

# Discussion on Mathematics Teaching Objectives in Higher Vocational Colleges from the Perspective of Quality Cultivation - Taking Urban Rail Transit Major as an Example

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**Abstract:** According to the "improvement of education and teaching related standards" put forward in the "national vocational education reform implementation plan", taking the urban rail transit specialty as an example, this paper discusses the determination of the knowledge target, ability target and quality target of the mathematics curriculum teaching in higher vocational education through the investigation of the post ability demand of the employing unit, the investigation of the teachers of the urban rail transit specialty, the analysis of the students' personal development quality demand and the internal logic of the mathematics curriculum knowledge content. I hope that we can use this as a reference for higher vocational mathematics teaching reform.

## 1. Introduction

With China entering a new stage of development, industrial upgrading and economic restructuring are accelerating, the demand for high-quality technical and skilled personnel in all walks of life is becoming more and more urgent, and the important position and role of vocational education are becoming increasingly prominent. In order to further run the vocational education in the new era, the State Council issued the national vocational education reform implementation plan in January 2019, which proposed to "improve the relevant standards of education and teaching", giving play to the basic role of standards in the quality improvement of vocational education.

From pursuing scale expansion to improving quality. Higher vocational colleges need to provide high-quality human resources support to promote social development and improve national competitiveness. Higher vocational schools should train high-quality technical and skilled personnel to serve the regional development.

Mathematics is one of the important tools for studying natural science and engineering technology, and is an important basic course for improving students' cultural quality and learning relevant professional knowledge. In the higher vocational stage, mathematics learning plays a very important role in the cultivation of students' comprehensive quality. The determination of mathematics curriculum standards in higher vocational colleges is of great significance in promoting the improvement of mathematics teaching quality in higher vocational colleges.

At present, there is no unified national teaching standard for higher vocational mathematics in China. Because different schools offer different specialties and have different demands for mathematics teaching, there are many factors to consider in establishing a national unified mathematics teaching standard for higher vocational education, which is difficult and unclear in practicability. At present, most domestic higher vocational colleges adopt their own curriculum standards or outlines to carry out teaching work. In order to make the curriculum standard of higher vocational mathematics, we need to make clear the teaching goal of higher vocational mathematics. This paper will take the urban rail transit specialty as an example, from the four dimensions of the employer's ability demand, the professional curriculum learning demand, the students' personal development demand and the inherent logic of mathematical knowledge, analyze, discuss and determine the teaching objectives of Higher Vocational Mathematics in the perspective of quality training.

## 2. To Determine the Path of Higher Vocational Mathematics Teaching Objectives

Mathematics is a basic course. This paper takes the educational concept of "work-study combination, unity of knowing and doing" as a guide, and takes the demand of job ability and professional course learning as a starting point to determine the teaching goal of mathematics course in higher vocational colleges from the perspective of quality cultivation.

Urban rail transportation is a management major, which requires relatively less mathematical knowledge than the common major of communication, signal, machinery and electronics in higher vocational colleges. This paper takes this major as an example to analyze the teaching objectives of mathematics in higher vocational colleges, and attempts to draw a conclusion that mathematics learning is still very important for these majors that do not seem to need to offer mathematics courses. In this paper, the path to determine the teaching objectives of higher vocational mathematics courses is as follows (see Fig. 1):

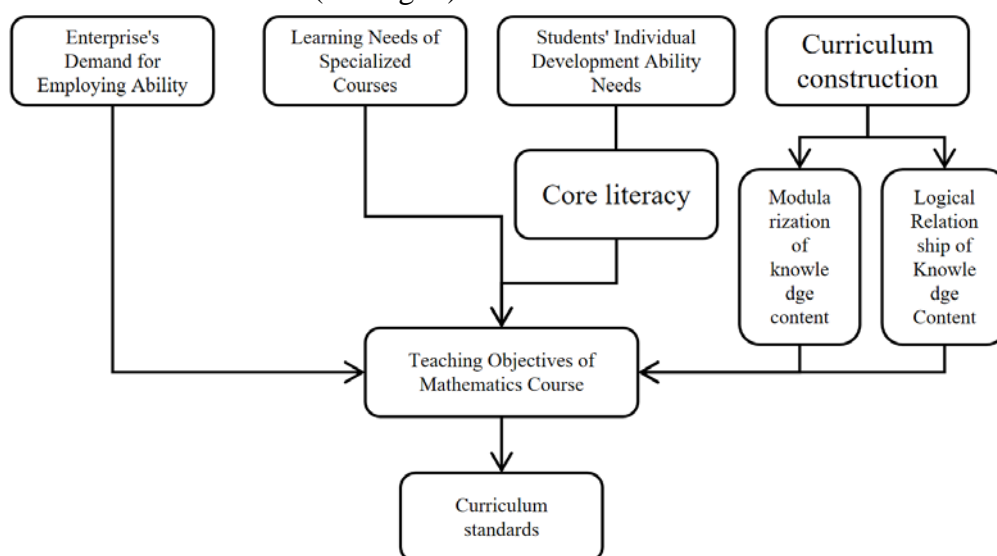


Fig. 1 the way to determine the teaching goal of Higher Vocational Mathematics from the perspective of quality training

Through the investigation of the employing units, understand the demand for the corresponding post capacity of the enterprise in this major; Through the investigation of the teachers of urban rail transportation specialty, we can understand the demand of mathematics knowledge for the specialty courses. According to the internal logic of mathematics curriculum knowledge content, combined with the needs of students' personal development quality, the teaching objectives of mathematics curriculum are determined, so as to formulate appropriate teaching standards for higher vocational mathematics curriculum.

## 3. Determination of Teaching Objectives of Mathematics in Higher Vocational Colleges

### 3.1 Professional background introduction

With the rapid development of China's social economy and urbanization, urban rail transit develops rapidly, and urban rail transit transportation and management specialty emerges as the times require. The training goal of the professional talents requires us to train professional talents with ideal, firm belief, moral and technical skills, comprehensive development, certain scientific and cultural level, good professional ethics and craftsman spirit, and strong employment and entrepreneurship ability. They should have the key ability to support lifelong development and adapt to the requirements of the times, and master the professional knowledge and technical skills of urban rail transit operation and management. They need urban rail transit service and other occupations facing the road transport industry, and can be engaged in passenger transport organization, traffic organization, ticketing organization, passenger transport service and other work

in urban rail transit station staff, station attendant and other job groups. They need to meet the needs of all-round development with four qualities of self-confidence, morality, intelligence, physique and aesthetics, and be able to become outstanding workers and reliable successors of socialism with Chinese characteristics.

### **3.2 Research on the demand for the post ability of the employing enterprises**

Through the interpretation of the talent training program, we have identified the jobs of the graduates of this major. According to the jobs, we conducted a sample questionnaire survey on one of the employing enterprises (Shenzhen Metro). The subjects of the survey are the frontline staff of Shenzhen subway and some management positions. The research topic is the demand of the positions for mathematical ability.

The analysis of the survey results shows that the employees in the relevant jobs of the employing unit (Shenzhen subway) need to have certain mathematical literacy, and the demand of the jobs for logical thinking ability is higher than the demand for mathematical knowledge. The ability that the enterprise needs is concentrated in: learning ability, logical reasoning ability, organization and communication ability, organization, emergency handling ability and standardization.

### **3.3 Investigation and Analysis on the demand of mathematics knowledge in the study of professional courses**

Through the interview and investigation of the relevant teachers of urban rail transportation major in Wuhan Railway Vocational and Technical College, we know that the knowledge demand for mathematics in the core curriculum of the major is operations research. Operational research is an important professional basic course of modern management, and it is a new subject developed in the early 1930s. Its main purpose is to provide scientific basis for managers in decision-making, and it is an important theory to realize effective management, correct decision-making and modern management.

The study of operations research requires certain mathematical modeling ability, strong logical thinking ability and basic linear algebra knowledge, as well as certain data analysis ability and calculation ability. The study of operations research is not closely related to mathematical knowledge such as higher mathematics and probability theory, but the mathematical thinking mode and the rigor of logical thinking developed in the early mathematics study are the important foundation of operations research study. That is, the study of urban rail transport professional courses requires students not only to have certain data analysis and mathematical operation ability, but also to have strong logical thinking ability and mathematical modeling ability. Compared with mastering basic mathematical knowledge, it requires higher learning level of mathematical thought and mathematical thinking.

### **3.4 Students' personal development core competence needs**

The core accomplishment of students' development mainly refers to the essential character and key ability that students should possess to adapt to the needs of life-long development and social development. Core accomplishment is the concretization of the Party's educational policy, a comprehensive expression of students' knowledge, skills, emotions, attitudes, values and other requirements, and an indispensable common accomplishment that every student needs to achieve a successful life and adapt to personal life-long development and social development. The core quality of Chinese students' Development released in 2016 focuses on the cultivation of "all-round development of people", which is divided into three aspects: cultural basis, independent development and social participation, covering the character and ability of students to adapt to life-long development and social development.

Mathematics core literacy is the embodiment of Chinese students' development core literacy in mathematics, which can accompany students for life, enable students to have the ability of lifelong learning, help students to develop in an all-round way and adapt to the future society. The essence of mathematical core literacy lies in observing the real world with mathematical vision, thinking about the real world with mathematical thinking and expressing the comprehensive literacy of the

real world with mathematical language. The key abilities of mathematics core literacy include mathematics abstract ability, mathematics reasoning ability, mathematics modeling ability, intuitive imagination ability, operation ability and data analysis concept.

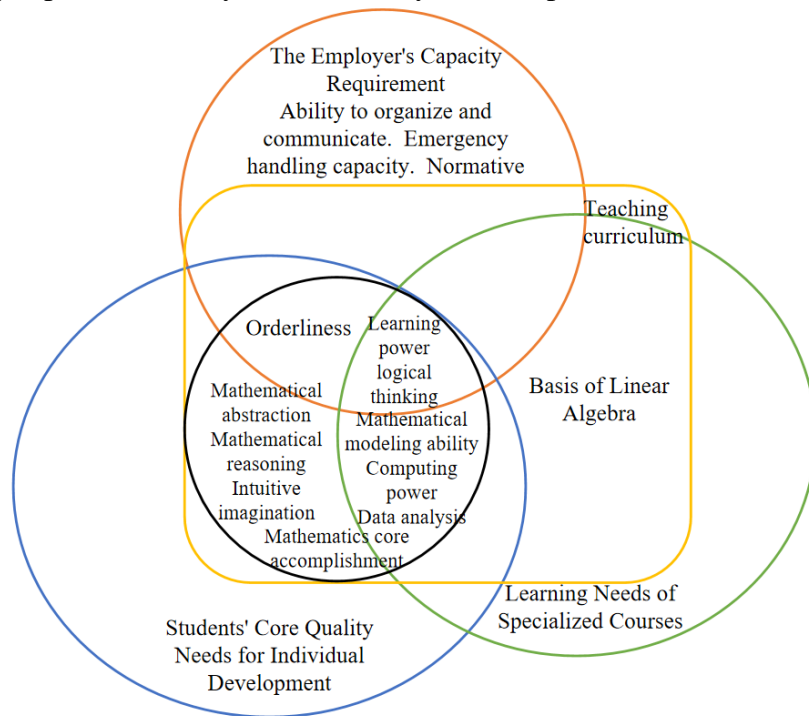


Fig. 2 Analysis of mathematics teaching goals in higher vocational education from the perspective of quality training

#### 4. Summary

Based on the above analysis (see fig. 2) and in combination with the physical and mental development characteristics and cognitive laws of students in higher vocational colleges, we define the learning objectives of higher vocational mathematics as knowledge objectives (unary calculus, matrix), ability objectives (logical thinking ability, operation ability, modeling awareness), and quality objectives (patriotism, craftsmanship, learning ability, and cooperation). In order to cultivate students' comprehensive ability, the aim is to cultivate their quality and the carrier is knowledge learning.

According to the characteristics of vocational education and the needs of social development, and in accordance with the spirit of the "national vocational education reform implementation plan", we have determined the overall teaching goal of higher vocational mathematics curriculum as follows: follow the principle of "practicality first and sufficiency second". In higher vocational mathematics teaching, it is necessary to strengthen the cultivation of students' thinking ability, strengthen the connection between the teaching content and the actual situation, and strengthen the cultivation of students' logical thinking ability, operation ability, problem analysis and problem solving ability. Through training students' awareness of mathematical modeling, students' mathematical literacy is gradually improved, and students' humanistic quality, scientific quality and sustainable development ability are cultivated.

Higher vocational mathematics teaching objectives are as follows:

##### 4.1 Knowledge target

- (1) Master basic knowledge of unary calculus, master basic concepts and perform basic operations;
- (2) Master the basic concepts and basic operations in matrix theory, and can use matrix operations to solve N-element linear equations.

## 4.2 Ability target

(1) Have a certain sense of mathematical application. Through the study of basic concepts, infiltration of mathematical modeling ideas, experience the use of mathematical thinking methods to analyze and solve practical problems, so that students have a certain sense of mathematical application;

(2) Can correctly carry out basic operations. Through basic operation training, improve logical reasoning ability, data analysis ability and operation ability;

(3) Can standardize the writing of mathematical expressions. Through training, improve students' ability to observe carefully and their awareness of obeying rules;

(4) Have certain visual imagination ability. Using graphic combination to train students' image thinking and improve students' visual imagination ability;

(5) Have certain analysis, reasoning and judgment ability. Through targeted thinking training, students' abilities of observation, imagination, judgment, calculation and logical reasoning are improved.

(6) Have certain learning ability. Through the course learning process, cultivate students' autonomous learning ability, help students find suitable learning methods, improve students' learning ability.

## 4.3 Quality objective

(1) Love the motherland, have correct learning attitude and strong sense of responsibility;

(2) Cultivate the spirit of craftsman, and have a strict and down-to-earth work style that follows rules and disciplines;

(3) Possessing certain autonomous learning ability;

(4) Strong communication, cooperation and innovation capabilities.

Higher vocational colleges provide high-quality technical and skilled talents for China's industrial upgrading and economic restructuring. Mathematics learning can cultivate students' key abilities to support their lifelong development and adapt to the requirements of the times. The teaching objectives determined according to the job requirements and subject characteristics will be an important basis for us to formulate the mathematics curriculum standards for higher vocational colleges. I hope this article can provide a reference for higher vocational mathematics teaching reform.

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