

AUTEC: A MATHEMATICS E-LEARNING SYSTEM FOCUSING ON NOTES MODULE

Siti Hafizah Ab Hamid

*Department of Software Engineering
University of Malaya
50630 Kuala Lumpur, Malaysia*

Yii Hee Ling

*Department of Software Engineering
University of Malaya
50630 Kuala Lumpur, Malaysia*

ABSTRACT

The advent of Electronic Learning (E-Learning) gives a significant impact in education environment. Students have more options in choosing ways of learning. Basically, the E-Learning has three modules, which are electronic notes, tutorial/quiz, and maintenance. And, the E-Learning developers mostly emphasize on electronic tutorial module more than others in making it automated in many ways and methods. It shows less concentration is given to notes module that make most of the notes are as same as and as simple as in text book. However, this paper presented an approach for electronic notes module of E-Learning of mathematics subject by providing step-by-step answers based on question asked. This paper explains all important features in producing a notes module in E-Learning and how the implementation works by stating the functional requirements and design involved in the development. In the first version, it used Microsoft Visual Basic .Net for the system implementation. Finally, a testing had been conducted to ensure the module is user-friendly, simple and has accurate answer.

KEYWORDS

Electronic Learning, Notes Module, Technology, Mathematics

1. INTRODUCTION

Electronic Learning or E-Learning is a learning process using advance electronic media like Internet, network, or standalone computer. There are many definitions of E-Learning on the web. Based on Drucker, (2000) , he defines E-Learning as just-in-time education integrated with high velocity value chains. It is the delivery of individualized, comprehensive, dynamic learning content in real time, aiding the development of communities of knowledge, linking learners and practitioners with experts. Because of the technologies it uses, the E-Learning system has many advance features to make the system effective to its end-users for example multimedia contents (Soula,1997), real time quizzes or tests (Okada,2000), and very good high maintenance feature (Garcia-Sanchez,2005) that do not only can be done by computer literate technicians, but also by non-computer-literate teachers. Now, E-Learning has merged with other technologies such as wireless technology, then, it is called Mobile Learning (M-Learning), where it allows students or teachers access the contents by using mobile devices as discussed in (Yu-Liang,2005).

No matter what the technology is, basically, E-Learning has three basic modules/main functions. They are notes, quizzes or tests, and maintenance (for administrator). At the beginning, E-Learning projects concentrate on making the content digital either as a courseware (offline system) or as an online system. However, the students found the system is not attractive and it is just like notes in the textbook. This earlier

system is not as effective as it should be to the students. Therefore, computer science practitioners combine the E-Learning with multimedia technology to overcome the problem (Yu-Liang,2005). Then, the notes module is not textual and graphical only but also has other multimedia elements like video, animation, and audio. There are a lot of coursewares or online learning systems especially for kindergarten and primary school subjects that have multimedia elements, for example NLightN Multimedia (Lambert,2004), EONA (Edutech,2003), ELTE (Marta,1997), Portal Pendidikan Utusan (Utusan Online,2006), CeLea (Innova Multimedia,2006), and many more.

The question that arises now is: How does higher level mathematics equation (such as calculus) can be represented in the notes module to ensure its effectiveness to students? Most of mathematics E-Learning systems applied multimedia elements to primary school's mathematics syllabus, where the application of the mathematics formula is obviously can be seen in daily life activities. However, for mathematics in higher level education, most of the applications only can be seen later in other subjects for example physics or computer (where the formula will combine with other formula). For that reason, this paper proposes to combine mathematics E-Learning system with interactive feature for higher education syllabus to ensure the student will understand the formula better.

2. SIGNIFICANCE

Most of the time, developers stress on the architecture of the whole system, or focus more on the presentation of the notes or quizzes. Therefore, it can be seen that some of E-Learning systems have multimedia element to attract the student's attention and to make the learning process more fun. There are so little efforts have been put on the notes module except for the multimedia feature. Thus, the notes module function becomes as same as notes in the textbook but more attractive. The students only can read but cannot do anything with it.

In Malaysia Education Certificate Examination (SPM), students are required to answer every question with correct working-steps. The answer is still considered wrong if the student gives wrong working-steps. Most of current E-Learning systems can provide a correct answer with attractive interface to attract the student's attention. However, it is not enough in the mathematics learning process. This is because some students would simply guess the answer and it could be correct. Therefore, this paper proposes a mathematics E-Learning system (called AuTec) that is not only can give a correct answer to the students but also shows them the working-steps of getting the answer.

3. OBJECTIVES

The project used automated approach in implementing step-by-step technique in producing the answer. The main objective of using automated approach is to make notes module of the E-Learning system becomes interactive, helpful, and useful to students. Basically, the system will display answer to the question by showing the steps of getting the answer. This is important for students to learn the formula in the mathematics. The domain is Mathematics subject for secondary school students (Form 4 and Form 5). These are the students who are going to sit SPM examination at the end of their Form 5, where the result will determine whether they are eligible to continue their study in university or not.

4. FUNCTIONAL REQUIREMENTS

According to Oestereich B (2002), use case is a set of activities of a system from the point of view of its actors which lead to perceptible outcome for the actors. The project has three main actors which are student, teacher, and parent. The student uses the system as learning tool and parent and teacher use the system as teaching tool. All of these actors access one use case only which is "get answer" where it has included use case named "get working steps answer". Figure 2 illustrates the use case diagram.

5. SYSTEM PROCESS

In this paper, the project design is illustrated by using a flowchart. The flowchart is a simple flowchart since the process only about the end-user requests an answer by giving an input. Then, the system will generate a step-by-step answer for the end-user. However, the step is limited to five steps only. Figure 3 is the project flowchart.

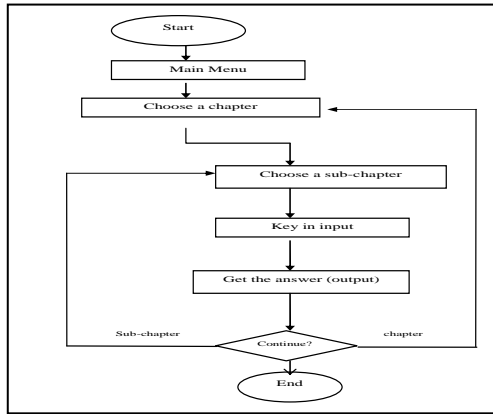


Figure 3. Flowchart

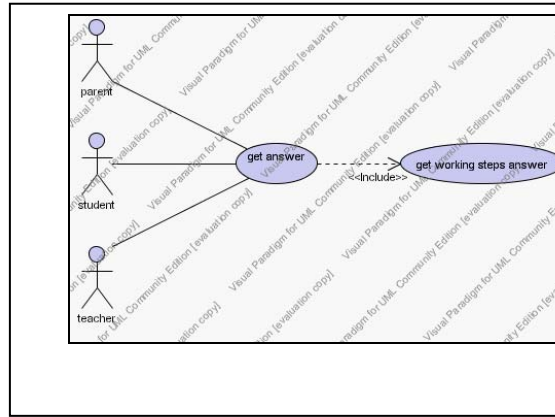


Figure 2. Use Case Diagram

6. SYSTEM IMPLEMENTATION

The implementation is using Visual Basic .Net as tool of development. There are two main interfaces of the system. They are Additional Mathematics subject and Modern Mathematics subject. Both are using SPM syllabus. The main interfaces listed all chapters covered in the system. Figure 4 shows the main interfaces.

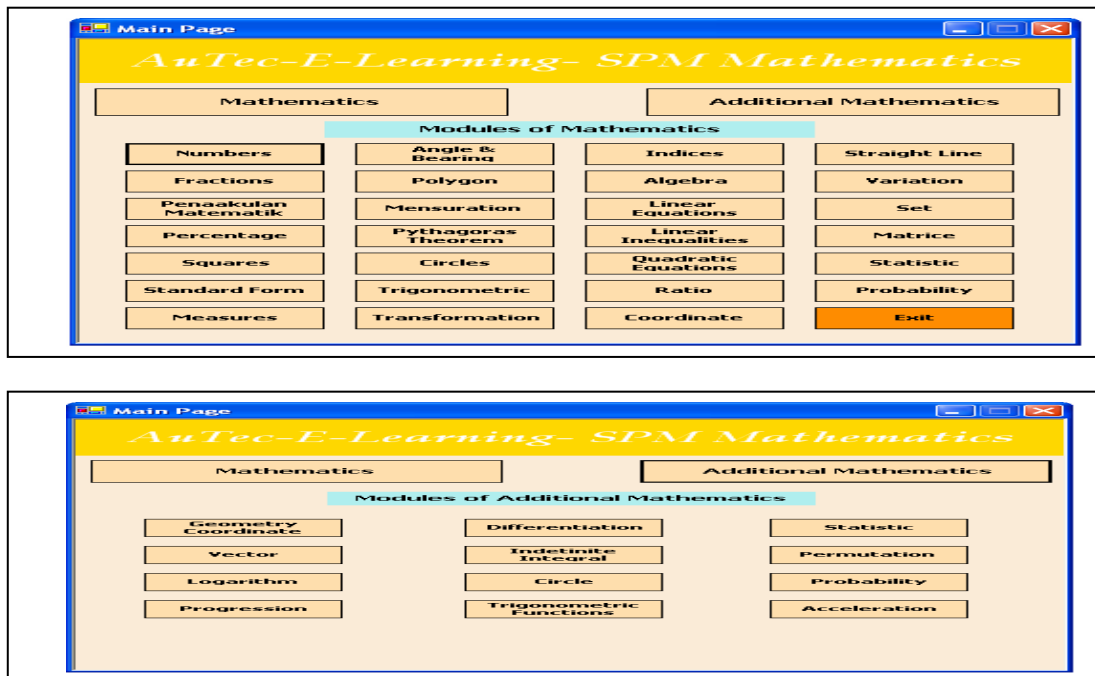


Figure 4. Main Interfaces

First, the end-user chooses the chapter that he wants to learn. In the chapter, the end-user will see a simple question from the chapter. There is a question that the student can key in values in order to look the answer that will appear. The answer that will come out is not the last answer but steps in getting the answer. Figure 5 shows one screenshot of a chapter called angle and bearing.

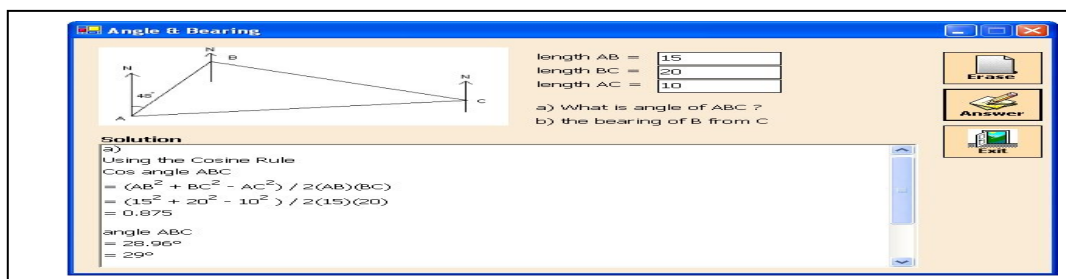


Figure 5. Screenshot

7. USER ACCEPTANCE EVALUATION

The implications of the system will be on students, teachers, and parents. All of these three people can use the system as learning tool or as teaching aid. One simple survey has been conducted to thirty respondents that consist of students, teachers, and parents. The survey is to get feedbacks from them in terms of system user-friendliness, simplicity of interfaces, and accuracy of the contents. However, before asking them about the system, they have been asked about their computer literacy (in basic computer skill). Figure 6 illustrates the survey on computer knowledge and courseware used. Most of the students have computer knowledge and used courseware in their learning session. However, it is quite surprise that there are some teachers have no computer knowledge and find difficulty in using the technology. Therefore, it is not surprise to have teachers who never use courseware. Thus, it can be concluded that all E-Learning systems including courseware should be simple and user-friendly in order to ensure all types of end-users can use the system well and effectively.

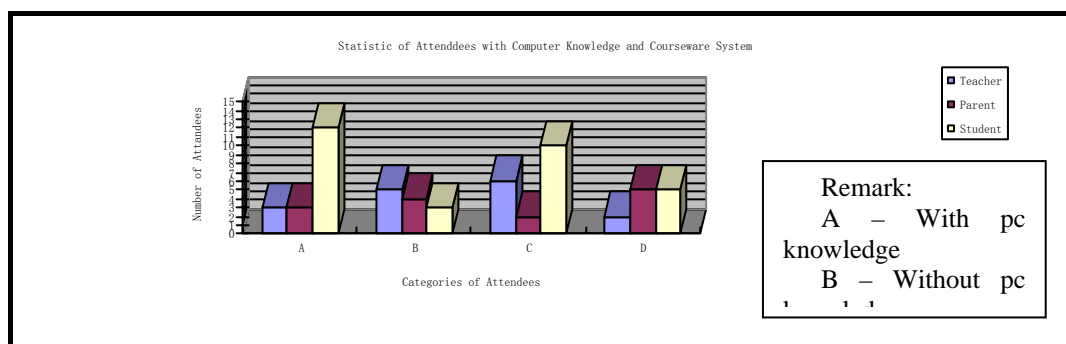


Figure 6 Computer Knowledge and Courseware Used

Figure 7 illustrates the survey result that has been carried out to get the end-users feedbacks in terms of user-friendliness, simplicity and accuracy of the system. The survey used 1 to 5 scale to evaluate the satisfactory where 1 as poor and 5 as good. The statistic on Figure 7 covers all three types of end-users which are student, parent, and teacher. Based on the statistics, it shows that most of the respondents are satisfied with the system of its user interface and its content. However, there are some respondents found the system is not friendly enough where they said the help function should be more specific and complete. They also found the content is not enough and should cover all chapters and every single type of question that could be asked to student. All of these feedbacks will be implemented in the next version of the system. However, all of them agreed that the system is significantly should be implemented.

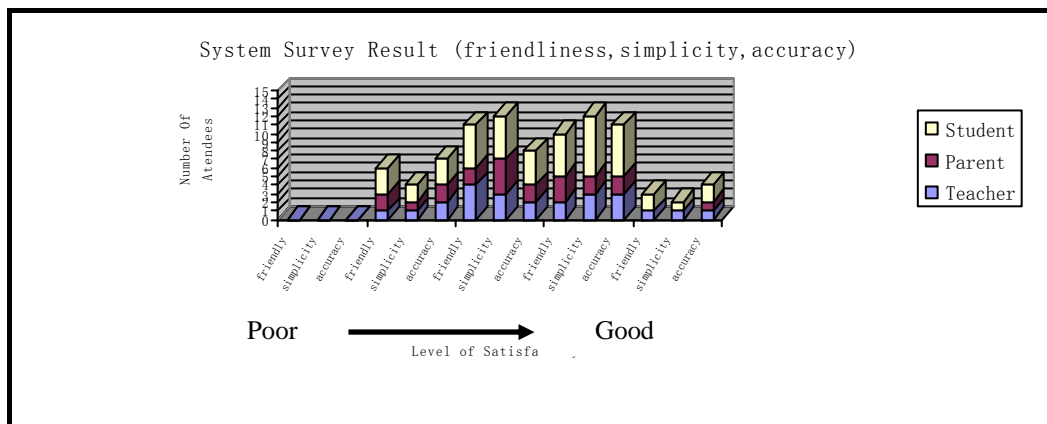


Figure 7. Results of the System Survey

8. CONCLUSION

This paper presents an E-Learning prototype named AuTec where the concentration of the system is only on notes module of the mathematics E-Learning system. The problem with the current mathematics E-Learning system where it only concentrates on attractive feature and not at interactive feature, leads this project to develop such a system by applying step-by step approach. It allows the end-users to key in value to test a question and get an answer with its working-steps. The justification of the approach is to ensure the end-users who use the system understand clearly of particular topic or formula they are learning. Even though the approach looks simple and uncomplicated, it needs to be implemented due to its importance (in examination) and effectiveness to student. The system used Visual Basic .Net for the development process. And, a survey has been conducted to make sure the prototype is user-friendly, simple and accurate. The contribution made by the project leads to its continuation where currently, the project is trying to apply the approach to all chapters in the syllabus and to all types of questions asked in the examination (SPM syllabus).

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