TOWARDS AN INTELLIGENT TUTORING SYSTEM
A CASE STUDY ON SSX1012 TAMADUN ISLAM DAN TAMADUN ASIA 1

by

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Abstrak

Internet menyediakan suatu struktur yang menyokong keupayaan komunikasi dan peluang usahasama yang di luar jangkaan. Ciri-ciri unik dan kemungkinan pada Internet seperti hiperteks, dan hypermedia, sejumlah laman web yang mempunyai sumber maklumat yang berkualiti, pembangunan drastik dalam perdagangan elektronik, penyiaran dan pemindahan digital, peralatan kerjasama adalah merupakan pembolehubah yang bekerjasama untuk membina persekitaran yang menakjubkan, di mana kेलbagaian pengalaman dalam pengajaran dan pembelajaran boleh dibangunkan. Dalam zaman Teknologi Maklumat (IT) sekarang, peranan tradisional para pengajar dan pelajar dalam menyediakan satu persekitaran yang menarik para pelajar, memenangkan pengetahuan dibina dengan jalan yang bermakna. Towards an Intelligent Tutoring System (ITS) bertujuan untuk menggabungkan beberapa ciri-ciri web untuk membangunkan satu sistem pengajaran prototaip bagi subjek SSX1012 Tamadun Islam dan Tamadun Asia 1 (TITAS1). Senibina ITS tipikal yang serupa akan diimplimentasikan kepada sistem yang mengandungi Modul Pelajar, Modul Pengajar dan Modul Pakar. Ketiga-tiga modul ini berkongsi satu dasar pengetahuan, menyediakan satu contoh yang menarik kepada guna semula pengetahuan yang disahkan. bidang yang tertentu khususnya dalam bidang pendidikan. Sistem ini memberi faedah kepada pelajar yang mengambil kursus SSX1012 iaitu Tamadun Islam dan Tamadun
Asia 1, dalam mempertingkatkan lagi mutu persembahan mereka dengan menggunakan sistem tutorial secara 'online' dan kurang melibatkan kertas. Dalam pada itu, pelajar dapat melihat kemajuan dan pencapaian yang telah mereka perolehi.
Abstract

The Internet provides an infrastructure that supports unprecedented communication capabilities and collaboration opportunities. The unique features and possibilities of the Internet such as hypertext and hypermedia, numerous websites with good quality sources of information, drastic development in electronic commerce, digital broadcasting and transfer, collaboration tools, are variables working together to create a fascinating environment where in diverse teaching and learning experiences can be developed. In today's Information Technology (IT) age, the traditional role of teachers and learners is being changed by multimedia courseware. Hypermedia offers much to learners in terms of providing an environment that engages the learner, allowing the construction of knowledge in a meaningful way. Towards an Intelligent Tutoring System (ITS) project aims to merge some features of the web to build a prototype learning system for SSX1012 Tamadun Islam dan Tamadun Asia 1 (TITAS1). Similar architecture of a typical ITS will be implemented in the system that includes Student Module, Tutor Module and Expert Module. Those three shares the same knowledge base providing an interesting example of reusability of declarative knowledge. This system will benefit the students taking SSX1012 which is known as Tamadun Islam dan Tamadun Asia 1 course, in increasing their performance by using online

Demo (Visit http://www.pdfsplitmerger.com)
tutorial and paperless tutoring system. Besides that, students will have the opportunity to monitor their progress and achievement.
CHAPTER 1
AN OVERVIEW

1.1 Introduction

'The essence of knowledge is having it, to apply it. Not having it, to confess your ignorance'.

Confucius

Knowledge is Power. The short three words best describe how knowledge confers power to any kinds of business. Knowledge is defined as the base of personal information, which is integrated in a fashion that allows it to be used in further interpretation and analysis of data [Lowe & Hall, 1999]

Knowledge is the competitive factor in the K-Economy. Wealth and business success depends on the generation, distribution and utilization of knowledge. The 'Portal Mania' has been sweeping the Internet Economy. Everybody is talking about knowledge portal, a gateway to access knowledge products. This will surely accelerate learning to learners, maximize intellectual resources and provide access to all learning opportunities and advice from one place, integrates disparate functions, dissolves cognitive boundaries between different
functions and facilitates "home schooling". After this point, only the corporate strategy to provide virtual teaching and learning will be discussed.

Teaching and learning approaches has become greatly affected by tidal waves of Information Technology and Multimedia, which have been put as standard feature in education. One of the alternatives to the economy-driven drift is to teaching as the primary medium of teacher-student contact, which is often presented in the use of technology in teaching and learning. Various terms such as open learning, flexible delivery or flexible learning environment is used to emphasize different aspects of approaches involving the use of computers in the learning process. Some of the way in which they are used includes, among others, simple communication applications, web access to learning material. Teaching and learning are also complex processes where a wide variety of techniques and facilities are needed to support them. Their focus on particular subject and group of students may vary at different times in many ways.

The Internet introduces a professional bond between teachers and learners where it enhances teaching and learning with its increasing capacity for multimedia, communication and information presentation, easy access to an ever growing body of information and new way of data presentation, presents educators with exciting opportunities to enhance teaching and learning. Due to these advantages, many people and organizations from the entire world attempt to convert this advance technology into solution in their teaching and
learning problems. For instance in Malaysia, Smart School program was introduced in order to enhance learner competence of using IT, multimedia technologies and pedagogy. Besides that, the Knowledge Portal that described in the first place can be the motivation to achieve corporate strategy towards excellence in learning.

The purpose of this project is to develop and implement an Intelligent Tutoring System (ITS) prototype for Tamadun Islam dan Tamadun Asia 1 (SSX1012). Intelligent Tutoring System (ITS) is a computer-based instructional system with models of instructional content that specify what to teach and teaching strategies that specify how to teach and aims to provide students with individualized, dedicated tutoring based partly upon an analysis of the procedures followed by the user and AI techniques which may provide some assistance on how the user should progress. [Hegarty & Routen, 1996]

The goal of the Tamadun Islam dan Tamadun Asia 1 tutoring system is to provide cost-effective training that teaches the users to perform appropriate way and at suitable place. TITAS1 is implemented by using three types of knowledge: knowledge of teaching strategy and methods, knowledge of the subject matter and the knowledge of the students based on the concept that knowledge is not simply transmitted from teacher to student. It is flexible and easy to use innovative technology where it is a useful tool as consultation to support student facilities and services.
This system focused on the learner, which is TITAS1, students which is attempts to capture a method of teaching and learning exemplified by one-on-one human tutoring interaction.

One-on-one tutoring allows learning to be highly individualized and consistently yields better outcomes than other methods of teaching. [Bloom, 1984]

TITAS1 consists of three major modules that is the Student Module, Tutor Module and Expert Module:

- **Student Module** – It keeps track of the status of the student knowledge and level of student understanding from the subject matter via maintaining student database.

- **Tutor Module** – Instructional techniques for teaching the procedural knowledge. Tutor module is important component because its can be represented as a teacher. It should design the desirable properties of the human tutor and it must know how to take learners from one skill to another. The set of instructional activities in TITAS1 provide discussion board and email facilities for investigating, exploring and simulating learning process.
1.2 Problem Statement

This project is proposed because the facts have shown that IT, multimedia tools and educational methodology could transform old learning environment to be a conducive, creative, learner-centered learning environment which can develop different style of learning, abilities enthusiasm, independence and towards a level of excellence. Although teachers are also using the Intelligent Tutoring System as they see fit, Intelligent Tutoring System is intend primarily to be used by students to do their exercises, studies and analysis. All other instructional activities, such as lectures, recitations and laboratories, can continue as before.

This system conduct students to be self paced, self explored and independent to develop their own way of thinking, maturity and discipline, based on the systems main goal as described later. In addition, this project targeted to be a new prototype or model for future improvement and extension to provide a solution for upcoming learning environment.
Noticeably, current tutoring system (Tutoring System for SSX1012 Tamadun Islam dan Asia 1 (TITAS1))\(^1\) has several weaknesses and problems. Though it is online, it lacks of several elements such as the expert module or intelligent portion of the system, which can respond to learner's progress.

Human Computer Interaction (HCI) aspect and usability studies regarding the system needs some improvements. Plain hypertext documents and static media can cause an unattractive and boring learning sessions. Still graphics used met satisfaction but some overuse of animation distracts student and could lead to uncomfortable learning.

Every learner has different learning style. A distinct learning style that is oriented to the learner’s need and background can add values in delivering knowledge. [Noami Salim, 1999].

Intelligent system is introduced where an instructional system with models of instructional content needed to specify what to teach and teaching strategies. In the context of an Intelligent Tutoring System (ITS), the learner is hypothesized in a knowledge base and instruction is individualized to the learner based on the knowledge learned about the learner.

\(^{1}\) SSX1012 Tamadun Islam dan Tamadun Asia 1 TITAS1 tutoring system can be accessed at http://ole.fit.unimas.my/titas
Why does a web-based tutoring system needed? From the concept of virtual class where learning and teaching environment is time and place independent, online tutoring system should be introduced. Web-based tutoring can deal with some matters such as the increasing number of students resulting more classes to be organized, timetable must be carefully arranged and the number of teachers to handle the classes should satisfy the student needs.

1.3 Project Objectives

The Intelligent Tutoring System on SSX1012 Tamadun Islam and Tamadun Asia 1 is constructed for the purpose

- To design the learning and tutoring environment that suit the needs of the student based on requirements and specifications.
- To design a system that is able to monitor the student's performance.
- To prepare an assessment such as quiz and tutorials those enhance student's understanding of the subject matter.
- To monitor the student understanding by analyzing the student's answers, comparing them with the correct answer system generated answers
- To develop as an online prototype for Faculty Information Technology
- To evaluate the developed prototype
1.4 Scope and Limitation

The main objective of this proposal is to develop a prototype of a web-based Intelligent Tutoring System for Faculty of Information Technology only. This prototype will conceal SSX1012 Tamadun Islam dan Tamadun Islam Asia 1 subject, which is a generic course that must be taken by all students in Universiti Malaysia Sarawak (UNIMAS).

As a web-based system, this tutoring system will provide online course for student to perform their studies, tutorial, exercises and consultation. The consultation is given to user's answers to the specific question.

Besides that, a discussion board (collaboration tool) is also provided in the system to enable students to post up their questions or enquires on a room on a web page and let the other people to provide answers and suggestions. This can help vertical and horizontal communication occur among learners or their teachers and closing the gap between those two.

However, as for the implementation of the prototype, this project focuses only on basic components of an ITS and will cover the complete three modules for Student, Tutor and Tutoring Expert module. It is also important to understand that the developed prototype is expandable and enable to support a very wide range of applications and features.
In this research, each module will be implemented with some limitations. This is happening due to the limited time and development tools used. The basic functions and the architecture for every module of the components will be described clearly.

Generally, in the learning environment, the student's requirement and teacher's requirements are personalized. The system will be able to cater learners' need in terms of providing an assessment that based on their level of understanding and guide them to monitor and track their academic performance. The tutorial or exercise page is dynamically generated HTML form used to analyze the learner's comprehension status. Simulation pages allow the learner to acquire a procedural knowledge on a target (simulated) system, which is presented as a state transition machine.

Furthermore, this system is implemented to enable students to access interactive features including motions pictures and images or sounds in a way that user can gain more understanding to the real situation. Thus an explanation page is provided for the task to simulate real problems with explanations. Explanation page presents a material describing or explaining the conceptual learning sub-goals of the courseware. As an explanation page, the ITS accepts any type of HTML data including plain text, image, audio, JAVA applet, and/or plug-in application such as VRML and Shockwave.