

**DEVELOPING AN ENGINEERING LABORATORY WORK WEBCD:
NON-DESTRUCTIVE TESTS**

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**This project has been submitted in partial fulfillment for the award of master of
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**Faculty Of Engineering Technology
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Especially dedicated to mum, dad, and all at home

My love to all...



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Abstract

The development of WebCD application has opened a new horizon for education, especially for an engineering laboratory work where demonstrations of physical phenomena are required. The use of WebCD in an engineering laboratory work is beneficial in several ways – providing learners with an economical, safe and simple way to visualize the dynamic behavior and to explore the various aspects of the actual laboratory work situation. In addition to that, this project is aimed at identifying the critical success factor for engineering laboratory work. Apart from that, features needed in a WebCD development are identified so that an engineering laboratory work WebCD can be developed. The engineering laboratory work WebCD, which was developed based on needs analysis will be evaluated, to examine the extent to which the product fulfills the needs of students and lecturers. Questionnaire distribution method is used where questionnaires are designed based on past researches along with the observations and experiences. 50 students and 10 lecturers from KUiTTHO's engineering department were selected as sample for the first stage of the project, which is needs analysis. 10 lecturers and 20 students from KUiTTHO's mechanical engineering departments were selected as samples for the third stage of the project, which is product evaluation. Through the findings, time management and teaching strategy are the critical success factor for engineering laboratory work. Non-destructive test is taken as an experimental topic for the product development, which is based on the needs analysis findings. Through product evaluation, a conclusion can be arrived at that the product successfully fulfills the needs of students and lecturers in time management and teaching strategy. However, some recommendations were given by the respondents for further research. Further research should be done on enhancing the features of the WebCD such as simulation and chat room. In addition to that, further research on integration of WebCD with an online conferencing should be carried out to further enhance the use of ICT in education.

Abstrak

Pembangunan aplikasi WebCD telah menyumbangkan satu lagi opsiyen dalam pendidikan, terutamanya dalam kerja makmal kejuruteraan dimana pelaksanaan secara fizikal diperlukan. Penggunaan WebCD dalam kerja makmal kejuruteraan mempunyai beberapa kebaikan – ia menawarkan kepada pelajar, satu opsiyen untuk mempelajari serta menjelajahi bidang kerja makmal kejuruteraan dengan lebih ekonomi, selamat dan mudah. Usulan daripada itu, objektif projek ini adalah untuk mengenalpastikan faktor kejayaan kritikal bagi kerja makmal kejuruteraan. Selain daripada itu, ciri-ciri yang diperlukan dalam pembangunan WebCD dikaji supaya satu WebCD kerja makmal kejuruteraan dapat dibangunkan. Webcd kerja makmal kejuruteraan yang telah dibangunkan berdasarkan analisa keperluan pengguna kemudiannya dinilai untuk mengenalpasti sejauhmanakah product tersebut memenuhi keperluan pelajar serta pensyarah. Kaedah kuantitatif digunakan dimana borang soal selidik dibangunkan berdasarkan kajian lepasan serta pemerhatian dan pengalaman. 50 pelajar dan 10 pensyarah daripada jabatan kejuruteraan KUiTTHO dipilih sebagai sampel kajian pada peringkat pertama iaitu penganalisan keperluan pengguna. 10 pensyarah serta 20 pelajar daripada jabatan kejuruteraan mekanikal dipilih sebagai sampel untuk peringkat kedua iaitu penilaian produk. Daripada hasil kajian, didapati pengurusan masa serta strategi pengajaran merupakan faktor kejayaan kritikal bagi kerja makmal kejuruteraan. Ujian tanpa musnah dipilih sebagai topic pembangunan WebCD dimana pembangunan produk adalah berdasarkan hasil penganalisan keperluan pengguna. Berdasarkan hasil penilaian produk, satu kesimpulan dapat dibuat bahawa produk ini telah berjaya memenuhi keperluan pelajar dan pensyarah dalam kerja makmal kejuruteraan. Disamping itu, cadangan telah diutarakan oleh responden bahawa kajian lanjutan patut dijalankan bagi memurnikan lagi ciri-ciri yang terdapat dalam WebCD. Responden mencadangkan bahawa simulasi dan “chat room” dibangunkan dalam WebCD untuk meningkatkan lagi ciri-ciri yang ada pada WebCD. Selain daripada itu, kajian lanjutan untuk mengintegrasikan WebCD dengan “online conference” patut dijalankan supaya proses pembelajaran dan pengajaran dapat dipertingkatkan lagi.

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CHAPTER I

INTRODUCTION

Since the beginning of the globalization era, many fields and sectors experienced rapid revolution especially in industry and economy sector. These phenomena indirectly influence Malaysia's technical and vocational educational system. In the process of development and industrialization, Malaysia needs more skillful workforces, who are competent not only in on-field knowledge but who also possess good hands-on skills.

The Ministry Of Education Malaysia took appropriate steps towards the task of producing quality workforces. As a result, the technical and vocational educational syllabus was introduced into the secondary school and primary school levels. Besides that, the teaching and learning system at higher-level education also experienced changes. Cognitive, psychomotor and affective characteristics were applied to teaching and learning system of higher-level educational, especially in psychomotor characteristic. Students were exposed more to hands-on skills through researches and laboratory work.

However, how has the effectiveness of laboratory work developed the student's competency? Can conventional teaching and learning of laboratory work overcome the tides of globalization that emphasizes effectiveness, time, and cost?

Can students that enrolled in distance learning programmes learn from laboratory experiments effectively?

1.1 Research Problems

Malaysia is marching toward the era of globalization, with the fast development of information and communication technology (ICT). We have to integrate ICT into our education in order to compete with others. Thus, our students can benefit more from it. Students can access the best and the latest information faster and easier without any time and space constraint. With this integration too, the process of teaching and learning will break the conventional barrier that limits the abilities of accessing and conveying information, knowledge, skills and news.

Integration between ICT and education provides a new platform. At this point of time, it is still in the early stages in Malaysia whereas other countries have progressed far beyond. The problem lies in the development of paths and instruments using appropriate methods. As ICT in education is still a new idea in Malaysia, little effort is put in to this field with little progress resulting from it.

This research will lead to production of a tool that integrates ICT in education. A WEB-CD will be produced at the final stage of this research. The WEB-CD will emphasized on the usage of ICT in engineering laboratory work.

1.2 Objective Of The Research

This study aims to identify problems that are faced by engineering students and lecturers in the process of learning hands-on skills in engineering laboratory work. This study also hopes that a suitable and appropriate solution can be generated. Besides that, a product, in the form of a WEB-CD, a form of e-learning, will be produced as one of the efforts to overcome the problems stated. To clearly identify the main goal of the research, the main objectives are stated out as below:

- i. Identification of critical success factor for engineering laboratory work.
- ii. Development of an engineering laboratory work WEB-CD.
- iii. Evaluation of the engineering laboratory work WEB-CD.

1.3 Research Question

Students are pillars to a country's foundation. They are the ones who will contribute to the future development of the country. They must be equipped with competency and experience in order to meet the standards of increasingly challenging industries. To ensure that our engineering students obtain the adequate competence, laboratory work has to become a key frame in providing adequate training on hands-on skills. In order to do so, attention must be paid to the following questions:

- i. *What are the Critical Success Factors for engineering laboratory work?*
- ii. *What are the features and contents needed in the WebCD?*
- iii. *To what extent does the content in the WEB-CD fulfill the needs?*

These questions must be answered so those engineering students can fully utilize the knowledge and skill that are obtained in laboratory work. They must not only have the theoretical knowledge. It is also a priority for them to have the experience.

Factors that contribute to these problems, whether they result from the teaching strategy and time management, will be identified in detail so that a method of solution based on the WEB-CD can be used to overcome this problem accurately.

1.4 Scope Of The Research

This research will be conducted in Kolej University Teknologi Tun Hussein Onn. Lecturers and students from the engineering department in this university college will be the respondents of this research. The product will consist of several laboratory works on the Non-Destructive Test.

The research will include feedback on the problems faced by Engineering Department's lecturers and students. Based on this feedback, a WEB-CD will then be produced to overcome the problems faced by them. An evaluation process will be undertaken to assess the effectiveness of the product.

1.5 Importance Of The Research

- i. To further enhanced the usage of ICT in education, especially in engineering laboratory works.
- ii. This product is aimed at helping lecturers and students to enhance engineering laboratory work.
- iii. This product is aimed at helping students participating in distance learning courses to overcome some laboratory work problems especially in engineering laboratory work.

1.6 Research Constraint

The duration given for this research is 6 month; this limits the data collecting, product development and the evaluation. Because of time constraint, only KUiTTHO's students and lecturers are taken as sample respondents. Mr. R. Arul Kumaran (product engineer for Macromedia Inc.), in his seminar at KUiTTHO on August 9, 2002 stated that it took 6 months with 6 professionals to produce a good interactive CD. Because of the time constraint, the product cannot be precisely tested, further improved and accurately evaluated.

1.7 Research Framework

Figure 1.1 shows that the process of conventional teaching and learning involving students and lecturers in the pre, during and post process for an engineering laboratory work.

The main outline of this research is to find out a solution to overcome problems occur at the input, process and output stage of the laboratory works. The solution will focus on reducing time and further enhance the teaching strategy of engineering laboratory work.

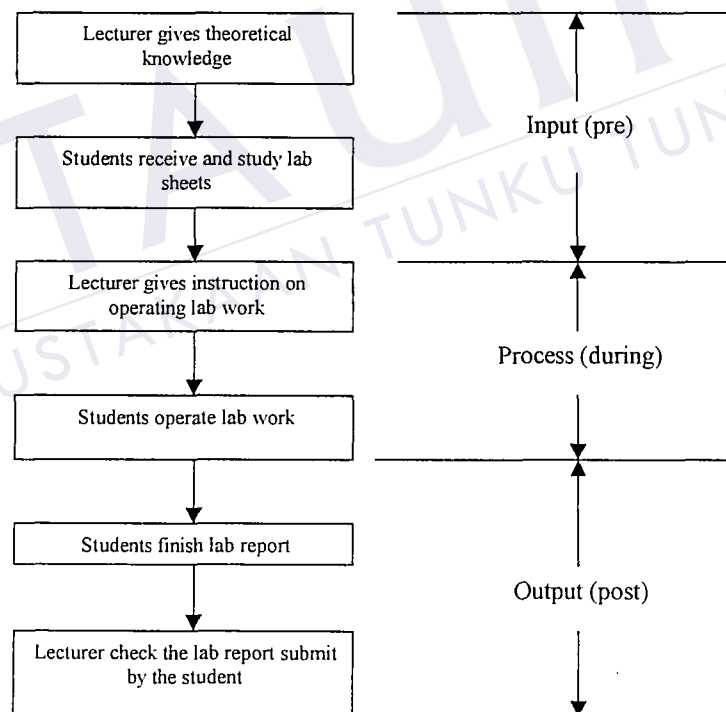


Figure 1.1: Flow chart for conventional engineering laboratory works

1.8 Conceptual And Operational Definitions

Critical Success Factors (CFS)

CFS in this context refers to the factors that will affect the outcome, results or the success of the engineering laboratory work. In this research, the main focus will be based on time management and teaching strategies.

WebCD development

In the end of this research a product will be produce. It will contain features that aim for CFS of engineering laboratory work. The product will stand of an interactive CD-ROM.

Needs Analysis

The needs in this context refer to CFS of the engineering laboratory work. At the end of the research, the product will be put into evaluation to determine whether it fulfill the CFS of engineering laboratory work.



CHAPTER II

LITERATURE REVIEW

In this chapter, studies are carried out to better understand the project in order to give a clearer framework to this research. The review topics are emphasized on engineering laboratory works, ICT and multimedia.

2.1 Engineering Laboratory Works

It does not only provide knowledge but it also equips students with the training they need as to complete the course they are under taking. This is to meet the demands of industries including engineering knowledge, hands-on skills and good attitude toward the engineering profession (*Adnan Kamis, 1988*).

In his thesis, Koo Kean Eng (*2000*) highlights that engineering laboratory work is different from other laboratory work such as science physical laboratory work. For science physical laboratory work, students are expose to the fundamental knowledge and application of theories in order to give an overview how the theories work. However, engineering laboratory work, students are to apply their engineering

knowledge into practice, in order to prepare them to face the real situation in industry world.

In summary, an overall view of science physical laboratory work is to let students understand the theories and fundamental of science in real situation. Engineering laboratory work provides a platform for student to apply the knowledge of engineering theories and the most important point is to learn hands-on skill.

2.1.1 The Purposes Of Engineering Laboratory Works

There are many perceptions concerning the objectives and purposes of engineering laboratory works. Engineering laboratory work is an activity so important that it cannot be changed or exempted (*Faucher, 1984 cited in Wahid Razzaly, 2001*). He further added that, various parties misunderstand the purposes of engineering laboratory works:

1. Some education administrators think that engineering laboratory work are expensive activities, although it produces great on-field experience for students.
2. Some educator and lecturers think that engineering laboratory work is time consuming. Whereas, it produces priceless output.
3. Some students think of engineering laboratory work as an additional knowledge, whereas it helps them in their work profession.

Walkington (*1994 cited in Wahid Razzaly, 2001*) further supports Faucher in his research and states that laboratory works is a necessity rather than an additional knowledge.

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