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Research Article

Study and Practice on Manufacturing Practice for Mechanical Industrial Design

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Abstract: In order to solve the problems existing in the manufacturing practice of mechanical industrial design, a series of methods are proposed, so as to improve the quality of manufacturing practice of mechanical industrial design. And the necessity of study and practice on manufacturing practice for the mechanical industrial design is discussed. In this study, the methods including establishing the new suitable mode of manufacturing practice of mechanical industrial design, establishing the stable base of manufacturing practice, strengthening the construction of instructors troops of manufacturing practice and paying attention to the rule of psychological activity of students and teaching scientifically, will certainly have a profound theoretical and practical guiding significance. On this foundation, the study and practice conclusion on manufacturing practice for mechanical industrial design is done.

Keywords: Mechanical industrial design, manufacturing practice, visit practice

INTRODUCTION

Manufacturing practice is very important to the mechanical industrial design, which has an irreplaceable role in cultivating students to integrate theory with practice and to think independently and to analyze and solve problems, especially in establishing engineering consciousness and improving the comprehensive practical ability (Liu *et al.*, 2008). But in recent years, with the rapid development of industrial design in our country and college expansion, the number of industrial design student flourishes. In China, from1999, common higher colleges start expansion and the enrolling number from 1998 in 1.08 million to 2010 in 6.57 million, increases to 508% (Chen *et al.*, 2011). The scale of running college of industrial design especially mechanical industrial design unprecedentedly expand and the colleges have set up mechanical industrial design major one after another. Many colleges open mechanical industrial design major blindly, due to only see the good student resource and good enrolling foundation, in fact they do not have enough preparation of various aspects of education resources, such as teachers, equipments and so on. They stranded after the students are enrolled, as expanding blindly (Wang, 2011). For this kind of practical discipline of mechanical industrial design, the practical ability of student is quite important. The problem that brought by blind expansion of mechanical industrial design major is that it already becomes quite difficult to carry through manufacturing practice for the enrolled students who are more than ever before in several times according to the past mode.

In addition, at present, the main unit of manufacturing practice of mechanical industrial design is the state-owned enterprise, which is in an adjustment and restructuring period and does not welcome the student practice and some of which even refuse (Xu, 2008). Even if accepting student practice, many manufacturing units also only allow students to do visit practice in green safe passage in a row. The green safe passage has a certain distance from the manufacturing equipment and this leads that the manufacturing practice more likes industrial tourism. It makes the quality of manufacturing practice to be sold at a discount greatly. Sometimes students of a few classes together go to practice at the same time, which leads that the practice team has more than one hundred meters long and the front team is already out of the workshop and the rear team has not entered the workshop (Zhang *et al.*, 2011). So the student practice often is going process, entering in the front door and going out in the back door, which could not reach the teaching requirement of manufacturing practice and it is difficult to guarantee the quality of manufacturing practice.

In the meantime, because of the time of most manufacturing practice in mechanical industrial design is only 2~3 weeks, it is difficult to carry on the full range and the whole process of manufacturing practice, as the time is not enough and it is inevitable to view the flowers on horseback (Lin, 2011).

Thus it can be seen that the link of manufacturing practice is the weakest link in mechanical industrial design major. How to do a good job in manufacturing practice teaching is the problem that mechanical industrial design should pay attention to and study

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seriously (Fu, 2011). So, to the mechanical industrial design, study and practice on manufacturing practice has a profound theoretical and practical guiding significance.

THE PROBLEMS EXISTING IN THE MANUFACTURING PRACTICE OF MECHANICAL INDUSTRIAL DESIGN

The outmoded mode in manufacturing practice: At present, many mechanical industrial design students take a manufacturing practice with other mechanical major students and the mode of manufacturing practice is still the traditional centralized manufacturing practice. Obviously, it already becomes quite difficult to carry through manufacturing practice for the students who are more than ever before in several times with the mode of centralized manufacturing practice. Because the number of students is numerous, spreading to the factory, the instructors do not give enough guidance, plus internal noise, even if explaining and only a few students can hear. So students only observe the process of production or look up the technological document of the factory and then record (Peng, 2008). Quite a few students even do not record and just view the flowers on horseback and watch the scene of bustle. To the mid and late stage of practice, because of losing their curiosities and interests, the students begin to try to avoid the teachers or even just play for fun, which influences the practice effect seriously.

Many difficulties in finding practice place: With the further development of economic reform, enterprises take the maximization of profit as the ultimate goal and are not willing to serve the practice students. The practice activity will increase the safety risk of an enterprise and may also bring some inconvenience in production and management. So the enterprises tend to reject the manufacturing practice. Even if receiving, it is only some departments which do not relate with the major closely, so it has not the effect of exercising that it should be had to student's practical ability.

The weak instructors troops in manufacturing practice: With the increasing introduction proportion of young college teachers, the education level and age structure of instructor troops has been further optimized. But most of the young teacher lack of the experience of real manufacturing work and practice knowledge is relatively short, so the ability and level of guiding manufacturing practice independently still needs to further improve.

In addition, Mechanical industrial design major is mostly put in the mechanical department. The Most of teachers of instructors troops are turned from the teachers of mechanical and electrical department and a few teachers come from the department of art design (Cheng and Jiang, 2010). While the teachers turned from mechanical and electrical department have not systematically learned industrial design and have also not engaged in design work, so it lacks of pertinence to guide manufacturing practice; the teachers coming from the department of art design have not learned mechanical courses, thus it appears powerless to guide manufacturing practice in manufacturing workshop, leading to the bad effect of manufacturing practice.

Student lacking of necessary psychological preparation to manufacturing practice: When taking a manufacturing practice, quite a number of students regard the manufacturing practice as the industrial tourism and they are not willing to do the real practice work, lacking of the thirst for knowledge and learning initiative. There are some students equate themselves with art industrial design students, thinking that it makes no sense to take a manufacturing practice with other mechanical major students to the manufacturing workshop. In addition, individual students lack of necessary psychological preparation to the manufacturing environment, feeling that the environment is quite different from school, so they are not willing to do the real practice work.

THE NECESSITY OF STUDY AND PRACTICE ON MANUFACTURING PRACTICE FOR MECHANICAL INDUSTRIAL DESIGN

At present, our country has become the largest manufacturing bases of the world, but the severe shortage of excellent industrial design talents especially the practical talents has restricted the sustainable development and become a bottleneck for industrial upgrading (Tang, 2008). So it becomes very urgent to perform the study on manufacturing practice and develop many very capable and practical talents major in industrial design.

- Perform the study and practice on manufacturing practice, build a manufacturing practice factory for the mechanical industrial design major at school. After learning some basic theoretical lessons, let students learn all kinds of practical skills at factory. So that the students' ability of practice can be improved and professional skills can be strengthened, in this way, we can really link theory with practice, which is also the needs of development and perfection of the subject itself (Ma, 2008). On the other hand, through manufacturing practice, the students' sense of organization and discipline will be enhanced; the spirit to bear hardships, hard work, cooperation and teamwork can be fostered. In this way, the comprehensive quality of the students can be improved.
- Perform the study and practice on manufacturing practice teaching, build a relationship with the enterprise and create a practice base outside school. So that students can walk out of school and contact with the society, which not only can make the

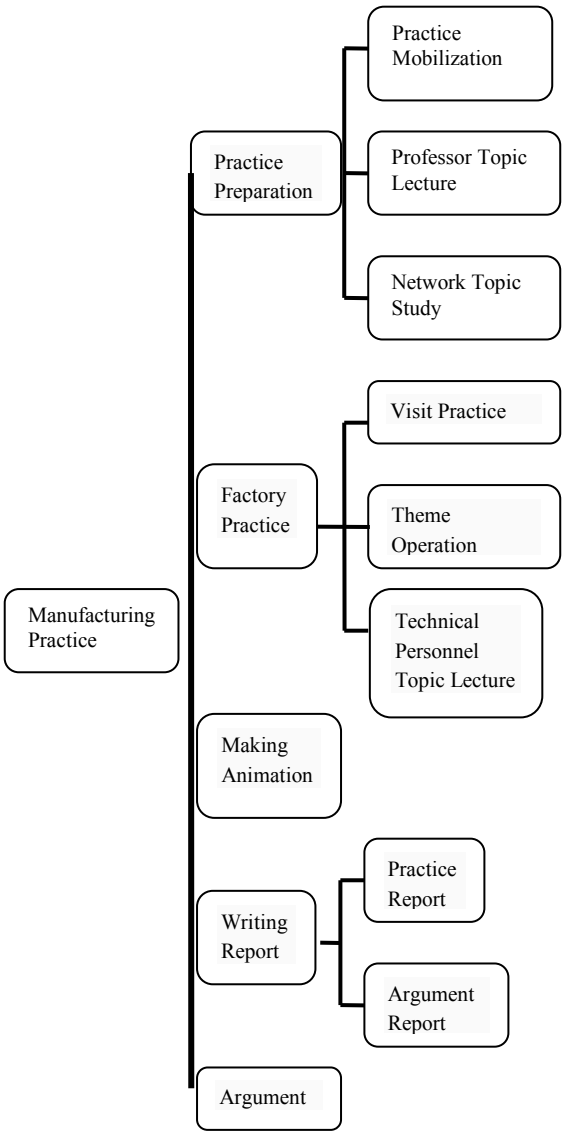

Fig. 1: New suitable mode of manufacturing practice

students have a better understanding about their own major and level of development of the relevant industries, but also can help them establish a correct outlook on life and values. Meanwhile, students can learn a lot of actual design process, access to new instruments, equipment, new methodologies and new processes which can't be learned on textbooks. It can effectively make up the insufficiency of class-teaching and lay a solid foundation for the study of the follow-up courses.

THE METHODS OF STUDY AND PRACTICE ON MANUFACTURING PRACTICE FOR MECHANICAL INDUSTRIAL DESIGN

Establishing the new suitable mode of manufacturing practice: Aiming at the numerous problems existing in the traditional centralized manufacturing practice, combining the major character and the development and change of society requirement, our subject team studies of a new suitable mode of manufacturing practice based on years of practical experience about the mode of traditional centralized manufacturing practice, as shown in Fig. 1. The new mode is divided into five modules. The first module is practice preparation, which is further divided into practice mobilization, professor topic lecture and network topic study. The second module is factory practice, which are further divided visit practice, theme operation and technical personnel topic lecture. The third module is making animation, which requires the students to make an assembling animation of some component that is seen in factory. The fourth module is writing reports, including writing manufacturing practice report of DOC format and argument report of PPT format. The fifth module is argument.

The explanation aiming at individual content of module is done as below:

- **Professor topic lecture:** The root cause why students try to avoid the teachers or even just play for fun is that the theory knowledge of manufacturing practice is not fully prepared, blind visit. In view of this, the practice preparation link increases the professor topic lecture. It could guide the student to integrate the knowledge that has learned to the practical knowledge and tell of students the key points and difficulties and the specific methods and practice.
- **Network topic study:** In addition to listen to professor lecture, students should also get to the manufacturing practice site to learn, on which there are web site links of learning material and the video teaching, of which the content is rich, specific and intuitive. In order to restrain students on the web site to study, teachers could examine student in asking questions way, not through the examination, one can take part in the next module of factory practice.
- **Factory practice:** The factory practice is the principal part of practice. But as the number of students is constantly increasing, the practice quality could not be ensured. In the new mode, the instructor leads the student to carry on the visit practice aiming at the practice content of every day in the first and then divides group and sets theme for students and lets students to carry on the practical operation. Finally, inviting technical personnel make topic lecture. As this making pointed practice every day could make students get a bigger profit.
- **Making animation:** Mechanical industrial design major and art industrial design major are entirely different. It requires the students to understand the mechanical internal structure, to understand certain processing technology and process. So having students make an assembling animation of some component that is seen in factory would have the

important meaning. This not only can restrain students seriously and deeply practice, also can greatly increase students' computer level. Nowadays the enterprises have high requirement of computer ability for the students of industrial design, through this training, it could better meet the needs of the enterprise and lay a solid employment foundation for the future.

- **Writing report:** Writing reports not only contains writing manufacturing practice report of DOC format, but also contains writing argument report of PPT format. The manufacturing practice report is a complete review and summary the student makes to practice. But not as an argument report, the argument report should make an illustrated PPT format, at the same time, the animation that is made before should also link to it.
- **Argument:** The argument link is to supervise students further seriously for manufacturing practice and to write a report. Instructors raise pointed questions according to the content of practice report, inspecting students the master degree to practice basic requirements and the serious degree of manufacturing practice. According to the content of practice report and argument report, the making quality of animation and the argument situation, the final result is confirmed. Argument link is an important supply to the objectively evaluate the manufacturing practice result of students.

Establishing the stable base of manufacturing practice: The industrial design especially the mechanical industrial design has a strong theoretical and practical feature, so the manufacturing practice teaching is fairly important for it. However the primary premise of strengthening manufacturing practice teaching is to establish the manufacturing practice factory on campus, which is the most stable base of manufacturing practice, just like the Bauhaus school, which lets students enter into the factory and learn various practical skills after learning certain basic courses. At the same time, colleges could also set up the outside cooperative manufacturing practice base, which relies on the college, establishing the cooperation relations with surrounding related enterprise. But mechanical industrial design major and art industrial design major are entirely different. It not only requires students to understand the whole process of designing, but also to understand the mechanical internal structure, to know certain processing technology and process. Therefore the outside cooperative base of manufacturing practice should be established with two types of enterprises and one type is the manufacturing enterprise in which students could learn certain processing technology and process; and the other type is industrial design enterprise or the manufacturer related to industrial design in which students could know the whole process of designing. For some areas in which the industrial design enterprise or the manufacturer related to industrial design is rare, such as the north of China, schools should change ideas, based on long-term considering, trying to lead students to the industrial design enterprises of developed city to visit and practice. Industrial design students must broaden their horizon and have a good grasp of the latest things and only in this way can they become outstanding design talents in the future.

Strengthening the construction of instructors troops of manufacturing practice: In order to rapidly improve the young teachers the guiding level of manufacturing practice, when taking a manufacturing practice, the grouping method combining the young teachers, middle-aged teachers with the old teachers could be adopted, realizing the teacher grouping that one helps one and one leads one. At the same time, it is required that the young teachers should well know each link of manufacturing practice enterprise. In addition, in the process of manufacturing practice, the teacher symposium should be held regularly, intensively discussing the problems that are found and encountered in the process of manufacturing practice, so as to improve the guiding ability of manufacturing practice in a short term.

In addition, in the long run, it is necessary to strengthen professional communication between two kinds of teachers, organizing mutual classes, learning from each other and trying to shorten the gap between the two disciplines (Jiang, 2011).

Paying Attention to the rule of psychological activity of students and teaching scientifically: In the beginning of manufacturing practice, students are sensitive and excited to the fresh things, analyzed from the psychology point. But when becoming more and more familiar with the surrounding environment, students gradually go to mental peace and the excitement gradually declined and at this time the learning enthusiasm also falls sharply. To this, the teaching strategy of arousing students themselves enthusiasm could be taken, letting the experienced teachers do introduction combining the major characteristics with the enterprise characteristics and other stations, so as to enable students to have a comprehensive understanding to the manufacturing practice (Yu, 2012). At the same time, the theoretical foundation knowledge and the professional knowledge that have be studied and are related to this manufacturing practice should be properly concluded and summed up, so as to make students understand the purpose and the importance of manufacturing practice, correct the attitude of manufacturing practice and attach great importance to manufacturing practice from the thought, arousing students the enthusiasm of manufacturing practice. At the same time, it is necessary to let students know the respective emphasis and the essential difference between the mechanical industrial design major and the art industrial design major. The

mechanical industrial design major especially requires students to understand the mechanical internal structure, to know certain processing technology and process.

CONCLUSION

The manufacturing practice has an important significance to improving mechanical industrial design students the professional literacy and ability of integrating theory with practice, but improving the quality of manufacturing practice is a difficult task. Aiming at the problems existing in the manufacturing practice, subject group carries on the thorough research and proposes a series of methods, aiming to improve the quality of manufacturing practice of mechanical industrial design, thus making students become the new type industrial design talents which have the strong practice ability, the reasonable knowledge structure and the solid theoretical basis and satisfy the demand of employing unit in the market.

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