

Study on Relation between <Human Engineering> and Design

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Abstract: Theories of Human Engineering (HE) are closely linked with design. It is also the guidance and evaluation of the process of design practice. Based on the characteristics of HE, this article aims to explore how to combine human engineering with design practice so as to stimulate students' interests within teaching practices, and apply the principle and method of human engineering in design to improve the level of design innovation.

Introduction

HE is one of the core curriculum for design type engineering and arts. It provides the parity theory and design method for product design. HE has wide range of applications, which mainly focus on whether design process is efficient enough, and whether the scheme of design not only comforts to perception, but also be in line with rationality. Although exists as an independent unit, Human Engineering is closely related to other courses. Only coheres with other courses can it achieves the effect of its theoretical guidance in practice. At the same time, only other follow-up industrial design courses complement with it, can the design method, design evaluation and design revision be justified.

Analysis

Existing Issues. Different from the traditional relevant courses, Human Engineering is an important part of science and technology knowledge system, which covers the contents of the engineering technology. Considering that HE has only been developed for a decade domestically, its discipline construction system is not mature. Therefore, it faces the challenges that how to apply and combine with industrial design and improve the discipline construct. Major problems that can be concluded from relevant surveys of HE's current situation in Wuhan Polytechnic University, Nanjing Forestry University, Wuhan University of Technology and Hubei University of Technology, etc. which open design type engineering and arts are as followings:

1) Tedious and complicated course contents and lack of interaction in class. HE focuses on the investigation of relationship between human-beings and machines, which is based on actual measurement, statistics and analysis. It covers an enormously wide range of contents and requires the understanding of the characteristics of people, the situation of environment and relevant information of products. In chapter Human Nature, it includes the physical and psychological attributes of human, namely, body structure size, perception characters、psychological activity, motion system, etc.. (Yulan Ding, 2009).It is the combination of comprehensive contents. The

theory system of Human Engineering is relatively enormous and complicated, which is very tiresome for industrial design students. The results of a study that investigated 90 industrial design students from 4 universities showed that 60% of the students considered the curriculum content is overwhelming, 80% believed that the knowledge they have learned is dull and nearly 90% thought that they were passively engaged and the teachers were simply scripted, and the entire course had no interaction.

2) Lack of connection with other design courses and no practical cases. Human - machine - environment system is independent of each other but also is closely associated. Some theoretical knowledge can only be clearly explained when it is combined with practical design case, it could be easily understood by students. Based on further investigation, it is found that HE course merely offers the students with the conclusion of the knowledge, and the contents only emphasizes on theory, principle, formula and data. Most teachers haven't connected the theory with professional design practice case, have not guided students to apply Human Engineering's principle and method to analyze design rationality and deficiency, or haven't considered how to further modify the design case.

3) The assessment method is rigid. Feedback from students in the survey indicates that assessments of many universities are mainly theoretical tests. Therefore, students with good memories, or successful assault before examination, can pass the test, whereas for those who have strong abilities in learning, they may still fail the exam if they cannot remember theories, even with a good knowledge of the principle and the method of Human Engineering though. That is to say, the assessment method can't detect the understanding ability, operational capability, however it mainly detects the mechanical memory level. This rigid examination method cannot promote the cultivation of students' innovative ability.

Methods and practices

In order to improve the above situation, the author and colleagues have made a summary from many years of experience in teaching and research in HE, as follows.

1) Focus on the key elements related to the design major. As mentioned above, the contents of Human Engineering are complicated. In addition to basic knowledge of design, HE also includes materials such as security, environment, and other more abstract theories. In order to reduce the burden of students, to stimulate their learning enthusiasm, the association between this disciplines and professions should be strengthened. For the design type arts students, teaching contents should focus on restriction and influence of human factors on design, emphasize the perception of the human-machine interface design and consumers' psychological needs. For engineering design students, attention should be paid to the exploration of comfortability and contents of experiments. In the design teaching process, the content of the safety engineering research as well as the spatial environment etc. might be suitably left out.

2) Closely combined with practical design. Human Engineering is a subject that assists design. Only combined with the design practice, can Human Engineering have a fresh vitality. To begin with, it is a good method to involve practical cases while teaching (Ding Zhou, 2011; Rong Shi, 2011). For the interior design, the main function of the Human Engineering is to make the indoor environment meet the need of human life activities through understanding the physiological and psychological of human, thereby achieving the goal of improving the quality of the indoor environment (Leiqing Xu, 2006). The first step is to clearly understand the psychological needs of specific consumer groups. Students could be arranged to conduct the questionnaire so that their

ability of analyzing and solving problems can be developed. The following step is to measure human body size and cognize the materials and space range in order to provide the basis of determinants of space scope, furniture design, and sensory adaptation ability. In addition, interaction should be paid attention in the whole course. Group discussion about subject selection, investigation, research and analysis as well as the conception is encouraged. Discussion about each one's work should be carried out, followed by the various methods to perform and simulate the scenarios of using the products. Then the group members evaluate the case, summarize the problems and solutions, and modify the cases. The best design can be obtained through group wisdom, so as to explore under-improved ergonomics problems and solutions. In the teaching practice, such method is generally considered being able to stimulate enthusiasm and initiative of students. Under this teaching method, the innovation ability of students can be cultivated.

3) Adjustment of the assessment method. Because of the intensified theoretical knowledge of HE and its educational aim is to combine the application with practice and improve students' ability to use Human Engineering theory to analyze, evaluate and revise the design plan, assessment should focus on practice and application, combined with practical, flexible and multivariate assessment methods, which emphasize the fairness and rationality and prioritize the role of students (Barbara.E-Walvoord, 2004). The combination of in-course performance and final exam score is suggested (Qifeng Liang, 2015; Kai Zhu, Huaming Huang, 2012). Students' course mark will be assessed separated, namely, the process of creative design will be mainly considered and final score will be supplement. In-course performance score increase the proportion of activities such as classroom discussion, classroom questioning, thematic discussions, Meanwhile, it strengthens assessment level of practical design training, in addition to traditional way of in-course assessment (table 1). By collecting and sorting the related data from universities mentioned above during 2013 and 2015 and analyzing the feedback from experts and students, this reformed assessment method turns out to be succeed in the evaluation of HE course. This method has improved students' learning initiative, consolidated the knowledge while strengthened their professional quality and practical ability. This evaluation system which centralize students' enthusiasm and practice ability into concrete teaching practices enable students have a better adaptation of the requirement of new initiative talents. By reasonably adjusting the content of the examination, the specific form and content of the students' participation in the teaching process are put forward.

Table 1 Evaluation System of human engineering course performance

Evaluation Criteria Name	Attendance		Discussio	Research	In-course	Test	Progressive Amplitude 5		Total
	Discipline		Question	15	Design	40	Improvement	Beyond expectation.	
Student A									
Student B									

Conclusion

In the era of human oriented society, design need the theoretical guidance of human engineering. Students' interests in learning human-machine- environment system are inspired and their abilities of learning, operation and innovation have been stimulated by improving teaching quality, promoting students' learning enthusiasm, increasing design practices, linking theory with practice

and using the reasonable curriculum assessment methods. As a result, students will subtly use Human Engineering's principle and method in the product design process to improve the rationality and comfortability of products. This exploration is also meaning for other similar edge science. It can further improve the basic theoretical knowledge of relevant teaching research and has certain practical and theoretical significance.

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