

An Adaptive Learning System Based on Proportional VARK to Enhance Learning Achievement Concept

Beesuda Daoruang*, Suthida Chaichomchuen[†], and Anirach Mingkhwan[‡]

Department of Computer Education

Faculty of Technical Education

King Mongkuts University of Technology North Bangkok

Bangkok, Thailand

Email: *beesuda.p@fitm.kmutnb.ac.th, [†]suthida.c@fte.kmutnb.ac.th, [‡]anirach@ieee.org

Abstract—This research aims to study the conceptual framework of learning by selecting the Personal Learning Activity Log to classify learner's learning styles. Adaptive Learning is able to organize content as a percentage of classifying learning patterns. Moreover, the developed adaptive learning system tends towards enhance learner achievement, which can effectively adapt their learning style throughout the end of a course content.

I. INTRODUCTION

Adaptive learning proposes a learning approach to tailor content directing towards learners based on individual learning abilities. The different perception of each learner influences to their effective learning. Characteristics of a learner with different learning styles is extremely important for the instructor to find out the appropriate contents. When learners obtain suitable content that match their preferences, they can finally have self-confidence and enjoyment in learning course.

Therefore, researchers decide to study the conceptual framework of learners learning by using the Personal Learning Activity Log to classify learners learning styles and provide adaptive learning systems that adapt learning patterns to fit learners learning patterns in the VARK. Learners do not have to take the quiz to classify academic aptitude as well as the methods of VARK questionnaire.

II. LITERATURE REVIEW

Fleming and Mills [1] proposed varying style of learning by preference or aptitude, dividing into four categories: Visual, Aural, Read/Write, and Kinesthetic, known as VARK Model or VARK Learning Styles. There are 16 questionnaires for the classification of four individual learning styles. Also, Hasibuan et al. [2] have developed a model for detecting learning patterns based on Agent Learning, known as Adaptive Dynamic Responsive (ADR). VARK learning model is selected as detected learning style. It can be adapted to meet the requirements of learner. Capability of this proposed model is that content is adjusted with the ability of learner to complete the course. The learning style can achieve of maintaining motivation of the learner with online learning. Tashtoush et al. [3] developed the Adaptive E-learning system for teaching

English by taking into account data mining techniques. Cross-validation in the format of Jackson's Learning styles offers content that is adaptable to the learner's learning style. For example, videos, content presentations, and quizzes can be adapted depending on the learner's learning style. The results showed that learners had the high achievement (87.4 %). Abdullah et al. [4] studied the adaptive e-learning model that matches the learning patterns between teachers and learners by using machine learning. Matched Educator-Student learning can match the learning patterns of teachers and learners by using Bayes Classification Techniques, Decision Tree, and Support Vector Machine. Also, learner achievement was compared by using Mat-ES and traditional learning styles. This research introduced Kolb learning styles for teaching process and VARK for the learning process. Results showed that Mat-ES learning model can improved learning performance. In addition, the J48 classifier provides the highest accuracy in classifying data.

From literature review above, researchers are able to gain an understanding of hypothesis suggestion that if there is no personal information acquired from learner via pre-questionnaire before using the learning system, it will be convenient to use for learner.

III. THE CONCEPTUAL MODEL

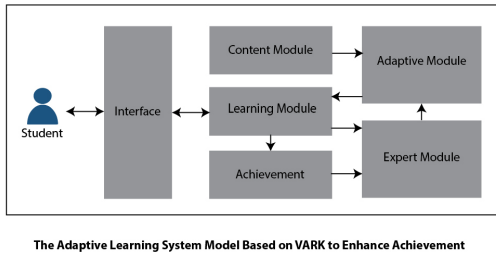
The concept development of adaptive learning system based on proportional VARK to enhance learning achievement is shown in Fig. 1. The modules can be divided into five modules as follows:

A. Content Module

A module stores the content of the lesson, pre-test, exercise during the course, the post-test, and the exam at the end of each chapter. The content of the lesson is created and stored in the VARK learning model, which consists of V (Visual), A (Aural), R (Read/write), and K (Kinesthetic), see Fig. 2a.

B. Adaptive Module

This module obtains results from the Expert module being able to classify a proportional VARK. It will then acquire the



The Adaptive Learning System Model Based on VARK to Enhance Achievement

Fig. 1. The concept of developing an adaptive learning system based on proportional VARK to enhance learning achievement.

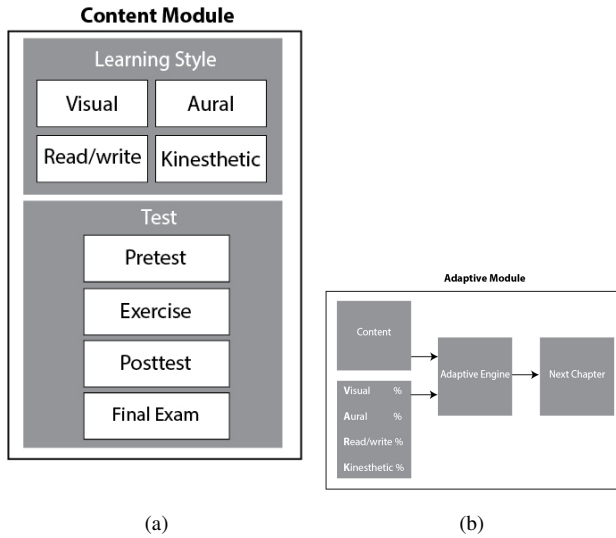


Fig. 2. (a) Content Module, (b) Adaptive Module.

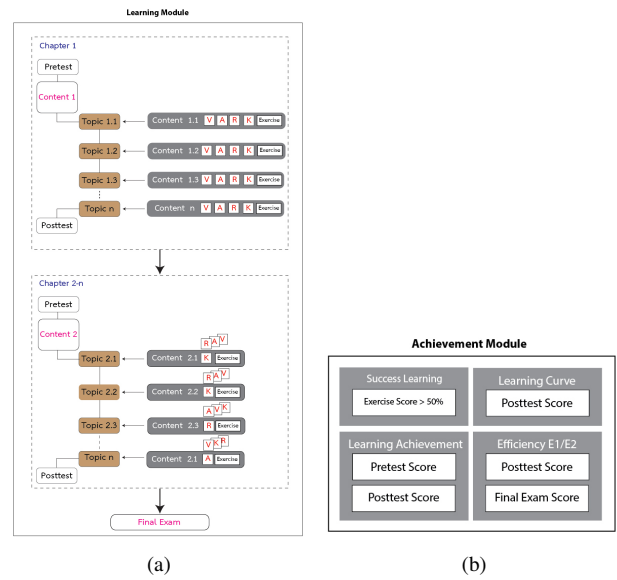


Fig. 3. (a) Learning Module, and (b) Achievement Module.

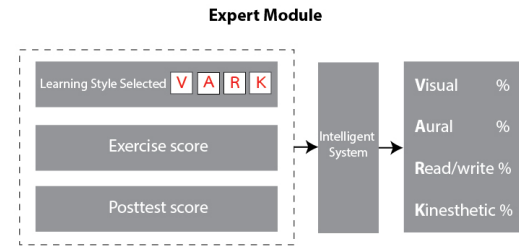


Fig. 4. Expert Module.

learning style and test from the content module to generate the next chapter for the learner, see Fig. 2b.

C. Learning Module

It is a learning module for learners, representing course materials, exercise during the course, pre-test and post-test scores for each lesson, and the final exam score after completing all contents as shown in Fig. 3a.

D. Achievement Module

This module is a collection of behaviour data from learners who use the adapted learning system. The information will be forwarded to the Expert Module for further analysis of learner learning and create a summary report of the system used by the learner as shown in Fig. 3b.

E. Expert Module

This section analyzes behavior of learners who have chosen the learning style in the lesson. Exercise score and post-test score are analyzed as classification of appropriate learning styles for the learner in the next chapter as shown in Fig. 4. As for the Intelligent System part, it uses learner behaviour data mining to classify learning style of the learner such as C4.5 or support vector machines algorithm.

IV. THE EXPECTED RESULT

Researchers strongly suggest that the developed adaptive learning system is able to improve learner achievement because the course content can be adjusted depending on the learner's ability. This research compares the pattern with the samples using the VARK questionnaire and the group using the classifying learning model in the adaptive learning system.

REFERENCES

- [1] VARK Learn. Introduction to VARK. [Online]. Available: <http://vark-learn.com> (Accessed January 9, 2018).
- [2] M. Hasibuan, L. Nugroho, P. I. Santosa, and S. S. Kusumawardani, "A proposed model for detecting learning styles based on agent learning," *International Journal of Emerging Technologies in Learning*, vol. 11, pp. 65–69, 2016.
- [3] Y. M. Tashtoush, M. Al-Soud, M. Fraihat, W. Al-Sarayrah, and M. A. Alsmirat, "Adaptive e-learning web-based English tutor using data mining techniques and Jackson's learning styles," in *Proceedings of the 8th International Conference on Information and Communication Systems (ICICS'17)*, Irbid, Jordan, April 4-6, 2017, pp. 86–91.
- [4] M. Abdullah, A. Y. Bayahya, E. S. B. Shammakh, K. A. Altuwairqi, and A. A. Alsaadi, "A novel adaptive e-learning model matching educator-student learning based on machine learning," in *Proceedings of the International Conference on Communication, Management and Information Technology (ICCMIT'16)*, Prague, Czech Republic, April 25-27, 2016, pp. 773–782.