

# Research on the Fusion Training Model of Electromagnetic Spectrum Technology and Management Specialty under the Guidance of “Emerging Engineering”

Han Liu\*, Guoqin Kang, Shuiqiao Jiang

College of Information and Communication, National University of Defense Technology, 45 Jiefang Park Road, Wuhan, China

Email: lujiangliuhan@sina.com

**Keywords:** Fusion training model, Electromagnetic spectrum technology and management specialty, Emerging Engineering, Academic education, Post education.

**Abstract:** Fusion training model of electromagnetic spectrum technology and management specialty under the guidance of “Emerging Engineering” is studied in this paper. Firstly, implementation of fusion training is introduced. Secondly, key problems to be solved in the process of implementation are listed. Thirdly, goals achieved with implementation are given. Lastly, significance of implementation are summarized. Fusion training model can provide theoretical guidance and practical support for personnel training under the concept “Emerging Engineering” in colleges and universities.

## 1. Introduction

From the “Fudan University Consensus” of February 18, 2017 to “Tianjin University Action” and “Beijing Guidelines”, the concept of “Emerging Engineering” [1-3] has been exploring vigorously in colleges and universities all over the country. “Emerging Engineering” contains two meanings: one is that there is no specialties in old engineering, and the other is that new ideas, standards and concepts should be infiltrated into old engineering. “Emerging Engineering of Strengthening the Army” is an important part of “Emerging Engineering”, and its core connotation is to build a new military personnel system. The discipline or field of “Emerging Engineering” can be understood as a newly “Emerging Engineering” discipline, field or direction related to military affairs that is emerging, being formed or about to be formed.

With the wide application of new technology in the army, new disciplines and specialties are emerging. The training of military personnel must follow the concept of “Emerging Engineering”, take the demand of post as the traction, and take the ability training as the core, so as to better realize the requirements of strengthening the army.

At present, some domestic scholars have studied the connection between academic education [4,5] and post education [6,7], but these two kinds of education are relatively separate, lack of integrated design, and only take curriculum teaching as the center. Under the guidance of “Emerging Engineering”, the personnel training program of “Emerging Engineering of Strengthening the Army” being carried out by the National University of Defense Technology will explore and practice the integration of three-year academic education and one-year post education.

This paper focuses on the new requirements of personnel training about electromagnetic spectrum technology and management specialty [8,9], renews the teaching concept, reconstructs the teaching system, innovates the training mode, solidifies the basic quality and core professional ability of undergraduates, improves the quality of personnel training, and provides theoretical guidance and practical support for personnel training under the concept “Emerging Engineering” in colleges and universities.

In short, relevant scholars have involved in “Emerging Engineering” and “fusion training”, but it is the first time to apply the combination of the two to electromagnetic spectrum technology and management specialty, which is innovative.

## **2. Implementation of fusion training**

Under the guidance of the concept of “Emerging Engineering”, undergraduates majoring in electronic science and technology (electromagnetic spectrum technology and management) in National Defense University of Science and Technology (Changsha headquarters, Wuhan college of information and communications) are trained in a fusion way (3-year academic education and 1-year post education). The concrete implementation is divided into five steps as follows.

### **2.1 Constructing competency and quality model in post field**

In order to build a normal communication and coordination mechanism, different colleges should work together to construct a competency and quality model in the field of electromagnetic spectrum technology and management posts, focusing on battlefield-oriented, future-oriented and post-oriented, which is the premise of personnel training mode. This is also the basic requirement for the personnel training of national defense and army reform.

### **2.2 Planning and arrangement of fusion training**

Relying on the respective advantages of the two colleges, the core is ability building. The undergraduates’ growth path is designed according to the professional training standards. Teaching links, curriculum system and time arrangement should be set up, and integrated teaching design is carried out to form the professional training plan.

### **2.3 Overall design and organization of curriculum teaching implementation**

Based on learning objectives, the curriculum implementation plan is formulated, implemented and evaluated. Firstly, according to the characteristics of the courses, the two colleges determine the contribution and degree of the learning objectives to the professional training standards, which can guide to design learning tasks and activities, decompose knowledge and ability objectives and design their expected training results and evaluation methods. Secondly, various teaching methods are applied to achieve the expected undergraduates’ learning results. Lastly, the final goal is to continuously improve the results of curriculum evaluation.

### **2.4 Constructing a comprehensive teaching quality assurance system with hierarchical classification**

The whole education quality assurance system is based on evaluation of the continuous improvement mechanism. Evaluating the existing training programs is the starting point for formulating new training programs. According to the results of the evaluation, feedback and follow-up are carried out in different levels and classifications, and a comprehensive teaching quality assurance system is built as a whole by the two colleges.

## **3. Key problems to be solved in the process of implementation**

### **3.1 Linking up the two kinds of education**

The two types of education should complement each other in resources and make use of their advantages. In terms of coordination mechanism, a normal communication and coordination mechanism should be established to deal with various common and unexpected problems, such as undergraduates changing specialties in the training process. In terms of curriculum system and teaching content system, it is necessary to design in an integrated way so as to prevent duplication of teaching content, different requirements of the same course in different colleges, inadequate professional basis for professional posts and so on. In order to ensure scientific nature and systematicness of curriculum system, further refinement should be made in the course of curriculum implementation. In the course content, the two stages should be linked up. In the joint training stage, the necessary extension and expansion should be made in the course teaching according to the professional regulations, not only to complete the teaching task of the course, but also to properly take care of the needs of the diversion stage. Professional course teaching should be linked with the

contents learned in the joint training stage so as to achieve the purpose of application. In practice evaluation, we should continue to practice, analyze and feedback the evaluation results in time. According to the evaluation results, the two colleges should improve the training program and teaching methods as a whole.

### **3.2 Innovation of educational ideas**

Organically absorbing and integrating new educational concepts with the characteristics of the times at home and abroad, such as “Emerging Engineering” paradigm. At the same time, the general origins of these concepts are put forward in the combination of science with the task, orientation of school personnel training and the characteristics of military personnel training. We innovate and form the educational idea of “Emerging Engineering of Strengthening the Army”, which is used as a brand-new educational idea to guide the formulation of personnel training program.

### **3.3 Promotion of supply reform**

Deepening the reform of supply-side education and teaching in personnel training is a university-level education reform, which is reflected in a series of university education supply-side reforms, such as the research on the demand for post-oriented personnel training, the innovation of teaching organization and management mode, and the improvement of teachers’ research level. Teaching reform is reflected in knowledge content and teaching methods provided by teachers.

## **4. Goals achieved with implementation**

“Ability-building as the core” personnel training model explores the battlefield-oriented, army-oriented and future needs. It builds the “undergraduate-centered, output-oriented, continuous improvement” concept of academic education and post education integration personnel training mode, focusing on the high-quality new military personnel training of electromagnetic spectrum technology and management field.

The trainees should achieve the following objectives: excellent ideological and political quality, scientific and cultural foundation, military basic quality and physical and psychological quality, and become high-quality new military personnel who can be competent for the first post related to electronic science and technology. This personnel training mode can be popularized and applied in colleges and universities with new “Emerging Engineering” and fusion training teaching practice all over the country.

## **5. Significance of implementation**

In-depth study and practice of this project has important theoretical and practical guiding significance for promoting the integration of personnel training based on the concept of “Emerging Engineering” in colleges and universities, which can improve the efficiency and quality of personnel training. Firstly, the professional training mode under the guidance of “Emerging Engineering” can provide theoretical guidance for the teaching work of colleges and universities. Secondly, the integration of academic education and post education can provide reference for the training of professional talents in colleges and universities. Thirdly, the practice of integration of electromagnetic spectrum technology and management specialty can provide reference and support for the practice of electronic communication specialty in colleges and universities. Fourthly, the evaluation cycle of continuous improvement based on the concept “Emerging Engineering” can provide guidance for the construction of a comprehensive teaching quality assurance system in colleges and universities.

## **6. Conclusion**

The training mode of electromagnetic spectrum technology and management professionals under the guidance of “Emerging Engineering” is studied. At first the specific steps of implementation are

listed. Secondly, the key problems to be solved in the implementation process are introduced. Then, the objectives of implementation are given. At last the significance of implementation are summarized. It is the first time that “Emerging Engineering” is combined with the integrated teaching mode, which is innovative. This mode can be popularized in colleges and universities that carry out “Emerging Engineering” and the fusion training teaching practice all over the country.

## References

- [1] S. Zhong, X. Zhou, University-enterprise cooperative education mode in the context of emerging engineering disciplines, *International Journal of Emerging Technologies in Learning*, vol.14, no. 8, pp. 82-96, 2019.
- [2] S. Zhao, H. Zhang, J. Wang, Cognition and system construction of civil engineering innovation and entrepreneurship system in emerging engineering education, *Cognitive Systems Research*, vol. 52, pp. 1020-1028, 2018.
- [3] M. D. Lytras, W. Alhalabi, M. J. T. Ruiz, et al., Emerging technologies for engineering education: Flexibility, consistent exploration, realism, integration, and sustainable development for active learning, *International Journal of Engineering Education*, vol. 32, no 4, pp. 1560-1565, 2016.
- [4] M. Roszak, B. Kolodziejczak, W. Kowalewski, Implementation of e-learning portal for academic education and lifelong learning, *International Journal of Continuing Engineering Education and Life-Long Learning*, vol. 26, no. 2, pp. 135-152, 2016.
- [5] A. Khoiri, M. S. Kahar, R. T. Indrawati, Ethnoscience approach in cooperative academic education programs (COOP) , *Journal of Physics: Conference Series*, vol. 1114, no. 1, December 7, 2018.
- [6] M. P. Malcolm, M. C. Roll, The impact of assistive technology services in post-secondary education for students with disabilities: Intervention outcomes, use-profiles, and user-experiences, *Assistive Technology*, vol. 29, no. 2, pp. 91-98, 2017.
- [7] L. A. Sañudo, Z. A. Hernández, A. Martín, et al., Sustainable urban drainage systems in undergraduate and post-graduate education in civil engineering: The pioneering experience of the University of Oviedo, *Revista de Obras Publicas*, vol. 166, no. 3607, pp. 120-124, 2019.
- [8] M. Saint, T. X. S. Brown, A dynamic policy license for flexible spectrum management, *Telecommunications Policy*, vol. 43, no. 1, pp. 23-37, 2019.
- [9] S. Wu, J. Zhang, R. Q. Zhang, Management of a shared-spectrum network in wireless communications, *Operations Research*, vol. 66, no. 4, pp. 1119-1135, 2018.