playing a major supporting role in cultivating students' aviation maintenance management abilities. It is a job-oriented course with a strong combination of theory and practice. With the continuous deepening of the digital transformation of higher education teaching, many problems have gradually emerged in the implementation of teaching this course under the traditional teaching model.

(1) The teaching content is highly theoretical, covers a wide range, and has many knowledge points, causing students to have a fear of learning difficulties.

As a job-oriented course, the teaching content of this course is closely related to the actual situation of aviation maintenance management and is closely connected to the work of students' future job positions. Besides mastering the basic knowledge, fundamental theories, basic methods and requirements of aviation maintenance management, students are also required to master the contents, organizational procedures, methods and requirements of various aviation maintenance management activities. The teaching content of this course is highly theoretical, and students generally have a fear of difficulties in their study.

(2) Students have poor initiative and enthusiasm in learning, and the participation degree in classroom teaching activities is low.

Due to the highly theoretical nature of the teaching content in the aviation maintenance management course, it is relatively dull to study. Moreover, the traditional teaching process is often teacher-centered, with knowledge being imparted in a one-way manner. Students lack opportunities for active participation and collaborative interaction, which results in their poor initiative and enthusiasm in the course learning and low participation in classroom teaching activities.

(3) It is difficult to transform and apply theories, the generation of maintenance management capabilities is slow, and the exercise of high-order thinking is insufficient.

The traditional teaching model that mainly focuses on in-depth lecturing can relatively well meet students' theoretical learning needs at the knowledge level. However, due to the lack of application and reflection on the learned content in the practice of maintenance and support, it is difficult to effectively connect the learned theoretical knowledge with the actual maintenance management situations. As a result, students' ability development is slow, and their high-order thinking can hardly be fully exercised.

(4) The integration of curriculum-based ideological and political education is not in-depth and lacks systematic design.

The excavation of ideological and political elements in the course is not in-depth, failing to effectively highlight the characteristics of aviation education, and lacking overall design. The connection with the teaching content is not natural, and there is a phenomenon of superficial curriculum-based ideological and political education.

In addition, the singularity and limitation of teaching resources also restrict the depth and breadth of students' learning.

4 Innovative Paths of Blended Teaching from the Perspective of CSCL

The course team follows the educational teaching concept of "student-centered, problem-driven, ability-oriented, and continuous improvement". Focusing on the pain points in the teaching of "Aviation Maintenance Information Management" mentioned above, the theory of Computer Supported Cooperative Learning (CSCL) is introduced in the blended teaching reform of the course. Comprehensive reforms and innovations have been carried out from aspects such as teaching content, teaching methods, teaching conditions, curriculum-based ideological and political education, and assessment and evaluation.

4.1 Centering on Problems, "Integrating" Teaching Content

According to the "First Principles of Problem-Centered Teaching", adhering to the guiding ideology of "job-position-led, demand-driven, task-driven" and the principle of "laying a solid foundation for job positions, thickening the development foundation, meeting the urgent needs of job positions, and guiding actual work", and comparing with the ability standard requirements specified in the talent cultivation plan, the course teaching content is reasonably determined. Based on the specific problems fed back by students in online pre-class learning and combined with the specific work contents and procedures of aviation maintenance management, specific classroom teaching content modules are designed to construct a teaching content system centered on problems, integrating theoretical learning and practical teaching, and connecting ability cultivation and job position work.

4.2 With Students as the Main Body, "Mixing" Teaching Methods

Following the educational teaching concept of "student-centered, problem-driven, ability-oriented, and continuous improvement", based on deep learning and active learning theories, modern information technologies are deeply integrated with course teaching. Relying on the CSCL platform, online and offline blended teaching is carried out by comprehensively using various methods such as PBL, RBL, CBL according to the three stages of "pre-class, in-class, after-class".

Before class, through activities such as individual self-study, online self-testing, and group collaborative study, students are helped to sort out the relationships between various knowledge points, complete the learning of basic knowledge and basic theories, and find out the difficult problems in learning, so that students can enter the classroom with questions, effectively stimulate their learning motivation, change from "passive learning" to "active learning", and lay the foundation for students to better understand and master relevant knowledge contents [6-7].

In class, the form of "divided classroom" is adopted to organize students to carry out participatory teaching activities, effectively improving students' learning enthusiasm and classroom participation degree. A large number of real pictures, materials, and cases from the front line of aviation maintenance management are introduced to carry out classroom teaching, so that students can actively explore and find the answers to problems in the process of job-position simulation operation, case analysis, and group discussion, personally experience the application of the learned knowledge in specific work, deeply understand the contents and requirements of aviation maintenance management, master the methods and tools of aviation maintenance management, overcome the fear of learning difficulties to achieve effective learning, complete the internalization of knowledge and fully exercise their management thinking and scientific logical thinking, and form preliminary aviation maintenance management capabilities.

After class, relying on the CSCL platform, students are organized to carry out personalized expansion learning based on their respective learning needs after completing homework and test questions, further consolidating the classroom teaching effect and improving the teaching quality.

4.3 Oriented by Demands, "Unifying" Teaching Resources

Based on the differences in students' professional backgrounds, knowledge abilities, learning habits, and learning goals, the course team deeply integrates CSCL technology with aviation maintenance management teaching to construct a multi-level, multi-element, and multi-directional "pan-classroom" teaching resource library composed of MOOC, SPOC, micro-courses, case libraries, and databases, better meeting the diverse learning needs of students from various majors.

4.4 Oriented by Goals, "Integrating" Curriculum-based Ideological and Political Education

Fully exert the education function oriented to professional requirements. Based on a systematic analysis of the course teaching content, divide the knowledge points into case-based, concept-based, principle-based, and method-based types. In contrast to the ideological and political goals of the course, deeply excavate the ideological and political elements contained in the knowledge points and organically integrate them into the course teaching, so as to achieve a deep integration of knowledge imparting, ability cultivation, and the cultivation of emotional and value outlooks. Further deepen students' understanding and cognition of cultivating excellent aviation maintenance

work styles, and enhance students' scientific logical thinking abilities and management qualities.

4.5 With Ability as the Core, "Synthesizing" Assessment and Evaluation

Deepen teaching interaction and focus on data analysis. Based on designing teaching content that closely adheres to the actual job work and students' learning needs, through refining the assessment and evaluation indicators and standards of teaching projects in each link of "before class, during class, and after class", a method combining quantitative and qualitative evaluation is adopted. Widely organize students to conduct self-evaluation, peer evaluation among students, and overall evaluation by teachers. From the three dimensions of completion degree, correctness degree, and execution degree, comprehensively assess and evaluate students' learning effects, enabling teachers to have a more objective, comprehensive, and in-depth understanding and more real-time grasp of students' achievement of knowledge goals, ability goals, and value goals. Effectively stimulate students' learning enthusiasm. The total course score consists of the formative assessment score (accounting for 40%) and the summative assessment score (accounting for 60%).

5 Conclusion

In response to the pain points in the teaching of the Aviation Maintenance Management course, guided by the concept of "student - centered, problem - driven, ability - oriented, and continuous improvement", the theory of Computer - Supported Collaborative Learning (CSCL) is introduced into the blended teaching reform of this course. The CSCL technology is deeply integrated with the course teaching. Through integrating teaching content, blending teaching methods, unifying teaching resources, incorporating ideological and political education into the curriculum, and comprehensively evaluating students, the course has been innovated in multiple dimensions and comprehensively. This effectively overcomes the drawbacks of the traditional teaching model, realizes the interconnection between online and offline as well as between in - class and out - of - class learning, creates an autonomous, cooperative, and inquiry - based learning environment, stimulates students' enthusiasm and initiative in learning, significantly improves students' knowledge acquisition, collaborative ability, and innovative thinking ability, and provides a strong guarantee for the improvement of the teaching quality of the course.

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