Research on Teaching Reform of Fuzzy Mathematics Curriculum for Professional Degree Engineering Masters

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ABSTRACT

This paper analyzes the characteristics of professional degree engineering Master, and put forward the "application practice ability" of professional degree engineering Master students as the core of cultivation. Taking the fuzzy mathematics curriculum of the professional degree of engineering degree in the field of Safety Engineering as an example, we have constructed a teaching mode for the fuzzy mathematics curriculum of professional degree engineering Masters based on the training mode of “applying practice ability”.¹

KEYWORDS

Professional Degree, Engineering Master; Fuzzy Mathematics curriculum; Application Practice Ability

INTRODUCTION

In order to optimize the structure of postgraduate education in China and adapt to the needs of the society for high-level applied talents, the Ministry of Education decided to enroll the full-time professional degree engineering Masters who are mainly undergraduate graduates in 2009. It changed the postgraduate education from academic talents. In 2012, the country has implemented a professional degree engineering Master training program for the “Special Needs for Personnel Training

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Program for National Special Needs”. As the first batch of pilot units, Chongqing University of Science and Technology was approved to enroll a Master’s degree in engineering in the fields of Safety Engineering and Petroleum engineering field in 2012. The course of fuzzy mathematics was selected as a degree elective course for professional degree engineering Masters in the field of safety engineering.

Over the years, we have taken the “application practical ability” of professional degree engineering Master as the starting point, and adhered to the teaching philosophy of “innovative application-oriented talent training”. In the process of constructing fuzzy mathematics curriculum, we have carried out bold innovations and practices in terms of the teaching content, teaching system, teaching methods and teaching modes of the curriculum. We have constructed a fuzzy mathematics curriculum teaching model for the professional application of engineering Master's "application practical ability" as the core of training, it have promoted the professional education of professional degree engineering Master. The quality of talent training has achieved good results.

NEW FEATURES OF FULL-TIME PROFESSIONAL DEGREE

The full-time Master's degree is a different degree from the academic degree Master. It is a different type of degree classification that belongs to the same level as the academic degree. The "professional degree" is relative to the "academic degree". Its training goal is to master solid professional knowledge and profound theoretical foundation in a certain professional field. It has strong ability to solve practical problems and be able to undertake professional technology or management work, and have good professional quality. The high-level application talents are based on the “applied engineering master’s degree”. Compared with academic degree Masters, the professional degree Masters have the following characteristics.

First, professional degree Masters have the characteristics of “occupationally”. With the rapid development of the country’s society, economy, science and technology, the professional degree is to meet the development of the specific field of the national economy, and to cultivate strong professional competence and professionalism. A type of degree that can be creatively engaged in high-level applied talents working in the professional field. It emphasizes that "professional degrees have a relatively independent educational model. It has a professional orientation in a specific professional field and professional and academic. Unite". Therefore, the professional degree of professional degree determines that the professional degree of engineering Master is aimed at cultivating applied talents engaged in non-academic occupations. "Occupationally" is the core element of the training goal of professional degree engineering Masters?

Secondly, the professional degree Masters have the characteristics of “applicability”. In 2009, the “Ministry of Education made some opinions on the training of full-time professional degree Masters”. It has pointed out that full-time professional degree graduates should have strong ability to solve practical problems.
They can undertake professional technology or management work.” This indicates that the full-time professional degree engineering Master education must implement practical application as the carrier in the process of talent cultivation. It must have clear practical application in curriculum construction and teaching. Therefore, practical application must run through the talent cultivation process.

Third, professional degree graduates have the characteristics of “domain”. The “domain” refers to the field of occupation or industry, such as oil engineering field, safety engineering field. The full-time professional degree postgraduate education is oriented to specific industry fields. It is required to introduce knowledge from the industry into the curriculum system. Based on the industry, we have established a model of joint training between schools and industries (enterprises). This can achieve an organic connection between teaching standards and professional standards, and thus achieve the ability to train students to solve practical problems in specific areas of society. Therefore, "domain" is the inherent requirement of its content.

CONSTRUCTION OF COURSE TEACHING MODE

The rationality of the teaching of the Master's degree program of professional degree is directly related to whether it can realize the development of the professional degree education of the application-oriented high-level talents that meets the needs of the society. Aiming at some of the new features appearing after the expansion of professional degree Masters and the problems existing in the current professional degree graduate education, we have analyzed the teaching status of the fuzzy mathematics curriculum offered by the Masters in the safety field of the Chongqing University of Science and Technology. The fuzzy mathematics curriculum teaching mode of “Building a master's degree in professional degree with practical ability training as the core” was determined.

Teaching Content and Teaching System

The perfect curriculum content and reasonable teaching system can help students build a reasonable knowledge structure. It can lay a solid foundation for students and enhance their ability to innovate and apply. Therefore, it is especially important to construct a reasonable postgraduate course teaching content and teaching system. Aiming at the core of the professional degree Master's degree and the characteristics of the safety engineering field. We continue to improve the teaching content and teaching system of fuzzy mathematics curriculum, and adhere to the "practical application-oriented" in the construction of fuzzy mathematics curriculum. It focuses on the combination of the theoretical nature of the curriculum and the applicability of the curriculum.

The fuzzy mathematics curriculum is a degree course in the field of security. Its knowledge is very broad and the content is very rich. We select the classic content of fuzzy mathematics as the teaching content of the curriculum. These contents
include the basic theory of fuzzy sets, such as the three principles of fuzzy, fuzzy relations and fuzzy reasoning. It allows students to master the basic theory of fuzzy mathematics and master the basic theories and methods of dealing with fuzzy phenomena. At the same time, they will lay the necessary mathematical foundation for further scientific research in their own fields.

Fuzzy mathematics is a more applied discipline arising from actual needs. It comes from reality and serves the reality. In the process of teach, we also combine the new situation in the current professional degree engineering master's education. We take the innovative thinking of the professional degree in the security field and the ability to solve practical problems as the core, and cultivate the ability to analyze and solve problems as the guiding ideology. The most widely used and mature models of fuzzy mathematics are selected. They include that fuzzy pattern recognition, fuzzy clustering analysis, fuzzy comprehensive evaluation and fuzzy linear programming, etc. These contents include both general theories and common models of fuzzy mathematics applications, as well as a wealth of application examples. The latest research results of the model in the field of safety engineering are introduced at any time according to the corresponding models. Through the introduction of the new application of these theoretical models, it not only mobilizes the enthusiasm of students to learn. And expands the horizons of students, but also inspires students' ideas and enhances students' innovative ability. Among them, we constantly create new results.

In short, we strive to clarify the teaching content of fuzzy mathematics curriculum to ensure basic and cutting-edge, and form a reasonable curriculum teaching system. It combines the fuzzy mathematics curriculum with the domain characteristics of a master's degree in safety engineering.

**Focus on Practice**

Practicality is a distinctive feature of the professional degree master's training process. The practical performance of the curriculum is closely related to the actual content of the curriculum, which helps the professional degree Master to solve the problems in practice. However, the proportion of practical curriculum in the professional degree postgraduate education was less than the theoretical curriculum. The content of the curriculum was light and practical in the past, which was not conducive to the graduate students to achieve scientific research and innovation and future development in their careers. According to the development strategy of professional degree in the field of safety engineering, we set up experimental and practical links in the teaching of fuzzy mathematics. The practice (experimental) time is not less than one-third of the total number of curriculum. For example, we have created a “Handwritten fuzzy model recognition”, Fuzzy clustering analysis of DNA”, “Fuzzy comprehensive evaluation of mine safety”, Fuzzy linear programming model of risk investment strategy”, etc. In the experimental class, the teacher leads the students to carry out experimental demonstrations. After the class,
the students develop these experiments or other experiments. Opening of these experimental classes mobilized the enthusiasm of students to learn and deepen their understanding of the teaching content, and improved the ability to apply fuzzy mathematics knowledge to solve practical problems.

**Case Studies and Discussion Courses**

The fuzzy mathematics curriculum is a branch of mathematics. It has the characteristics of conceptual abstraction, strong theoretical theory and wide application. While carrying out the teaching content and system reform, we carried out the "case teaching method" and reformed the teaching model and teaching methods of fuzzy mathematics curriculum.

The "Case Teaching Method" is a method of organizing students to learn, research, and exercise skills by asking questions, analyzing problems, and solving problems according to the needs of the teaching objectives and content. We have built a "fuzzy pattern recognition" case library, the "fuzzy cluster analysis method" case library, the "fuzzy comprehensive evaluation" case library, the "fuzzy linear programming" case library, etc. Application case teaching method, students can systematically master the whole process of data processing, model building, solving, and result analysis. It teaches students to use the knowledge and methods they have learned to solve practical problems.

Full-time engineering Masters are mostly from fresh graduates. They have certain self-learning ability. In order to highlight the characteristics of research teaching in professional postgraduate education, we try to organize fuzzy mathematics teaching in a similar scientific way. Students learn independently, cultivate students' innovative spirit, improve the teaching mode of independent research ability, and open a certain number of research and discussion classes. The seminars are taught by teachers or students for a certain period of time. The teacher group discusses the students around the theme, including There are difficult problems and how to find solutions, explain their respective evaluations of relevant theories and opinions, and express their own opinions. This kind of research-based teaching method can not only promote graduate students to read carefully, understand reading materials, grasp the essence of the theory, but also cultivate the ability of graduate students to think independently and express their opinions clearly, and stimulate creative thinking through the collision of different viewpoints.

**CONCLUSIONS**

The fuzzy mathematics curriculum involves rich theoretical knowledge, strong practicality, and wide application range. The teaching model of academic degree graduate students can’t meet the requirements of professional degree education. Combining the characteristics of the safety engineering field and the goal of master's degree training for full-time professional degree engineering. We take the course of
fuzzy mathematics curriculum as the entry point. We carry out teaching reform exploration from the aspects of curriculum teaching content, teaching system, teaching mode and teaching methods. This model provides a reference for solving some of the problems students have when they study this curriculum. The model also explores new training models for the cultivation of innovative application talents for professional degree engineering Masters.

REFERENCES