Available online at www.sciencedirect.com

SciVerse ScienceDirect

IERI Procedia 2 (2012) 590 – 596

Procedia IERI

www.elsevier.com/locate/procedia

2012 International Conference on Future Computer Supported Education

Research on Multimedia Teaching Materials of Ergonomics Experiments*

Yang Lifang[a], Wang Jia[b]

[a]*Harbin Institue of Technology, P.Box748, Harbin Institue of Technology Harbin, Heilongjiang Province,China,150001*
[b] *The fifteenth apartments, Harbin Institute of Technology, Heilongjiang Province,China, 150001*

Abstract

As important foundation for product design, ergonomics studying has been necessary for most engineering students. Ergonomics experiments can help students obtain perceptual knowledge of human factors. Through research of integrating multimedia technology into ergonomics experiments teaching, the author hopes to improve the teaching effect of ergonomics experiment. By introducing some film shooting technology, the multimedia courseware can clearly present the process of ergonomics experiment and by means of adding more ergonomics related background knowledge, the multimedia courseware can provide students rich useful information for ergonomics study. The development of ergonomics multimedia courseware gives a novel idea is to improve teaching effect.

Selection and peer review under responsibility of Information Engineering Research Institute

Keywords: Multimedia, teaching material, ergonomics experiment

* *Yang Lifang. Tel.: +86-13936490113 ; fax: +86-451-86402015 .
E-mail address: yanglifang@hit.edu.cn

 doi:10.1016/j.ieri.2012.06.139

1. Introduction

Ergonomics studying will help improve appropriateness of product design, the experiment teaching can make the students effectively master the basic theory and method of ergonomics and lay the necessary foundation for following product design course studying. The purposes of ergonomics experiments mainly help students obtain perceptual knowledge of human factors (characteristics of human visual, auditory and tactile sense) and thus as guide to product design (Wang Huifen et al., 2007, Wu haiyan, 2002,). Any knowledge point of ergonomics can become a great inspiration of product design or product improvement.

In recent years, the multimedia technology has obtained rapid development and permeated into almost every areas of human life, such as games, education, archives, books, entertainment, arts and so on.(Yuan Guo-jun et al.,2009) Multimedia technology has the following main characteristics: (1) enrich the course teaching (2) Change passive learning to active learning, effectively carry out individualization teaching and students teaching in accordance with their aptitude.(3) change monotonous traditional education mode(4) provide rich extracurricular reading(5) The implementation of Distance Education.

Multimedia teaching mode of ergonomics experiments will improve the teaching effect and makes the students master more useful ergonomics information.

2. The analysis of existing ergonomics experimental teaching

2.1. The application of multimedia technology

As a basic subject of product design major, ergonomics experiment course is still in the initial stage and at present has not great development in China college education. In the paper of Consideration on Ergonomics Teaching Experiments, Lu Lan et al., 1999, remarks that owing to its strong engineering practice background, purely theory teaching often make students feel difficult to understand and master ergonomics. As an important teaching means, ergonomics experiments can give the students an intuitive, vivid understanding about the abstract concept, model, data of ergonomics.

Qiu Zixu, 2004, brings up the perspective of reasonable use of multimedia and optimizing experiment teaching effect. By means of multimedia teaching and the organization of multimedia information, the teacher can break through constraints of space and time, more clearly, vividly explain some theoretical issues (Liang Baiju et al., 2011).

2.2. The ergonomics experiment teaching system

The program mainly includes two aspects: theory and its application, from the body measurement, environmental factors, work intensity, to human sensory system. The overall style tendency, more theory, less practice, little or no for ergonomics practical application. As experimental teaching materials for industrial design major, the teaching material should strengthen ergonomics understanding and prospect of industrial product applications and this is the purpose of ergonomics course setting(Ole Broberg,1997).

Figure1 is the analysis of existing ergonomics teaching system. For the old ergonomics teaching system, each teaching link is based on linear relation. The linear link easily leads to discontinuities of knowledge system. If a part of the knowledge is adverse and lead to broken link, the next step of learning will not proceed.

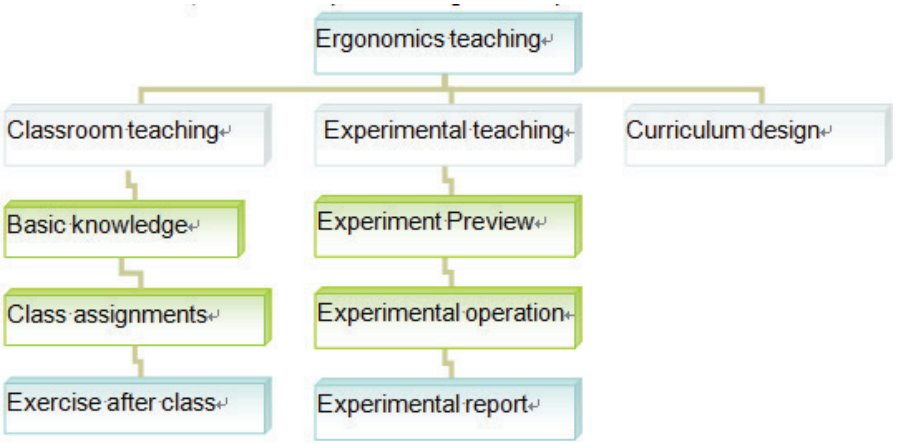

Figure1 the exiting teaching system

2.3. The feedback of actual teaching

Ergonomics experimental teaching synchronizes with and ergonomics course teaching. The course teaching will arrange students the experimental task, the students will prepare experiment content, understand the relevant knowledge background. Owing to the extensive requirements of ergonomics-related knowledge, each experiment involves much background knowledge, plus every experiment with a variety of experimental equipment, these have led to difficult manipulation of experiment based on ordinary experiment method.

For the ergonomics experiments, the test preparation materials and experimental background knowledge are mostly confined to textbook and experimental guide books. Due to insufficient experiment data, especially unfamiliar with the experimental process, experimental equipment, these often lead to good experimental purpose can not be achieved

3. Solutions to multimedia experimental teaching

3.1. Positioning of multimedia experimental teaching

Based on fully understanding of experimental teaching goal, the keynote of the research is giving a detailed presentation and explanation of the experimental process. The detailed design principle mainly abides by following aspects:

（1）Multimedia courseware design for each experiment, mainly complete presentation of experimental process, the previous experimental video information presentation interspersed with appropriate explanation;

（2）As a whole system, all of the experimental teaching material should have a unified system style;

（3） As a multimedia courseware, a multimedia platform should be set for showing： Video courseware as main body, aided with the TV, DVD and network display.

Figure 2 is the desired ergonomics teaching system with multimedia courseware. With the multimedia courseware's participation, the linear contact link becomes a netlike connection. In this way, the relevance between different links is enhanced, the coordination between teaching and learning is strengthened, the relationship between all teaching links becomes more firm. Figure 3 shows the link flow chart of new teaching courseware.

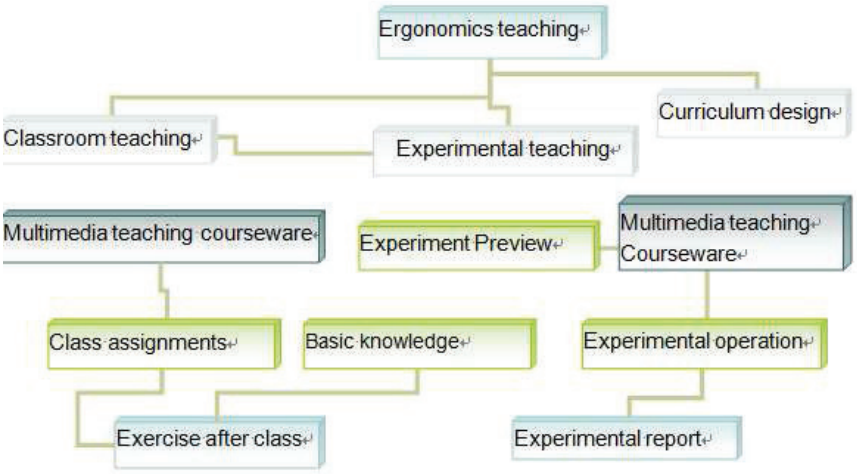

Figure2 Ergonomics teaching system with multimedia courseware

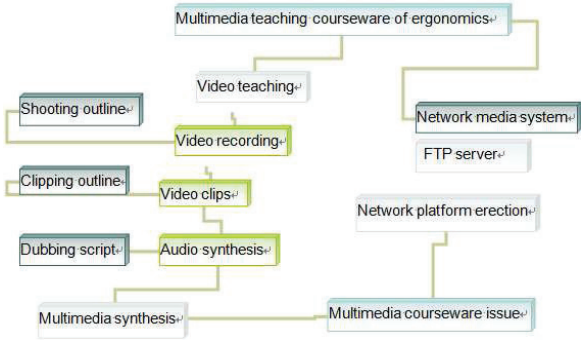

Figure3 Diagram of process flow

3.2. Outline for multimedia filming

The shooting syllabus should comply with the following principles.

（1）The shooting should consider about later film clips. Each lens collection must consider the post processing and multimedia courseware demand, endless video shooting will lead to the late media processing increase

（2）Considering non professional actors and photographer, the clips allowance should be kept, the filming time of the single lens shooting should be increased, necessary repeated shots should have for important point of view scene.

（3）Shooting script should be prepared for each experiment before shooting, the design of shooting script is useful for reasonable shooting scenes in the filming process, the rendering drawing of shooting script need not much detailed, it is enough if the shooting personnel can understand the simple painting. Figure 4 is the shooting sub-lens design example of noise measurement experiment.

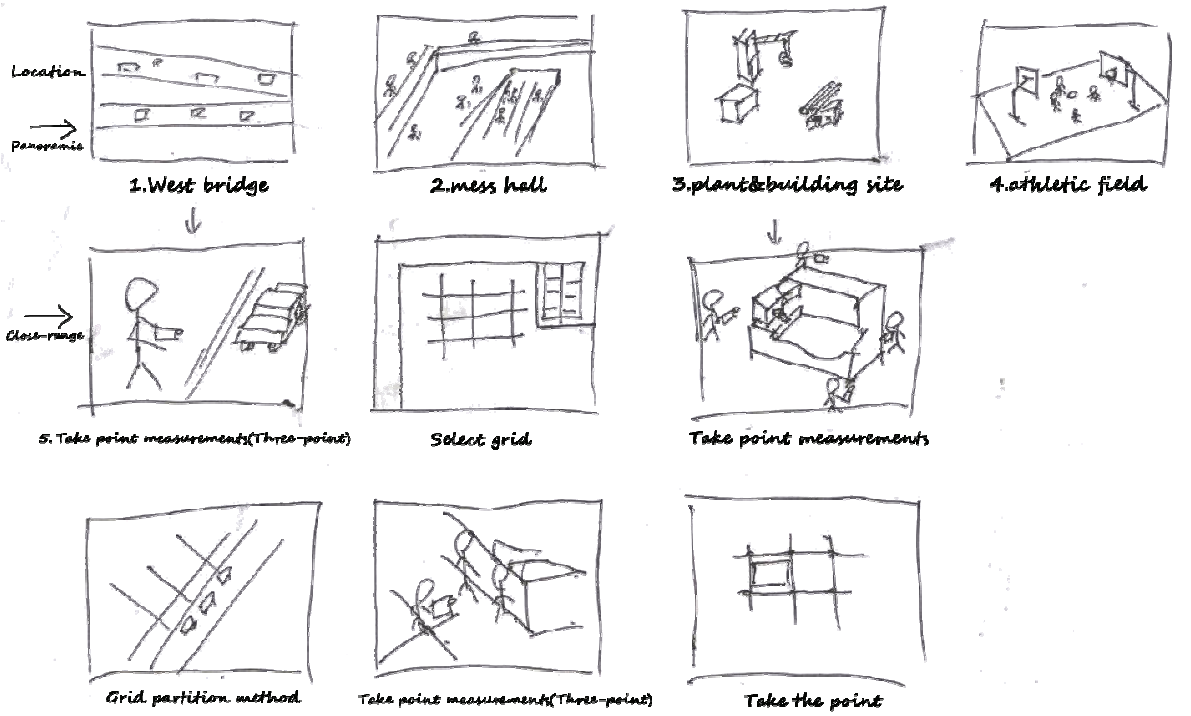

Figure 4 Sub-lens shooting design of noise measuring experiment

After the actors and photographer are familiar with outline and script, the experiment filming can start. Most process of experiments filming are same, the following is the shooting process of noise measurement experiment as to introduce. Figure 5 is the noise experimental scene.

Figure 5 The scenes of noise measurement experiment

3.3. Video courseware clipping

3.4. The original source material of video clips is the real record of the experiment process. For each experiment scene, every has the specific meaning, such as description of the experimental environment, the experimenter posture, the perspective of subjects or examiner, the experimental equipment operating procedures and so on. The narrative scenes must be connected to the expression of the content, and then it can be used for teaching.

Generally the single lens do not have independent narrative and ideographic function, several shots lens connection can achieve some meaning. Each former lens must be ready to trigger the next shot.

The variety of video clips is much various and each clip has its particular style. As multimedia courseware, the video clip can refer to either educational or documentary film clip style: The multimedia courseware needs both full details and precise, concise and credible lens, at the same time, avoid the broken clip. The specific experimental steps are needed to determine the lens switching or field application.

4. Design of multimedia interactive interface

4.1. The title and site design

Clip design consists of titles design, transition animation design and video processing production. For the three parts, the same color and movement style is taken and a unified system subject is formed.

For the title and transition animation design, based on the production efficiency, a simple Flash vector animation is used, then by the ffdshow encoder, SWF vector media is transcoded to avi media for use.

For the 12 video coursewares, the unified visual element is adopted. A linear motion and deformation are mixed, aim to obtain concise and bright style and close to video shooting style.

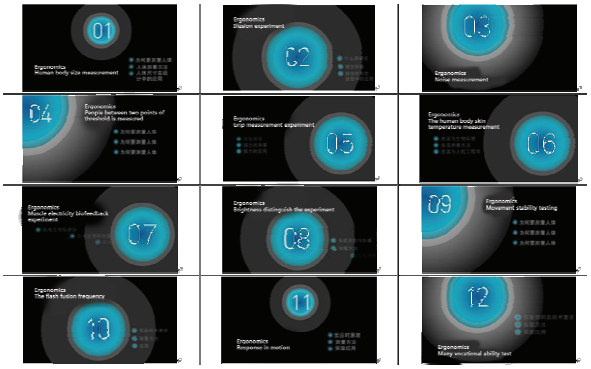

Figure 6 Color style of titles and transitions

4.2. Color and style

The simplicity and easy to use is chosen as color style of whole video, the Individuals of system are required unity but without repetitive. The main color of title is based on black, blue, white, the main body color of project is based on white, ash, black. The video shooting environment is selected in ergonomics laboratory, the white wall of laboratory can easily integrate with other color systems. The shooting color style can refer to figure 7.

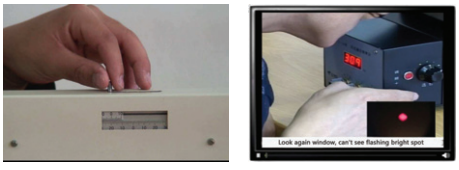

Figure 7 Color style of the instrument picture

5. Conclusion

Ergonomics course is a basic professional course for industrial design major. The experimental course can help students gain practical knowledge of ergonomics. Based on the improvement of the ergonomics experiment teaching effect, through the original video shooting of the ergonomics experiment and the making of the multimedia courseware of experiment, a feasible scheme for experiment teaching reform is put forward and the following conclusions are obtained.

(1) Through the multimedia teaching, more easily purpose of ergonomics learning can be understood by students, the students can clearly understand the experimental basic flow and learn more knowledge about experimental course.

(2) Based on ergonomics fundamental, the design of experiment teaching courseware improves the learning method and increases learning efficiency.

(3) Through practical examples of ergonomics, the students' comprehensive application of knowledge and innovative practice ability get enhanced, the students' ideal of considering product problem based on the perspective of ergonomics is built up.

References

[1] Wang Huifen, Liu Tingting ,Research and Practice on Course Teaching Mode of Human Engineering, MIE of China,2007,36(9)71-74

[2] Wu haiyan, Ergonomics Experimental Application of Scientific Research Achievements, Technology and Management, 2002,19(02),12-14,21

[3] Yuan Guo-jun, Mu Qiang, Analysis of advantages and disadvantages in multimedia experimental teaching and corresponding countermeasures, Laboratory Science, 2009(05), 39-40

[4] Lu Lan,Song Zhi qiang,Han Shang mei,Li Lian Jiang, Consideration on Ergonomics Teaching Experiments, Industrial Engineering Journal,1999,2(04),59-62

[5] Qiu Zixu, Study on Design and Making of Multimedia Experiment Teaching, Journal of Hubei Automotive Industries Institute, 2004, 18(3), 28-31

[6] Liang Baiju Guangdong , Video multimedia experimental teaching media literacy of college students ,China Modern Educational Equipment,2011(11),109-111

[7] Ole Broberg. Integrating ergonomics into the product development process. International Journal of Industrial Ergonomics.1997(19):317-327