



Research Article

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Study on training factors of HARP-CDIO education model for industrial design specialty

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ABSTRACT

The feasibility of combining industrial design undergraduate teaching with CDIO education model is analyzed. A new education model "HARP(Humanism, Art, Responsibility, Professionalism)-CDIO" for industrial design specialty is discussed. HARP-CDIO is not only the development on the training factors of CDIO but also an education Reform of industrial higher education system for societal demands for professional designers in the background of national industry upgrading.

Keywords: industrial design; CDIO; HARP-CDIO; design project; education model

INTRODUCTION

CDIO(conceive, design, implement, operate)which is the latest fruit of Engineering education reform has been widely admitted in the global. The model stands for design, realization and performance. The students are able to learn with great initiative based on the carrier of life span of products. In 2000, CDIO engineering education concept and the international cooperation organization named after CDIO had been established by Massachusetts institute of technology and the Swedish royal institute of technology and other several universities. In 2008 China CDIO pilot was implemented in colleges and universities, including 39 universities in total. The first batch of pilot CDIO for mechanical, electrical, chemical, civil, etc has begun to pay off. As the applicable major, design aims at developing design practice ability and solving practical problems enterprises ability of designer. On the one hand, the connotation of the industrial design professional training objectives and CDIO education idea should be consistent. CDIO, on the other hand, emphasizes the application oriented education mode, aiming at the results, revolving the engineering process which is in high consistency with the industrial design practice. Moreover, the integration of CDIO teaching plan and the industrial design process and the design cycle is of similar platform based on the correspondence. As a result, the CDIO education mode is applied in industrial design professional education, and products, processes or systems of production cycle is regarded as the framework or environment of education. For the present more and more emphasized industrial design – professional education, it is of great benefits and operability.

INDUSTRIAL DESIGN PROFESSIONAL TEACHING AND CDIO MODE

Aiming at the cultivation of students' ability

According to the outline of CDIO, the students' ability can be divided into four layers: engineering foundation knowledge, personal ability, interpersonal ability of team and engineering system. The outline requires that it must be cultivated comprehensively in order to reach the expected goal.

Through the study on CDIO, integrate the subject's concept and ability, emphasize the applicability and resolve practical problems and operational skills. For example, the principles of mechanical project can not only limit in the grasp of theoretical knowledge, but must be applied in the process of designing of mechanical products flexibly. In

the process of designing professional education, the critical ability of industrial designing elites not only presents in the grasp of professional knowledge and theory, the registration of innovative consciousness and innovative ability, but also presents in the ability of transforming to products. The innovative spirit has already become the indispensable demand for industrial designing elites. The so-called innovative cultivation refers to that the creative psychological quality is regarded as the core, the significant creative thinking ability as the characteristic. Meanwhile, it is also a necessity to grasp the high level of comprehensive qualities such as the basic knowledge, basic skills and initial creation practice experience.

Table 1 CDIO teaching programme matched with Professional education needs of industrial design

CDIO outline			The ability as a graduate
Technical knowledge and reasoning	Basic knowledge; Basic knowledge of the core project; Senior knowledge of project	consistency	Hand-painted expression ability, Model making technology; Vector drawing and pixel mapping software, three modeling software, the use of 2 d mechanical drawing software; independent; Design and production technology and process ;thinking and ability of communication; design procedure and time control
Personal professional skills and professional morality	The ability of deducing and dealing with issues; seeking for knowledge in experimentation; systematic mindset; personal skills and attitudes; professional skills and morality		
Communicative skills ; team cooperation and interaction	Team spirit; communication; foreign language communication		
The design ,implementation and operation systems of enterprises and society	External and social environment; enterprise & business environment; design and systematic project; design, implementation and operation.		

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THE HUMANISTIC SPIRIT

Humanism is a human survival significance and value of self-care, presenting in the destiny of human dignity, value, pursue for human legacy of the height of the spiritual and cultural value. The emphasis on humanistic spirit has been added to the industrial design CDIO teaching. One of the reasons resides in that Industrial design professional is in rapid development stage in our country, some people suffer the severance between knowledge and ability; personality and learning; emotion and reason. The general lack of humanistic spirit is the weak aspect of design education mode. Through the education function and role to reshape the humanistic spirit, the design values should not only emphasize humanistic spirit, but also the emphasis and supplement on the existing CDIO must be intensified. Therefore, Humanities curriculum system which is related with Industrial design professional has been introduced into CDIO teaching framework. Meanwhile, the basic knowledge of humanities of Industrial design professional humanities also has to be established, namely, to intensify the CDIO teaching idea on the values, and implement industrial design specialty on the basis of specific practical teaching plan.

ART ACCOMPLISHMENT

Art knowledge system and its corresponding quality training is the area that has not been covered by CDIO outline. Based on the previous professional characteristics, it is necessary to supplement the structure. In return, the adaptability of CDIO has been expanded and the connotation has been enriched. General industrial design aesthetics has far exceeded the content of the visual aesthetic feeling. Designers not only itself should have good aesthetic cultivation, but more social and cultural information resources should be integrated and the content, value and format must be assimilated into the designing of products. This is the embodiment of professional intersection which has not involved the targeted adjustments to syllabus, but also the corresponding evaluation values should be supplemented based on the 12 pieces of standards newly established. The embodiment of the students' artistic accomplishment embodies in the transformation and application in the designing layer in which the aesthetic taste, the visual and psychological feeling can be conversed into experience and skills in the products. Thus adding the new traits of material, structure, shape, color, surface processing, decoration. Moreover, the product artistic temperament and cultural connotation can be registered. Take the course "Picture of product effect" which is the important fundamental course of Industrial design professional for example. The traditional CDIO outline belongs to

personal professional skills.

If “Picture of product effect” aims at the pure skill training, there exists absence of the the designer's professional quality. On the one hand, the enhancement of the skill relies on the cognition and appreciative ability of aesthetics; on the other hand, the expression also includes the designer's design orientation and artistic accomplishment. Therefore, for the Industrial design professional education, the adoption of aesthetics into CDIO is necessary and practical either from the perspective of skill training or the perspective of the demand of more macro interdisciplinary development.

DESIGNER RESPONSIBILITY

The responsibility in HARP-CDIO is different from the personal professional skills, professional ethics and attitude in the CDIO outline. Here, it refers to the social responsibility of Industrial designers. Designers accept the entrustment or designing tasks, thus the sales being on the rise and the consumers are willing to consume. This is a narrow understanding which refers to a part of the designer responsibility. However, the connotation of the designers' responsibility is richer than the work duty: The design of the designer must aim at improving the living conditions and environment and creating a better living conditions and environment for people, namely “design on the benefit of people”. Due to the peculiarity of initiative and creation, human beings not only comply with the nature, but also transform the nature. This also demands the designers to regard the sustainable development of the natural environment as the direction and put the design into practice. It is highly recommended to think from the inextricable integrity of human beings, nature and society to create the harmonious relationship between human beings and nature. And then the state of a harmonious and orderly development of man and nature is promising. It is the designing responsibility, such as green design, Universal design etc that has been publicized and applied widely. Enrich original CDIO elements about the cultivation of professional responsibility and professional ethics connotation to the designer's design ethics and social responsibility, the humanistic spirit is the very point deserved to be discussed by Industrial design professional CDIO teaching. However, there exist many industrial designs major of colleges and universities, and the consciousness training of design responsibility has been neglected. Many Industrial design graduates are in the lack of morality in values, and the cultivation of the sense of responsibility needs to be established through a long period. This is also one of the reasons of the deterioration of “designing ecology”.

PROFESSIONAL

The focus of Industrial design professional is the role that the Industrial designers have played in the enterprise. In professional education stage, the students are required to meet the requirements of enterprise comprehensive ability of the industrial designer as soon as possible and adapt to the current system of enterprise management under the architecture designer. Besides, career guidance curriculum settings based on the Practical design is appearing more urgent.

And for the professional teaching, Students practical ability training can be intensified by light of project designing, thus forming Industrial design curriculum system based on the projects. This is a kind of targeted CDIO mode reform which is flexible in class teaching. The teaching and the products designing can be combined, the projects requirements are consistent with the control of design process and more opportunities and the opportunities to transform the designing results can be provided. HARP—CDIO made the Professional learning meets the social demands to complete the core of basic professional skill learning and training. Industrial design students are able to deal with the practical problems through different types of design projects training and the preliminary Industrial designers' project experience and coping ability is established. Meanwhile, more people will pursue Innovative thinking and originality design. In addition, it is also valid to explore the Industrial design major students towards the future industrial design career service system to reduce the time of the maturity of designers.

CONCLUSION

According to the experience at home and abroad, CDIO concept and method is suitable for the each reform of engineering education. At present, the urgent task of professional industrial design education in China is to cultivate the industrial designer which meets the demand of the epoch. Many problems exist in the educational practice, such as the practice which emphasizes the theory but neglects design, neglecting on the innovation etc. By connecting the CDIO professional suitability and reform, Industrial design HARP-CDIO education model and evaluation system can be explored, thus better cultivating students' ability to solve practical problems by way of team cooperation and possessing the good project research and development, the design and the ability to control. The innovation and the ability of original design can be pursued. The spirit of team cooperation and leading ability based on the good communication, stronger the consciousness of designing expression and propaganda as well as the Humanistic values which is consistent with the requirements of the epoch and the good artistic cultivation are the challenge for

the designers with the sense of designing and designing morality.

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