Research on the Multi Tutor Model of "Plastic Mold Design" in Graduation Design

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Abstract. Graduation design is an important teaching link to cultivate engineering college students' practical ability, innovation ability and engineer quality, and the guiding teacher is the key factor to ensure the quality of graduation design. This paper discusses a combination of several guiding teachers of three-dimensional guidance model replaces one dimensional guiding model of single tutor in the selection of "plastic mold design", which improves the content and quality of graduation design from many aspects and angles and effectively solves the problem of the individual teacher's knowledge limitation.

Introduction

Graduation design is one of the important practical teaching links in the undergraduate teaching of colleges and universities, a process in which students can analyze and solve scientific research and practical problems based on theory foundation knowledge that they have learned, cultivate the actual combat ability and improve the comprehensive practical ability and quality, and one of the key links to realize training target and check teaching quality. The important goal of talents training in mold specialty is that by means of graduation design, the students can master the process and method of die design so well that they are able to independently complete design work and quickly adapt to the actual needs of the mold industry.

With the computer CAD/CAE/CAM technology is widely used in modern mold design, the traditional product development and manufacturing method of the mould has been fundamentally changed. In addition, it is beneficial to promote product quality, shorten new product development cycle and reduce production cost, as the result, the development of die industry can be accelerated. "Plastic mold design" as a graduated project topic selection for mould specialty can fully meet the needs of today's industry technology development. Modern ideas and methods are applied to guide students to complete the task of mold design which has an important significance to train students' professional ability and plays a practical meaning in the future.

Organization of the Text

Problems in the Single Tutor Guidance Model

Based on topic selection of plastic mold design, the main steps of modern mould design in this study were “to complete product modeling by utilizing the 3D modeling software→to analyze the product modeling with the aid of injection molding and optimization software→to design parting surface and call mould base→to output 2D assembly drawing and part drawing→to machine the parts with the assistance of computer→to write graduation thesis and translate some foreign literatures”. During these processes, it needs not only professional knowledge of die design containing mechanical design, mechanical drawing, mechanical processing and multidisciplinary and multi-field knowledge which involves interchangeability and measurement technique, but also demands to master computer application software, such as 3D design software(UGA|ROE),
computer aided analysis software (MOLDFLOW), two dimensional drawing software (AUTOCAD) and text editing software. Because this kind of topic is comprehensive and practical, it is hard to independently complete it for students without the help of tutors. However, the tutor may have limitations in some respects which leads to the lack of possibility carrying out comprehensive and detailed guidance to the students. For this reason, it is difficult for students to get the best training and improvement. How to solve this problem? A new management mode, multi tutor combined three-dimensional guidance model, is established for giving full play to each tutor’s specialty according to his major and interest and getting the graduation design done as efficiently as possible.

The Model of Multi Tutor Guidance

As all we know, the guiding teacher plays an important role in improving the quality of students' graduation design, so that only when we give full play to the guiding role of teachers can we maximumly improve the teaching quality of graduation design and adapt to the current "made in China" talent demand. The model of multi tutor guidance is applied to the graduation design of mould specialty which can meet the requirements of modern mold manufacturing industry.

Once the choosing topic of graduate design is determined, it means that the students have determined their main guiding teachers who will be totally responsible for task allocation, process planning and acceptance evaluation of graduation design. Then other teachers in the form of voluntary combination or unified reasonable arranged by the concerned department take advantage of their own strengths to assist the students to complete their designs. So the teacher is not only the main teacher, but also assistant instructor. A graduation design topic is likely to be guided by a number of tutors and the specific model is shown in Figure 1. Generally speaking, the teachers who are jointly responsible for a graduation project will be combined into a group, one for main teacher who is in charge of the overall process and quality of the graduation design, the others for assistant instructors who assist the main teacher to guide the related steps of graduation design, according to their respective different expertise. In this way, each plastic mold design subject is mainly responsible by the main teacher and is assisted instructed by other professional teachers, so the quality of graduation design can be guaranteed well.

![Figure 1. The Multi Tutor Model of Plastic Mold Graduation Design.](image)
3D design software such as Pro/E and UG software is most widely used in industry currently. Pro/E is able to complete the whole process from product design to manufacturing because of its powerful software function mainly including 3D solid modeling, assembly simulation, machining simulation, NC automatic programming and finite element analysis. UG software as one of the top integrated software in computer aided design analysis and manufacturing can provide very powerful application tools for engineers and technicians and complete product design, analysis, engineering drawing, CNC processing and so on. It is not easy to use them (Pro/E and UG) well for each teacher due to the fact that they have many function modules and high degree of integration. Moldflow software is fast and convenient in the test of product process and optimization of mold design. It is mainly used in injection molding analysis and optimized design which provides guidance and support for the relative person, resulting in reduction of design cost and design period. As a CAD/CAM software based on PC platform, MasterCAM not only has the powerful and stable modeling function, for example designing complex curves and surfaces of parts, but also has strong and flexible processing function in surface rough machining and surface finish machining. The whole process of the parts is simulated by MasterCAM, and during the simulated procedure, it can clearly display the tools and fixtures, check the interference and collision between the tools and fixtures and the manufactured components and truly reflect the actual situation in the process. So it is an excellent CAD/CAM software in machining simulation of mold parts in injection mold design.

Thus, in the design process of the plastic mold, a lot of computer aided software is used causing none of the instructors can master it so well. If there are some problems in the design process, the student can ask the teacher for help, and this teacher who is good at related software is appointed his assistant tutor. In this way, we can give full play to the strengths of each tutor to improve the quality of graduation design and enable the students to learn as much as possible. Meanwhile, the main tutor is mainly responsible for guiding students’ drawing and drawing output, writing and editing of graduation thesis and translation of foreign literatures, that is, the main tutor is in charge of the overall picture and the quality of graduation design and answering students’ difficult problems and eliminating learning barriers in time.

The Positive Effects of Multi Teacher Guidance Model

The modern mold design is a comprehensive and practical graduation design topic in mould specialty, and the guidance teachers play an important role in student's graduation design. The teacher guides the students in direction, method and process. This full guidance consists of the selected topic of graduation design, the collection of data, drawing up the outline, the guidance of design process and thesis defense. And the selected topic of graduation design and the guidance of design process are most important in all of them. Therefore, the multi teacher joint guidance is more conducive to the completion of the design, and the positive effects are as follows: (1) The graduation design can be underway in an orderly manner under the macro management and overall arrangement of the main teacher; (2) The assistant teachers provide special training and coaching that will be conducive to solving difficult problems and the successful completion of the design; (3) With the joint guidance of the teachers, the quality of graduation design can be improved; (4) With the joint guidance of the teachers, the students can learn as much as possible; (5) The joint guidance of the teachers is helpful to cultivate students' capacity to acquire and apply knowledge, practical ability and creative thinking ability; (6) The joint guidance of the teachers is good to train excellent engineers.

Implementation and Guarantee of Multi Tutor Guidance Model

In order to ensure that the multi tutor guidance model can really fulfil his potential, the following work must be done: (1) The management platform of multiple teacher guidance should be set up and its management should be continuously strengthened. According to different teachers' expertise and experience to determine the composition of the joint steering group and the rational allocation of their respective tasks and responsibilities; (2) The training of teachers' special business ability, especially in computer software, should been actively promoted to improve the level of teachers' practical guidance and enable teachers to quickly adapt to the update of software; (3)
Communication among teachers should be strengthened to improve their business skills and ensure the guidance work to be successfully completed; (4) In order to keep pace with the times, schools or faculties should actively organize teachers to the production frontline of the mold industry for research and learning. In addition, the school can contact some teaching and research units which have a good achievement in mould specialty such as universities, research institutes and enterprises for the teachers to have a chance of on-site training and study.

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References