

CIVIL ENGINEERING TEACHING METHODS AT THE UNIVERSITY OF FLORIDA AND THE MAHANAKORN UNIVERSITY OF TECHNOLOGY IN THAILAND

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Abstract

This paper has been focused on undergraduate Civil Engineering Teaching Methods at the University of Florida (UF) and The Mahanakorn University of Technology (MUT), in Thailand. The education techniques are separately considered in the view of lecture, laboratory and training. The additional teaching process such as guest speakers and field works are also important components of teaching methods. The teaching styles between the universities above are discussed as well. Although, the general teaching is the same, there are some differences based on the culture and socio-economic demands. At the UF, students' participation and interaction are highly encouraged by the instructors. While at the MUT, instructors are the persons who mostly present lectures. Furthermore, at the UF, audio/video and electronic learning recently provides a lot of advantages to instructors and students. These new innovative method affects the learning process positively and mostly students enjoy the new technology.

Introduction

The University of Florida (UF) is a major public university. The state's oldest university was established in 1853. Subsequently, the civil and coastal engineering department strives to build upon a leading program of exceptional teaching, innovative research and dedicated service by maintaining a strong curriculum, a highly qualified and committed faculty, outstanding facilities and essential funding. The department of civil engineering, which was established in 1905, has been a recognized leader in innovative educational programs and is widely considered to be among the top programs in the United State. The Department merged with the Department of Coastal Engineering in 1999 and currently has 44 faculty members in 10 technology areas. There are 469 undergraduate students and 206 graduate students in the department. The 2001-02 research expenditures are \$13.5 Million [1].

The Mahanakorn University of Technology (MUT) was found in 1990 as a new generation of private university in Thailand. The university was honored by Asia Week Magazine to be the 32nd – ranking of the best science and technology institute in 1998 [2]. The MUT is the first university in Thailand, which constructs and owns a micro satellite, which operates for collecting the information of geographic image called Thai-Paht (Figure 1). The Department of Civil Engineering was among the first departments at the university. Currently, the department of Civil Engineering has more than 30 faculty members. In this paper, the teaching methods of the both university are described and compared in term of education background, methodologies and techniques, facilities, evaluation and the future, which are classified into lecture, laboratory and training.

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Comparison of Teaching Methods

Program and Curriculum Background

The undergraduate students of civil engineering department at the UF are educated in a wide-ranging of engineering services in structural, geotechnical, transportation, hydraulics, civil engineering materials, surveying sciences, construction engineering and general civil engineering, leading to a bachelor's degree in civil engineering. The department also offers a separate degree program in surveying and mapping, one of the few such programs in the country. Each of the specialty areas also can be developed in greater depth at the graduate level. The mission of the Department of Civil Engineering is to build upon a leading program of exceptional teaching, innovative research, and dedicated service by maintaining a strong curriculum; a highly qualified and committed faculty, outstanding facilities and essential funding required meeting program needs.

The primary objective of the Department is to provide the student in the Basic Program with a curriculum designed to accomplish three primary purposes are to provide a broad general education that enhances communication skills and encourages all-around development of students, both individually and as productive members of society, to ensure a thorough preparation in the fundamentals of science and engineering, and to provide a foundation to the planning, design, construction, and operation of civil engineering projects [3].

The program and curriculum to accomplish these objectives permit a graduate to enter practice and commence life-long learning through professional activities or graduate studies. The secondary objective is to enhance contributions to the State, Nation, and profession through strong programs in teaching, research and service. The necessary preparatory courses such as mathematics, chemistry, and physics, serve as a foundation for the civil engineering degree. The regular duration of the undergraduate level is about 4 years with total 131 credit hours.

AT the MUT, there are two different programs in the undergraduate. One is a regular program, four years of study with 150 credit hours and the other one is a three-year program for technical students, who had studied in technical colleges for two years before getting in the university. The students in the second program have to earn 108 credit hours before getting a bachelor's degree in civil engineering. The MUT provides courses for the undergraduate in structural, construction, transportation and survey, soil mechanics, hydraulics and environmental engineering [4].



Figure 1: Thai-Paht, a micro satellite [5]

Techniques and Methods

In the universities, lecture and laboratory classes are provided. Class duration is fifty minutes as one-hour credit period. At the UF, the classes are separately scheduled into one or two period per day while the MUT combined continually in the same day teaching. For instance, at the UF, three-credit hour course may be scheduled as one hour-period on Monday, Wednesday and Friday, whereas, it might be programmed in a continuing period for three-hour period on Tuesday at the MUT. Moreover, at the MUT the lectures will be given on Monday to Sunday. These kinds of schedule make the difference in teaching methods between the universities. In this paper, the techniques of teaching methods are presented in two types of techniques, the traditional technique and web-based technique.

Traditional Technique

The fundamental teaching process such as giving a presentation, class discussion, guest speakers and field works are also important components of teaching method. Although, the general teaching is the same, there are some differences on the culture and socio-economic demands.

Since the MUT offers the courses of civil engineering for Thais and most of the instructors are Thai native together with the numbers of the undergraduate students. Therefore, a teacher-centered with subject-based learning is the traditional teaching method. The instructors are the persons who mostly present lectures. The teaching assistance does not allow giving a lecture only for helping the instructors and students at the course. The homework and individual assignment are generally allocated for the lecture class. In addition, the project assignment is also assigned. The examination, mostly, divided into two parts, midterm and final examination, which are planned by the university. At the MUT's laboratory class, teaching assistances are assigned to facilitate the students during the class. A group-based student is the concept for the laboratory experience. The procedure of the laboratory class is to do the experiment, analyze and discuss the data, as well as present the report.

Though at the UF, students' participation and interaction are highly facilitated by the instructors. As an international class, the instructors impart a broad point of views and interchange knowledge with the students. The teaching assistance may be assigned to give a lecture as a part of the course or take part as the full course instructor with supervising by the professor who is responsible for the course. The grading is variably evaluated by multi-homework, term project, class participation, examination - midterm and final examination. The taking-home or open-book examination is probably arranged to be parts of the grading score. The UF laboratory classes offer a small group per the experiment. Some of the laboratory classes are a part of lecture classes, in which the instructor will arrange the timetable amount laboratory and lecture classes in the provided credit hours. The others are separately scheduled in different credit hours, which may require the student to take along with some lecture courses or have to get some courses to be prerequisites.

Aside, the active learning in both lecture and laboratory as mention above, the actual field oriented studies and internships for every student after third years of undergraduate studies are a part of an integrated educational system. Leading industries and companies are contacted to provide first hand professional experience to the students. MUT has a tradition of sharing and imparting explosive growth of knowledge and providing unique learning opportunities to its faculty and students. Seminars, workshops and short courses are regularly arranged at these civil engineering college campuses. Students are encouraged to take part in such extra activities.

Web-Based Technique

At the University of Florida, The department has provided learning solutions for a changing world since 1919 through the creation of the Division of Continuing Education. This sector aims to develop and offer continuing education programs designed to meet a wide range of personal and professional educational and learning needs. They established the creation of a flexible learning environment to tens of thousands of non-traditional students each year in Florida and internationally. This is accomplished through a distance learning option which offers open-enrollment courses and programs that allow students to study in their own place at their own pace. The University of Florida provides a time-tested correspondence study as well as high tech, on-line learning that include an extensive curriculum of college credit courses, professional development opportunities, and high school courses, which is called WebCT.

WebCT ("Web Course Tools") is a course management system, which facilitates the creation of sophisticated web-based educational environments. It does this in three ways [6]: it provides an interface allowing the design of the presentation of the course (color schemes, layout, etc.); it provides a set of educational tools to facilitate learning, communication and collaboration, it provides a set of administrative tools to assist the instructor in the process of management and continuous improvement of the course.

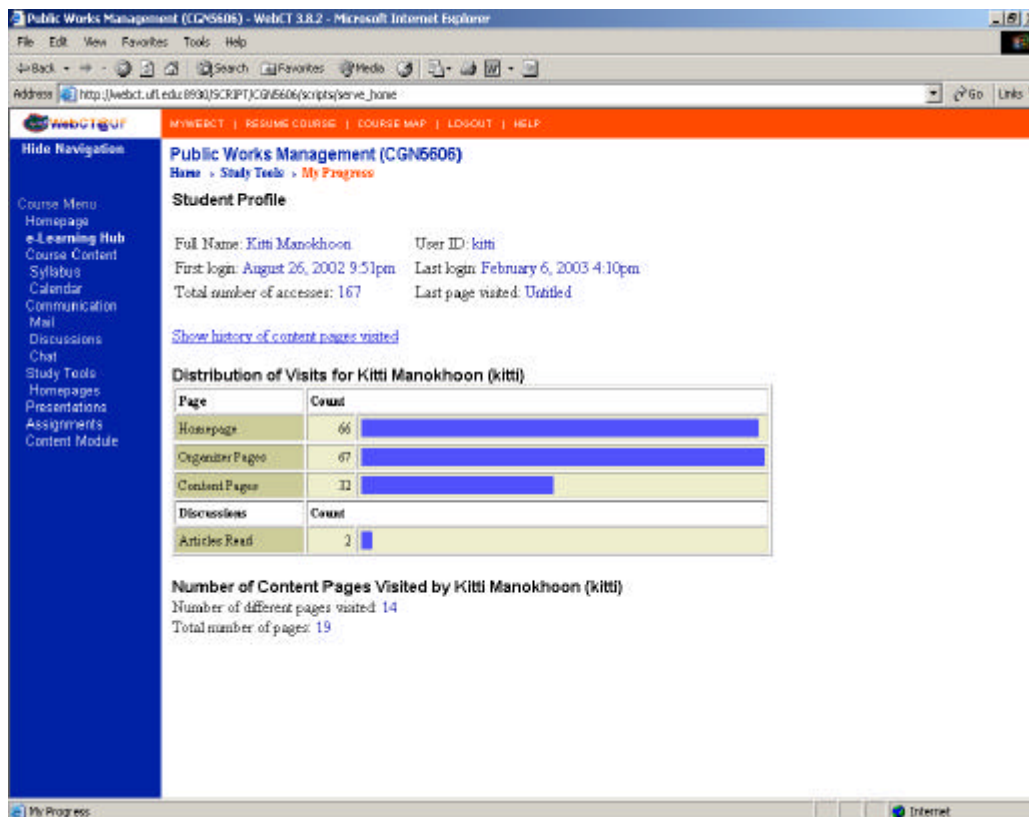


Figure 2: An example of WebCT interface

WebCT was built by instructors for instructors. Created by educators at the University of British Columbia, WebCT is a tool that allows other educators to build web-based learning environments without a lot of time, resources or technical expertise. The project lead has published in the area of the

educational effectiveness and student acceptance of web-based learning resources both in a distance learning setting and as a supplement to lecture-based courses. Still, WebCT is pedagogically neutral. Its goal is to provide a set of tools useful for a broad range of teaching methodologies, yet make it easy to experiment with new techniques [6].

At the UF, there are many courses using this tool to be a communication tool with the students. The example of WebCT interface is shown in Figure 2, which also represented the students' respond to this system. These new innovative method affects the learning process positively and mostly students enjoy the new technology.

At the MUT, there is no official web-based system as an education supported. However, the instructors are using the Internet as a tool in teaching techniques. The interactions between the student and the instructor related to the course are formed on the web site such as sending electronic mails, downloading and sending home-works, announcing grades or asking questions through the web board. The department of civil engineering is trying to develop the web-based technique to reach the demand of distance learning as an alternative of the teaching methods.

Facilities

The facilities play a role important in teaching methods. Classrooms, laboratories, computer resources and libraries are exposed with the purpose of the comparison between the universities. A classroom type is one of the factors on teaching methods, which instructor apply to the course. At the UF, there are four levels of equipments built in classroom: Level-1: Equipped with overhead projector, Level-2: Equipped with overhead projector and TV/VCR, Level-3: Equipped with overhead projector, ceiling-mounted LCD projector, multimedia patch panel, VHS VCR, Level-4: Equipped with overhead projector, ceiling-mounted LCD projector, multimedia patch panel, podium with lectern light, VHS VCR, computer, document camera

The College of Engineering requires that all engineering students have access to a mobile (notebook) computer for engineering courses in order to be able to function in the current learning environment. Starting Fall 2001, some engineering courses will require the use of mobile computers for coursework. Students are required to access electronic forms of information, submit assignments and communicate with other students and faculty electronically. In order to do so, the following functional requirements must be met [7].

The university of Florida library system was established to meet the informational needs of the faculty, staff and students community by providing access to all relevant forms of recorded knowledge. By 2002, the Libraries will provide significantly improved access to electronic information resources and services. Most of the primary constituents will expect to access the Libraries from their homes and offices. The University of Florida Libraries will join with other State University System (SUS) libraries to coordinate collection development, optimize the expenditure of limited materials budgets, and develop the infrastructure to access and deliver materials rapidly. Continuing development of the infrastructure for shared resource and collection development will position the UF Libraries to serve as a state, regional, and national resource in maintaining state of the art access to those collections [8].

MUT library is kept up to date with latest technical books both for reference and issue purposes. A variety of current journals are also available for effective spread of knowledge. It services on the cataloging, bulletin board, digital resource, video guide, and database online. The library offers current awareness and information services. Audiovisual training materials are also available as the alternative teaching aids for civil engineering education.

Teaching Evaluation

Class evaluation is assessed at the end of the course in both lecture and laboratory classes. The instructor performance and teaching method, student understanding and overall rating are measured in the class evaluation report. This evaluation acts as a feedback to the instructor in order to adjust the teaching methods for reaching the student demand and the objectives of learning. This system is applied in the department of civil engineering at the UF and MUT.

In the education assurance, the MUT is an ISO: 9001-2000 [9] certified institution of civil engineering in Thailand that offers degree courses at the undergraduate level. Civil engineering degree offered by MUT is based on balanced distribution of theoretical knowledge, practical training and fieldwork terminating into group projects designed to solve practical civil engineering problems.

Table 1: The teaching support at the UF and MUT

Teaching Supports	UF	MUT
1. Traditional Technique	Adequate	Adequate
2. Web-Based Technique	Outstanding	Sufficient
3. Facilities	Outstanding	Adequate
4. Teaching Evaluation	Adequate	Adequate
5. Student Response	Adequate	Adequate

Based on the information above, Table 1 summarizes the level of the teaching supports at the UF and MUT. The strong point at the MUT is the traditional technique; likewise, at the UF, web-based technique and facilities are outstanding. The Teaching Evaluation and Student Response at both UF and MUT are adequate.

Future Teaching Methods

Civil Engineers generally work in one of these areas: 1) In private practice- plans, design, constructs and operates physical works and facilities used by the public, 2) In academia- teaches students the fundamentals of civil engineering and also, involved in research in order to advance the state-of-the-art, 3) In public practice- involved in city and/or regional planning, layout and construction of highways and pipelines, and 4) In combination with other disciplines- a civil engineering degree combined with another degree such as: Engineering Geologist, Engineering Economist, or Engineering/Attorney [1]. In the next two decades, as the world's population grows, environmental concerns mount, the technological revolution expands and we continue space habitation, there will be an unprecedented demand for civil engineers [1].

The importance of education quality and student-centered learning for lifelong learners are increasing recognized in civil engineering professional development in today world of more complex and rapid changes of knowledge and technology. Therefore the main goal of professors here is to give basic concepts and where possible relate them to real life counterparts when lecturing students. In these institutes, teaching learning is considered a continuous process.

The Civil Engineering department at the MUT has developed linkages with international universities. A joint degree program in affiliation with the foreign universities is another highlight such as the program between the MUT and the University of New South Wale (UNSW), Australia. This aspect also adds a global perspective to its activities to remain current on the latest developments. Regular feature of immense significance is frequent visits by eminent professors from reputed foreign universities from USA, Canada, UK, Australia, and Japan to these civil engineering schools.

Conclusion

Today, civil engineers apply computers, robotics, lasers, thermography, global position systems, satellite imaging, remote sensing, geographic information systems, new materials and other high-tech developments to every aspect of their works in research, construction and management. Although, the general teaching method of the universities is similar, there are some differences on the culture and socio-economic demands. The education background, facilities and evaluation procedure are the factors concerned in the teaching techniques. At the UF, students' participation and interaction are highly encouraged by the instructors whereas; a teacher-centered with subject-based learning is the traditional teaching method at the MUT, which is a strong point at the MUT, while at the UF, web-based technique and facilities are outstanding. These findings can contribute to enrich the teaching methods at both universities. Additionally, the teaching methods, which focus on learners' critical knowledge, problem-solving proficiency, self-directed learning, and team-oriented working skills, are the approach in various educational fields including civil engineering. This has been built the environment education in many countries worldwide from its student-centered learning approach for lifelong learners.

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