Chapter 9
Intelligent Agent-Based e-Learning System for Adaptive Learning

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ABSTRACT

Adaptive learning approaches support learners to achieve the intended learning outcomes through a personalized way. Previous studies mistakenly treat adaptive e-Learning as personalizing the presentation style of the learning materials, which is not completely correct. The main idea of adaptive learning is to personalize the earning content in a way that can cope with individual differences in aptitude. In this study, an adaptive learning model is designed based on the Aptitude-Treatment Interaction theory and Constructive Alignment Model. The model aims at improving students’ learning outcomes through enhancing their intrinsic motivation to learn. This model is operationalized with a multi-agent framework and is validated under a controlled laboratory setting. The result is quite promising. The individual differences of students, especially in the experimental group, have been narrowed significantly. Students who have difficulties in learning show significant improvement after the test. However, the longitudinal effect of this model is not tested in this study and will be studied in the future.

INTRODUCTION

Individuals learn differently. The concept of adaptive learning is used to cope with individual differences in aptitude. It is assumed that adaptive learning can support individuals to achieve the designated learning outcome by picking the most suitable means. Adaptive learning in fact is not new to the fields of education and information systems. However, most adaptive e-Learning research focuses on applying the available technologies to personalize the presentation style of

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A short curriculum called Introduction to Hang Seng Index has been constructed by two experienced teachers in this discipline, based on Biggs’ Constructive Alignment framework. Biggs’ framework was referenced because this alignment mechanism concerns the matching between the course objectives and course contents. This framework also suggests that assessment task is a good tool to test the level of development of students. Before advancing to the next level, teachers have to make sure the students have no fundamental problem in the current level with assessment task(s). These characteristic makes this framework a good choice to work as the operation blueprint of the ATI theory. Based on the current aptitude level (or level of development of individual students), the adaptive e-Learning system is able to provide adaptive support without human intervention.

A controlled experiment was conducted, in which 81 undergraduate students who study in the College of Business of one Hong Kong university joined voluntarily. They were randomly assigned to either the experimental group or the control group. Adaptive features were only provided to the experimental group. Each student has spent at most 1.5 hours to go through the curriculum under a controlled laboratory setting, while discussions were prohibited throughout the study. Debriefing was provided after the experiment. Certain individual differences variables, such as gender, age, education level, and preference in presentation mode are well controlled. The pre-test and post-test data were collected both quantitatively and qualitatively. The results showed that students who did badly in the assessment tasks and had received the adaptive support can benefit the most.

LITERATURE REVIEW

People learn differently is absolutely not a new idea (Fizzell, 1984). Keefe (1979) defined individual differences in learning as a consistent
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