

# On the Construction of Mathematics Courses in Higher Vocational and Technical Colleges Based on Working Process

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**Abstract.** This paper analyzes the current teaching situation of traditional mathematics courses in higher vocational colleges and the characteristics of higher vocational mathematics courses based on working process, and combines with the actual situation of mathematics curriculum reform in Beijing Vocational College of Electronic Science and Technology. This paper expounds the work of several key links in the development of higher vocational mathematics curriculum guided by engineering process.

## Introduction

In recent years, higher vocational colleges have generally carried out the reform of the course of combination of work and learning. As a compulsory basic course of higher vocational colleges, higher mathematics is not closely related to the practical work field, but its basic forms of expression are consistent. That is, the integration of theory and practice of comprehensive learning task. Therefore, higher mathematics in higher vocational colleges must change the present situation of imparting knowledge as the center and focus on cultivating students' ability to acquire knowledge. Under this background, it is urgent to open up a mathematics course based on working process and suitable for higher mathematics education in higher vocational education. Combined with the actual situation of mathematics curriculum reform in Beijing Vocational College of Electronic Science and Technology, this paper briefly discusses the course Construction of higher Vocational Mathematics under the combination of work and Learning.

## The Present Situation of Traditional Course of Advanced Mathematics

The students in higher vocational colleges are admitted in the final batch, their mathematics foundation and ability are different from those of undergraduate students, and the students in the same class are different, which brings difficulties to mathematics teaching.

In recent years, the theory teaching of mathematics in higher vocational colleges adheres to the principle of "taking application as the purpose, taking necessity as a measure of necessity". At the same time, due to the influence of market demand, many higher vocational schools are drastically reducing the class hours of basic theory courses. The teaching time of higher mathematics has been greatly reduced, higher mathematics has become "tool mathematics", students' learning of mathematics is becoming more and more difficult, and there is a fear of difficulties in learning higher mathematics. It has brought great difficulties and negative effects to the students' further study.

The teaching method is monotonous and the knowledge structure is single. The traditional process of mathematics teaching is still one in which the teacher speaks, the student listens, the student always follows the teacher, the teacher learns what the student says, and the assignment is still based on consolidating the knowledge he has learned. Students in the process of learning to produce a strong dependence on teachers, a serious lack of initiative and enthusiasm for learning.

## Characteristics of Higher Vocational Mathematics Course Based on Working Process

The idea of mathematics curriculum construction based on work process is student-centered,

teachers are organizers and coordinators of students' learning process, and the implementation of task implementation, students' initiative learning, integration of teaching, learning, training, doing, and evaluation are all carried out. It breaks the implementation mode of subject course teaching which is inculcated by knowledge, accepted passively by students, disjointed from practice and theory, and completed the whole process from clear task, making plan, carrying out inspection to evaluating feedback. At the same time, promote the improvement of students' comprehensive quality. Its main features are as follows:

### **Arousing Students' Enthusiasm and Initiative in Learning Mathematics**

The teaching mode based on working process is task-driven teaching and the application of knowledge to practical teaching. This model enables students to learn mathematics with problems, and consciously solves problems with mathematical methods, thus promoting students to integrate theory with practice, to be closely linked with their professional knowledge, and to make students see mathematics and daily life in a real way. The close relationship between production practice and scientific research shows the magic of mathematics in real life and the beauty of mathematics in the objective world, thus arousing students' enthusiasm and initiative in learning mathematics.

### **To Cultivate and Improve the Students' Ability of Computer Application and Occupation**

Mathematics practice course enables students to master modern computing tools, that is, computers and various mathematical software. The use of these computing tools has trained the students' ability of data processing and computer programming. At the same time, in the process of solving practical problems with computer, the students' professional ability has been improved.

### **Promoting and Strengthening the Construction of Teachers' Team**

The introduction of mathematics practice course has changed the teacher's understanding of mathematics teaching task and function. In the past, the understanding of mathematics was to attach importance to its foundation, that is, to emphasize basic knowledge, basic skills and basic mathematical ideas and methods, but the extensive application of mathematics was not well understood, and the mathematical modeling and experiment were not well understood. Mathematics practice requires teachers to have a wide range of knowledge, creative thinking, hard to think, to go deep into reality, to solve practical problems, but also to learn how to use the computer skillfully, to continue to learn. This has promoted and guaranteed the quality and level of mathematics teachers in higher vocational colleges, especially in young and middle-aged mathematics teachers.

## **Development of Mathematics course in higher Vocational Colleges based on working process**

The mathematics curriculum development of "combination of work and study" is a process from work system to learning system. In order to carry out the knowledge that is really useful to students, we need to adopt job analysis, teaching analysis, and goal determination. The selection of teaching contents, the design of task carrier, the design of teaching organization, the implementation of teaching, the evaluation of teaching, and so on, finally, the design of integrated teaching of "teaching, learning, training, doing and evaluating" is carried out. According to the actual situation of mathematics course construction in our college, this paper expounds the work of several key links.

### **Job Task Analysis**

Most teachers in higher vocational colleges come from ordinary universities and lack practical work experience, so it is very important for curriculum development to go out and carry out solid work research. The course development team and the enterprise personnel work together to carry out the typical work task analysis solid, through the field observation, the enterprise visit and the questionnaire investigation and so on way carries on the typical work task analysis. The analysis includes two aspects: one is to analyze the whole process of production (service), including the work object, working steps, work requirements, process specification and equipment tools and so on.

The second is to analyze the organizational structure of posts and departments, clarify the way of labor organization, and understand how to be reasonable. Division of labor and efficient work.

Each work process includes elements such as work objects, tools, methods, labor organization, job requirements, and so on, which reflect the knowledge of the work process related to the work situation, so that it can be based on the analysis of typical work tasks. Combing the learning content with work elements is the useful knowledge for students to work in the future, and it is the learning content that students should learn.

### **Choosing Practical Problems (Projects) as the Teaching Carrier**

The famous mathematics educator H. Freudenthal, believes that mathematics teaching should teach the mathematical discovery process of abstracting these structures from rich realistic situations. Learning refers to the formation of this systematic process of mathematical activity, not the final result of systematization. Because the systematic end result is a system, a beautiful closed system, even closed to no entry or exit. What students want to learn is not mathematics as a closed system, but mathematics as a human activity, that is, the mathematical process from real life. If necessary, it can also include mathematical processes starting from mathematics itself. Students should form a relatively open system is at least a closed system with both entrances and exits.

"Problem solving" precisely reflects the "entrance" and "export" problems, that is, starting from the real situation (the "entrance"), which includes both the objective world and the real life. Also includes the student later enters the work position the work process. In fact, this is a very important aspect of the application. The so-called "export" refers to the application of mathematical knowledge to real situations. What we're talking about is not just solving the export problem, but more importantly, solving the entrance problem, that is, introducing mathematics from the real situation so that students can feel math around me anytime and anywhere. In mathematics, textbooks pay more attention to numbers. Learn the application. When dealing with mathematical content, we should follow the model of "practical problem (working process) and mathematical application (working process)".

The selection of the carrier of the course teaching project is completed in our college through three ways. The first is to choose the suitable teaching carrier from the typical vocational task; the second is to design the problem (project) to meet the needs of the enterprise according to the various information of the enterprise's demand. Third, teachers and students through mathematical modeling competition to study and capture social hot issues (social economy, energy, information, environmental protection, transportation, communications) as the teaching carrier. Of course, the selected project should have a professional background, easy to teach, interesting or easy to attract students' attention.

### **Curriculum Assessment Model**

The examination mode of higher vocational mathematics has always been carried out in the form of final written examination, which makes the students who can only do the same thing have the advantage, which seriously restricts the students' innovation ability. Mathematics course in higher vocational education is a compulsory course for every major in our school. The main teaching goal is to train students' logical thinking ability, operation ability and solving some experimental problems by using mathematical experimental methods and mathematical modeling ideas. Therefore, the assessment system of our school adopts 1-2-2-5 examination system, that is, basic quality is 10, computer operation is 20, homework (experiment report) is 20, written test score is 50.

(1) Basic quality: the attendance rate of students, classroom discipline and abide by the rules and regulations of the computer room;

(2) Computer operation: complete the mathematics experiment task in the course and carry on the computer test;

(3) Normal classes: according to the requirements of the curriculum to complete mathematical modeling and analysis of the experimental report;

(4) The basic theory part of mathematics is tested in the form of closed paper. The same examination paper is used in the same course, and the collective examination paper is organized

after the examination.

### **The Construction of Teaching Team**

With the continuous exploration of higher vocational education and the deepening of educational and teaching reform, after completing the orientation of running a school and establishing the idea of running a school, each higher vocational college gradually shifts its focus of work to the professional construction and curriculum reform. In particular, the construction of professional teaching team has become a key and hot issue in higher vocational colleges. Building a high level of professional teaching team is an important guarantee of specialty construction, curriculum construction and implementation of "combination of work and learning" in higher vocational colleges, and is also a key measure to improve the quality of higher vocational education.

The teaching team should be composed of mathematics teachers, professional teachers and part-time teachers in enterprises. The team needs to integrate teachers of different specialties, and teachers should work in the front line for a long time. With rich teaching experience, professional courses and part-time teachers in enterprises play an important role in the orientation of courses, the choice of teaching carriers and the revision of contents.

Mathematics teaching based on the working process insists on the organizational boundary of the work scope as the curriculum content, the organizational logic of the work process as the curriculum content, the typical work task as the carrier, and the completion of the work task as the curriculum goal. Taking the action orientation of work process as the course implementing principle, this paper emphasizes the ability of using mathematics knowledge to solve practical problems, which fully reflects the function of higher vocational education in cultivating high skill applied talents. The reform of higher vocational mathematics teaching based on working process is just in the initial stage of exploration. With the efforts of its peers, it will become more perfect and become an effective teaching mode of higher vocational education.

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