Exploration of Undergraduate Graduation Design Reform in Communication Engineering under the Background of New Engineering Construction

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Abstract: Under the background of the new engineering construction, as an important component of the undergraduate education curriculum system and a crucial link in the talent cultivation, the undergraduate graduation design of the communication engineering major faces many problems and urgently needs reformation. Focusing on the background of the new engineering construction, this paper analyzes the problems faced by the undergraduate graduation design of the communication engineering major, such as the difficulty in subject selection in order to adapt to the needs of high-quality communication talent cultivation, short time and insufficient investment, severe shortage of teaching resources, and incomplete assessment and evaluation system, and explores possible reformation directions. From the aspects of subject selection optimization, process control reformation, teaching resource investment, and assessment and evaluation system, this paper explores corresponding reformation strategies, which have important reference value for improving the quality of undergraduate graduation design of the communication engineering major in the context of the new engineering construction.

1. Introduction

In response to a new round of technological and industrial transformation, and to support a series of major national strategic deployments such as "Made in China 2025", the Ministry of Education launched the construction of new engineering disciplines in 2017, aiming to use emerging intelligent science and technology such as artificial intelligence, big data, and block-chain for the upgrading and transformation of traditional engineering specialties. The proposal of the construction of new engineering disciplines is a new challenge and demand posed by economic, social, and technological development to the reform and development of engineering education in the context of deepening reform and opening up in China. It is an inevitable manifestation of the demand for innovative engineering and technology talents in the new era. In order to promote the construction of new engineering disciplines and do a good job in cultivating high-quality and complex new engineering talents, as one of the important engineering disciplines, the undergraduate education of communication engineering should closely follow the rapid development of information and communication technology, take engineering as the feature, and cover a wider range of knowledge such as the Internet of Things, industrial Internet, distributed communication networks, etc, emphasize the cultivation of students' ability to extract theoretical and technical problems in engineering applications and propose solutions through basic theoretical and key technical research.

2. Problems with the undergraduate graduation design of the Communication Engineering major

The undergraduate graduation design of the Communication Engineering major is an important teaching practice for undergraduate students to deepen their theoretical understanding and cultivate engineering problem-solving skills in the field of communication based on the basic communication

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theory they have learned. With the rapid development of 5G communication technology and the rapid advancement of 6G communication technology research, higher requirements have been put forward for the innovative engineering ability of communication engineering professionals. However, the existing undergraduate graduation designs in the field of communication engineering are difficult to meet the rapidly developing industry needs.[1]

The selection of graduation project topics is difficult to meet the needs of cultivating high-quality communication talents. The rapid development of communication technology requires that undergraduate graduation projects in the field of communication engineering be closely related to the latest communication technology, ensuring that students can keep up with the pace of communication technology development and cultivate their ability to solve practical communication engineering problems in their future work. [2]However, it is difficult to meet the needs of future talent cultivation in the current undergraduate thesis topic selection for communication engineering majors. Firstly, due to the short duration of the graduation project, in order to ensure that students can complete the project work on time, guidance teachers often only make slight changes to previous year's topics or choose more mature and easy topics due to habitual thinking when selecting topics. This directly leads to outdated communication technology involved in the graduation project, which cannot keep up with the rapid development of communication technology. Secondly, for students, the limited graduation project time prevents them from deeply thinking about the topic of the graduation project, insufficient understanding of the background and motivation of the project, loss of interest and subjective initiative in the project, and blindly borrowing from the experiences of others in previous years, applying previous solutions, and proceeding with the graduation project and thesis writing step by step, resulting in the graduation project not being completed independently.Moreover, the existing graduation project topics often do not fully consider the characteristics and interests of students, resulting in the phenomenon of changing graduation project topics midway due to the graduation project not meeting students' expectations. Once again, as the Communication Engineering major leans towards practical applications, it is necessary to choose graduation project topics that are as close to practical engineering application problems as possible . However, there are not many guidance teachers with practical experience in communication engineering in existing universities, which leads to a disconnect between the topic selection of graduation design and actual engineering practice. Finally, practical communication engineering problems are systemic and require collaboration among multiple people to solve them. Most graduation project topics are one-on-one, and each topic is independent of each other. This leads to a lack of collaborative innovation among students, and their engineering practical collaboration ability has not been well improved. Therefore, the difficulty in selecting topics for undergraduate graduation projects to meet the needs of cultivating high-quality communication talents is an important issue they face.[3]

3. Reform strategy

The reform strategy for undergraduate thesis design in the field of communication engineering is the last and most important part of undergraduate education. It is the most important practical examination method for students to use the theoretical knowledge they have learned during their university years to solve practical problems. In response to the main problems in the current undergraduate graduation design of the Communication Engineering major, the author proposes the following four reform strategies based on the new situation of new engineering construction

3.1 Optimization of graduation project topic selection

A good graduation project topic is a prerequisite for high-quality completion of the graduation project. In response to the problem that the topic selection of graduation design is difficult to meet the needs of cultivating high-quality communication talents, it is recommended to optimize the topic selection of graduation design, including the following reform strategies.

3.2 Optimize the dual selection process for students and supervisors

Currently, many universities have implemented a dual selection system for students and supervisors, providing them with a certain degree of autonomy. However, the general dual choice platform does not provide basic information about students and teachers, making it difficult for students and teachers to understand each other and fully utilize the advantages of the dual choice system. Therefore, it is recommended to add student information (such as undergraduate course grades, awards, etc.) and teacher information (such as resumes, teaching and research status, etc.) on the platform of a dual choice system for students and mentors. In addition, currently on the dual choice platform, teachers first publish the topic, students then apply for the topic, and finally teachers select students. This approach does not fully utilize the strengths of students, and their participation in topic selection is not high, which cannot effectively stimulate their enthusiasm. Therefore, it is recommended to increase the number of students posting research topics based on their own interests, so that teachers can choose their own research topics. This approach can maximize the subjective initiative of students.

3.3 Joint training between schools and enterprises

Enterprises are closer to engineering practice than universities, allowing them to participate in the topic selection of graduation projects and achieve joint guidance between schools and enterprises. Universities should promote information sharing with communication industry enterprises through various means, such as holding regular discussion meetings to understand the latest development trends in communication engineering. At the same time, universities should encourage joint training between schools and enterprises for students majoring in communication engineering, increase practical courses for students in enterprises, enhance their engineering practical abilities, and select suitable students from the six issues of the Journal of Higher Education from 129-2024 to directly enter the enterprise after graduation. In addition, teachers can also be encouraged to transform their industrialized scientific research achievements into graduation project topics, especially graduation project topics based on practical communication engineering problems, engineering projects, and typical cases. By combining the graduation project with the needs of the enterprise, the topic selection of the graduation project is more closely aligned with the needs of the communication industry, which can better cultivate urgently needed talents in the industry.

3.4 Encourage team collaboration

The graduation project topics of most students are independent, neglecting the cultivation of teamwork awareness among students. In addition, under the background of new engineering disciplines, there is a cross disciplinary relationship between communication engineering, computer science, and artificial intelligence, often requiring a multidisciplinary background to ensure the smooth implementation of actual engineering projects. To this end, universities should encourage collaborative graduation projects, especially interdisciplinary teamwork, which involves breaking down a large engineering project into several graduation project topics with organic connections between them. Each student should undertake a decomposed project, and students need to work together to complete the entire project. By allowing students to freely team up their graduation projects within their own college or across colleges, they can divide projects based on their respective professional backgrounds, knowledge structures, and interests. This approach can promote the cultivation of teamwork awareness and communication skills among students, and fully exercise them in team collaboration.

4. Reform of Process Control for Graduation Design

In response to the problem of short graduation design time and insufficient investment from students and mentors, it is recommended to carry out reform in the process control of graduation design, including the following reform strategies.

1) Graduation Design Time Flexibility

Undergraduate graduation projects are usually arranged in the second semester of their senior year, which leads to conflicts between undergraduate graduation projects and student work and postgraduate entrance exams, resulting in a decrease in student investment in graduation projects and a decrease in the quality of graduation projects. So, it is recommended to extend the cycle of graduation design. If starting from freshman or sophomore year, students do not have any basic knowledge of communication engineering and lack sufficient understanding of the professional field, blindly carrying out graduation project preparation work at this time will have little effect. Therefore, the author suggests that students can voluntarily apply for undergraduate graduation projects starting from their junior year. Communication engineering students generally start studying communication related courses from their third year of college, such as communication principles. At this time, they will have a better understanding of the communication engineering major, further understand the characteristics of the major, conduct targeted course experiments, and gradually choose a suitable research direction for their graduation project. They will also have sufficient time for one year to conduct literature research and learning, design and experiment plans. The organization of reports and other work can better improve the quality of graduation projects, while mentors can provide directional guidance to students and determine graduation project topics based on their own scientific research projects. So technical problems and resource shortages encountered during the graduation project process can be solved . In the first semester of my senior year, I can focus my main energy on the postgraduate entrance examination or internship. In the second semester of my senior year, I will mainly organize and summarize the materials for my graduation project, write a thesis, and defend my thesis.

2) Topic review stage

A two-level examination method has been adopted. Level 1: Professional level.The members of the Communication Engineering Graduation Design Working Group carefully would review the teacher's initial project proposal and provide feedback on the review and modification suggestions to the graduation guidance teacher.Afterwards, a second review of the topic selection report that needs to be modified should be conducted to control the quality. Level 2: College level. The professionally reviewed and improved topic selection would be Submitted to the college, and secondary checks on the graduation topic selection can be conducted to further ensure the quality of the topic selection.

3) Topic selection stage

A mixed selection method of designated students and teacher-student interaction can be adopted , allowing teachers to pr-establish a portion of outstanding students in topic selection to ensure the completion rate of excellent topic selection.Other topics are selected using a system dual selection method, with students independently selecting topics in the system to ensure that each student has a certain degree of freedom in their choices.Considering the actual situation where some students need to intern at contracted units, students are allowed to carry out off campus graduation design work on the premise of mutual agreement between the school, company, and individual student.

4) Graduation Design Guidance Section

The guidance work for graduation design is of utmost importance in the quality management of graduation design. We strictly follow the requirements of the school and college to carry out guidance work, and the specific requirements are as follows:

(1) The requirements for answering questions about graduation projects should be strictly implemented, so each teacher must meet with students twice a week to answer questions, and regular tracking would be conducted.

(2) The instruction manual must be carefully filled out by every teacher and student.

(3) According to each time node the graduation project proposal report, English translation inspection and guidance review work would be completed with quality and quantity.

(4) Mid term inspection work has been carried out to achieve the goal of supervising progress and quality

5) Teacher evaluation stage

By adopting a consistent research direction and cross evaluation approach, the objectivity and

accuracy of teacher evaluations are further ensured. evaluation forms for guiding teachers and reviewing teachers have been added, and conducted evaluations based on curriculum objectives should be carried out.

5. Conclusion

Under the background of the construction of new engineering disciplines, the graduation design of the Communication Engineering major faces many problems. As an important part of talent cultivation in the Communication Engineering major, its reform is urgent. Based on the analysis of the problems in the graduation design of the Communication Engineering major, this paper explores possible reform strategies through the optimization of graduation design topic selection, process control reform, teaching resource investment, and assessment and evaluation system, which is of great significance for improving the quality of graduation in the Communication Engineering major under the background of new engineering construction.

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