

Major Problems Existing in Graduation Project of Undergraduates in Machinery Majors of Engineering Colleges of China and Solutions

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Abstract

Graduation project is one of the most important aspects in practical teaching of engineering undergraduates and is also the final learning and comprehensive training phase during the academic career of graduates. This paper mainly summarizes the major problems existing in the graduation project of undergraduates in machinery majors and proposes countermeasures and solutions in terms of scientific and rational selection of a subject, strengthening the strength of guidance in graduation and cultivating the innovative consciousness and innovative capacity of graduates. This lays foundation for improvement of the quality of the graduation project.

Keywords: Machinery, Graduation Project, Major Problems, Solutions.

Introduction

Graduation project is one of the most important aspects in practical teaching of engineering undergraduates and is also a phase that verifies the comprehensive practical capacity of graduates. During this phase, the graduates analyze and resolve problems with regards to engineering technology or social practice related with their majors through comprehensive application of the basic theory and basic knowledge they have learnt. This further consolidates and deepens their comprehension in the theory and practical knowledge, strengthens their basic skills and cultivates their competence. Thus, it can be seen that, graduation project is of great significance for students to consolidate their learning achievements, broaden their vision field and cultivate their own comprehensive quality and innovation capacity (Liu Birong, 2009).

1. Major Problems Existing in the Graduation Project

1.1 The Selection of Topics in the Graduation Project is Open to be Improved

Selection of topics is the critical aspect in graduation project. It defines the research content and research direction of the graduation project and the quality of the selection of topics has a direct effect on the quality of the graduation project. Over the past few years, the teaching tasks and scientific research tasks of guiding instructors for the graduation project have become onerous. Besides, as the number of undergraduates enrolled has been continuously expanded, the number of graduates guided by each instructor is also on a constant increase. As a result, the guiding instructors have no much time or energy to put to optimization of the topics of the graduation project. Hence, some of the topics of the graduation projects are over-sized or too much simple, as a result of which either some students are unable to complete the topics of the project within the stipulated time or some students have not enough tasks. The capacity of students is far from being exerted. Some topics of the graduation project are too out-of-date, with much repetition. There are even some students who plagiarize the design achievements of the students who have graduated one year earlier. In addition, the guiding instructors almost totally decide themselves on the selection of the topics. The schools are lacking in due supervision. All the above drawbacks have brought about adverse influences to the quality of the selection of topics for the graduation project (Gan Weimin, 2005).

1.2 The Graduation Project Comes into Conflict with the Postgraduate Entrance Exams and the Employment of Graduates

The final school semester for students in the school is mainly for the graduation project. However, this stage is exactly a critical period for postgraduate entrance exams and the employment of graduates. In the first place, at this stage, students who take the postgraduate entrances exams are faced with postgraduate re-examinations. With continuous expansion of enrollment of postgraduates, all the colleges and universities, one after another, intensify the process of re-examination. Thus, the graduates have to dedicate a lot of energy to review the subjects of re-examination. This results in insufficient emphasis on the graduation project. In the second place, this stage is exactly the period for students who have failed in the postgraduate entrance exams and who have not yet found a working unit to search for an employment unit. In the face of the fierce competition pressure, the students are busy with all kinds of job fairs in order to find a job as soon as possible. Thus, they have no time for the graduation project and it is placed at a subordinate position. In the third place, some students who have found a job hold the view that the job they will get involved in after graduation may have no correlation with the graduation project. Consequently, they don't want to spend a lot of time and energy at all on the graduation project.

1.3 The Graduates are Lacking in Integral Engineering Consciousness

After getting a topic of the graduation project, quite a lot of students encounter the actual problems of engineering. They have no correct engineering concept and go about several tasks at a time. They think that they will get through it to draw several graph papers and write a design instruction. They can't wait to finish the graduation project within one month. As a matter of fact, an engineering issue is far from being that simple. First of all, it is necessary to look up a lot of data to determine the entire design scheme and to design a rational structure according to the reality. Then, it is necessary to calculate and examine the size of the structure. Finally, it is the processing and experiment of components and parts as well as writing of the design instruction. Each step is mutually correlated and interacted. Only if each step is well done, can we ensure the quality of the graduation project.

1.4 Mastery of the Basic Knowledge is not Solid

The elementary courses that machinery majors use in their graduation projects include “Mechanical Graphing”, “Mechanical Precision Analysis”, “Mechanical Design” and “Mechanics of Materials”. Design and verification of intensity and rigidity, determination of the major parameters of components and parts and design of accuracy are all conducted on the basis of relevant knowledge in the above elementary courses. All the design tasks are finally embodied in the engineering drawing. Some students do not grasp solid knowledge in elementary courses, often with lots of mistakes in design of the structure and the technical issues, annotation of tolerance dimension of the components and parts and selection of components and parts. They have great difficulty in achieving the requirements of the design.

1.5 The Basis of Mechanical Drawing is Weak

For quite a long period of time, drawing of graph papers has been an important aspect in the graduation project of machinery graduates. However, over the past few years, the quality of the graduation project of students has been quite worrying. The consciousness of standardization of the graph papers among some students is weak, so they draw the graph papers as they wish. The standard components are not drawn in accordance with the standard; the title bar and the specification list are filled in randomly; the figure lines are not distinguished in terms of thickness and thinness or in terms of dotted line and full line; value of tolerance and roughness is not reasonable and annotation of size is not standard or complete; and the way in which components and parts are connected is unreasonable. All the above phenomena emerge in endlessly. This results in the fact that the graph papers graduates draw are unlikely to express the structure of components and parts in a rational, complete and correct way and that components and parts of the design are difficult to be processed or unlikely to be processed (Ji Xiaogang, 2008).

1.6 The Innovative Consciousness and Innovative Capacity of Students is Weak

The graduation project of machinery majors involves knowledge summary and conclusion and comprehensive application in several aspects of machine, hydraulic pressure, electrics and computer and is a process in which multidisciplinary knowledge is applied comprehensively. When faced with selection of the topics, quite a lot of students merely show preference for the topics in the domain they are familiar with. Nonetheless, they are neither willing to step into the topics that involve new knowledge and new domain nor willing to place their time and energy in the research on new problems and on exploration of new methods. The students have no strong consciousness of innovation. In the process of the design, when encountered with difficulties, what they take priority consideration of is not to how to make full use of extant resources to analyze and resolve problems, but to depend on their instructors and wish to resort them to resolve the problems. They show preference for design step by step according to the train of thought and method of their instructors. Instead, they are unable to use new train thought and new method to resolve difficulties, lacking in the capacity of innovation (Hu Guoyu, Zao Remu & Zhou Jianping, 2011).

1.7 The Evaluation and Management Process of the Graduation Project is Open to Be Resolved

At present, the graduation project of graduates in machinery majors needs computer whether in terms of the type-in of the text or in terms of the drawing of graph papers. However, neither the classroom nor the computer room of the school is able to meet the need of one computer for each student. The large majority of students conduct their graduation design either in the dormitory or in the internet bar. Therefore, daily management or evaluation becomes a great difficulty. In addition, the instructors are busy with their teaching and scientific research tasks, so they have no enough energy dedicated to their instruction on the graduates. Furthermore, the school loosens their supervision on the evaluation of the performance of the graduation project, so few students fail to graduate as they do not pass the graduation design. All the

above reasons cause the evaluation and management of the graduation project to become a mere formality.

2. Solutions and Countermeasures

2.1 Scientific and Rational Selection of the Topics According to the Target of the Training

Whether a topic is selected in a correct and appropriate way has a direct effect on the quality of the graduation project. The principles of the selection of topics mainly contain the following several aspects. The selection of topics have to revolve around the training direction and target requirements of the machinery majors and are able to reflect the capacity of graduates in resolving actual problems by means of comprehensive application of scientific theories, methods and technical means. The selection of topics needs to be combined with production and technical transformation or scientific research tasks so as to enable students to cultivate the spirit of assiduous study and the innovative and practical competence through the graduation project. The selection of topics is supposed to be advanced. It is better that it is combined with practice of production, pays attention to combination with electrics, computer and modern manufacturing technology and adapts to the need of the knowledge-based economy and social development. The topic should be moderate in terms of difficulty and be appropriate in terms of the amount of work. It should not only assess application of the elementary knowledge, but should also be of challenges. In that way, the students are able to complete the tasks in time within the prescribed time limit and receive exercise. In the principle, each student is supposed to have one topic. As for those topics with a great deal of work amount and with many tasks to combine with the practice, it is possible to arrange students to constitute groups of the graduation project.

2.2 Scientific and Rational Adjustment of the Time for the Graduation Project

Given that the time of the graduation project comes into conflict with the employment and postgraduate entrance exams of students, it is considerable to adjust the beginning time of graduation design from the eighth semester previously to the seventh semester and to carry out flexible management in terms of the time for the graduation project. The students can choose to make a reasonable arrangement of the beginning time for their graduation project based on their own situation. The students who take the postgraduate entrance exams may apply for the graduation design in the last semester, so they will dedicate themselves to preparing for the exams in the first semester. The other students may choose to embark on their graduation project in the first semester. Since in the seventh semester, students can also learn the professional courses, they may choose to learn with the problems they have encountered with in the process of the graduation design. This will not only consolidate their learning achievements, but will also improve their level of the graduation project. In the meantime, it is necessary to end time of the graduation project ahead of time. In this way, the employing units are able to survey students' quality in a comprehensive way by referring to the performance of their graduation projects. Also, the students will place more emphasis on the graduation project. Those students who have finished the graduation project ahead of time are able to take all kinds of selective practical short-training courses. This will further improve the capacity of the graduates in adapting to the work.

2.3 Strengthening the Strength of Guidance on the Graduation Project

2.3.1 The Guiding Instructors Should Track and Guide Each Step in the Graduation Project

The guiding instructors need to conduct careful investigation to each step in the graduation design. They are mainly responsible for checking whether the design content is overall, whether arrangement of the chapters of a thesis is reasonable, whether the viewpoints of a

thesis is correct, whether an argument is sufficient, whether a conclusion is correct and whether there is fabrication or false imagination. As for any issue detected, the instructors should offer specific guidance in due course and analyze students' design thesis in a comprehensive and overall way.

2.3.2 The Guiding Instructors Should Train Students' Scientific Inquiry Capacity

The guiding instructors need to instruct students to apply the reference books in a correct way, grasp the method to look up the materials in relevant domains and resort to online resources to know about the latest scientific trend. They should teach students how to combine knowledge in the books closely with engineering practice, encourage students to think creatively and to continuously explore new design methods and stimulate students' strong thirst for knowledge and profound interest in the graduation project of machinery majors.

2.3.3 The Guiding Instructors Should Offer Guidance by Different Levels in the Process of the Guidance

The students differ from each other in their capacity in analyzing problems and resolving problems. And the guiding instructors may conduct guidance by different levels according to their characteristics. As for those students who have strong capacity and whose progress in the graduation design is fast, the guiding instructors may expand the design tasks according to the titles of the thesis topics and encourage students to study independently. As for those students who have weak capacity and whose progress in the graduation design is slow, the guiding instructors may place the emphasis of guidance on the analysis of the project and on guidance of the design thought and encourage students to finish the design task by themselves.

2.4 Cultivating Students' Consciousness of Innovation and Capacity in Innovation

2.4.1 Breaking the Normal Procedures and Awakening Students' Consciousness of Innovation

At the beginning of the design, the guiding instructors ought to direct students broaden their train of thought in due course and guide them to innovate boldly and exercise their independent capacity in thinking instead of confining to the outdated design thought. As for those students who have the train of thought in innovation, the guiding instructors should encourage them to detect new problems in the train of thought, guide the interest of students to resolve specific problems, stimulate their curiosity and thirst for knowledge and make the design filled with vitality and vigor.

2.4.2 Paying Attention to Training Students' Capacity in Learning New Knowledge

When students encounter with difficulties, the instructors should not take on what ought to be done by the students themselves. Instead, they should be good at inspiring the students and instructing and enable students to come to realize that only new knowledge will, forever, become the primary motive for the social and economic development. As for the students, the process of independently resolving problems is also a process in which they comprehend the new knowledge and digest the knowledge into the knowledge they apply themselves. This kind of learning capacity will help the graduates to better adapt themselves to the society and to better integrate themselves into the society.

2.4.3 Paying Attention to Innovation in the Mode of Training

On one hand, the guiding instructors may use the content in the existing scientific research projects to design and develop innovative graduation project titles and add the proportion of the content with combination of comprehensiveness of the titles and the production practice. On the other hand, the instructors may also probe into cultivation with coalition of colleges and enterprises and combination involving production, teaching and research for the

graduation design and encourage students to finish their graduation project by working in the internship units. Or the instructors may invite the staff with abundant practical experience in the enterprises to take part in guiding the graduation design so as to continuously enhance students' operational practice capacity and capacity of innovation.

2.5 Standardizing the Process Management of the Graduation Project and Taking Strict Control over the Quality

During the period of the graduation project, the external factors, such as, the postgraduate entrance exam and employment, have great influences upon the graduation design. Besides, the graduation design in itself is of great flexibility, there is certain difficulty in management of the graduation project. Therefore, it is considerable to set up supervision groups at the two levels of university and college for the graduation project, which mainly administer the process of the graduation project so as to ensure the quality of the graduation project.

2.5.1 Strengthen Supervision Management of the Step of Selection of Topics

The two-level supervision groups need to take strict control over the selection of topics. It is firmly required to reject the topics that do not conform with the requirements of the cultivation target, that do not get closely connected with the practice of production and that are outdated and are not sufficient in terms of innovativeness. As for feasibility of the topics, it is necessary to organize the guiding instructors and experts as well as professors to demonstrate so as to ensure the quality of the topics and guard the first pass for the graduation project.

2.5.2 Intensify Supervision Management of All Stages in the Graduation Project

The guiding instructors need to decompose and refine the content of the graduation project into several tasks and targets according to the requirements of the tasks of the graduation project and require the students to finish the graduation project in accordance with the targets of the tasks. It is also necessary for the guiding instructors to conduct regular check on the completion of students' task targets and conduct a spot check at any time. The college-level supervision group is responsible for checking the guidance of the guiding instructors, whereas the university-level supervision group is responsible for checking the entire progress of the graduation project in the college. In this way, the mechanism of a superior level supervising an inferior level is formed. This ensures successful progressing of every stage in the graduation project and that it is completed with both the quality and the quantity being guaranteed and avoids rushing work and carelessness of the guiding instructors (Sun Zhengrong, 2005).

2.5.3 Do a Good Job of Supervision Management of the Thesis Defense for the Graduation Project

The college-level supervision group needs to conduct strict examination on the thesis of the graduates, while the university-level supervision group needs to conduct random inspection on the thesis and assures that the students whose thesis does not pass the inspection will not be allowed for the thesis defense. In the process of the thesis defense, the focus should be on investigating students' practical operational capacity, their language expression capacity, their understanding of the topics as well as their familiarity with the graduation project.

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