

Practice OBE concept and innovate the guidance method for graduation design of electrical engineering

Xiaofang Meng, Lidi Wang, Youwen Tian, Nannan Zhang, and Hui Wang*

Shenyang Agricultural University, Information and Electrical Engineering, Liaoning Shenyang 110866, China

Abstract. In order to improve the quality of undergraduate graduation design, this paper studies and improves the guidance method of electrical engineering graduation design based on the OBE concept. The graduation design teaching process was discussed around the topic selection stage, the topic opening stage, and the design stage. The main goal is to expand students' knowledge, enhance their engineering knowledge and improve their ability to solve practical engineering problems. The process inspection and guidance methods were optimized from the three levels of instructors, majors and colleges. The process inspection and guidance of colleges and specialties were online or offline. After the student selected the topic, the graduation design guidance and inspection of the instructor was conducted face to face or online. Through the questionnaire survey, this paper completed the achievement degree analysis of graduation design goals. The method proposed in this paper is beneficial to improving the practical ability and innovation ability of electrical engineering undergraduates.

1 Introduction

Undergraduate graduation design is an important teaching link of electrical engineering, a basic training to integrate and improve the knowledge learned by undergraduate students of electrical engineering, and a basic method to cultivate innovative thinking and practical ability of undergraduate students. Therefore, it has been highly valued by all colleges and universities [1]. Through graduation design, undergraduates can comprehensively apply their relatively independent professional knowledge, promote the combination of theory and practice, and cultivate their ability to analyze and solve practical problems and conduct scientific research [2].

At present, the new economy represented by new technologies, new models and new industries is developing vigorously, which puts forward higher requirements for engineering and technical personnel [3]. It has become the consensus of the whole society to accelerate the construction and development of electrical engineering specialty, and cultivate electrical engineering professionals under the background of new engineering

* Corresponding author: xfmeng123@syau.edu.cn

disciplines leading the future technology and industrial development [4]. However, there are a series of problems in the graduation design at present. The quality of the graduation design is not high [2], and the training effect on students' comprehensive quality and engineering practice ability is not good. This makes it urgent to improve the guidance method of the graduation design for electrical engineering majors.

Based on Outcomes Based Education (OBE for short), according to the requirements of engineering education certification standards and training programs, this paper analyzes the problems faced by the graduation design of electrical engineering specialty and the corresponding measures, and makes an in-depth discussion from the aspects of teaching process design, process inspection, guidance reform and optimization.

2 Problems and countermeasures of undergraduate graduation design teaching

2.1 Problems in undergraduate design teaching of electrical engineering

The graduation design of electrical engineering specialty is faced with a series of problems from planning to implementation and guidance of graduation design. How to guide students to complete the design work in a time tight, task heavy and high-quality way? How to implement the guidance direction and quality requirements of graduation design and form verifiable documents while preparing for professional certification? How to improve students' ability to solve complex engineering problems with graduation design? These are the problems that must be faced and solved in the graduation design of electrical engineering major.

2.2 Countermeasures

In view of the above problems, first of all, we need to unify our thinking, enhance confidence in the face of difficulties, and strengthen the guidance of graduation design. Discuss at all levels of colleges, majors, teaching and research offices and instructors, reach a consensus on the important role of graduation design in the training of engineering applied talents, fully consider and plan the problems that may be faced in the graduation design, and then formulate the graduation design guidance plan. According to the requirements of the Graduation Design in the Engineering Education Certification Standards, and in combination with the actual engineering problems of the electrical engineering specialty, cultivate the students' engineering awareness, cooperation spirit, and the ability to comprehensively apply the knowledge learned to solve practical complex engineering problems [5]. In addition, the college and the major timely track and regularly check the guidance work of the graduation design, and timely adjust the guidance plan to effectively promote the graduation design.

3 Design of graduation design teaching process based on OBE concept

The undergraduate graduation design of electrical engineering should be student centered, focusing on students' learning achievements, educational practicality and students' adaptability to social production and life [6]. In order to effectively solve the problems encountered in the graduation design, based on the OBE concept, in accordance with the

requirements of the engineering education certification standards and training programs, we need to carefully design the "graduation design" teaching process, as shown in Figure 1.

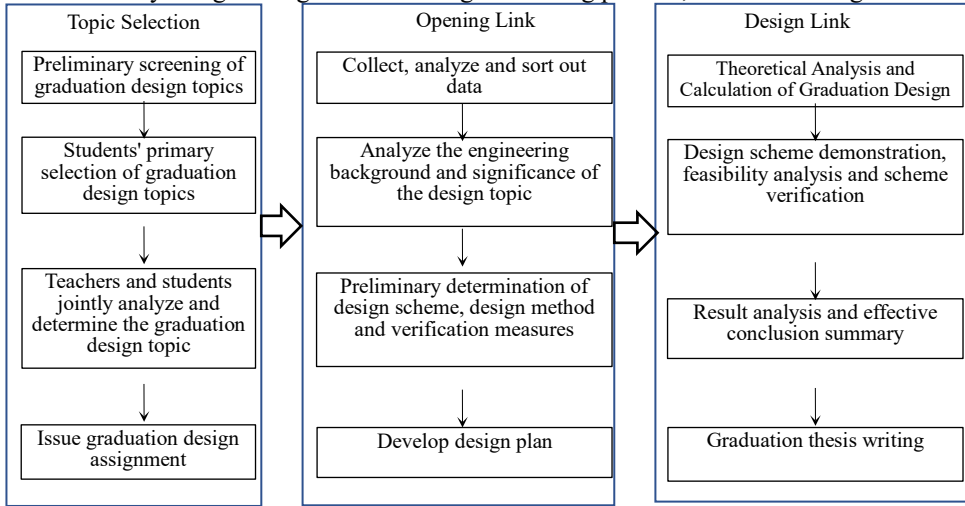


Fig. 1. Graduation design teaching flow chart.

3.1 Topic selection

Before selecting the topic, it is necessary to investigate the needs of relevant enterprises in the field of electrical engineering, understand the employment needs of enterprises, and determine the graduation design topic based on the needs of enterprises. In order to improve students' comprehensive ability to solve practical problems in a limited time, it is recommended to start the topic selection before the graduation design time period uniformly planned by the school. It is a good choice to select the topic at the end of the semester before the graduation design officially starts.

In the process of topic selection, the method of two-way topic selection is adopted, and the final completed topic is related to students' work or future planning, so as to stimulate students' interest in autonomous learning. After the students select the topic, the instructor explains the tasks and requirements of the graduation design specifically according to the students' conditions, so that the students have an overall understanding of the graduation design and establish the design goals.

3.2 Opening link

First of all, we should collect data and research, and complete data analysis and sorting. Make full use of the vacation time, students carry out research work in combination with the actual production, collect and analyze relevant data. Clear the engineering background and significance of the design topic, as well as the current situation and development trend, and then complete the literature review. On this basis, further analyze the design topic, preliminarily determine the design scheme, design methods and verification measures, formulate the design plan, and form the framework of the graduation design thesis.

3.3 Design link

First, carry out theoretical calculation and analysis, apply the methods of modeling, calculation, simulation, experiment, data analysis and information synthesis to study the

engineering problems of the graduation design, and complete the demonstration of the graduation design scheme and feasibility analysis. Draw relevant design drawings, sort out theoretical calculation and analysis, experimental or simulation research results, method application and actual problem solving effect, and complete effective conclusion summary. Write papers based on comprehensive analysis. In the process of writing the thesis, we will form a deeper understanding of the theoretical or practical problems related to design, generate new insights, and improve students' innovation ability.

4 Optimization process inspection and guidance

Process inspection and guidance are carried out at three levels, namely, instructors, professionals and colleges. In order to facilitate contact and communication, each instructor has established a QQ group or WeChat group for graduation design guidance. The process inspection and guidance of the college and specialty shall be carried out in an orderly manner in the semester when the graduation design officially starts, and the online or offline centralized mode shall be adopted.

Professional guidance is aimed at all students of the major, with the main goal of expanding students' knowledge, enhancing engineering knowledge, and improving their ability to solve practical engineering problems. The guidance is completed through school enterprise cooperation guidance and inviting experts to make relevant reports. The guidance content includes requirements, steps, common modeling methods, verification methods, and writing methods of design papers. The graduation design guidance of the instructor is aimed at the students. He/she needs to publish the relevant information required for the completion of the design in the contact group at the right time in combination with the students' completion topics, as well as the specific schedule for regular meeting or online communication guidance. Instructors can complete the guidance of graduation design through face-to-face or online communication. The specific guidance contents include: data collection, analysis and sorting, and writing of literature review; The determination of design scheme, design method and verification measures, the formulation of design plan, the writing of design outline, the determination of graduation design thesis structure, and the writing of graduation design proposal report; Determination of design contents, analysis and calculation methods, and rationality and effectiveness of conclusions; Instruction and guidance of the school on the format and requirements of graduation design.

The graduation design process inspection is indispensable, including weekly inspection, mid-term inspection, pre defense and defense. The instructor inspects and supervises the completion of students' graduation design every week, and the specialty checks the progress of some students' graduation design every week to find and solve problems in a timely manner. The college and professional association will organize the mid-term examination. The pre oral defense is conducted before the formal oral defense. Students are instructed to prepare the oral defense report materials. Through the pre oral defense, the students' abilities in sorting out the research results, writing, oral presentation, summary and analysis are mainly exercised. The oral defense shall be conducted by professional groups and the oral defense committee shall be formed. According to the defense process, the defense committee members of each group organize the defense process and adhere to the tutor avoidance review system. Through the defense work, students can exercise and improve their comprehensive abilities in time concept, thinking and politics, summary, expression, mentality, and social responsibility.

Through specific guidance and supervision of design progress, students have made great progress in research methods, simulation tools, system development, engineering design, experimental means, data collation, conclusion formation and comparative research.

5 Questionnaire

After the college organizes the oral defense, it conducts a questionnaire survey on the subjective satisfaction of the graduation design and the achievement of the graduation goals participated by all students for the students of this major through online questionnaires, which can complete the analysis of the achievement of the graduation design goals, and summarize the shortcomings in the graduation design, so as to facilitate the further improvement of the graduation design.

6 Summary

Graduation design is an indispensable teaching link. With the help of graduation design, students can use the basic theories, basic knowledge and basic skills of their major to analyze and solve relevant theoretical and practical problems, which can cultivate students' ability to carry out research independently. Based on OBE concept, student-centered, this paper discusses the design of graduation design teaching process, the optimization of process inspection and guidance methods, the implementation of questionnaire survey, and the optimization of electrical engineering graduation design guidance methods, which can improve the quality of graduation design and is of great significance to the cultivation of students' comprehensive quality and engineering practice ability.

References

1. Meng Xiaofang, Park Zailin, Tian Youwen. Research on Strategies for Improving the Graduation Design of Electrical Engineering [J]. *China Electric Power Education*, 2011, (27): 130-131.
2. Wang Yuanyuan, Zeng Xiangjun. Reflections on Several Issues of Undergraduate Graduation Design of Electrical Engineering [J]. *China Electric Power Education*, 2013, (23): 103-111.
3. Zhang Jianhui, Wei Baoquan, Zeng Jianjun. Research on the Training Mode of Electrical Professionals in the Context of New Engineering [J]. *Journal of Electrical and Electronics Education*, 2020, 42 (5): 18-22.
4. Yu Lei, Fei Shumin. Research on the Training of Electrical Engineering and Automation Professionals in the Context of New Engineering [J]. *Journal of Electrical and Electronics Teaching*, 2019, 41 (5): 17-21, 25.
5. Ma Lina, Ning Guixia, Han Feng, et al. Research and Practice of the Graduation Design under the Joint Guidance of the School and Enterprise of Civil Engineering Specialty Based on the OBE Concept [J]. *China Modern Education Equipment*, 2022, (5): 79-81.
6. Luo Zhen. Exploration of Teaching Reform of Graduation Design Course in Application-Oriented Universities Based on OBE Concept [J]. *Industrial Design*, 2021, (12): 46-47.