

## Exploration on the Construction of New Energy Materials and Devices Specialty in Applied Colleges under the Background of “Emerging Engineering Education”

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**Abstract:** “Emerging Engineering Education” is the new trend for Chinese universities and have been attracted much attention. In order to accelerate the development of New Energy Materials and Devices Specialty (NEMD) in Applied Colleges base to " Emerging Engineering Education ", some factors that hindered the development of NEMD were analyzed and the further strategies for development of NEMD were discussed in this paper.

### 1. Introduction

In order to enable China's higher education to adapt to the demand of the technological revolution and industrial change, the concept of “Emerging Engineering Education” was proposed and promoted by the Ministry of Education.

The quality of undergraduate teaching and cultivating talents should be improved through the cultivation of diversified and innovative outstanding engineering talents. The great opportunities of the engineering education innovation appear after that the action plan of “Emerging Engineering Education” was proposed by the meetings of “Fudan Consensus”, “Tianda Action” and “Beijing Guide” since 2017 [1-2].

The specialty of New Energy Materials and Devices which combines the contents of specialty of Materials and that of Energy was one of the most important specialties of “Emerging Engineering Education” [3]. Although the specialty develops rapidly, there are still several factors that hinders the construction and development of the specialty.

The discussions were focusing on the following two aspects: Factors hindering the development of the specialty, Strategies accelerating the development of the specialty.

### 2. The Factors hindering the development of NEMD

#### 2.1. The Inaccurate Orientation of Training Objectives

The orientation of application-oriented colleges was proposed by Mr. Pan [4]: to cultivate application-oriented undergraduate colleges and universities with the purpose of learning professional knowledge of various industries and transforming high-tech into productivity. However, in the process of setting the professional training objectives, teachers who graduated from high-level research-oriented universities were influenced by their own professional background and established the training objectives and corresponding curriculum system. The lack of in-depth understanding of

the local industry, talent needs and their own characteristics, resulted in the mismatch between students' engineering competence and the demand for technological innovation of enterprises.

## **2.2. The inappropriate training ideas and methods of applied talents**

In the current system of higher education, national high-level research-oriented universities which have better social recognition and reputation are the leaders of the revolution of education. However, Local colleges and universities which have weak recognition, influence and weak resource integration ability are the main institutions for training application-oriented talents.

The "discrimination" was still in the process of training applied talents, which is suitable for enterprises and innovation practice.

At present, most of the core teachers of colleges and universities should have a doctorate. Only the high-level research universities have the right to confer doctor degrees. Because almost all of the core teachers graduated from high-level research universities, they are lack of experience and understanding of the concepts and methods in training applied talents.

Under the requirement of "Emerging Engineering Education", it is necessary for teachers to reconstruct their core knowledge, change their training mode and research training methods, so as to train applied talents.

## **2.3. The immature system of knowledge**

In the current system of higher education, domestic high-level research universities which have higher social recognition and reputation are leaders of the revolution of education. However, local colleges which has weak recognition, influence and weak resource integration ability are the main institutions for training application-oriented talents.

The "discrimination" was still in the process of training applied talents, which is suitable for enterprises and innovation practice.

At present, most of the core teachers in Colleges should have a doctorate, and only high-level research universities have the right to confer doctor degrees. Base on their educational background, the core teachers are lack of the concept and method of applied talents training.

Under the requirement of " Emerging Engineering Education ", it is necessary for teachers to reconstruct core knowledge, change training mode and research training methods, so as to train applied talents.

## **2.4. The lack of good teachers and researchers of the specialty**

The specialty of NEMD in most colleges was just opened and grew up rapidly, the Quantity and quality of teachers and researchers with corresponding professional background can't meet the requirements of professional development. In order to carry out the undergraduate education process, it introduced teachers with similar professional background.

In order to carry out undergraduate education smoothly, only teachers with similar professional background can be introduced. The teachers may lack a good understanding of the teaching effect and process of The specialty of NEMD and they with different academic background also need time to adapt to the construction of NEMD. On the other hand, it is very difficult for application-oriented universities to introduce mature researchers and high-level teachers. It would take a long time to get a lot of good teachers of the NEMD for application-oriented universities.

## **2.5. The lack of teaching resources**

NEMD which is one of "Emerging Engineering Education" specialties, is still lack of sufficient teaching resources which are fully qualified.

At present, it is feasible to introduce teaching resources from similar majors, but it is still necessary to compile their own teaching resources such as textbooks to meet the requirements of local industries. [5]

In addition, in the process of professional construction, the improvement of teaching facilities should be completed first. If we want to achieve the teaching goal of combining theoretical

knowledge with practical operation, software and hardware should be prepared at the same time. New teaching management mode must also be established and practiced.

Therefore, in order to ensure the control of the quality of talents and make students better learn the cutting-edge knowledge and operation skills, it is necessary to strengthen school-enterprise cooperation and jointly build a joint cultivation mode. Through target management of school and enterprise, Hardware construction, a high-quality teaching environment, stage implementation and feedback, cultural fusion, education training plan would be implemented.

## **2.6. The lack of enough support from leaders of colleges**

Although many college leaders realize that new energy is a strategic industry of the country, they do not pay enough attention to the construction of NEMD.

There is a large demand for talents of NEMD, and the specialty of NEMD has been or will be set up in many colleges. However, most leaders are not willing to invest more resources and pay more attention to NEMD. They would like to support those specialties that are popular among students and in society or that have more employment positions, or that can improve its reputation, influence and scientific research achievements for the University [6]. However, they are not willing to pay much attention to the new specialties which can't bring the reputation quickly. They even don't like to set up the new specialty because of its large investment and low social recognition.

This negative attitude is bad neither for NEMD, nor for the students, and can lead to a negative feedback system.

## **3. Strategies accelerating the development of NEMD**

### **3.1. The strategic height of school development and key work of the leaders**

The construction of “Emerging Engineering Education” is one of the most important opportunities for the application-oriented universities. It should be promoted to the strategic height of the Universities, as the key work of the development of the Universities. The emergence of new industries is the good opportunity for application-oriented universities to create advantageous specialties and improve popularity because the development and replacement of specialty is often based on industry development. Only by paying more attention to the construction of new industries and specialties, providing enough support and making them competitive, can we realize the high-quality development of application-oriented universities.

### **3.2. The strategies for increasing investment**

The construction process of new specialty needs the input of people, finance, material, site and system. Learning objectives and tasks of the specialty have changed a lot, and they have higher requirements and expectations for their learning ability and practical operation ability. Increasing investment in teaching facilities is the foundation of professional teaching; when conditions permit, purchase some equipment with high technology content to ensure the teaching quality, and let students have more access to some high-tech equipment, so as to lay the foundation for work, production, teaching and research.

### **3.3. The strategies for the introduction and training of Teachers**

Quantity and quality of teachers is the core element of professional construction. Only when teachers are competitive can majors be competitive. The strategy of “Introducing outside and cultivating inside” is an inevitable choice.

Although many colleges introduce teachers from other countries, this approach can alleviate the problem of lack of talents to a certain extent, it is still unrealistic to achieve the goal of enough professional teachers only by introducing because the specialty was just opened and there are not many mature talents. Therefore, to solve the problem of teachers' lack of talents needs the help of universities and enterprises. The multi-channel training and promotion for teachers is the best choice. Degree promotion program, Ability promotion program, visiting scholars, technology

Commissioners, enterprise postdoctoral, double teacher training program and even school enterprise co-construction are the good ways for teachers' promotion. The improvement of the academic competence and engineering application capability will improve the teachers' quality. Especially the level of professional application can be upgraded when teachers can go deeply into the enterprises and get in touch with the latest technology of industry.

### **3.4. The construction of teaching system**

According to the requirements of "Emerging Engineering Education" and the graduation certification of engineering education certification standard and the talents' cultivation standard, the in-depth participation of enterprises in the whole construction process of NEMD is necessary. The teaching system is needed to be redesigned and constructed from training objectives, teaching plans, curriculum construction, specialty construction, teaching methods and other aspects.

## **4. Conclusion**

Based to "Emerging Engineering Education", for the specialty of NEMD, in order to achieve better development, the factors hindering the development of NEMD were analyzed, and several strategies were also proposed. In order to achieve the construction goal of NEMD, the teaching system and the new teaching management mode also need to be redesigned and implemented.

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