Innovation of Online Teaching Mode of "Introduction to Airworthiness" Based on "Three Steps"

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ABSTRACT

This paper analyzes the research status of online teaching, especially the demand for offline teaching in the context of epidemic situation. According to the teaching practice of "Introduction to Airworthiness", the reform and practice of "three progressive" teaching mode of "before class, during class and after class" are explored and practiced. Pre-class focus on "preparation", so as to teach on demand, reasonable platform, resource integration; The focus of the class is "teaching", so as to teach as the leading, learning as the main body, spontaneous; After class focus on "evaluation", so as to track the effect, answer questions, eliminate debts. Through the reform of pre-class setting, online discussion, classroom turnover, after-class follow-up, counseling and q&A, the initiative of students has been fully mobilized, the activity and innovation of the course has been improved, the participation and interest of students have been stimulated, and the quality and effect of classroom teaching has been effectively improved.

Keywords: three progressive, online teaching, teaching mode, innovation.

1. INTRODUCTION

Online teaching is not only the development direction of teaching modernization, but also an important mode to expand the scope of teaching and improve the teaching effect. Due to the impact of COVID-19, the adoption rate and importance of online teaching have been significantly increased, which has become the consensus of all kinds of colleges and universities in China and has been widely promoted. There are many definitions of "online education", but the more accessible interpretation is provided by Baidu Baike: distance education refers to educational activities conducted across geographical space, including lectures, discussions and internships. Usually classes as a unit to organize the teaching and two-way interaction, mainly recorded classes, in the form of "recording + online q&A" or "live + online Q&A" implementation. Especially during the epidemic, when offline teaching cannot be carried out normally, online teaching plays a unique and irreplaceable role as a reliable guarantee for communication and teaching between teachers and students. For online teaching, many domestic scholars have carried out in-depth research, in [1] , Xie Huomu took the online teaching practice of Xiamen University under the background of the epidemic as an example, the key points such as the construction of online teaching platform on campus, the selection of off-campus platform and resources, the guarantee of online teaching operation, and the monitoring of online teaching quality are put forward. In [2], Sun introduced the selection of online teaching platform, selection of live broadcast software, construction of course resources, course teaching design, teaching effect evaluation, etc., and expounds the aspects to be improved in the two mixed teaching modes. In [3], Guo-xun wang took electromechanical courses as an example, this paper preliminarily explores the online teaching mode, and discusses the online teaching preparation, online teaching work and online teaching quality management. In [4], in order to cultivate students' learning ability under the information environment, this paper puts forward some teaching strategies that teachers can adopt, such as enriching teaching methods, skillfully using online teaching platform, changing negative expectation and creating a receptive learning environment. In [5], Wai kong explored the effect of online teaching during the epidemic prevention and control period and the direction of future reform. In [6], GuanHanNan discussed the action framework and implementation strategy of integrated online teaching in the context of large-scale online teaching, and conducted relevant reflective research. The above research results provide a good reference for online teaching research and implementation.

According to the teaching characteristics of aircraft airworthiness technology professional students, the author selected the airworthiness introduction "course teaching pattern reform exploration, elaborate, earnestly implement, for every class attentively, the careful design good every link, and professional students, teachers and students cooperation and close coordination, complete the teaching plan. With the help of existing online teaching resources and micro-lesson videos recorded by the course teaching team, the author plans online teaching into three stages: pre-class, in-class and after-class, and carries out online teaching practice step by step. The pre-class focus on "preparation", so as to teach according to need, find the point of entry, targeted; The focus of the class is "teaching", so that online as offline, kind and natural, the effect does not decay; After class, the focus is on "evaluation", so as to know the truth, return visit in real time, solve difficult problems in time, and leave no debts. In the process of practice, we fully consider the difference between it and classroom teaching. Aiming at the barrier of space and the difficulty of interaction, we resolve the reality of network delay or possible obstruction in time. We adopt the teaching strategy of building platform, real-time interaction, on-demand design and paying attention to actual effect, and achieve good practical teaching effect.

2. "PREPARE FOR TEACHING" BEFORE CLASS TO REALIZE PLATFORM INTEGRATION OF TEACHING RESOURCES

The teaching object of "Introduction to Airworthiness" course is students majoring in aircraft airworthiness technology. The number of class is small and the foundation is good, which creates excellent conditions for the implementation of small class teaching. The author established a wechat group one week in advance, connected with students and opened an online platform of rain class. Through questionnaire and interview, the author identified the professional basis and interests of each student, creating implementation conditions for the smooth opening of classes and accurate teaching.

2.1. Pre-release of teaching points

According to the overall arrangement of the teaching plan, the author prepares teaching courseware one week in advance before each lecture, collects online teaching resources, and releases them through online platforms and wechat groups, so as to prepare students for preview of teaching content and warm-up of teaching.For example, when teaching the history and current situation of airworthiness development, the special interview of Xu Chaoqun, director of the Department of Airworthiness Certification of CAAC, is delivered to the students, introducing the history of airworthiness

development of CAAC over 30 years from 1987 to now, so that the students can improve their understanding of airworthiness and get familiar with airworthiness related laws and regulations and model development process. It is convenient for students to grasp the cognition of airworthiness on the whole and from the historical perspective, and establish the basic concept system of airworthiness.

2.2. Organize online seminars

Centering on the knowledge points of each class, the author insists on uploading relevant materials or arranging students to check and collect teaching resources by themselves, so as to create conditions for knowledge deepening and application transformation. Through interesting and life-oriented knowledge supplement, create an independent and lively learning atmosphere for students, and promote students to change from "I want to learn" to "I want to learn". Introduction to Airworthiness is a professional course commonly offered by domestic aviation colleges and universities, as well as an introductory course for students majoring in airworthiness. There are all kinds of relevant teaching resources on the Internet, which can be used for me in teaching. For example, for the connection and difference between airworthiness and safety, let students refer to GJB 900A and 451A, and recommend reading the we chat public account article "Overview of Aircraft airworthiness", in [7], Xiao Chuwan analysed on several Issues concerning the Relationship between airworthiness of military Aircraft and the "Five Characteristics "of equipment quality" was written to guide students to deepen their understanding of relevant knowledge.

2.3. Make good use of online high-quality resources

The Internet is like an information superhighway, flowing with all kinds of high-quality resources, cutting-edge disciplines, master lectures, high-quality websites are colorful , video open courses, micro-courses MOOC, e-book fascinating. How to make high-quality resources into the classroom, the author practiced the open teaching mode, drew materials from various sources, extracted the essence, introduced 10 national quality resource courses, MOOC courses and quality resources, such as Introduction to Aerospace, Introduction to Aviation, Aircraft Structural Mechanics, Aircraft Stability and Maneuvability (English). It selected more than 20 public accounts such as "Safety Micro Class", "Large Aircraft airworthiness" and "Hangjia Technology", and pushed online network resources such as Beijing University of Aeronautics and Astronautics, Northwestern Polytechnical University and Civil Aviation University, realizing the integration of high-quality resources in an inclusive way and setting up a big stage for students to

learn online. For example, Civil Aviation University offers the "Introduction to Aircraft Airworthiness" public account, Chinese university MOOC offers "Introduction to Aviation" MOOC, Beijing University of Aeronautics and Astronautics offers "Introduction to Aviation" MOOC, Northwestern Polytechnical University offers "Introduction to Aviation" MOOC, and so on. These online resources provide alternative resources for the teaching of this course, complementing and enriching the classroom teaching of this course.

3. "GUIDE TEACHING" IN THE SECOND CLASS, TO ACHIEVE THE REVERSAL OF CLASSROOM TEACHING

Classroom is the main position of teaching mode reform and also the interactive place of teachers and students. In the classroom, teachers should not only advance teaching according to the time process, but also take into account other teaching resources and teaching means. It is difficult to integrate the two organically. In this case, the author tries to combine online teaching with offline teaching, dividing classroom teaching time reasonably according to teaching knowledge points and difficulties, and handing part of teaching content to students to play the leading role, so as to realize the reversal of classroom teaching. Compared with traditional classes, online "flipped teaching" has greater freedom and classroom order is difficult to maintain. In order to avoid the differentiation of students, some students "ride" and "follow the trend" and eliminate the performance in class, the author established a point system, reasonable class arrangement according to the student number, as far as possible to let every student participate in it, improve the sense of participation of students.

3.1. Random questions depending on the situation

The key of classroom teaching lies in that teachers should be able to grasp the students' psychology, explain the knowledge at the same time, through the traction of problems, lead the teaching activities to the depth, and achieve challenging teaching, difficult teaching. Therefore, in class, I often ask students questions, select individual students to ask questions, in the traction of a question, to achieve knowledge imparting and solving doubts. For example, when teaching the indicator requirements of airworthiness, I set three questions. First question, what are the statistics of civil plane accidents in international civil aviation? At what level? By showing the flight accident data chart to the students, the students can discover the data rules independently and improve their observation ability and thinking ability. The second question, combined with the concept of airworthiness, makes students think and determine what safety level is appropriate as airworthiness index? What is the basis of

this indicator? Enlighten students to understand the connotation of minimum safety standards for airworthiness. The third problem, how to get the safety index of subsystem and equipment from the safety index of the whole machine? The development process of reliability is compared and analyzed, and the relation and difference between them are analyzed. Enlighten students to be familiar with the development process of model, and discover the difference between them, and establish the cognition and understanding of the particularity of airworthiness.

3.2. Simulated airworthiness review

Aircraft airworthiness has three types of certificates, which are type certificate, production license and single aircraft airworthiness certificate. These three types of documents are approved by civil Aviation Administration according to the requirements of airworthiness standards according to the procedures and approved under the premise of confirming the requirements, which fully reflects the importance of airworthiness certification. How to let students establish the concept of airworthiness certification, familiar with the basic process of airworthiness certification, master the main work in each stage of the certification process, grasp the essence of airworthiness certification. I thought about the class of the method of simulation exercise, on the basis of the basic knowledge on airworthiness approval, for students to extend the C919, the ARJ21, military aircraft airworthiness approval of materials, such as for grouping students, by a group of army as authorized, another group of authorized application procedure, the scene simulation, and implementation process of the main software, MoNiHua, Improve the realism and sense of scene through continuous improvement.

3.3. Group Confrontation

The key of flipped classroom lies in how to fully mobilize the participation and enthusiasm of students and achieve the teaching effect of "teaching-oriented and learning-oriented" under the guidance and organization of teachers. Therefore, IN the process of mode reform, I introduce the way of classroom competition. Specific practices include :

solo competition. Each student is a contestant, and the order of appearance is determined by the student number, either in a fixed order or in other ways. The topic involves English term identification, airworthiness concept explanation, airworthiness law sampling, etc. By calculating the score of each student, the total score of the student is determined and the ranking is determined;

Group confrontation. The students were divided into 2 groups and implemented in 3 cycles. In order to create a tense competition atmosphere, the competition will be

arranged in the form of randomly drawing questions according to student number, randomly answering questions according to seat order, and two groups picking each other's opponents. The questions are divided into fixed questions, random questions, on-site questions, etc., both short answer, but also case analysis; Both In Chinese and English, so that the students' teaching effect is tested in all directions.

4. "TEST TEACHING" AFTER CLASS TO REALIZE REAL-TIME FEEDBACK OF TEACHING EFFECT

In the process of classroom teaching, I divided the teaching activities into three stages: pre-class, in-class and after-class, among which the after-class link is mainly answering questions, supplementing and improving, and tracking the effect of inquiry. In view of the fact that junior professional students have heavy learning tasks, high requirements for physical training and limited free time, I adopted the method of combining offline classroom guidance with online video guidance. Through the initiative to contact with students, make an appointment in advance, to find out the gaps, to grasp the real-time dynamics of students, timely follow up the teaching truth, effectively enhance the purpose of teaching effect.

4.1. Online work

In view of the difficulties in teaching each class, the we chat group is used to release relevant professional knowledge of airworthiness to students, provide links of various materials, introduce the process of model development, and provide auxiliary materials for case study to help students complete knowledge sorting. For example, in the introduction of model certification examination, for the students to collect and display the airworthiness certificate, with the object to strengthen the knowledge of the students. When introducing the continuous airworthiness management of military aircraft, airworthiness reports of relevant models will be published online so that students can be familiar with the airworthiness work of new models and have a good idea.

4.2. Online Q&A

Since airworthiness is import, many terms are lack of native words, sounds uncommon, reads incoherent, also not easy to remember, for this kind of situation, I use the advantage of network media, for students forward relevant airworthiness of interviews, WeChat public Numbers, news broadcast, dynamic resources such as science and technology, in osmosis, repeatedly, to help students build airworthiness professional knowledge system, The transformation of textbook knowledge has also answered students' concerns and puzzles.

4.3. Online tutoring

In order to know students' learning status of the course in real time, IN addition to giving students homework, correcting and correcting, I also used interactive means such as Tencent conference and we chat group to conduct online tutoring and q&A during weekends, holidays and epidemic prevention and control. With the students over the content of each chapter, with the students to sort out knowledge points, random check students on the degree of knowledge, understand the students' interest, blind spots and weaknesses, timely help them correct and improve. Frequent communication and interaction not only deepens cognition and strengthens knowledge learning, but also establishes deep feelings with students, which is conducive to better communication with students in the future.

5. CONCLUSIONS

To sum up, during the teaching process of "Introduction to Airworthiness", the author actively explored and tried various effective teaching reforms and achieved ideal teaching effects. We can strengthen actual combat teaching, innovation of classroom teaching methods and satisfy requirements for docking troops.

At the same time, the shortcomings of course teaching are also found, which are embodied in the following aspects: first, the construction of teaching resources still needs further development, focusing on the collection and sorting of cases, and the deepening and expansion of practical teaching; Second, the number and application degree of online teaching micro-lessons are not enough, and they fail to cover all knowledge points. Third, the strength of teaching innovation is not enough, there is no innovation in every class, some teaching methods are stiff, the emotional mobilization of students is not sufficient. In the next step, it is necessary to focus on the above shortcomings, continue to strengthen curriculum construction, introduce new teaching methods, closely follow up with military and civil aircraft airworthiness pilot, and promote the continuous improvement of teaching effects.

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REFERENCES

[1] Xie Huomu, Liu Lichun, Chen Yan 'an. Thoughts on online teaching in universities under the background of epidemic [J]. Chinese University Teaching, 2020 (05) : 57-60.

[2] Sun Ke, ZHAO Kaifu. Journal of Shenyang Normal University (Natural Science), 201,39 (04) : 365-369.

[3] Wang Guoxun, LI Li. Research on online teaching mode of mechanical and electrical courses during epidemic prevention and control [J]. Industry and Information Education, 2021 (12) : 26-30.

[4] Jin Songli. Identification and Transformation of "Marginal People" in Online Teaching [J]. Modern Education Management, 2021 (4).

[5] Jiang Wei, Chen Diyi, Wang Yuchuan. Practice and reflection of online teaching in colleges and universities during epidemic [J]. Chinese Adult Education, 2021 (03) : 28-30.

[6] Guan Hannan, LI Rui, FENG Yangcun. Integrated online teaching: Action Framework, Implementation Strategy and Reflection [J]. Open Education Research, 2021 (02).

[7] Xiao Chuwan, Han Wei, DENG Li et al. Aviation Maintenance and Engineering, 2016 (08) : 35-38.