Influence Factor Analysis for Graduate Engineering Educational Professional Certification

Wen-Qiang PENG\textsuperscript{a,*}, Yuan Li\textsuperscript{b} and Yu-Bo SHEN\textsuperscript{c}

College of Basic Education, National University of Defense Technology, Changsha Hunan Province, China 410073
\textsuperscript{a}plxhaz@126.com, \textsuperscript{b}yli@nudt.edu.cn, \textsuperscript{c}2767083852@qq.com
*Corresponding author

Keywords: Professional Certification, Graduate Engineering Education, Factor Analysis.

Abstract. Graduate engineering educational professional certification has become a key point in the higher engineering education reform in various countries. The formation of professional certification has become very essential for improvement of quality of higher education in our country. The educational difference research between domestic universities was carried out. Meanwhile the influence factors of graduate engineering educational professional certification have been analyzed. The common certification stand was then presented accordingly.

Introduction

According to incomplete statistics, the number of science and engineering colleges and universities has been reached 617 in our country, and there are a total of 128 engineering specialty and 13433 professional points. The number of engineering graduate students in the school has reached 0.318 million [1]. The personnel training are complex systems engineering, but innovation talents cultivation is the mission of the higher education. In the process of personnel training, training students and training objectives is the core elements of training model. Colleges and universities in Europe and the United States in the mode of personnel training not only attach importance to the cultivation of innovative ability, but also adapt to the needs of the community [2, 3]. Meanwhile their training goals are increasingly diversified. The perfect certification system of engineering education is a great important way to guarantee and promote its continuous quality improvement of engineering education [4, 5]. Professional certification in China's higher engineering education evaluation system is still a weak part. In addition to the Ministry of Construction in the field of construction engineering carried out some exploration, China has not yet carried out a large-scale professional certification work.

With the continuous progress of reform and opening up, China's education level has been greatly improved. Meanwhile the scale of graduate education is also expanding. Taking our university for example, graduate enrollment scale is close to undergraduate. Taking into account the difference in students, the development of professional disciplines in different directions and teaching resources, different teaching and research units of the training level is not the same. How to further improve the quality of graduate training and continue to
improve the level of graduate teaching has become an important task of teaching reform. Engineering education professional certification is an important part of engineering education quality assurance system. It is a cooperation bridge between the engineering education and industry cooperation. The establishment of the graduate engineering education professional certification has a very important role in improving the international competitiveness of engineering education in our country. It is one of the key tasks to carry out the current teaching evaluation and teaching quality to explore the influencing factors of the certification standards of graduate engineering education in China.

**Analysis of the Differences in the Cultivation of Graduates**

China's educational academic resources are unevenly distributed to a certain extent. Different colleges and universities of graduate education and teaching level is not the same. Meanwhile different training objectives lead to different research training differences. Differences are mainly reflected in the following six aspects.

1. **Different training object.** At present, the source of graduate students in our country can be divided into full-time and part-time ones. Full-time training students have no work experience, while part-time training ones have a certain work experience of serving staff and are co-cultivation with business units. Part-time students work while studying to complete the different stages of graduate training tasks. Take the engineering master as an example to distinguish between full-time and part-time. Different training units on the training object access threshold is not the same, such as the overall quality requirements of students in Double First-level and ‘985’ universities are significantly higher than other universities, and students of these universities are also significantly better than others.

2. **Different training system.** In our country graduate students are divided into doctorate and master's degree. For different institutions of different graduate students, the level of training system is not the same. There exist 2 years, 2.5 years and 3 years for the master level. Taking Wuhan University, National University of Defense Technology and Central South University, for example, Wuhan University master's degree training system is 2 years, National Defense University of Science and Technology is 2.5 years, while Central South University master's degree system is 3 years [6, 7]. What’s more doctoral training system is more flexible. Even if the same school for different disciplines of professional training system is not the same.

3. **Different credit.** Due to the difference between the training system and the research direction, there are obvious differences in the total credits of graduate students in different colleges and universities. Taking transportation engineering profession in our university as an example, the minimum credit requirement for full-time degree graduate students is 24 credits, while the minimum credit requirement for part-time degree is 32 credits. The total credits for the same level of graduate students in different universities are also not the same. From comparison of transportation engineering professional for full-time degree graduate students in National University of Defense Technology and Central South University, the credit requirements of not less than 24 credits in National University of Defense Technology, while the minimum credit requirement is not less than 36 credits in Central South University.
(4) Different course system. At present, China's graduate curriculum is divided into public courses, major require and selective courses and practice training. For different levels of graduate students in different colleges and universities, different courses proportions of the total course hours are significantly different.

(5) Different requirement for academic dissertation. The dissertation is a key step for graduates in colleges and universities, but the requirements of the graduates are not the same. Different have colleges and universities have the different minimum working time requirement for the paper. For master graduate students have the requirement to work for at least 1 year or 1.5 years. Most of colleges and universities have the demand for the number of words and literature on graduation thesis, although the requirements are different.

(6) Different teaching and research resources. The differences in the development level of professional disciplines will inevitably lead to different conditions such as laboratory equipment, education support funds, and retrieval of books and literature resources. These factors will greatly affect the quality of graduate training [8].

Analysis of General Standard Professional Certification Cased on the Differences

Based on the current training model of graduate students in China and taking account into the different training objectives for graduate students, cultivate the elements of the impact of all aspects can be affected by the quality of graduate students at develop different stages can be analyzed, as shown in Fig.1. The influence factors can be divided into the academic system, credit, curriculum design, degree thesis, tutors, research conditions and other elements in the majority of colleges and universities. By analyzing some of the recommendations are as follows:
Figure 1. Influence Factor Analysis for Quality of Graduate Training.

(1) Graduation requirements. Through the previous analysis we can see that there are obvious different professional training system in different colleges and universities. Therefore through the graduate standard requirements, appropriate training system should be established based on different graduate level according to the discipline and research direction. Taking the profession traffic transportation engineering for example, the minimum training system for full-time graduate student is 2 years, but not as the current school for the same university to establish a unified system of education. Compared with undergraduates, graduate students should pay more attention to the cultivation of practical ability, application ability and research ability. For the graduate students in the requirements of the ability of the standard can learn from the current China Education Association Arbitration Association undergraduate 12 graduate requirements. On the basis of changes, it should increase the ability to innovate, engineering analysis, experimental design analysis, innovation, as shown in Fig. 2.
Figure 2. Graduate Competency Standards.

(2) Course system. The course system of graduate students mainly includes course study, practice and dissertation. In the previous analysis, it can be seen that the proportion of credits of different courses in different colleges and universities is different. Considering the diversity of professional orientation and employment direction of graduates, it is suggested that we must set up the curriculum of humanities and social sciences to improve the overall literacy and professional ethics of graduates, natural science courses that meet the requirements of professional graduation, major required and selective courses. In order to ensure the quality the practice and degree thesis must give the minimum time requirements, but don’t need to give the minimum proportion of credit requirements.

(3) Tutor strength. The quality of graduate students has a direct relationship with the level of tutors’ ability, and most of the research work of the graduate students is completed under the guidance of the instructor. Therefore, the number of instructor (mentor group or mentor) in the General Standard, professional instructors, engineering experience, professional development ability and practice research and analysis capabilities explicitly all should be taken into considering. Tutors in different universities can be quantified by instructor assessment or investigation.

(4) Research conditions. Graduate training is a deeper level of teaching and research personnel training, so meet the conditions of college training units must have the laboratory, library, classroom, academic exchange center and related equipment to ensure the smooth implementation of graduate teaching. There also should be the lowest graduate education funding guarantee and the international and domestic cooperation projects for graduate students to carry out project research and academic exchanges.

Conclusions

To promote the level of graduate education reach international standard, the establishment for China’s graduate engineering education professional
certification is imperative. This paper comprehensively analyzes the differences in the cultivation of graduate students in China, such as training system, credit system, curriculum system, degree thesis, teaching resources and so on. Through the analysis of differences, the paper summarizes the different factors that affect the quality cultivation of postgraduates, and puts forward the general standard which is applicable to our professional certification.

Acknowledgement

This research was financially supported by Education Reform Projects sponsored by National University of Defense Technology (NO.U2016012 and U2016107).

References


