

Web-Aided Teaching in Materials Science and Engineering

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Abstract : Chinese Societies of Materials Science, also known as Materials Research Society, Taiwan, has pioneered a project, sponsored by the Ministry of Education, ROC, to promote the web-aided teaching in Materials Science and Engineering in Taiwan in the past four years. To date, there are nine web-aided courses available in the Internet. Three more web-aided courses will be offered in the current academic year. The courses include those at the elementary level as well as advanced level. Responses from both teachers and students are generally quite favorable. However, knowledge in web design, artistry, teaching skill in addition to the scientific and technological expertise are all needed for the effective implementation of a web-course. In this paper, the lessons learned and insights gained in the endeavor will be reported. Suggestions for the effective teaching will be offered.

Keywords: web-aided courses, Chinese Society for Materials Science, materials science and engineering

I. Introduction

The Internet has revolutionized teaching in engineering curriculum in recent years. The potential benefits for the utilization of Internet to the engineering education are both far-reaching and deep. It can be used to enhance the educational experience of both teachers and students as well as to stimulate interactive class activities using e-mail. It will undoubtedly become even more ubiquitous in the coming years. As a result, there is an urgent need for the engineering profession to face the challenges and take an early lead in the web-aided education.

Chinese Societies of Materials Science, also known as Materials Research Society, Taiwan, has pioneered a project, sponsored by the Ministry of Education, ROC, to promote the web-aided teaching in Materials Science and Engineering in the past four years [1]. To date, there are nine web-aided courses available in the Internet. Three more web-aided courses will be offered in the current academic year. The courses include those at elementary level as well as advanced level. Responses from both teachers and students are generally quite favorable. However, knowledge in web design, artistry, teaching skill in addition to the scientific and technological expertise are all needed for the effective implementation of a web-course. In this paper, the lessons learned and insights gained in the endeavor will be reported. Suggestions for the effective teaching will be offered.

II. Initiation

The Internet was becoming rather prevalent in about 1995 with the founding of the Netscape Company in 1994. The CSMS governing board has seen its potential and seized the opportunity to launch its web site in 1995, one of the first, if not the first, web site for an academic society in Taiwan. The Web Page of the Society now features English version in addition to the Chinese version. The page includes introduction to MRS-T, awards, membership, publications, materials-related job information in Taiwan, materials-related university and college, and research institution in Taiwan, information links etc. Furthermore, there are interactive sites on materials science technology, materials-related conferences, materials-related industry links, Materials science education. Within the materials education section are web-aided courses. The CSMS home page is shown in Fig. 1. The web page address is csms.mse.nthu.edu.tw (140.114.18.47).

III. Evolution of the Web-aided Courses.

The Society offers nine web-aided courses, three per year since 1996. For the academic year of 1996-97, Electron Microscopy for Materials, Electronic Materials, Microelectronic Materials and Processing were offered. In the following academic years, courses on Thermodynamics, Introduction to Materials Sciences, and Crystallography

and Diffraction were introduced followed by Materials and Daily Life, Solid State Physics, Surface Analysis Techniques in the academic year of 1998-99. Three new web courses on Biomaterials, Thin Film Engineering, and Surface Coating Technology will be offered in the academic year of 1999-2000. The contents of all web-courses are primarily in Chinese at this time. The Web-Course home page is shown in Fig. 2. The address of the web page is pilot.mse.nthu.edu.tw (140.114.18.41).



Fig. 1 Home page of the Chinese Society for Materials Science

**Chinese Society for Materials
Science**

Web-Aided Courses
(Supported by the Ministry of Education)

<address:pilot.mse.nthu.edu.tw>

A.Surface Analysis Techniques
B.Solid-State Physics
C.Materials Technology and Daily Life
1.Metallurgical Thermodynamics
2.Introduction to Materials Sciences
3.Crystallography and Crystal Diffraction
I.Electron Microscopy for Materials
II.Electronic Materials
III.Microelectronics Materials and Processing

The First Web Design Contest for College Students

Fig. 2 Home page of the web courses for the Chinese Society for Materials Science

IV. Web-Page Design Contest

The Society sponsored a Web Page Design Contest for college students. There are two categories for competition; the first category is materials science and engineering and the other category is special topics on materials. The competition attracted 20 entries. Awards were given during the Annual Meeting of the Society in 1998. The Second Web Page Design Contest for college students is in progress. The sites for prize-winning entries have been linked to the web page of the Web-aided Courses and serve as the supplementary materials for the courses. The winning entries for special topics on materials include thin film processing, diamond thin films, optical disks, integrated circuits processing, superconductors, liquid crystal display, hydrogen storage materials, metallization for integrated circuits and electron microscopy analysis of thin films etc.

V. Experiences and Lessons

Although the Internet is becoming rather pervasive, most of the materials science and engineering teachers in Taiwan, almost exclusively in their 40s or 50s, are not well versed in the internet technology and applications. As a result, it is rather difficult to persuade good teachers to participate in developing a web-aided course. The professors, which have developed courses, are from National Tsing Hua University, National Taiwan University, National Chiao-Tung University, and National Sun-Yat-Sen University. For the new academic years, faculties at National Cheng-Kung University and National Chung-Hsing University are developing two courses. The twelve courses have been developed by faculties from seven universities. The number of courses undoubtedly needs to increase much further to reach the goal of a comprehensive coverage of subjects important in the field of materials science and engineering. In addition, owing to the enormous time needed for developing the course materials, the contents tend to be uneven. In some cases, the contents are literally a much-enhanced version of a textbook in print. In other cases, the materials are primarily outlines of the course. The general responses from the students are quite favorable. In the answers to the questionnaires distributed in the participating classes, the students consider convenience, timeliness, better communication between teachers and students, and enhancement of print materials are the main merits of the web-aided courses. Many enjoyed the features of supplementary materials, questions and web-links. On the other hand, it has to be pointed out that although some of web-aided course include animations, full advantages of the multimedia have generally not been taken owing to the lack of expertise on the part of the teacher. It is felt that a team which are composed of instructor, artist, education expert and information technologist to develop a high quality web-aided course.

IV. Summary and Conclusions

Chinese Societies of Materials Science has pioneered the web-aided teaching in Materials Science and Engineering in Taiwan in the past four years. To date, there are nine web-aided courses available in the Internet. Three more web-aided courses will be offered in the current academic year. It has achieved its original goals to take advantage of the progress of Internet technology to share the resources among teachers and students in the field. Responses from both teachers and students are generally quite favorable. However, knowledge in web design, artistry, teaching skill in addition to the scientific and technological expertise are all needed for the effective implementation of a web-course in order to exploit fully the richness and variety of the Internet. Much efforts and resources are needed to consolidate the progress that has been made so far. There is clearly a need for improvement in the quality, variety and content of web-aided courses available. It is our hope that the examples of good practice will encourage others to contribute to the pool of shared resources.

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Reference

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