Exploration and Practice of Blended Teaching for Courses in the Context of Digital Transformation

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Abstract. The curriculum is the basic basis and carrier of educational and teaching activities, and it is the core of the digital transformation of education. With the continuous deep integration of digital technology in the curriculum and teaching, how to effectively deal with the impact and influence of the continuous innovation and breakthrough of digital technology on the curriculum and teaching, and better promote students' inquiry and personalized learning has become an urgent problem in front of us. This paper focuses on the digital transformation of the background of the curriculum teaching issues, aviation maintenance management course as an example to carry out analysis and research, which can promote the deep integration of digital technology and curriculum teaching to provide reference and reference..

1. Introduction

With the rise of big data, artificial intelligence, blockchain, 5G and other digital technologies and continuous innovation and breakthroughs, computers and the Internet, etc. are rapidly changing the way of creating, acquiring, disseminating, verifying and using knowledge, and the digital transformation of higher education is also occurring under the combined effect of a variety of factors. At the end of the year 2022, the "Infinite Possibilities: the world's Digital Development Report on Higher Education" points out that the digital transformation of higher education teaching has become an inevitable trend, and digital technology will reshape the concept, mode and practice of higher education. The key to the digital transformation of teaching lies in the deep integration of digital technology into all stages of teaching and learning, and the realization of all-round innovation with teaching as the core [1]. Curriculum and teaching as the core of the digital transformation of higher education teaching, in its constituent elements, development process, implementation methods and means, etc. have undergone major changes.

2. Components of curriculum and instruction

Curriculum and teaching is a complex dynamic system composed of various elements such as course objectives, course content, teachers, students, teaching activities, teaching environment, learning evaluation and feedback (as shown in Figure 1). Reasonable deployment between the elements of curriculum and teaching is the key to improving the quality of curriculum and teaching.

2.1. Course objectives

The "21st century core literacy" states that digital media and technology literacy is one of the core competencies that students in the information society need to master [2]. In order to be able to cope with the challenges brought about by the digital economy, artificial intelligence and the vigorous development of the intelligent digitalization process of enterprise production, and to better meet the new requirements put forward by digitalization on the cultivation of aviation maintenance talents, the objectives of the "aviation maintenance management" course must be shifted from a relatively stable to a dynamic adjustment, so as to enable the students to better adapt to the requirements of the job market ability. In order to better cope with the rapid development and wide application of big data, artificial intelligence, block chain, 5G and other digital technologies in the field of aviation maintenance, it is necessary to pay attention to the impacts and challenges brought by digital technologies to aviation maintenance, pay attention to and adapt to the requirements of new technologies in the process of occupational renewal and upgrading, and make digital literacy and skills one of the core objectives of the curriculum and teaching, so as to make students better adapt to the requirements and changes of job competence. The requirements and changes in job competence will enable students to better adapt to the needs of future digital maintenance management and guarantee.
2.2. Course content

The course content of aviation maintenance management is based on the specific tasks and practical problems in aviation maintenance management. With the maturity of big data, the Internet and other technologies, the speed of knowledge growth and updating is increasingly accelerated and accelerated, the link between the course content and the theory of aviation maintenance management and the development of aviation maintenance technology will be closer, and presented as a fusion of a variety of media, systematic, high-quality, dynamic digital open teaching resources to become an important source of course content, the course content from the fixed, structured knowledge to dynamic, open, unstructured multi-state course content.

2.3. Teaching activities

Cell phones, tablet computers, network teaching platforms, intelligent teaching systems, video conferencing systems and other diversified electronic equipment and technical systems provide the necessary material basis and technical support for carrying out various forms of teaching activities. The organization of courses has expanded from fixed-time class lectures to a combination of online and offline forms before, during and after classes. Teaching is no longer limited to one-way transmission of course content to students by instructors in order to achieve the course objectives, and the teaching activities have shifted from one-way transmission by teachers to two-way or even multi-directional interactions between teachers and students emphasizing "student-centeredness", and have expanded from face-to-face teaching activities confined to a specific physical space to diversified activities in the space of integration of reality and reality.

2.4. Teaching environment

In the process of digital transformation, the environment is always in dynamic change. With the deepening development of the digital transformation of education, the physical teaching space and digital teaching space seamlessly, virtual and real integration of teaching space is becoming the main place where teaching activities can take place [3]. The teaching environment with multi-functional digital teaching and learning tools can provide a personalized and intelligent green learning environment for students, allowing students to access anytime, anywhere, on-demand learning opportunities and continuous teaching services. It also collects, captures, analyses and processes information about the physical environment and equipment status in real time, gives students scientific and reasonable assessments, and pushes out high-quality learning resources and the most suitable learning tasks in real situations.

2.5. Learning Evaluation and Feedback

Mobile Internet, cloud computing, big data, data mining, learning analytics, artificial intelligence and other new technologies continue to emerge, providing new methods for learning evaluation, multi-dimensional analysis can be carried out with the help of big data generated in the course teaching process, process evaluation and dynamic feedback. The data source of evaluation and feedback includes teaching and learning behaviours, physiological signals of teachers and students, psychological awareness activities, facial expressions and other aspects of information; the content of evaluation and feedback includes students' daily learning achievements and behaviours, learning satisfaction, and teachers' teaching and learning process information and effects; the way of evaluation and feedback is more convenient, and can be timely, accurate and personalized teaching guidance; the form of evaluation and feedback is more rich, and the automatically generated visualization data can be used for evaluation and dynamic feedback. The automatically generated visual presentation form can help teachers analyse students' learning behaviour and learning effects from horizontal and vertical aspects, and promote timely improvement of teaching and learning.
3. Course development process

Aviation maintenance management course is the main compulsory course of aviation aircraft maintenance specialty, which plays a major role in supporting the cultivation of students' aviation maintenance management ability, and belongs to the post course with strong combination of theory and practice, including two parts of theoretical teaching and practical teaching. In the process of course development, we adhere to the guiding ideology of "job-led, demand-driven, task-driven" and the principle of "laying a solid foundation for employment, solid development, meeting the urgent needs of jobs, and guiding the actual work", and based on the cultivation objectives of aviation maintenance personnel. Based on the typical task content of aviation maintenance management work, according to the characteristics and specific situation of students, based on the basic theory and method of aviation maintenance management, with the organization and implementation of aviation maintenance work as the main line, and focusing on strengthening the practical ability of aviation maintenance management, the teaching content system is constructed, and the online and offline teaching content is reasonably determined. Among them, in theory teaching, the development of face-to-face courses to hybrid courses is realized through the construction of richer digital teaching shared resources, the provision of hybrid course development templates for teachers, the provision of network learning space and the support of digital teaching tools. In terms of practical teaching, through carrying out the whole process of analysing the impact and changes of digital technology on aviation aircraft maintenance positions, specific practical courses are set up to lay a solid foundation for the generation of students' aviation maintenance management ability (as shown in Figure 2).

![Figure 2 Digital transformation of the curriculum development "Aviation Maintenance Management".](image)

3.1. Analysis of aviation aircraft maintenance positions in the digital era

The rapid development and wide application of digital technology has had a great impact and influence on the field of aviation equipment, and the connotation of the professional ability of aviation aircraft maintenance positions has also changed to a certain extent, and in the analysis of the job capacity corresponding to the curriculum must be based on the traditional job capacity to fully explore its digital connotation, including digital professional capacity, digital learning ability and comprehensive digital literacy.

3.2. Typical work task analysis with digital technology support

Analyze the support of digital technology in the process of aviation maintenance management for the implementation of specific maintenance tasks, as well as the typical work involving digital professional competence, digital learning ability and comprehensive literacy training.

3.3. Deep integration of digital technology and curriculum

Convert typical work tasks supported by digital technology into learning tasks, and consider how digital technology can satisfy students' work process-oriented learning and support the realization of job competency cultivation objectives. For example, in the teaching content design of the unit of this course "Aviation Maintenance Quality Management", based on the principle of "problem-centered primary teaching", we design specific teaching content based on the specific problems fed back from students' online learning, through benchmarking the requirements of job competency standards and combining the actual work of aviation maintenance quality control with digital technology. Maintenance quality control work in the actual design of specific teaching content, so that students in the aviation maintenance of the first line of quality inspection of typical case studies and the analysis of aviation maintenance quality information data to achieve effective learning (a deep understanding of aviation maintenance quality of the content and requirements of aviation
maintain quality to master the aviation maintenance quality management methods and tools), and the formation of the initial aviation maintenance quality management capabilities.

3.4. Organization of blended learning units by integrating the real and virtual worlds

First, the learning task is converted into a digital blended learning unit that takes into account the physical teaching environment and virtual network learning space; second, the teaching objectives, teaching content and teaching activities are divided into online and offline; third, the data of “teaching” and “learning” in the whole process of students' learning are collected, so as to provide relative data on “teaching” and “learning” in the whole process of students' learning. The third is to collect data on “teaching” and “learning” in the whole process of students' learning, so as to evaluate students' learning process and learning results relatively objectively and accurately.

4. Methods and means of teaching implementation

4.1. Teaching system becomes more open, complex and dynamic.

The rapid development of digital technology has prompted the teaching relationship from "one to one, one to many" simple linear relationship into "many to many" non-linear relationship, and presents the characteristics of complex network linkage: self-organization, emergence and uncertainty [4]. Compared with traditional teaching digital teaching to follow different laws: from linear order to open and complex dynamic systems, the understanding of the laws of education and teaching from the traditional linear thinking into non-linear thinking, and relying on the Internet and other digital technology will teach and learn the process of behavior in the form of data recorded, teachers can be based on more sufficient evidence of timely diagnosis of student learning and guidance, teacher-student interaction is more comprehensive and in-depth. In-depth. For example, in order to improve students' independent learning ability and give full play to the students' main position, the course team has constructed rich information resources including series of micro-class, regulations database, VR cloud hall, etc. on the basis of network teaching platform, and the students make use of these information resources to carry out pre-course pre-study and post-course consolidation according to the learning tasks issued by the teachers and according to their own learning needs in the form of independent learning or group learning. Teachers use the teaching platform to feedback the results of students' pre-study and learning needs, for the doubts and difficulties that exist in students' online learning, combined with the actual work of aviation aircraft maintenance positions, through the four links of comments and summaries, the comprehensive use of classroom lectures, group seminars, case studies, role-playing, and other methods and means of organizing students to carry out classroom learning to help students achieve the teaching goals and requirements, and play a role in making up for the shortcomings and practicing the ability.

4.2. Teaching scenarios are greatly expanded in the dimension of time and space

First, the time limit has been broken through, from synchronous teaching to synchronous/asynchronous on-demand choices. Teaching can be synchronous learning of the same content at the same time under the guidance of the teacher, or asynchronous learning of suitable content at the same or different times at the pace of the students according to their own needs. The classroom of synchronous blended teaching generally requires teachers and students to have specific synchronous blended teaching tools (e.g., smart teaching platform, online real-time interactive tools, etc.), integrating the traditional classroom and the online classroom under one space and time, so that the teacher can interact with the students in real time through the screen, text, and voice, to understand the ideas and dynamics of the students, and provide timely feedback.

Secondly, it breaks the limitation of location, and the location of teacher-student interaction expands from the same place to anytime and anywhere. Teaching can be conducted both face-to-face and off-site. Teachers judge the degree of flexibility of students coming to campus from other places according to the actual situation, make clear the proportion of time allocation between face-to-face teaching and online teaching in the whole semester, and how wide a range of classes can be taught, so as to flexibly carry out co-located or co-located teaching with the help of rich technical means.

Thirdly, the teaching space has been expanded from offline teaching in physical space to mixed teaching in virtual space. In the past, classroom teaching activities mostly took place in physical spaces (such as classrooms, laboratories, etc.). With the increasing maturity of technology systems (network teaching platforms, video conferencing systems, etc.), online learning activities are increasingly integrated into daily classroom teaching, and hybrid teaching in virtual and real space has become the new normal, reflecting the characteristics of teaching development toward digitalization, contextualization, and presence. It has significant positive effects on students' academic performance [5], learning motivation [6], satisfaction [7], and satisfaction of internal psychological needs. For example, the Aviation Equipment Quality and Safety Education Warning Cloud (VR) built by the curriculum Group based on the campus network can provide online learning support for all teachers and students through the learning terminal connected to the students in the school.
4.3. The form of teaching to a variety of forms of mixed teaching

Mixed teaching not only retains the teacher's face-to-face supervision and learning atmosphere, but also increases the autonomy and flexibility of online learning. Students can switch learning methods anytime and anywhere and maintain the continuity of learning. Teachers can use the Internet to obtain open teaching resources with abundant forms, low cost and easy dissemination, and flexibly organize course content and teaching activities in terms of time and space based on students' characteristics [8]. For example, in the teaching of this course "aviation maintenance safety management" unit, the course team has built a series of micro-courses for students, regulatory database, case database, VR cloud hall and other rich information resources, the course content scenario, to provide students with immersive, hands-on, interactive virtual reality teaching environment for remote interaction between teachers and students to create a face-to-face immersive teaching and learning environment. Create a face-to-face immersive teaching experience. Students use these information resources online to carry out the learning of relevant safety theory and basic knowledge, and teachers implement diagnostic analysis of learning conditions and intelligent pushing of resources with the help of learning analytics and other technologies. Using real data information and cases, students are led to analyse and summarize the causes of aviation maintenance errors with the theory they have learned and, on this basis, are taught to use the accident causation model to find out the specific aviation maintenance work.

References