

# Initial Analysis on Strengthening the Guidance of Topic Selection for the Graduation Design of Science Subject

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## ABSTRACT

Graduation design is an important teaching link at the stage of undergraduate education to cultivate engineering college students' practical ability, innovation ability and engineer quality. Taking the questionnaire result of the graduation design of university students as the main foundation, this paper analyzes the problems in the topic selection for the graduation design of science subject and advances some corresponding suggestions. The main principles of graduated project topic selection are as follows: the title should not only meet the requirement of graduation and specialty training goal, it also covers the main course and professional knowledge system; it better to improve the proportion of topic selection for design to meet the professional standards of engineering education certification and cultivate students' ability to analyze and solve complex problems; the topics should be full of original, prospective and challenging insights; the topics should accord with university students' specialization interest and reinforce their employing competition.<sup>1</sup>

## INTRODUCTION

With the country strategy of "made in china 2025" being put forward, there is a higher and higher requirement of talent's practical ability and innovation ability and new challenges have also emerged in the training of talents in institutions of higher

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learning[1]. Graduation design is an important practice teaching link at the stage of undergraduate education to cultivate high quality coming engineers, which is the main basis for testing students' comprehensive quality and teaching quality. So that strengthening the management of graduation design is helpful to improve the ability of undergraduate graduates. There's been severe problems in many colleges and agency so far, for instance, in large quantity of graduates and young instructors lead to the lack of guidance which reduces the quality of students' graduation design[2]. In addition, the graduation design topic without novelty, innovation and practicality and the lack of long-term regulatory mechanism in the course of guidance cause the deficiency of students' creative and practice[3,4]. In order to further strengthen the training of outstanding talents with strong professional quality and practical ability, and better carried out the practical teaching work of graduation design, based on the "questionnaire of graduation design of material students", this paper studies the topic selection module of graduation design process.

Topic selection is the first step and the key link of the whole graduation project which determines the research direction and research methods of graduation design, and to a certain extent, affects the improvement of the comprehensive ability of graduates [5]. The subject of graduation design covers the knowledge system of the main courses and professional courses must conform to the goal of professional training and the requirements of graduation, so that students can apply the theoretical knowledge and professional skills of multidisciplinary, and get comprehensive and comprehensive training. In this paper, a questionnaire survey was conducted on the source, type and basis of the graduation project and the use of software tools in the graduation design.

## **SUBJECT SOURCE**

Figure 1 shows an investigation of the topic source of graduation design. It can be seen from the figure that 81.3% of the subjects are drawn up by the instructor, 10% from the students and very few from the engineering practice. Owing to the instructors, rich experience, subjects from tutors are easier to meet the graduation requirements and the students' professional skills can be fully exercised. But an unfortunate side effect is that students in the position of passive acceptance of knowledge are unable to give full play to their potential and enthusiasm. However, these come from the students themselves are put forward for certain specific problems which ensures the novelty, innovation and practicality of selected topic. On the other hand, it is beneficial to train the student to analyze and solves the problem. But there are also shortcomings if students choose their own topics, from example, it is difficult to control the quality and feasibility of the subject leads to the lack of comprehensive exercise. The reason why design projects from engineering practice are fewer is due to the uniqueness of our university management system and social credit system. In order to ensure the safety of students and the convenience of management, it is not allowed to decide by students themselves which internship to

practice. Therefore, the students have few opportunities to participate the relevant engineering practice, the students' professional thinking is difficult to be inspired by the actual project, and it is difficult for students to put forward personalized design topics. Moreover, most of the guidance teachers of materials are engaged in basic theoretical research but their practical experience is not enough, so the design topics of students tend to focus on theoretical research. The students will choose the topic according to their own actual conditions after the teacher has drawn up the topic, and this joint decision model will help improve the feasibility of the graduation project. On the one hand, schools and society should fully mobilize the sense of social responsibility of large and medium-sized state-owned enterprises as far as possible and fully tap the flexibility and convenience of private enterprises. On the other hand, through strengthening the understanding of concept of corporate tax levers and social responsibility, enterprises can provide as many high quality practice bases as possible for talents training, and provide a full stage for the improvement of students' practical ability.

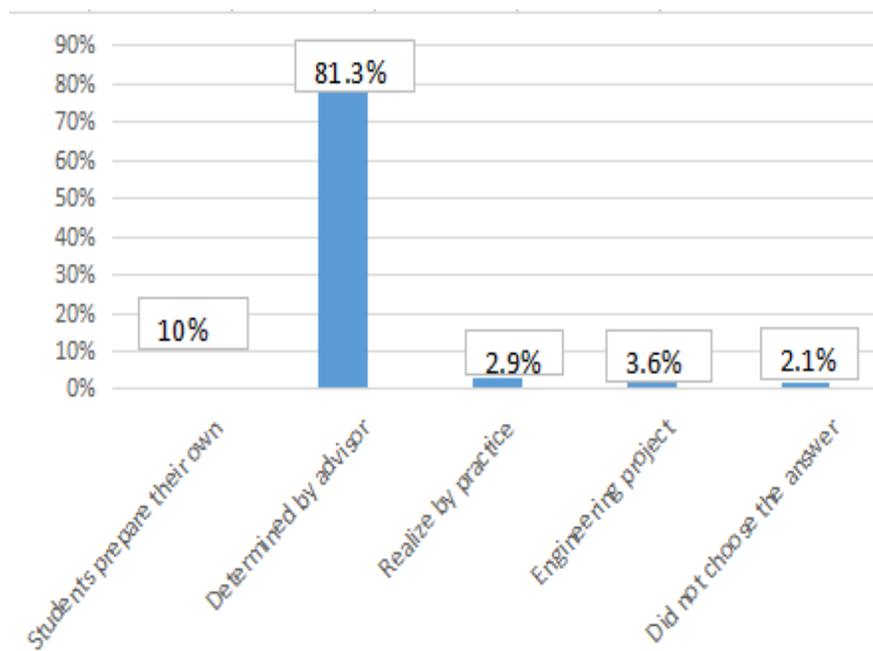


Figure 1. Subject source.

## QUESTION TYPES

The type of thesis is also the most important problem that students pay attention to when they choose the thesis. Figure 2 shows the survey status of graduation design topics. It can be seen from the figure that the graduation design topics mainly

include research papers, experimental dissertations, design dissertations, engineering applications, and theoretical calculations. The 60.4% is experimental graduation design; 24.5% is design graduation design and 1.4% is research graduation design. The main work of the experimental graduation design is to consult data, formulate experimental programs, carry out experiments, analyze the experimental results, and write papers and so on. Students can learn and master the methods of materials science research through the specific implementation of experimental projects, and make use of the basic theories of their major to analyze and solve practical problems. As is known to all, materials science is a basic discipline, and most teachers are engaged in basic theoretical research, so the experimental graduate designs are in the majority in the selected topic. Since the material processing profession involves the design of material processing tools and the optimization of material technology, the professional teacher can provide design graduation project. The main task of the design topic selection is to design, transform, output engineering drawings and design instructions according to the requirements of a specific mold, tooling, equipment, and engineering parts. In the process of design, more knowledge of cartography, machinery, computer, material and mechanics can be used, which can make the major and basic courses well consolidated and improve the students' practical ability and engineering accomplishment. Since China's accession to the Washington Accord, engineering education accreditation has been highly concerned by the domestic educational circles. The ministry of education clearly stipulates that the basic requirement of becoming a first-class professional is through engineering education accreditation. According to the national standard of engineering education accreditation, the topic of engineering graduation design should be mostly of design subject[6], which to improve students' comprehensive ability. Therefore, students should choose topics according to their training objectives and graduation requirements, and confirm the types of questions according to their employment needs. Teachers should also be familiar with the training objectives of the major, and combine their professional expertise to provide a feasible graduation project and improve the quality of graduation design.

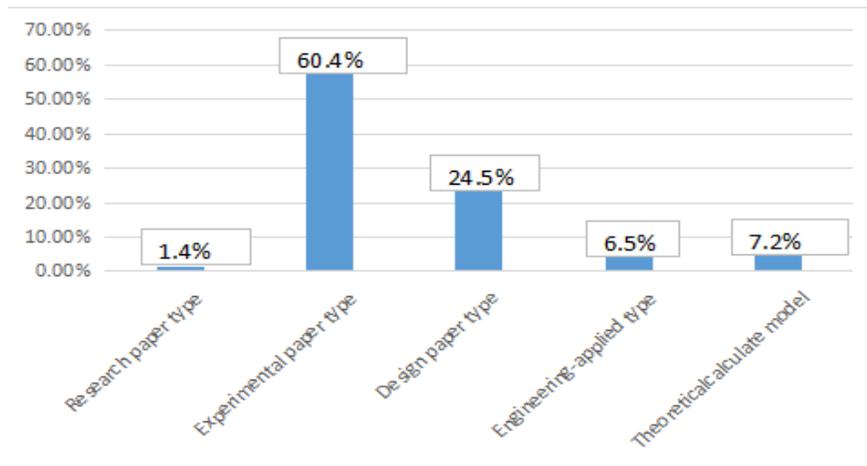


Figure 2. Question types.

## BASIS FOR TOPIC SELECTION

Graduation topic selection is a two-way selection process. The teacher uploads the task book after the school unified open graduate design (paper) on-line topics selection system and then the students begin to select the topic on the internet. After the deadline, the instructors select the students according to their choice of subjects. Finally, the department organizes the teachers to confirm the list of topics. When the students selected topics, they were concerned about the subject instructors, the relevance of design topics and employment, and the degree of difficulty of the subjects, accounting for 25.2%, 20.9%, and 1.5%, respectively (Figure 3). At present, contemporary college students have clear views on their personal development and interests. In the ordinary teaching, teachers need to guide students' interests in a reasonable way so that students can understand the development frontiers and hot topics in the industry, let students understand the development trend of the industry, cultivate students' professional hobbies and professional recognition, and enhance students' professional self-confidence, which will determine the students' future direction of development and employment. The function of the university is to cultivate talents. According to the grades of universities in our country, it can be divided into comprehensive schools which mainly emphasizes on training compound talents through basic knowledge education and applied universities that focuses on training applied talents via skills education [7,8]. Therefore, for colleges and universities that cultivate applied talents, students need to be able to grasp the professional background and requirements of the industry, understand the graduation requirements that they should achieve when they graduate and learn professional knowledge and professional skills in a targeted way. Through the graduation design stage, we can improve students' comprehensive professional ability so that they can adapt to their jobs as soon as possible. In the process of

graduation design, instructors should also pay more attention to the development and demand of professional industries and train students in a targeted manner. In the last practical teaching session, teachers must strictly require students, solve the problems encountered in graduation design in a down-to-earth manner, do a good job in every step of the graduation project, and improve the students' ability to analyze and solve problems. Do their best to enhance the sense of responsibility of students, and make students become responsible and responsible individuals.

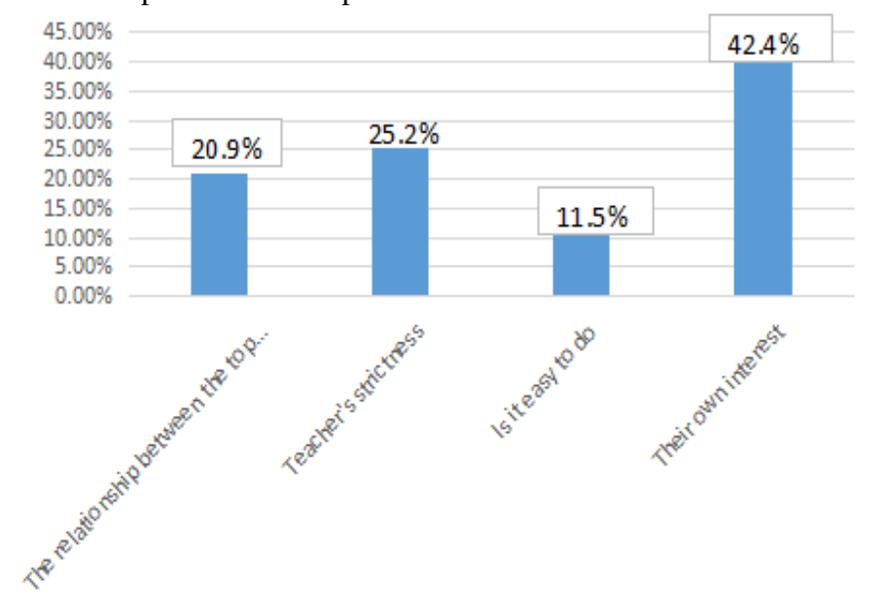


Figure 3. Basis for topic selection.

## THE USE OF SOFTWARE TOOLS

With the constant development of computer technique, the use of electronic computers has become more and more common in all walks of life, which played a positive role for software development and the development of science and technology. In the training goal of colleges and universities, computer use, introducing usual office software and relevant professional software, as a basic literacy to develop. At present, there are three types of software used frequently, the frequency of one of them has reached to 67.6%, as shown in Figure 4. In the graduation design of material engineering students, the software is very often used that reveals the importance of usual office software and relevant professional software for successfully completing the graduation project, so that the application of basic knowledge and computer software should be combined into the process of subject-selecting organically, only in this way can the graduate be accepted by society as soon as possible.

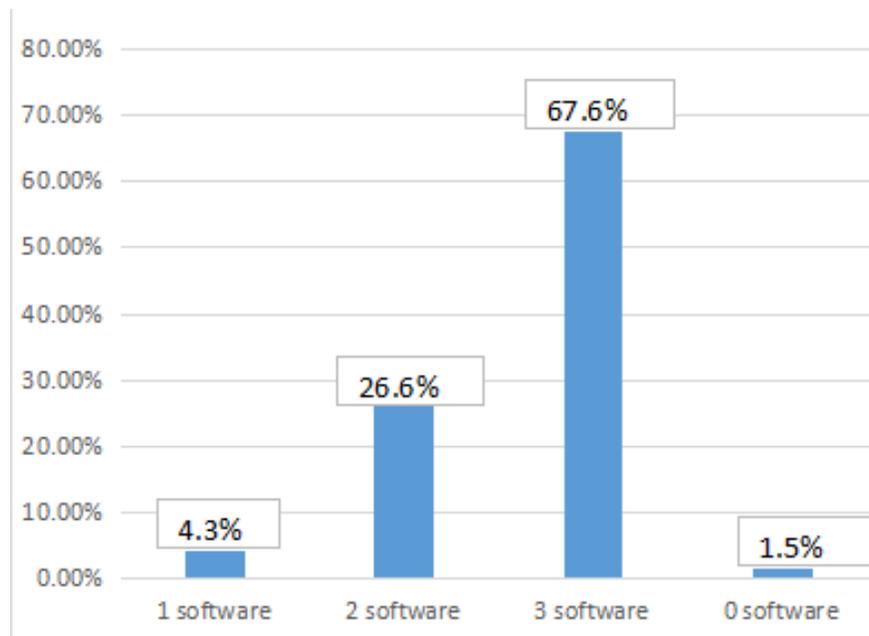


Figure 4. Software tools.

## CONCLUSIONS

Based on the above discussion, the topic selection of graduation design should follow the following principles:

(1) The topics should meet the professional training objectives and graduation requirements, and try to cover the main courses and professional knowledge system.

(2) Under the premise of meeting the professional standards of engineering education accreditation, we should improve the proportion of design classes in graduation design topics which to cultivate students' ability to analyze and solve complex problems.

(3) The topics with novelty, epochal character and advance is in line with students' professional interest which will enhance students, employment competitiveness.

## REFERENCES

1. Mingjuan Zhao, Longzhi Zhao, Chunying Ma, et al. 2013. "Research on the Training Mode of Excellent Engineer for Mould Specialty", *Journal of East China Jiaotong University*, 30(S2): 76-78.
2. Haiyan Chen, Yunchun Cao. 2018. "The Exploration and Practice of Undergraduate Graduation Design in Colleges and Universities", *Higher Education Journals*, 4: 128-130.

3. Longzhi Zhao, Mingjuan Zhao, Jian Zhao, et al. 2015. "Research on the Cultivation of Innovative Talents in the Integration of Science and Education", *Journal of East China Jiaotong University*, 32(S1): 56-59.
4. Lili Zhe. 2018. "The Teaching Research on Combination of Innovation Activities and Graduation Design", *Journal of Liaoning University of Technology (Social Science Edition)*, 20(2): 117-119.
5. Fengyun Yu, Jinpin Hu. 2018. "Establishment and Application of Item Bank in Graduation Project of the Application-Oriented Mechanical Engineering Undergraduate", *Education and Teaching Forum*, 1: 207-208.
6. Zhengping Hu, Peiliang Wu, Chenqian Xu, et al. 2016. "Teaching Study How Teachers Guide the Graduate Dissertation of Science Subject from the Perspective of Professional Certification", *Teaching Research*, 39(2): 103-106.
7. Hongyun Zhang, Jinbiao Zhang, Jian Liu, et al. 2010. "Thoughts on Improving the Quality of Graduate Design of Engineer Course in Application-Oriented Universities", *Journal of Xinxiang College: Natural Science Edition*, 27(6): 91-92.
8. Mingjuan Zhao, Longzhi Zhao, Yong Hu, et al. 2017. "Research on the Multi Tutor Model of "Plastic Mold Design" in Graduation Design", *2017 International Conference on Education Science and Education Management (ESEM 2017)*: 85-88.