

CHAPTER 6

Conclusion and Future Enhancement

6.1 Conclusion

ITS is an enhancement from CAI, which provides tutoring guidance for students to solve problem in acquiring knowledge. ITS is more helpful to student compared to CAI as it explicitly addresses the issues of how students learn, how to teach and what to teach, with behaviorist transmission model of teaching and learning. VECITS was developed for this project to fulfill the objectives, as mentioned in 1.2.

VECITS is able to let students do their own revision by providing guidance in completing the exercise. The guidance includes hints, help and notes as a reference when solving each step of the problem. System will detect and analyze the answer for each stage in each step and will not allow student to proceed to the next step until the previous step is corrected. It helps student to understand what mistakes they have done and know how to solve it systematically by using the clue in the immediate feedback's pop-up window. It has two-way communication features between students and their teacher. VECITS instructs student the next step to follow until student gets an appropriate answer. The aim of VECITS is to act as a tutor for students to learn and master mathematics vector by rectifying their mistakes. Direction of vector is an entity that students commonly find difficult to visualize especially for a 3-dimensional representation. It requires a power of imagination as opposed to quantities, which are easier to grasp. The misconception of direction leads to serious mistakes in calculation.

VECITS will help students to understand the theory and solving vector by providing the examples, explaining rules of vector and method of solving either using algebraic method, geometric method or theory of calculus. To enhance students in learning, animation and other

features such as hint and help tutor buttons are provided to give students an overview of the guidance provided by the system.

In developing the system, basic model of knowledge needs to be stressed. Firstly, domain expertise or expert knowledge model, which is a source of knowledge to be conveyed to the students, has to be developed. Secondly, user interface model which allows communication between the student and other aspects of the ITS and present knowledge to them, needs to be considered. Thirdly, student model, which remains a core in the development, has to be incorporated. It consists of the incorrect and incomplete knowledge that students begin with and stores a student's misconception and missing conception. Lastly, instructional model, which is also known as pedagogical knowledge, is included. It will interact with students to determine the level of understanding and misunderstanding of the domain. It allows the system to decide what to teach and when to teach it.

Another important aspect in the development is to provide help and feedback features. It is useful in guiding students and to avoid the feeling of being totally lost in trying to start solving a problem. Thus VECITS is able to assess the student's ability and identify the students' misconception and incomplete knowledge. It instructs the students what to do and how to do. Besides the help features, feedback is also an important feature of giving an acknowledgement whether the answer is correct or not and consequently directing students the various steps necessary to rectify their mistakes. If incorrect answer was entered, system will diagnose it and give an incorrect feedback together with the mistakes that the students have done. These help them to realize the mistakes made and students are able to have an idea of how to solve it. At the last stage of solving the problem, student is congratulated by the system if the final answer is correct. This is to affirm and reward the student answer. Multimedia capabilities with colour, graphics and animation are added features to VECITS. It has several features at help, hint and coaching format but the empowering format can be further developed.

The study has been conducted within 6 months beginning with the finding materials related to mathematics vector followed by the development of prototype system which is called VECITS. VECITS has been tested to 10 students from Faculty of Computer Science and Information Technology, University Malaya. From the testing, they claimed that the system is useful for the beginner who have no basic skill in vector or for those who have previously learned the topic and have failed to recall the procedure skills. Using the animation provided, they can well understood of how the calculation of vector is made. The notes are useful as the references during solving the problems.

In the tutorial part, the step by step solution helps them to get an overview of what they have to do by using the 'hint' button. Besides that the 'note' button also helps them refer to the related note containing either formulae or the rules of how to solve the particular problem. The 'tutor' button gives guidance for them to solve the problem in the related step. The feedback provided for the incorrect answer helps them to know what mistakes they have done and how to solve it until they get the correct answer. By not allowing them to go to the next step before correcting the previous step, allow them to understand what mistakes they have done and this may help them to be cautious in the next steps.

Because of the time limitation, certain multimedia elements such as audio or real life photographs are not included in this system prototype. These elements are important for student to understand better especially in visualizing the concepts of vector. The system will be enhanced to be a complete system including the notes and questions to be solved. All of these will be included in the future enhancement.

6.2 Future Enhancement

In future, the system can also be adapted to various topics in mathematics such as calculus and dynamics. These topics can be included in one system and a hierarchy of menu is provided to allow students to access the relevant topics. In such a system, there are the domain dependent and domain independent parts. The domain independent part is a common part for all topics, whereas the domain dependent part is designed to suit the particular topic. The system can also

be enhanced by covering more subtopics and application of vectors in other topics. The system developed should be implemented in educational institution to foster effective learning and improve the traditional method of teaching.

Graphic in the form of sound effect and real life photographs can be included to improve the system and illustrate the theory of vector for better understanding of the topic. In VECITS, the problems are set by the system and the students are asked to solve them. Intelligence can be enhanced by attending the needs of the students to solve the problems asked by them.