Application of Flipped Classroom in New Technology of Modern Animal and Aquatic Products Processing Experimental Teaching

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Abstract: order to develop students' scientific quality,innovation and technology applications,the existing problems of experiment teaching of New Technology of Modern Animal and Aquatic Products Processing are first analyzed in this paper. Then the teaching objectives are resolved, teaching processes are designed,and teaching contents are optimized by applying flipped classroom teaching mode.

1. Introduction

"New Technology of Modern Animal and Aquatic Products Processing" is a very important professional course for the major of food science and engineering, food quality and safety, and food engineering of Shandong Agriculture And Engineering University of science and technology. It's main purpose is to enable students to systematically master the basic principles and process equipment of new food high technology, including the new freezing technology, new heating technology, new separation technology, new sterilization technology, new packaging technology, and new texture adjust.And it make reasonable application in production practice . Adding experimental teaching links in the teaching process of this course can not only enhance students' understanding of basic concepts and laws, but also better cultivate students' scientific quality, innovation awareness and technology application ability.

Flipped classroom is a new teaching mode originated in the United States and gradually popular all over the world. It is also called flipped classroom or flipped classroom.It's essence is that the traditional teaching process of "imparting knowledge in class, completing homework after class" is flipped, so that students can complete the learning of knowledge before class, and complete the absorption and mastery of knowledge in class in the environment of information technology, The usual teaching method is that teachers provide learning resources in the form of teaching videos, and students complete knowledge learning before class. And it achieves knowledge internalization through teacher-student communication and homework in the classroom.

At present, there are more and more teaching research and practice about flipped classroom at home and abroad, but most of them are concentrated in primary and secondary schools, and there are relatively few practical research on flipped classroom in Colleges and universities [1] .In view of the problems existing in the experimental teaching of "New Technology of Modern Animal and Aquatic Products Processing", this paper applies the flipped classroom teaching mode to decompose the teaching objectives, design the teaching process and optimize the teaching content [2].

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2. Problems in the experiment teaching of "New Technology of Modern Animal and Aquatic Products Processing"

“New Technology of Modern Animal and Aquatic Products Processing "is an application course involving a wide range of subjects, many interdisciplinary subjects, quick knowledge renewal and strong practicality [3]. With the rapid development of China's food industry, more and more colleges and universities have set up this course to train more innovative food professionals. However, due to the influence of the traditional teaching mode and the incomplete experimental equipment, there are still many problems in the experimental teaching of this course [4].

2.1 The teaching mode is relatively stable

At present, the course generally adopts the "pouring" teaching mode, whose main purpose is to take classroom teaching as the center, teachers as the center and books as the center.Almost all of the experimental items are confirmatory experiments, such as the production of whole milk powder, the production of freeze-dried fish slices,etc,which lack of design experiments, comprehensive experiments and innovative experiments.Although these experiments used the new technology of food processing [1-3], such as freeze drying, spray drying and so on. In general, they were repetitive experiments aimed at consolidating their knowledge, developing their hands-on ability and verifying the known results.This kind of teaching mode ignores the students' subjectivity and simply regards the knowledge of the course as an objective experience that can be transferred to students by teachers. It is difficult to stimulate students' deep learning motivation and interest.

2.2 Backward teaching facilities

The required laboratory facilities have high investment and maintenance costs, and the operation is complex, requiring special maintenance, such as molecular distillation unit, supercritical fluid extraction unit and so on, Many colleges and universities are very difficult to complete.Students rarely have the opportunity to operate independently because of a limited number of these decices. They are usually only colloid mill, spray drying equipment, microwave heating equipment and other simple devices [5].

2.3 Teaching process is in a hurry

If the traditional teaching process of "imparting knowledge in class and finishing homework after class" is adopted in the experimental teaching, the teaching effect will be limited by the experimental class hours. At present, each experimental project usually only has 3-4 class hours. Taking the processing experiment of Western enema as an example, there are needed to complete the experiment at least 4 class hours when the teacher finishes teaching the experimental principle, determines the experimental parameters, and formulates the experimental steps, and then the students follow the proposed steps. There not increase the time of independent thinking and mutual discussion. Therefore, it is difficult for students to complete a complex design, comprehensive or innovative experiment in a limited time.

3. The application of flipped classroom in experimental teaching

The flipped classroom teaching mode has flipped the traditional teaching process, but also shaken the main position of teachers in the traditional classroom, forming a real sense of "combination of main body / leading" teaching method. That is to say, students are the main body of knowledge construction, teachers are the main body of teaching activities. Then the role and focus of teachers have changed from the original one-way knowledge exporter to the guide and promoter of knowledge acquisition. Therefore, flipped classroom not only requires teachers to design the whole teaching process, but also puts forward higher requirements for teaching content.

3.1 Decomposition of teaching objectives

As mentioned before, the teaching objective of this course is to enable students to systematically master the basic principles and process equipment of food high-tech such as ultra-fine grinding technology, new granulation technology and new freezing technology, and to be able to apply them reasonably in production practice. Then experimental teaching should involve these new technologies as comprehensively as possible, and decompose and integrate the teaching objectives of the course into each experimental project. According to the characteristics of flipped classroom, students can have more time to expand learning and thinking, so they can add some comprehensive and innovative experiment projects while retaining part of the validation experiment projects reasonably.The reserved confirmatory experiment can make students master the basic knowledge more firmly, the additional comprehensive experiment can cultivate students' ability of technology application, and the innovative experiment is conducive to cultivate students' innovative consciousness.

The breakdown of experimental items and teaching objectives of New Technology of Modern Animal and Aquatic Products Processing are in Table 1.

Table 1 experimental items and teaching objectives of New Technology of Modern Animal and Aquatic Products Processing

Experiment project	teaching objective	experiment type
The production of full milk powder,	Grasp high pressure homogenization, spray drying and other new technologies and equipment.	Confirmatory experiment
Preparation of freeze-dried fish slices	Grasp the new technology of freeze-drying and vacuum packaging	Confirmatory experiment
Processing of Western enema	Exploratory use of new technologies and equipment for texture adjustment	Innovative experiment

3.2 Teaching process design

The implementation process of this course is basically consistent with other flipped classes, mainly including four stages: pre-class resource preparation, pre-class autonomous learning, classroom activities and feedback and evaluation. Combined with the characteristics of this course and the actual situation of our school, the teaching process model is designed.

Resource preparation before class. The main task of teachers' pre-class preparation is the preparation of teaching resources. First of all, on the basis of fully analyzing students' learning situation such as existing knowledge reserve and new knowledge acceptance, the teacher determine the experimental projects that need to be set up in this course, and reasonably group students.Then they make courseware, video recording and expand resources. Because of the different foundation and attitude of each group, the effect of pre-class learning will be very different.

The teaching process model is shown in Figure 1.

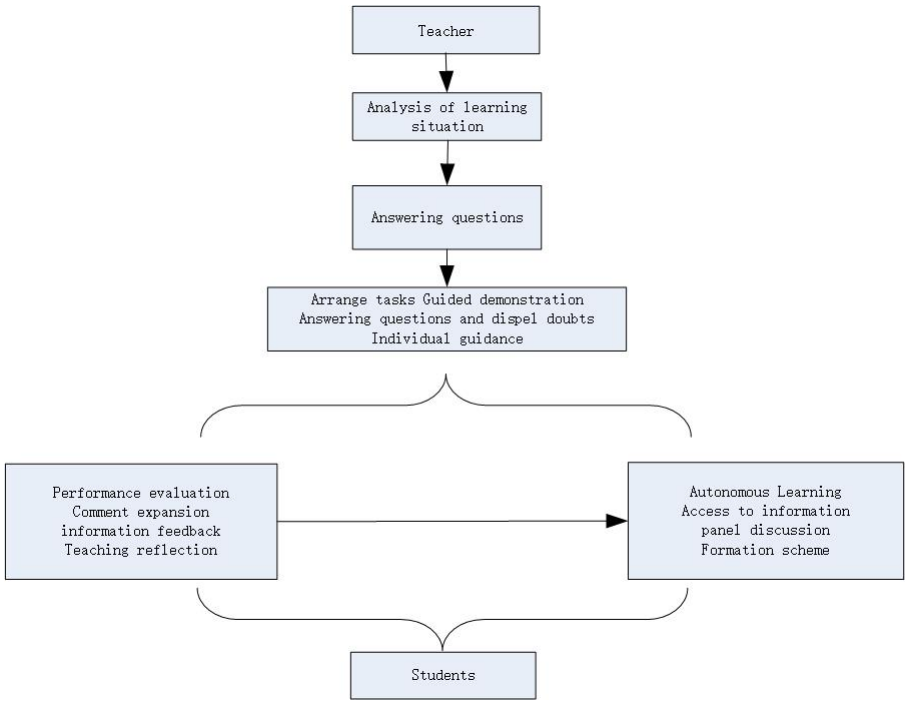

Figure 1 Teaching process model

Self-study before class. Students study independently in groups, and teachers provide courseware, videos, references and other materials. In the process of learning, they should understand the purpose of the experiment, understand the principle of the experiment, grasp the experimental method initially, and put forward questions for the knowledge points that are difficult to understand, and then try to solve the problems by consulting materials and group discussion. Students need to design the experiment plan in advance and submit it to the teachers for examination through the network platform in processing of Western enema and other innovative experiments.

Classroom activities. The stage of classroom experiment is the key to the success of flipped classroom teaching mode. As the organizer of the project, the teacher first checks the students' pre-class learning by asking questions about the main knowledge points, and then explains the experimental arrangement and precautions of this lesson As a result of pre-class learning, students have basically understood the experimental content and operation methods, and can carry out experiments according to their own understanding. During the experiment, teachers should guide each group on a tour. For some common problems in the confirmatory experiment, they should find and answer questions in time. For the innovative experiment, they should pay more attention to observation, not easily intervene and interrupt the independent exploration process of students, and give personalized guidance according to the experimental process and problems faced by each group. Students need to think more in the process of experiment. When they encounter problems, they should first solve them through cooperative exploration. If there are still unsolved problems, they should communicate with teachers to find solutions together.

Feedback and evaluation. After students finish the experiment, they can show the products, and make sensory evaluation and experience sharing among groups, then form the experiment report. The experimental report should reflect the reflection of problems and the consolidation of key and difficult knowledge. Teachers need to evaluate the results according to the classroom experiments and experimental reports, and sort out the key points and difficulties in the experiments more systematically, and feed back the information to the students in time. In addition, teachers should continue to reflect on teaching, improve teaching level, and improve students' ability of self-study and problem-solving in a subtle way.

3.3 Optimization of teaching content

In the traditional experimental classroom, teachers only need to prepare experimental instruction, while in the flipped classroom, teachers are required to prepare all teaching resources before class, including courseware, video and extended resources. Video course is the core content of teaching resources. According to the teaching objectives and knowledge difficulty of each experimental project, 1-3 video courses are usually recorded, and the time of each video course is generally less than 10 minutes. For example, the production of freeze-dried fish slices only needs to record the operation video of freeze-drying equipment, while the production of Western enema to record the operation video of texture adjustment , microwave baking and other processes respectively.Taking the experimental project of "making Western enema" as an example, the content of teaching resources is mainly shown in Table 2. In addition, for comprehensive experiments and innovative experiments, they can also download the video resources related to the experimental teaching content from the high-quality teaching resources developed on the Internet.

The teaching resources of "making Western enema"is in Table 2.

Table 2 teaching resources of "Western enema" experimental project

Teaching resources	Main content
PPT courseware	Experiment purpose, principle, method and operation rules of related instruments and equipment The use of texture equipment for meat Comparison between microwave baking and oven baking of Western enema
Video resources	Teaching materials: food processing technology, high and new technology of food engineering
Extend resources	Journal: relevant literature of food science, Chinese Journal of food science, food chemistry and other journals Network: Food partner network, daily food network, etc

It is found that the application of flipped classroom enables students to have more time to learn the course content of each experimental project, grasp the key and difficult knowledge more firmly, operate the experiment more standardized, and the experimental results, are more accurate especially the confirmatory experimental results. At the same time, students have more time to expand learning, thinking and group communication. Not only can they independently design innovative experiment methods and parameters, but also each group can basically produce expected products according to their own designed experiment scheme.

4. Conclusion

In view of the problems existing in the experimental teaching of "New Technology of Modern Animal and Aquatic Products Processing", such as the solidification of teaching mode, the backwardness of teaching facilities and the shortness of teaching time, this paper applies the teaching mode of flipped classroom, analyzes the teaching objectives, designs the teaching process and optimizes the teaching content, so that students can master the basic principle of "New Technology of Modern Animal and Aquatic Products Processing" more comprehensively And process equipment, improve the comprehensive quality, innovation awareness and technology application ability.

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