

An Interactive Tutoring System for Tourism and Hospitality Students

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Abstract : It is well known that web-based Computer Aided Learning (CAL) can provide an interactive environment for students to learn without any time and geographic boundaries. This paper describes the architecture of an Interactive Tutoring System (ITS) for assisting hospitality and tourism students at Hong Kong Polytechnic University to learn Information Technology. The system not only provides learning aids but also incorporates mini games and industry related examples into the learning experience. The ITS can also meet different students' needs by displaying course materials base on a student's knowledge level as a novice, intermediate to advanced learner. Advanced learner can skip the course materials if they can pass the quiz. The ITS can assist students to identify their knowledge level and monitor their study pace. On the basis of the feedback from students, diagram, photo quiz, and examples were the top three most favourable items in the ITS.

Keywords: Computer Aided Learning, Education, Information Technology, Knowledge Level, Game-based learning.

Introduction

At present, knowledge of Information Technology (IT) is a core requirement for daily activities (Law & Jogaratnam, 2005). No matter which academic programs students are registered in, IT is always a core subject that no one can ignore (Dennignton, 1989; Miller, 1989; Pederson & Pederson, 1993). However, the wide range of knowledge levels of students could create difficulties for IT instructors.

Many students had already attended IT subject in secondary schools. For those who are interested in this subject, they can explore the IT world after class and gain plenty of practical experience. On the other hand, those who are not interested in IT will only gain basic knowledge during class time and many of them can easily forget what they have learnt after examinations.

Computer Aided Learning (CAL) can assist subject instructors and students to understand comprehensive models and concepts. Nevertheless, the system design affects the usage intension. The content within the system must be comprehensive enough for novice students but useful and interesting enough for the experienced students to access without feeling bored. In order to cater for different students' needs and achieve the subject objectives, the project "Interactive Tutoring System" (ITS) was initiated.

Literature Review

Compared to the 1970s or 1980s, students' present access to technology at school and at home has largely increased (Facer & Furlong, 2001; Hennessy, Ruthven & Brindley, 2005; HKSAR, 2004). Teachers commonly use IT as a teaching aid and students use the Internet as the primary source of information. Presumably, students should have certain IT knowledge. However, research discovered that although students have some computer skills, their confidence levels do not extend far into advanced IT applications (Messineo & DeOllos, 2005). Even though the hospitality industry is not technologically oriented, the information-intensive nature of the industry requires that IT be used to assist daily operations and business decision-making. In order to produce managerial talent, business and management schools have the responsibility to integrate IT into their academic programs (Crowley, 1997). Many research results suggested that technology mediated learning environments can improve students' achievement in learning (Hiltz, 1995; Maki et al., 2000), and for this reason, web-based CAL was introduced. Broadly defined, CAL is educational software that tracks students' work, tailors feedback and hints along the way. By collecting information on a particular student's performance, CAL can make inferences about the student's strengths and weaknesses, and can suggest additional work / learning experiences. Moreover, research suggested that carefully designed courseware can lead to a large reduction in teaching time, with no significant difference in learning (Coleman et al., 1998). With web accessibility, students can gain access to the CAL without time and geographic barriers.

The learning environment by CAL usually provide interactive problem solving visual aids, however, the system may not able to handle different students needs. Especially for IT, student with different knowledge background have different learning needs. Instructor should stick to the course materials when handling lower-cognitive students, but creative teaching strategies should be used when

teaching higher-achievement students (Zohar, Degani & Vaaknin, 2001). Neumann and Zirvas (1998) developed an Internet-based teaching and learning system that coped with students with different knowledge levels and different learning preferences. For students who have prior knowledge on certain topics, their profiles would be marked or they can bypass that topic by completing the qualifying questions.

Purely using technology alone does not motivate students that have lived in the midst of technology. To draw students' interest, using CAL online computer games in education was recommended. Computer games may create a new learning culture that corresponds better with students' habits and interests (Prensky, 2001). Kiili (2005) proposed an experimental gaming model that linked game-play with experiential learning to facilitate flow experience. The aim of an educational game is to provide challenge related task for students to complete. However, both the task and the use of the artifact should not be too complex, or it would detract the user's attention (Pearce & Howard, 2004).

Other than games, Renkl and Atkinson (2002) pointed out that examples are also an important source of learning (VanLehn, 1996), and it is a preferred learning model for novices (Anderson, Farrell, & Sauters, 1984; Lefevre & Dixon, 1986).

Methodology

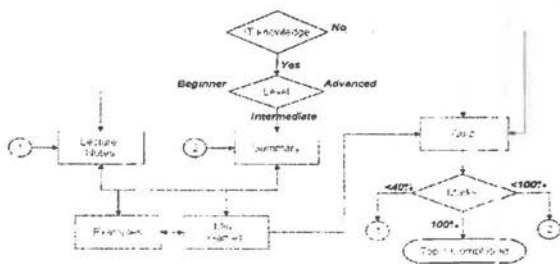
This exploratory project's content was based on the syllabus of the core subject of captioned program named "Technology Management in Hotel and Tourism" (TMHT) offered at the undergraduate level of a tourism and hospitality program in Hong Kong. The objective of this subject was to introduce basic computer and IT concepts including computer and networking components, applications use in hospitality and tourism industry, e-commerce and strategic use of IT in the hospitality and tourism industries. Students are not only taught with concepts and models but also have practical experience with some most commonly used commercial software on office automation products, image processing software, and basic property management system operations. From the comments of subject lecturers and instructors, the IT knowledge level among students ranges for a very wide scale. Some students were novice to computers that they only have basic computer operation skills like Internet browsing, email handling and word processing; whereas other students have in-depth IT knowledge that they have their own web pages and can write computer programs.

Before the ITS system design phase was started, 30 students from a hospitality and tourism program were invited to join a focus group meeting. These students have completed 80% of the course lectures of TMHT. They were divided into two groups and shared their experience in studying the subject. The main purpose of

the focus group discussion was to identify what difficulties they have encountered when studying the subject. During the focus group discussion, it was found that most male students have certain level of IT knowledge but most of the female students have very minimal or no IT knowledge. The female students also stated that they did not like the subject because it is too technical. Some students emphasized that they did not like reading textbooks, and Power-point lecture notes were not detailed enough. As such, they felt that theoretical topics were very boring. They also pointed out several difficulties that they had faced when studying this subject, e.g. memorizing the meaning of new vocabulary, identifying the difference between terms, associating the jargon with real life, and identifying different hardware components from text only lecture notes. They expected a system that can use visual aids to conduct lectures (such as video), provide more interactive activities such as mini games, simulation, multiple choice quiz, and use more examples that are related to hospitality and tourism as to explain theories.

The ITS workflow design was based on the comments received from the focus group discussion. In order to cater for different knowledge levels, students can either state their knowledge level before they start using the system or they can let the system to identify their knowledge level after participated a test. To ensure that a student fully understands a topic, when the student identifies himself/herself as an "Advanced" level learner, he/she is required to achieve 100% accuracy in the quiz. If a student's score is less than 40% in the quiz, the student will be classified as a "Beginner" learner. For the students who receive scores between 40% - 100%, they are classified as "Intermediate" level learners. If a student can get an 100% accuracy, this implies that he/she can fully understand the topic and the system will record them as "Topic Completed" without the need for going through the course content. For users at the beginner level, comprehensive lecture notes will be displayed but only summary contents are shown for intermediate level users. Once a student has completed all the lecture notes, the student is required to complete a test. If the student cannot achieve 100%, the lecture notes relating to wrongly answered questions will be displayed again for review.

Figure 1 (Fig. 1) shows the flow of the ITS



ITS operation

The ITS was written by Flash MX in order to provide an interactive environment with graphical and animated interfaces for students. Each student was assigned a unique user ID and password for ITS logon. Their activities within ITS were stored inside the database so that the course lecturer could review each student's progress and performance, and provide assistance when necessary. The ITS also provides a check function for student to review their own performance and learning pace for each topic.

Upon the system start up, student can select the topic they would like to study. To cater for different students' needs, the system will require student to identify their IT knowledge level as basic, intermediate and advance (Fig. 2).



Fig. 2. Identification of knowledge level

When students have selected the "basic" level, the system will show the detailed lecture notes for the student to read. When students have encountered a special term that they do not understand, they can simply use the mouse pointer to point on the vocabulary and the pop-up balloon will display a detailed explanation of that term (Fig 3).

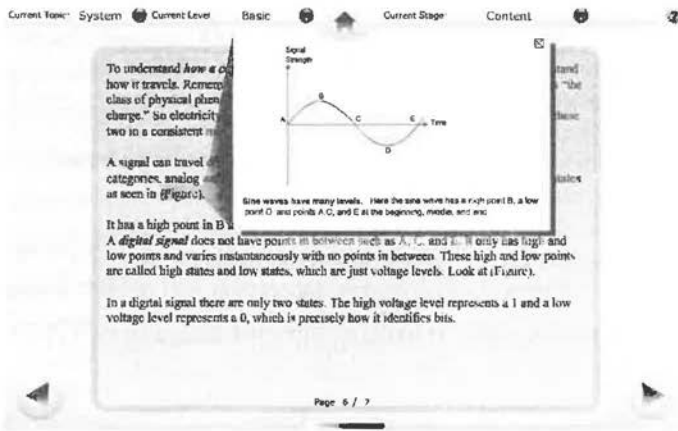


Fig. 3. Lecture notes with explanation on vocabulary

For students who identified themselves as “Intermediate” learners, they can read the summary lecture notes as a revision to refresh their memory. If they want to obtain the comprehensive content, they can switch back to the detailed lecture notes which are only one simple click away. To strengthen students’ memory on each topic, they can retrieve the worked-out examples from the ITS (Fig. 4), or to access numerous online examples as selected by instructors. These online examples were mostly related to the hospitality and tourism industries and thus can assist students to strengthen their knowledge.



Fig. 4. Students can key in any character to get the ASCII value

Having completed the lecture notes, students can optionally choose to participate the mini game. Since this subject contains numerous new vocabulary terms, matching games can help students to test their understanding of each term and to ensure that they do not mix up with other similar terms. (Fig 5). Every time after a student has selected the matching game, the content and choices will be randomly assigned. Moreover, there are ten choices for eight questions to prevent students from blindly assigning the last choice to the last question

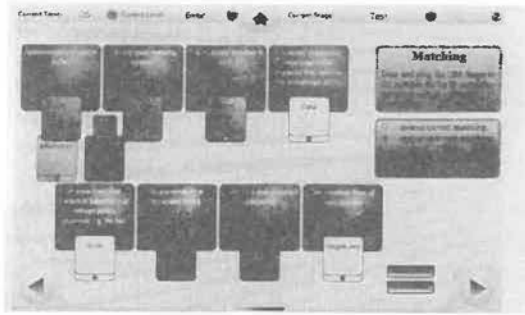


Fig 5. Matching games to test a student's understanding of special terms

Most students already know how to operate a PC. However, many of them have no idea about the components inside the computer as the hardware components that make them confused and have difficulties to identify. Moreover, some female students mentioned that they have difficulties in recognizing different peripheral cables. Fig. 6 shows the computer assembling mini game that helps students identify the key components inside a PC and they can subsequently select the components from the list and assemble their own PC. This helps them identify each component and its location inside the case. After a student has completed the assembling, the second stage of the game requires them to plug the cables into the correct location (Fig. 7).

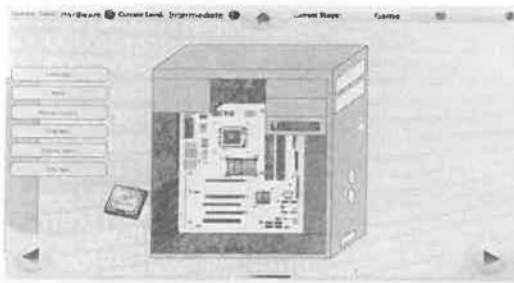


Fig. 6. Students can assemble their own PC with the components provided

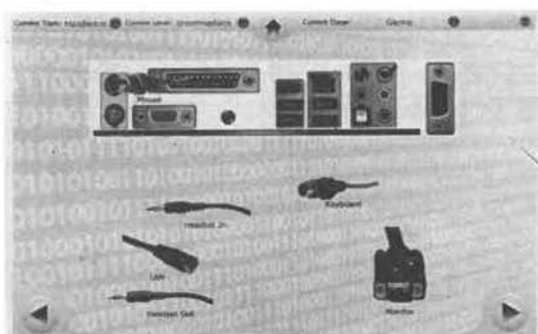


Fig. 7. Mini games that teaches the students to assign the right cables

Upon completion of the course materials, students are required to complete the quiz. The quiz comprises many multiple choice questions. The answer of each question is in random order every time it is displayed. This is to prevent students from memorizing the position. Students can scroll through all questions and revise their answers without time limit. Students can choose to submit their answers to the system or skip the quiz if they feel that they need to read the lecture notes further. When students have completed all the questions and feel comfortable with the answer, they can press the submit button and the final scores and correct answers are shown for review (Fig. 8). Moreover, the course content that is related to the wrongly answered questions will be displayed on screen again for revision. The topic will be marked as completed when all the multiple choice questions were answered correctly.

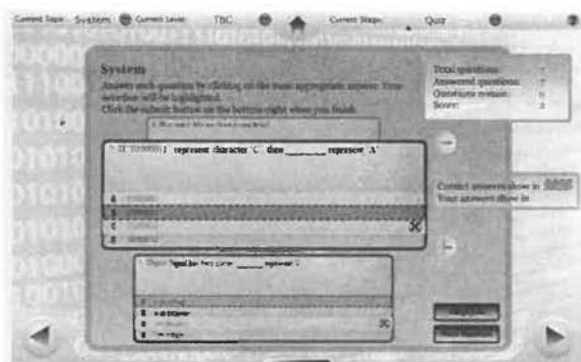


Fig. 8. Multiple choice questions to test a student's understanding of each topic

Students' feedback on ITS

After the ITS development was completed, a total of 128 undergraduate students were invited to evaluate the system. Briefing sessions were conducted during tutorial classes to introduce the basic operation of the ITS. Students were requested to provide their comments by filling in the feedback questionnaires. All questionnaires were collected one week after the briefing sessions but since testing the ITS was a voluntary activity, only 26 questionnaires were returned, representing a return rate of 20.31%.

The feedback questionnaire contains three sections: student's IT background, system design and content, and comments on the ITS. Inside the questionnaire, the rating on system design and content were on a 5-point Likert scale where 5 is the highest rating and 1 is the lowest rating. In addition, there are three open-ended questions for seeking students' feedback on the ITS.

On the basis of students' feedback, students liked the system on the layout side more than its functions. As indicated in Table 1, items relating to layout and design score received the highest score with 3.48 and above, which implies that students have experience. In system functions, students like the quiz and record checking function because this can examine their understanding on each topic and monitor their own learning pace. From the feedback, the labeling of the system is not clear enough, balloon help and mouse over labeling were thus recommended.

Table 1. Rating on overall system design:

Item	Mean	STD
Background Color	3.73	0.60
Font Color	3.69	0.79
Layout	3.65	0.85
Font Size	3.62	1.10
Navigation	3.48	0.92
Usefulness of the Check Record Function	3.48	0.87
Color Contrast (Font color Vs Background color)	3.46	0.58
Usefulness of Quiz for me to understand the content	3.32	0.85
Helpfulness of the Check Record function for me to understand my progress	3.28	0.74
Download Time	3.27	0.87
Playfulness of the Mini Game	3.25	0.90
Labeling / Explanation	3.24	0.78
Usefulness of the Mini Game for me to understand the concept	3.24	0.88
Playfulness of Quiz	3.04	0.89

In this exploratory project, there are four topics on computer essentials, including System, Hardware, Software, and Operating System. As shown from the feedback in Table 2, illustration diagram and examples were most welcomed by the students. It reflected that the students needed external information to help them understand vague concepts and models (Table 2).

Table 2. Rating on course contents in ITS

	Mean	STD
System		
Examples are useful	3.63	0.77
Contents are easy to understand	3.58	0.65
Additional examples help me to understand more on this topic	3.50	0.88
Diagrams are useful	3.40	0.87
Quiz questions are related to course content	3.40	0.76
Keyword explanation are clear	3.38	0.58
Hardware		
Diagrams are useful	3.71	0.62
Quiz questions are related to course content	3.68	0.69
Additional examples help me to understand more on this topic	3.56	0.71
Contents are easy to understand	3.46	0.78
Keyword explanations are clear	3.46	0.66
Examples are useful	3.44	0.71
Mini Game helps me to know more	3.36	0.86
Software		
Quiz questions are related to course content	3.54	0.66
Examples are useful	3.48	0.71
Diagrams are useful	3.44	0.71
Additional examples help me to understand more on this topic	3.36	0.86
Contents are easy to understand	3.28	0.98
Keyword explanations are clear	3.24	0.83
Operating System		
Examples are useful	3.64	0.81
Contents are easy to understand	3.60	0.71
Diagrams are useful	3.60	0.87
Additional examples help me to understand more on this topic	3.52	0.71
Keyword explanations are clear	3.48	0.71
Quiz questions are related to course content	3.40	0.71

Students were asked to identify their perceived level of difficulties on the four topics that they have studied previously and after using ITS by indicating "1" as very easy to "5" as very difficult. Since only one student from advanced level returned the feedback questionnaire, it was dropped from performance analysis. The performance of the ITS for novice and intermediate level users were shown in Table 3.

Table 3 – Level of difficulties in Studying IT

Topics	Novice Level (N=16)				Intermediate Level (N=7)			
	Before ITS	After ITS	t	Sig.	Before ITS	After ITS	t	Sig.
System	3.12	3.06	0.293	0.774	2.50	2.25	0.798	0.451
Hardware	3.00	3.06	-0.293	0.774	2.63	2.25	1.158	0.285
Software	3.44	3.44	0.000	1.000	2.88	2.76	0.424	0.685
Operating System	3.63	3.56	0.202	0.843	2.63	2.50	1.000	0.351

According to Table 3, there was no significant difference on students' perceptions of level of difficulties before and after using ITS. For novice level users, students feel "System" and "Operating System" were slightly easier after using the ITS and there is no difference for "Software". Interestingly, novice students found that "Hardware" was even more difficult after using the ITS. For intermediate level users, students felt the topics become easier after using the ITS especially on "Hardware", which has the biggest mean difference on before and after using the ITS.

There were three open-ended questions for students to express their likeliness of the ITS. Nine students stated that they like quiz most because it can help them understand their level of comprehension of a topic. Three students liked the examples and illustration diagrams most and one student liked the function which system is able to cater for students with different knowledge levels. What they liked the least is the URL links for additional examples to external websites as that did not provide detailed description about that websites. Another function that they did not like is that the screen is full of text, making them feel bored in reading.

The students have recommended several areas for improvement. First, they would like to have videos to provide clearer and effective explanations on specific topics without the need to read lots of text. Additionally, they needed more multiple choice questions so that they can examine their knowledge of each topic. As well, more mini games with sound effect would be welcomed by the students. Finally, more pictures and diagrams on different computer components and models would be expected.

Conclusions and Future Research

The ITS is currently not a compulsory coursework for TMHT, therefore, only few students actively participated in the testing process. In order to increase its usage, some lecturers suggested using the marks they have achieved in ITS quiz as one of the assessment criteria. However, some students pointed out that it will create additional pressure and may lose their interest on treating ITS as a teaching and learning aid.

This is an exploratory project. Due to resource limitation, only one-tenth of the course contents were included. From the student feedback, because the ITS only covers a small part of the course content, they did not want to spend their time and effort to access the system since it would not provide significant outcome. Moreover, the topics selected for this exploratory project were purely theoretical and conceptual. Therefore, it is very difficult to convert the contents into games and videos.

In the future, if the ITS can be expanded to include more course materials, Flash might not be a good development tool. Flash content only starts functioning when the download is complete. However, if putting more contents into Flash, the large file size needs a long download time. As a result, students might not be interested to wait for the download to complete.

For future enhancement, it was recommended to incorporate videos into application software demonstration. Moreover, gender difference could be considered because female and male students have different learning strategies. (Volman & van Eckd, 2001). As such, the design of the ITS should be able to accommodate different genders' learning needs.

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