

## Research on the Construction of Course Group for Industrial Design Engineering Based on Ability Training

Shi-Bin CHEN<sup>1,2,a,\*</sup>, Zi-Jun FU<sup>1,2,b</sup>, Wei-She ZHANG<sup>1,2,c</sup>, Yun-Shi YAO<sup>1,2,d</sup>

<sup>1</sup>National Engineering Laboratory for Highway Maintenance Equipment, Chang'an University, Xi'an 710054, China

<sup>2</sup>Key Laboratory of Road Construction Technology and Equipment of MOE, Chang'an University, Xi'an 710054, China

<sup>a</sup>shibinchen520@sina.com, <sup>b</sup>1739657465@qq.com, <sup>c</sup>jxgcx@chd.edu.cn, <sup>d</sup>yaoyo@che.edu.cn

\*shibinchen520@sina.com

**Keywords:** Industrial engineering, Course group, Training quality, Electromechanical products, Innovation design ability.

**Abstract.** In order to improve the quality of the industrial engineering graduate students, professional courses of Industrial Design Engineering for engineering school was analyzed, and professional courses of Electromechanical Products Innovation Design Ability (EMPIDA) was established and construction method of professional course group of Industrial Design Engineering was put forward. The relevant teaching goals, course structures, teaching methods need be researched around the training of EMPIDA based on the course group. The content of the courses within the course groups need be reformed under the principle of attention to the foundation, cross and study, which will solve the problem of duplication and cohesion, unclear boundaries and so on, and form reasonable knowledge structures, the discipline integration of course contents and teaching methods. The construction capacity of the group was studied, and seven course groups with professional characteristics were planned and constructed. This study can promote the development of professional talent training mode of Industrial Design, and improve the quality of talent cultivation, and also has a positive demonstration effect on other specialties.

### Introduction

With the continuous changing of social and economic development ideas, the development of Industrial Design has been paid more and more attention by all countries [1, 2]. Industrial Design is an important factor in the independent innovation and development of enterprises. The production of Industrial Design reflects the effectual combination of art and technology. The Industrial Design trains professional graduate students [3, 4]. The professional graduate students are required to be skilled in the use of advanced science and technology and experimental methods, who should have the ability to independently engage in industrial design engineering research, transformation, development and application (including management). Therefore, it is very important to improve the training quality using the effective methods.

Course teaching is the most basic, the most direct and the most important link in the process of graduate education. It is the central link to improve the quality of graduate education. At present, the problems existing in the group of professional design specialized courses construction summarized up in the following aspects:(1)it is easy to cause the students confused in learning the courses because the problems of repetition and cohesion between courses have not been solved effectively.(2)it is difficult to meet the demand of the market because the educational position of course group constructed trend to symbolization of skills.(3)it is difficult in the training plan to fully reflect the educational idea of people-oriented and tap the potential because the construction of the course group is not enough degree of flexibility. The construction of course group is new contents for the purpose of integrating the relevant courses together, removing duplicate outdated content, enhancing the people's competitiveness and improving the quality of the personnel training, so as to improve the teaching efficiency. Through the integration of the old course group, the construction of

course group generates new one, having a new talent training target, realizing economies of scale, having a strong operability and practicability. Goshtasebi studied small group teaching in epidemiology courses. The students were satisfied with participatory learning and team working, effectiveness and developing self learning skills [5]. Rahman set Course group (1. auditing 2. taxation 3. public sector 4. basic course 5. optional course), which obtained better learning effect [6]. Chen explored on implementing the CDIO in the Experimental Teaching of Software Engineering Course Group, which brought good effects and was a successful exploration in the experimental teaching innovation [7]. Course group can gain good effects on ability training of students, and there is no report about construction of Industrial Design Engineering course group.

In this paper, the construction of Industrial Design Engineering course group was investigated based on ability training. The content includes construction goal of Industrial Design Engineering and constructed method of course group.

### Construction Goal of Industrial Design Engineering

Graduate education is a professional, exploratory, high-level and innovative nature. The knowledge of constructivism is in line with the content of graduate education reform. The understanding of the characteristics of knowledge provides a new perspective for the reform of graduate education courses in Industrial Design Engineering. According to the training goal of Industrial Design professionals and the structural requirements of industrial designers in the 21st century, it is necessary to establish a professional course group of Industrial Design Engineering disciplines which is distinctive in engineering school, which requires to establish a professional training courses for personnel training in EMPIDA, as shown in figure 1. The group consists of 6 major courses.

The relevant teaching goals, course structures, teaching methods need be researched around EMPIDA based on the course group. The six contents within the course group need be reformed with the principle of attention to the foundation, cross and study, which will solve the problem of duplication and cohesion, unclear boundaries and so on. Course contents and teaching methods with reasonable knowledge structures and the discipline integration can be formed, which will obtain the overall characteristic and create academic advantages for the subject.

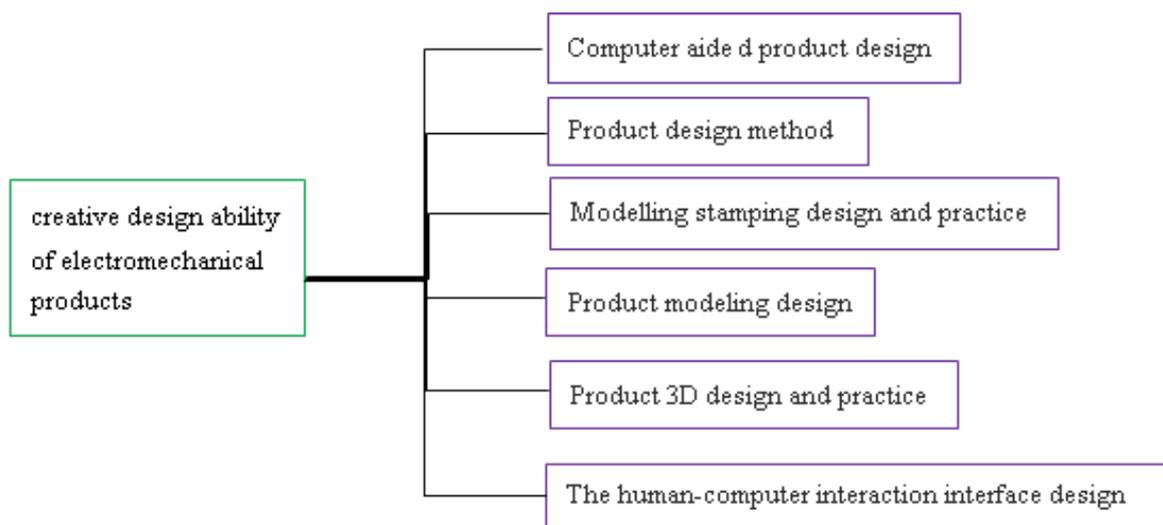


Figure 1. EMPIDA deconstruction diagrams

### Construction of Course Group and Course System

According to the previous statement, based on industrial design talent of EMPIDA as the characteristic should meet the innovation ability, we plan to build seven professional courses except the elementary course group, such as mechanical product structure design ability training course

group, product innovation design method course group, product modeling design expressive techniques course group, product modeling forming technology course group, electromechanical products man-machine interface with engineering design course group, computer aided product design course group, as shown in figure 2. In these courses, the model of the knowledge and training innovative capability will be highlighted.

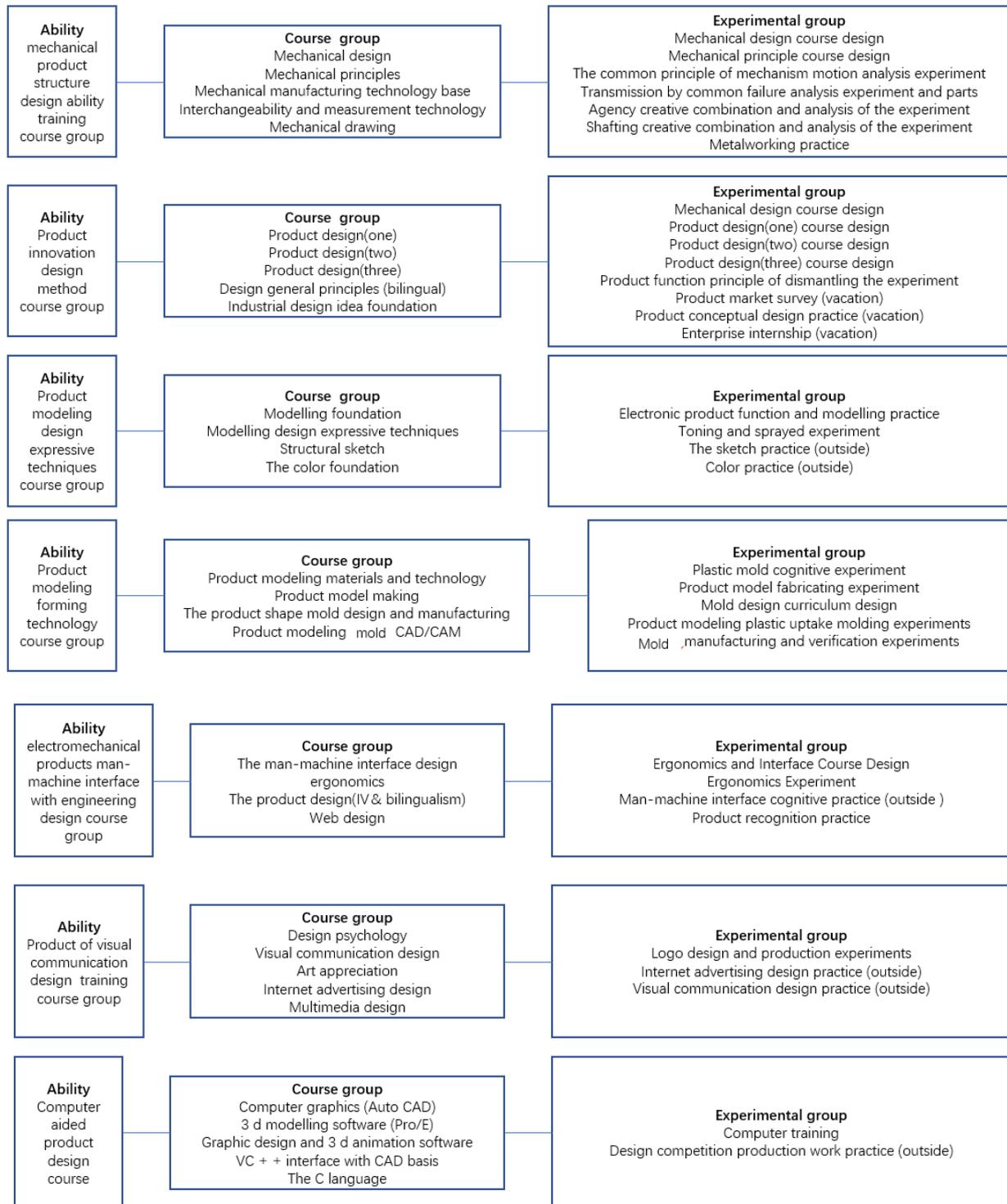


Figure 2 Seven major course groups

According to the knowledge structure that makes up the ability, the course group and its teaching platform construction should be solved by point, line, face and body. The teaching problems can be solved as below:

(1)The directionality problem of Industrial Design Engineering degree courses or elective courses teaching content, teaching methods and method improvement could be solved. Through the optimization of the course construction, the characteristics of the subject will be cultivated.

(2)The Industrial Design Engineering experiment and practical course content and method need improving. Through the construction of curriculum group teaching platform, it achieves the effective combining the theory and the teaching, so as to improve teaching efficiency.

(3)The course group and the method of constructing teaching platform need exploring, which help graduate students cultivate designing capability in mechanical and electrical product in three aspects, such as cultivating the innovative thinking, mastering the innovative methods, familiar with use of tools in mechanical and electrical product.

(4)The problem of the construction and optimization of the platform could be solved, which makes it promote each other among the discipline construction, scientific research, and design competition.

We use the systematic method to study the professional training objectives and break down cultivated students' professional ability, which can get a number of cultivating abilities. According to the above course group constructions, the training objectives of course group can be achieved through the improvement of the course system, teaching materials, construction of experimental practice environment.

On the basis of the elementary theory course, we increased the knowledge points that EMPIDA was required and the new course approach to create innovation ability training course group and teaching platform of graduate students. And course construction can effectively cultivate academic echelon. Therefore, these can form a perfect combination for the discipline construction, scientific research and design competition. This method is conducive to the teaching content that is both intact and closely linked, is conducive to evaluation of the learning quality of the stage and local students, and will provide the basis for continuous improvements of the teaching system.

## **Conclusion**

Based on the characteristics of the course group and construction method of teaching platform and having the ability of Industrial Design professional talent of EMPIDA as the characteristics, we apply the construction methods of point, line, surface, body course group to plan and construct the course group, which break the limitations of disciplinary systems, and face the future, and face the engineer, and face the students' ability to organize course group and teaching platform. This study can promote the development of professional talent training mode of industrial design, and improve the quality of talent cultivation, and also has a positive demonstration effect on other specialties.

## **Acknowledgments**

This work is supported by Education and Teaching reform Special Funds for the Central Universities of China (No. 310625156106, 310625172406 and 310625170801).

## **References**

- [1] Y.W. Meng, P.Y. Mok, and X.G. Jin, Computer aided clothing pattern design with 3D editing and pattern alteration Original Research Article, *Computer-Aided Design*, 2012, Vol. 44, No. 8, pp. 721-734.
- [2] D.B. Kim, and H. Kwan, Computer-aided appearance design based on BRDF measurements, *Computer-Aided Design*, 2011, Vol. 43, No. 9, pp. 1181-1193.
- [3] S.L. Xu, J.R. Yang, and Y.Q. Wang, Application of Fractal Art for the Package Decoration Design, In: *Computer-Aided Industrial Design & Conceptual Design IEEE 10th International Conference*, Wenzhou, China, 2009, pp. 705-709, Nov 26- 29.

- [4] C.Y. Liu, and R. Du, Expert Label Pattern Design System, WSEAS Transactions on Computers, 2006, Vol. 5, No. 9, pp. 2077-2083.
- [5] A Goshtasebi, A Zarifi, B Tarami, A Ghorbani. Small Group Teaching in Epidemiology Courses. Journal of Medical Education, 2006, 9(1):11-15
- [6] H.A. Rahman Set of course Course group: 1. auditing 2. taxation 3. public sector 4. basic course 5. optional course.2007, Fakultas Ekonomi.
- [7] Hao CHEN, Zhong MING, Xiao-gang PENG, Exploration on Implementing the CDIO in the Experimental Teaching of Software Engineering Course Group, Experiment Science and Technology, 2011,04.