Information Teaching Design of Food Instrumental Analysis Technology Based on Hybrid Teaching Model—Take "Determination of Organophosphorus Pesticide Residues in Apples by Gas Chromatography" as an Example

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Abstract—Educational informatization is an inevitable requirement for food instrumental analysis technology courses to adapt to the new social development. This paper is based on the analysis of the learning situation of food inspection and testing technology professional courses, and combined with the current status of informatization of lectures, puts forward the idea of deep integration of informatization technology into the design of the teaching content of instrumental analysis courses, and designs a deep integration of industry and education, and a combination of theory and reality, and a combination of virtual and real teaching methods. At the same time, taking "Determination of organophosphorus pesticide residues in apples by gas chromatography" as an example, the use of intelligent teaching tools to carry out the content design around the pre-course, during the class, and after the class, and the implementation of information technology teaching teaching evaluation and effect of the teaching is summarised and explained. This paper can provide a reference for the design of informatization teaching in food inspection and testing technology, and the use of digital technology to empower the classroom teaching of first-class food courses.

Keywords- Information teaching, Teaching design, Instrumental analysis

1. Introduction

Modern information technology has brought great changes to education in the new era, bringing new opportunities and challenges, and traditional teaching methods are gradually replaced by inter-temporal, traditional teaching methods are gradually replaced by inter-temporal, informative, interactive and personalised learning methods, making classroom teaching and learning enter the information age[1-2]. This series of changes requires workers engaged in education to adapt to the new era[3]. This series of changes require workers engaged in education to adapt to the development of the new era, from the teaching concept, teaching design, teaching methods, teaching process, teaching methods, teaching evaluation, teaching reflection and other aspects of the design of new teaching concepts, exploring new teaching design new teaching concepts, exploring new teaching modes, and creating new teaching methods, in order to adapt to the new standards of the new era of information

technology teaching and learning, and to realise the new standards of education teaching and learning and achieve a comprehensive reform of education and teaching[4-5]. The students will explore new teaching concepts, explore new teaching modes, create new teaching methods to adapt to the new standard of information-based teaching in the new era, and realise the comprehensive reform of education and teaching[6].

This paper takes gas chromatography determination of organophosphorus pesticide residues in apples as an example, describes the specific implementation process of informatization teaching, uses intelligent teaching tools to carry out content design around the pre-course, in-course and post-course, and summarises and explains the teaching evaluation and effect of the implementation of informatization teaching, in order to provide a certain reference to this kind of course learning.

2. Overall teaching design ideas

This course standard is oriented to the employment of food nutrition and testing students, according to the industry vocational ability analysis table, at the same time follow the cognitive law of students in higher vocational colleges and universities, combined with the relevant assessment requirements in the real job positions of food inspectors, to determine the teaching units, course projects and work tasks of this course.

In order to fully embody the idea of task-led and project-oriented, this course determines the main teaching content according to the instrumental analysis skills that should be possessed in the jobs, tasks and vocational abilities of food testing enterprises and industries. The main content includes absorption spectrometry detection technology, potentiometric analysis detection technology, chromatography detection technology, mass spectrometry detection technology, for each detection technology, respectively, select a representative of the real testing tasks as a carrier to organise the project course content, including sample pre-treatment, instrument specification testing, data processing and evaluation, test report issuance, maintenance of the instrument and other aspects of the study.

3. Analysis of information teaching design

3.1. Analysis of learning situation

The object of the lesson is the second year students of food inspection and testing technology, who are interested in real testing tasks, but their theoretical knowledge, especially chromatography theory, is not solid enough, the foundation is relatively weak, and the level of difference is large, and they are not quite brave enough to independently operate high-end instrument operation. Students have the ability to search for information, do not like passive preaching, like to explore novelty, and have a strong personality. There is still a need to strengthen the education in the awareness of safe operation and standard operation.

3.2. Teaching Strategies

The project is driven by the "determination of organophosphorus pesticide residues in apples", which is a real task of the third-party testing company, and through the interaction of the

Vocational Education Cloud Teaching Platform, the operation of the self-developed virtual simulation operating system, watch the teaching micro-teaching, show animation, live demonstration of standard operation and other information teaching means, the school-enterprise dual-teacher teachers cooperate in the smart classroom, Virtual simulation training room, physical integration classroom and enterprise teaching centre and other places to organize teaching.

Teachers and students teach and learn by doing, and the activities on the curriculum platform are carried out before, during and after classes. Before class, students learn independently through the course platform; during class, they achieve the combination of theory and practice through theoretical learning, virtual simulation, and practical operation; after class, they consolidate and expand their new knowledge through comprehensive evaluation. Students learn independently in small groups, discuss and interact with each other, complete various teaching tasks, strengthen emotional experience, and promote professionalism.

Teaching platform automatic scoring, virtual simulation software automatic record scoring and enterprise teacher scoring three dimensions to achieve the whole learning process, knowledge ability all-round, diversified comprehensive evaluation.

Through the analysis of food safety incidents, the recognition of the serious consequences of non-standard operation and the introduction of new technology and new processes in enterprises, we implement the fundamental task of establishing moral education and cultivate students to develop the professional habit of striving for excellence, the professional attitude of truthfulness and pragmatism, and the awareness of innovation based on the post.

3.3. Teaching Implementation

Before the class, the teacher transforms the real testing project of the cooperative enterprise into a teaching project; the school-enterprise cooperation develops microclasses, teaching animations, videos, test questions and other teaching resources and uploads them to the Vocational Education Cloud Learning Platform, and releases the self-learning task list; the students log on the platform to complete the self-learning, complete the test, discussion and homework; the teachers and students communicate in real time by using the teaching platform, and the teacher adjusts and optimises the teaching strategy through the pre-course learning situation.

In the class, the teaching is divided into four teaching tasks, each teaching task is divided into four parts: creating a situation, determining the task, implementing the task, and summarising and evaluating.

1) Creation of the situation

The residual organophosphorus pesticides in apples on the human body to create a situation, derive the work of the course learning tasks, stimulate students' interest, and strengthen the maintenance of food safety occupational sensitivity.

2) Determine the task

According to the students' cognitive law and the actual work tasks of organophosphorus pesticide detection to determine the four tasks of this teaching.

3) Task implementation

Task 1: Cognition of gas chromatographs

Through virtual simulation, the instrument is split and the workflow is shown, which strengthens the two teaching focuses of instrument structure and workflow. The animation demonstration highlights the learning of the two difficult points about the separation principle of the chromatographic column and the detection principle of the detector.

Task 2: Cognition of gas chromatography detection technology

Through the virtual simulation software, the whole process of gas chromatography determination of organophosphorus pesticide residues in apples is simulated, so that students can master the correct detection process and operation more intuitively, and the background of the software automatically records the operation of the error points, which helps students to improve and enhance continuously. Through the breakthrough game, teaching animation, breakthrough detection principle, chromatographic conditions and other difficult learning.

Task 3: sample pre-treatment practice

Teachers and students work together to analyse the precautions of the testing process, and through live means, give students a demonstration of standard operation to strengthen the standard operation. Students according to the operating procedures, group sample pre-treatment practice, recording the operation process, uploaded to the teaching platform. Dual-teacher teachers guide the whole process and make real-time evaluations and summarise.

Task 4: Hands-on testing

Enterprise teachers combined with enterprise cases to help students solve the problems in theoretical learning, and through the live demonstration of the standard operation to strengthen the focus. Students in the completion of the observation and learning, based on group cooperation to complete the testing of practical exercises on the machine, and ultimately get the test results, the enterprise teacher will be the results of the students and the results of the enterprise measurement comparison, to find out the shortcomings of the students in the operation.

4) Summary evaluation

The platform automatically collects process scores such as teachers' scores, students' mutual evaluation and test scores; the simulation software automatically generates operation scores; and the enterprise teachers make group scores according to the comparison of results. Teachers summarise the students' mastery of teaching key points and difficulties according to the students' scores collected in the classroom, and comment on the students' problems in learning.

After the class, according to the students' learning in the class, the teacher carries out new knowledge learning of new processes, new methods and new technologies of the enterprise on the platform of the students, and releases certain group expansion tasks to cultivate the students' innovation ability and unity and cooperation ability.

3.4. Implementation effect

"Real workplace experience, innovation and entrepreneurship education, and inheritance of craftsmanship" are integrated into the whole process of teaching, and the cultivation of vocational emotion, vocational attitude and vocational habits are integrated into the process of combining work and study. The teaching design fully applies the teaching methods of "teaching by doing, learning by doing" and "integration of industry and education, teaching and doing", in which students, as the main body of learning, learn basic knowledge and cognitive practice before class. In the classroom teaching, the teacher takes the students' problems as the guidance, learning interest as the motivation, and project teaching as the main line to guide the students to enter the set teaching situation. Students through the pre-course independent learning and cognitive practice to produce a strong interest in learning, to achieve the expected teaching goals, successfully complete the teaching task, and achieve good learning results. By comparing the examination results, the excellence rate of the students in this project teaching is 92.5%, while the excellence rate of the students in traditional teaching is 76.5%; the passing rate of the students in this project teaching is 100%, while the passing rate of the students in traditional teaching is 95%; comparing the two teaching methods, the success rate of the practical operation is increased from 75% to more than 97%.

Comprehensive use of the course platform, virtual simulation, animation demonstration, live broadcast and other information technology teaching tools and resources, effectively strengthen the teaching focus on cracking the difficulties, students can quickly master the basic knowledge of organophosphorus pesticide testing in apples. In addition, based on the real testing projects undertaken by on-campus enterprises - testing companies with third-party testing qualifications, through the hands-on guidance of enterprise teachers to regulate the testing operation, and testing companies with testing qualifications of the testing staff for the operation and testing results of the comparison, to find the problem, and deepen the students' understanding of the rigorous professional quality and The experience of students on the rigorous professional quality and the craftsmanship of excellence. Information-based teaching resources to reduce the difficulty of learning, student comprehension increased, both before and after class to maintain a strong interest in learning, teaching to achieve the student as the main body, combined with the real inspection tasks, through the information technology platform can be more closely linked to the teachers and students, communication and interaction is more direct and more convenient, teaching and learning are not limited by time and place, can be carried out at any time and any place.

The improved quality of students' post-course assignments, active classroom discussions, and significantly improved learning motivation indicate that the use of informatised teaching means to obtain good teaching results and teaching feedback. Through information technology teaching, students' ability to find problems, analyse problems and solve problems is significantly improved, their teamwork ability is significantly enhanced, their hands-on skills on the machine are proficient and orderly, their understanding and mastery of course knowledge is more three-dimensional and rich, and they have their own understanding of the vocational quality of food inspection and testing positions. Students' comprehensive quality, professional skills and innovation ability have been greatly improved, and they have won the first prize of the National Vocational College Skills Competition as well as the gold and silver

prizes of China's "Internet+" College Students' Innovation and Entrepreneurship Competition for many times.

4. Teaching reflection and improvement

4.1. Characteristics and Innovation

The deep integration of industry and education, combined with the requirements of talent cultivation programme, curriculum standards and the needs of inspection jobs, the university and enterprises jointly reconstruct the course content, dual cooperation to write a loose-leaf "Food Instrumental Analysis Workbook" teaching materials, and dual-teacher teachers to guide the whole process. Self-developed virtual simulation operating system, can simulate a real working environment, effectively achieve the pre-processing, equipment operation, data processing and other work tasks of the whole process of testing simulation, and real-time collection of the learning situation.

Based on the real testing projects undertaken by the cooperative enterprises - third-party testing companies, real workplace education, professional teachers and enterprise teachers hand in hand to guide the standard operation, deepening the students' experience of rigorous professional quality and craftsmanship of excellence, and more vocational emotions, professional attitudes and habits of the training into the process of combining work and study.

4.2. Problems and Improvement Methods

There are differences in students' cognitive and learning abilities, and they lack the ability to adapt when encountering unexpected problems. The virtual simulation software lacks the simulation of the detailed operation process of some instruments. Strengthen the emergency training for emergency situations, and carry out analysis and response to real testing emergencies with cooperative enterprises in due course. Carry out the third phase of virtual simulation software project development, for the operation of the details of the point to improve, the use of VR technology, the development of more reflective of the testing environment of the simulation system.

5. Conclusion

The new era of information technology is endless, and the diverse digital media resources have changed the roles of both teachers and students, and is a new mode of education for teaching and learning. In recent years, education has moved to a new peak under the impetus of informatization, and the shadow of informatization education can be seen everywhere in compulsory education, vocational education, higher education and adult education. This requires workers engaged in education to conduct a lot of research on teaching mode, teaching concepts, teaching methods, etc., i.e., accurate screening and integration of digital media resources, abandonment of erroneous concepts of informatization, use of informatization used in solving difficult and important problems that are difficult to be solved by traditional education, as well as improving the motivation and initiative of students' learning with the help of informatization. Teaching evaluation is the key to reflect the success of teaching

design, in order to make the evaluation more comprehensive and objective, scientific and reasonable use of information technology to enhance the authenticity and effectiveness of evaluation, which requires educators to conduct more in-depth research in the future teaching work, through the teaching evaluation and reflection, constantly updating the concept of informatization of education and teaching, perfecting the informatization of the course of teaching design, and laying a solid foundation for the healthy development of informatization of teaching. development.

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