Chapter 3

Advances in E-Pedagogy for Online Instruction: Proven Learning Analytics Rasch Item Response Theory

Elspeth McKay  
RMIT University, Australia

Allaa Barefah  
RMIT University, Australia

Marlina Mohamad  
Universiti Tun Hussein Onn Malaysia,  
Malaysia

Mahmoud N. Bakkar  
Holmes Institute, Australia

ABSTRACT

Many people are finding it relatively easy to engage with courseware development and simply upload it to the internet. The trouble with this approach is there are no quality controls to ensure the impending instructional strategies are designed well. This chapter presents a set of research projects that incrementally focus on instructional strategies as they apply in today’s information communications technology (ICT) tools. They commence with a simple investigation into online courseware matching cognitive preferences. Next, a project extends this principle and takes the research to a government-training context to concentrate on dealing with a broader range of stakeholders to customize training for a user-centered environment. Then the authors present a project designed for mobile healthcare training on an iPad. The final research project synthesizes the current instructional systems design (ISD) thinking to promote a prescriptive information systems (IS)-design model for educational courseware, offering it to the ISD research community as an extension to the ADDIE training development model.

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INTRODUCTION

Understanding the effects of instructional strategies on learning outcomes has been a continual topic of interest among educational technology researchers (McKay, 2018); (Merrill, Barclay, & Van-Schaak, 2016);(Cooper-Smith & McKay, 2015);(Minor, 2014);(Parker, 2004). To this end, the Mohamad and McKay (2014) joined the research community to examine various aspects of a web-mediated instructional system (WMIS) in the acquisition of programming skills to reveal that novice-learners performed better with text-plus-textual metaphors than text-plus-graphical metaphors regardless of their cognitive preferences (Allwood, Traum, & Jokinen, 2000).

The main purpose of this paper is to provide an extension of the Mohamad and McKay (2014) paper and present the research developments since. Before presenting three new contributions, to set the context there will be an overview of the initial 2014 paper; this work reported on the Mohamad (2012) thesis, which examined the interactive effects of online instruction and cognitive style preferences for learning computer programming. Then, the first of the new research projects describes how the researchers prepared for their funded experimental research project. This involved an investigation of the interactive effect of instructional strategies (face-to-face; a blend of face-to-face and computerised instruction; and computerised only facilitation), and cognitive instructional preferences for gaining introductory ethics knowledge and skills in the public sector for government trainees (McKay & Izard, 2014). The second new research project describes a part of the Bakkar (2016) thesis to concentrate on the same instructional design (ID) process used by Mohamad (2012) to highlight the importance of conducting a fine-grained approach to planning courseware development for a mobile device. Last but not the least important is the work of Allaa Barefah as she prepares to complete her thesis in the coming months. This work is a synthesis of the earlier research projects to advocate for a prescriptive IS-design model (McKay, 2018) to enhance user-centred instruction.

The Mohamad (2012) thesis used the cognitive styles analysis (CSA) developed by Riding and Cheema (1991) to determine participants’ preferred cognitive instructional mode (verbaliser-imager (VI) dimension that depicts the way people represent information during thinking and the wholist-analytic (WA) dimension which explains the mode of processing information (Riding, 2005). The participants were given the CSA to determine their cognitive styles ratio (VI:WA) that was used to allocate the instructional treatment (text-plus-textual metaphor (T1) and the text-plus-graphical metaphor (T2) (see Figure-1). Initially there were 399-participants who took part in this experiment. They were second year undergraduate students enrolled in a Malaysian university for a Bachelor of Civil Engineering course (Mohamad, 2012). However, the data from 47-participants were discarded from the analysis due to not sitting for the CSA test or they had incomplete answers to the
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