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Instructional Technology Competencies as Perceived by University Lecturers in Malaysia

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Abstract

University lecturers' perceptions of the importance and relevance of instructional technology competencies, as well as factors that contribute to instructional technology competencies required to enhance knowledge and delivery skills of university lecturers are examined in this study. A framework model is presented with the aim of revising and further developing curriculum competencies in tertiary education based on reviews on the philosophies and learning theories from past studies. In this regard, particular attention would be directed towards the Analysis, Design, Develop, Implement, Evaluate (ADDIE) instructional design model. It is proposed that by extending the ADDIE instructional design model to include three learning theories, namely the Behaviourist, Cognitive, and Constructivist theories, a suitable training programme for lecturers can be developed after taking into account their perceptions of instructional technology competencies. Students in institutions of higher learning would certainly benefit from lecturers who are able not only to design curriculums that are relevant to the demands of the marketplace, but, are also able to ensure that their delivery is effective and meets the needs of their students.

Keywords: ADDIE Instructional Design Model, Behaviourist Learning Theory, Cognitive Learning Theory, Constructivist Learning Theory, Instructional Design Model, Tertiary Education

Introduction

According to the goals outlined in "Vision 2020" and the "Malaysia Education Blueprint 2015 – 2025 (Higher Education)," Malaysia seeks to become an international education hub and a high-income nation by 2025 (Malaysia Ministry of Education, 2015; Malaysia Higher Education Department, 2015). One of the ways to achieve these goals is through improving the quality of education to ensure that school-leavers and graduates are of high calibre, competent, and employable. It is, therefore, important not only to revise the content of existing curriculums and educational programmes but also to ensure that the delivery system is effective and that it

addresses students' needs (Malaysia Education Blueprint 2015 – 2025 (Higher Education), pg. 1-11).

To date, there are 20 public universities, 46 private universities, 28 private university colleges, and 9 foreign branch universities in Malaysia (Malaysian Education Blueprint 2015-2025; Ministry of Higher Education, 2016). The primary objective of these universities is to produce quality graduates who possess the necessary knowledge and skills to meet the needs of the industry (Kazi, 2010). Hence, universities are entrusted with the task to ensure that their graduates are employable, i.e. equipped with the requisite skills, knowledge, and competencies to be gainfully employed upon graduation (Ramakrishnan & Yasin, 2012). This objective is in line with Malaysia's vision to be an industrialized nation by 2020 (Md. Shahid et al., 2014). Hence the challenge for the nation is how to ensure that Malaysian university lecturers are capable of developing and delivering new curriculums and instructional programmes to improve the quality and marketability of graduates. The aim here is to help improve the nation's productivity and enable Malaysia to become a high-income nation as envisaged by the government.

Problem Statement

There were approximately 200,000 Malaysian graduates from universities, polytechnics and community colleges in 2016 (“找不到工薪水是主因,” 2016). About 3.5 per cent of these graduates remained unemployed even six months after graduation (“Gerakan youth, “2016; Singh, 2016). Hence, at the time writing, the unemployment rate among graduates was high (Anwar, 2017; “找不到工薪水是主因,” 2016).

Several factors have been identified as having contributed towards unemployment among graduates in Malaysia. The root causes include skill mismatch between qualifications obtained and labour market requirements (“Gerakan youth, “2016; Med Mazak et al., 2014; Singh, Tambura, & Ramey, 2014), ineffective curriculum (Ang, 2015; Mod Salehi et al., 2015; Hanoi, Nordic, & Ridzwan, 2014; Hanapi & Nordin, 2014), lecturer deficiency in instructional design skills (Hanapi et al., 2015; Madar et al., 2008), and ineffective curriculum delivery system in Higher Education Institutions (HEIs) (Grapragasem, Krishnan & Mansor, 2014; Daud et al., 2011; Jurse & Tominc, 2008). All these reasons point to lecturers' lack of competence in designing and delivering instructional programmes and revising curriculums to include the necessary skills and knowledge required in the job market (Vaismoradi et al., 2014; Davidson-Shivers & Hulon, 2013).

The main objectives of this study are to explore the factors that contribute to instructional technology competencies, and to examine the perception of training needs, knowledge competence, and instructional technology competencies among university lecturers. To the best of the researchers' knowledge, there is scant literature on studies investigating lecturers' competencies in instructional design, curriculum content, and curriculum delivery in HEIs (Khalil & Elkhider, 2016) that are essential to improve employability of graduates. Hence, there is an urgent need to fill the gap in the literature so that the authorities can take appropriate steps to improve lecturers' competencies in these areas so as to help students be more employable upon graduation.

Literature Review

This review of literature in this study emphasizes on the Behaviourist, Cognitivist and Constructivist learning theories, and learning theories used in the Analysis, Design, Develop, Implement, Evaluate (ADDIE) instructional design model. These theories are discussed with regards to how they support the design or development of a curriculum to allow university lecturers design appropriate learning objectives to improve employability of graduates.

Literature on Learning Theories reflecting a Paucity in Instructional Design Model Framework

Behaviourist Learning Theory

The Behaviourist Learning Theory posits that learning stems from the interaction between the student and his surroundings. In putting this theory into practice in educational institutions (Kantar, 2013; Weegar & Pacis, 2012; Woolard, 2010; Dick, 1991; Merrill, 1991), coach community (Peel, 2005) and healthcare settings (Kantar, 2013; Creedon, 2006; Pearson et al., 2002), instructional content or curriculum or programme is broken down into smaller instructional steps, followed by an interactive question or an activity to elicit a response from the learner, and concluded with corrective or confirming feedback (Sink, 2014; Weegar & Pacis, 2012; Woolard, 2010). It is the role and responsibility of the instructional designer or educator to devise techniques or ways to help learners master the content that is taught (Bloom, 1968).

Kantar (2013), in his research on instructional strategies, proposes counteractive measures based on three theories of learning, namely Cognitivist, Behaviourist, and Constructivist theories. He found that when educators were faced with the challenge of teaching case-based pedagogy in a nursing curriculum in an institution of higher learning, the learning theories had proven very useful in providing explanations and recommendations for improving pedagogy in curriculum transformation.

However, the study focused on case-based learning where lecturers were expected to teach their courses in accordance with the assumptions of these theories, without adequate knowledge of the theoretical framework of the design and development of the courses or programmes. Moreover, the lecturers were merely concerned that the curriculum alignment was maintained within an approved programme of study. Kantar's study also lacked a theoretical framework to explain the basis of assessment or evaluation to demonstrate that educators understood the materials that they taught; neither were there guidelines on planning and designing instruction for the curriculum.

In contrast to Kantar's study, findings from Creedon's (2006) research reported poor success rate of healthcare workers' compliance with hand hygiene guidelines. Despite the tendency towards non-compliance, multifaceted interventions based on the Behaviourist theory had shown better success in behavioural change in terms of attitudes, belief and knowledge than the provision of gift vouchers or intervention programmes not based on the Behaviourist theory (Gopal Rao et al., 2002; Pittet, 2000; Larson et al., 2001). The journal article described the research as quasi-experimental, focusing on the impact of direct reinforcement on healthcare workers' behaviour in a ward setting. The needs of healthcare workers were based on a specific desired outcome, i.e. that healthcare workers must remember to follow the hand hygiene guidelines. However,

the study lacked a theoretical framework to guide the planning of instruction in intervention programmes.

In summary, Behaviourists believe that learning occurs due to stimulus-response between the student and the environments, that triggering changes in their responses. Cognitive Learning Theory is introduced to explain how knowledge is involved in guiding the transition process that takes place in the mind, which does not explain by Behaviourist learning theory (Edgar, 2012).

Cognitive Learning Theory

The Cognitive Learning Theory views the learner as a processor of information (Mayer, 1996). The study of the learner's mind can be conceptualized as a study of how sensory input is transformed, stored, retrieved and used whenever it is required (Gurbin, 2015; Zhang et al., 2006; Hunt, 1980). For instance, Blayne, Kalyuga & Sweller (2015) investigated adaptive instruction effect in the Cognitive Load Theory. Learners were presented information in either an isolated, non-interactive form, or fully interactive form. It was found that there was a relationship between instructional procedures and level of learner's prior knowledge, thus indicating expertise reversal effect. There is, therefore, a need to use instruction that is adaptive to an individual learner's level of expertise. For instance, less knowledgeable students should be provided with a high degree of guidance to help recoup their lack of relevant schemas in long-term memory. However, the Cognitive Load Theory used in this study focused on defining the outcome of instructional materials and ignored the processes involved in designing instructional materials. The study also did not provide a practical framework for implementing the Cognitive Learning Theory in the laboratory. Hence, it did not facilitate a systematic approach to the planning and designing of instructional materials.

Ojose (2008) studied mainly observations of mental processes, and so there was difficulty quantifying or measuring the effect that cognition had on mental development and representation for both child and adult learning. Moreover, the study did not discuss how the findings could be generalized; the findings were applicable only to certain group of users and the instructional model. The researcher did not explain the method of designing and implementing the instruction, and there was no mention of the outcomes.

Constructivist Learning Theory

According to constructivists, learners construct meaning and knowledge through experiencing things and through their experiences of phenomena, rather than receiving and storing externally-sourced knowledge (Tam, 2000; Ben-Ari, 1998; Bereiter, 1994). Azwin et al. (2014) reported that the learning theories adopted in their study had encouraged ESL learners to make choices about how they preferred to learn; they restructured and reformed surroundings and environments according to their physiological and cognitive needs. The application of the Constructivist Learning Theory by a multimedia courseware used in the study showed high impact on a learning environment that was not only conducive for learning, but also encouraged the individual learner to explore knowledge construction through experimentations or reorganization and in-depth comprehension in a relaxed and comfortable manner (Azwin, 2006).

However, the development of multimedia in the student-centred learning approach did not consolidate the learning theories and their implementation in the actual classroom in engineering education, which in turn, cannot be generalized to the learning of other subjects. In addition, the study did not provide guidelines on designing activities that facilitate learning, nor did it explain clearly the processes involved in evaluating the practicality and effectiveness of the module.

Collins (2008) found that the Constructivist Theory applied in the SD1910 course to facilitate enhanced adult student learning was effective. Anecdotal evidence also showed that the application of the Constructivist Theory in the learning environment enabled students' learning needs to be met (Bajbouj, Alwi & Shah, 2015) as in such a learning environment, the learner would find it safe to make mistakes and construct new meaning. However, these studies lacked a practical framework for implementing the Constructivist Theory in the laboratory and offered no explanation on the research method employed. Hence, they were not able to facilitate a systematic approach to the planning of instruction.

Literature on Instructional Design Model reflecting a Paucity of Theoretical Foundation

Reinbold (2013) investigated the level of knowledge possessed by librarians at Weill Cornell Medical College (WCMC) with regard to instruction design and delivery using the Analysis, Design, Develop, Implement, Evaluate (ADDIE) model to redesign the curriculum for evidence-based medicine (EBM) training of first-year medical students. The study found that the librarians were able to design relevant and effective instruction by using the ADDIE model. They were successful in creating focused, learner-centred instruction that achieved the learning objectives. Similarly, Cheung (2016) also found that the ADDIE model of instructional design model helped instructors to not only develop their own curricula to teach chest radiograph interpretation, but also to diagnose and manage respiratory diseases. However, Cheung's investigation of the ADDIE model used to develop medical curriculum did not provide guidelines nor the theory underpinning the study. Simply applying the ADDIE model without any theoretical basis could result in a poorly designed training curriculum.

Literature on the interplay between Learning Theories and ADDIE Instructional Design Model

Although Behaviourist, Cognitive, and Constructivist theories all describe learning differently, they are not necessarily exclusive of one another. Activities belonging to more than one theoretical approach can be integrated in the design of the same instruction (Cronje, 2006). Some reported outcomes are positive, while others produced contradictory results.

Hua (2016) conducted a study to examine students' experience with the design, application, and testing of interactive educational TV programmes based on the Cognitive Load Theory, along with the five steps of the ADDIE model (Analysis, Design, Develop, Implement, and Evaluation). The study found that there was a good level of programme quality and there was satisfactory performance on three aspects (instruction, interactivity, and technique). Thus, a systematic and collaborative approach to embedding information literacy within academic courses was shown to have resulted in an efficient and effective pedagogical approach to curriculum design based on the ADDIE model (Almomen et al., 2016; Mustafa et al., 2016). In short, the Camera basic skills

interactive educational TV programme in this study was found to be effective for undergraduate students, with respect to instruction, interactivity, and technique. However, the processes involved and techniques for measuring cognitive load in this study were not addressed by the Cognitive Load Theory. In addition, lack of explanation about the constructs themselves resulted in validity and reliability issues. Hence, such an approach might not be useful for use in the actual classroom.

Zain et al. (2016) formulated and developed ASIE (Analyse, Strategize, Implement, and Evaluate), an integrated instructional design model as a solution to the challenges faced by Malaysian school instructors/teachers when they wanted to integrate instruction during preparation of lessons plans. The objective of the ASIE model was to enable teachers to visualize the incorporation of a learning framework in classroom practice by providing a mechanism for designing the instruction needed for teaching and learning. However, there was inadequate explanation of the theories and principles of instructional design used to develop the model. The model also did not provide for the assessment of teachers / instructor's competencies. In addition, this model was specially designed for use by school teachers only. Past studies reported a positive relationship among three factors (perceived mastery of instruction, experience in designing instruction, and training on instructional technology) and university lecturers' perceived importance, level of knowledge, and perceived needs of instruction competencies.

Literature on Instructional Technology Competencies

Many researchers have conducted studies on instructional technology competencies in various settings. The focus was on (1) instructional design competency that the instructional designer must have (Kang & Ritzhaupt, 2015; Klein & Jun, 2014; Hudson, 2014; Kenny et al., 2005), (2) instructional technology competencies required in different work settings, such as business and higher education sectors (Iqdami & Branch, 2016; Ritzhaupt & Kumar, 2015; Hudson, 2014), (3) specific types of competencies, for example, multimedia competencies (Ritzhaupt & Martin, 2014; van Rooij, 2013; Sugar et al., 2011), and (4) most commonly used data sources (instructional technology experts, project leaders, practitioners, instructional designers from university and faculty managers), and commonly used data collection methods (survey, job announcement, interview, case study, and Delphi technique). The studies were aimed at determining either a specific setting of instructional design competency or different contexts or settings of instructional design competency, and the research methods used (qualitative or quantitative or mixed methods).

However, there is paucity of literature on studies investigating the process of formulating effective guidelines on instructional design for tertiary curricula or programmes preparing university lecturers for instruction, as well as requisite competencies needed for instructional design (Weber, Delaney & Snow, 2016; Journell et al., 2013) in the Malaysian context. Hence, there is a significant need for related knowledge, skills, and understanding of instructional design and models when developing tertiary education curricula to meet the needs of university students (Barbour et al., 2013; Cardullo, 2013; Picciano & Seaman, 2009).

Other Influencing Factors

According to past studies, there are other factors that might have influenced perceived needs for instructional technology competencies in various settings. The reasons for the selection of these factors to be investigated among university lecturers in the Malaysian university setting are explained in the following paragraphs.

Age

Past studies have found a positive relationship between age and perception, and experiences on instructional technology in educational settings. For example, Figueroa (2014) examined how instructional designers' personal characteristics influenced their Instructional Design (ID) practice. All 15 participants for the study agreed that specific personal characteristics like age, gender, experiences did have an impact on their perception and experience of ID processes.

Gender

Gender was identified as an important factor that affects faculty staff or teachers' perception of and experience with instructional technology (Iqdami & Branch, 2016; Figueroa, 2014; Campbell & Varnhagen, 2002). For example, Figueroa (2014) found that besides age and personal characteristics, gender had an impact on instructional designers' experience with instructional design processes. Another study (Campbell & Varnhagen, 2002) revealed that females were shown to have better perception, were more likely to spend time on instruction and had more confidence in the use of instructional technology than their male counterparts. However, findings from other studies (Ngussa, 2014; Dogan, 2010) reported no gender differences on perception, experience and implementation of instructional design.

Years of Teaching Experience

Studies have been conducted to investigate the relationship between years of teaching experience, age, gender, and perception of instructional technology in higher education settings (Iqdami & Branch, 2016; Ritzhaupt & Kumar, 2015). The researchers who wanted to identify the knowledge and skills perceived as needed by instructional designers in higher education settings reported that a positive relationship existed between years of teaching experience and perception of instructional technology. On the other hand, Ngussa (2014) did not find any such relationship.

Training on Instructional Technology

Nasrin, Amitava and Grace (2014) carried out a study to determine how the disconnection between theory for designing educational applications and theory relating to the application of technology in classrooms might be bridged. At the same time, they examined the lack of alignment between technology, curriculum and pedagogy in mathematics computer-based applications as perceived by Australian primary teachers and educators through the use of ADDIE framework. The researchers found that after being trained on how to use the ADDIE instructional design model, the pre-service and in-service teachers were able to define and set certain mathematics pedagogical and learning objectives that were aligned with the Australian curriculum; the teachers were also able to use the multimedia application as a tool to teach the planned objectives. In general, the ADDIE instructional design model was a useful teacher's guide.

In another study by Chaudry and Rahman (2010), 120 academicians from different academic departments at Allama Iqbal Open University in Pakistan were assessed on their perceptions of the process of instructional design of a distance learning system. Findings indicated that 82 percent of academicians stated that a needs assessment was not done before conceiving the outlines of a course and 62 percent stated that they were not trained in designing instruction for distance education.

Experience in Designing Instruction

Instructional technology experience can be defined as an individual's exposure to using instructional technologies, as well as the skills and abilities that she or he gains through using the technologies (Ball & Levy, 2008). Although pre-service teacher programmes that include training in instructional technology have proven useful, studies have found that many institutions of higher learning worldwide, including in Malaysia, failed to appropriately expose pre-service teachers to positive experiences with instructional technology so as to create an awareness of the potential benefits of integrating educational technology into their curriculum (Hsu et al., 2014; Youngmin, 2006).

Hsu et al. (2014) found evidence of the effectiveness of the ADDIE instructional approach after nurses and patients used it to revise the SHARE caring curriculum development in Taiwan. This finding might serve as a reference for the revision of the SHARE (Sense people's needs before they ask. Help each other out. Acknowledge people's feelings. Respect the dignity and privacy of others. Explain what's happening) caring curriculum at the participating hospital in Taiwan and other hospitals. Youngmin (2006, pp. 12-17) investigated the effectiveness of adopting the ADDIE instructional design model by teachers to develop multimedia rich project-based learning methods for effective instruction in a Korean mechanical engineering high school. The findings showed that teachers who had experience in designing materials using ADDIE instructional design model were able to produce better quality course materials. Their students were more motivated to learn using the newly designed module with guidance from their teachers.

Based on the review of related literature, it is proposed that three learning theories (Behaviourist, Cognitive, and Constructivist theories) be included in the theoretical framework of the present study, together with perceived instruction training and perceived instruction experience in order to predict university lecturers' perceived needs for instructional technology competencies in tertiary education. Figure 1 depicts the theoretical framework of this study. It shows the theories and their relationships to be examined for this study.

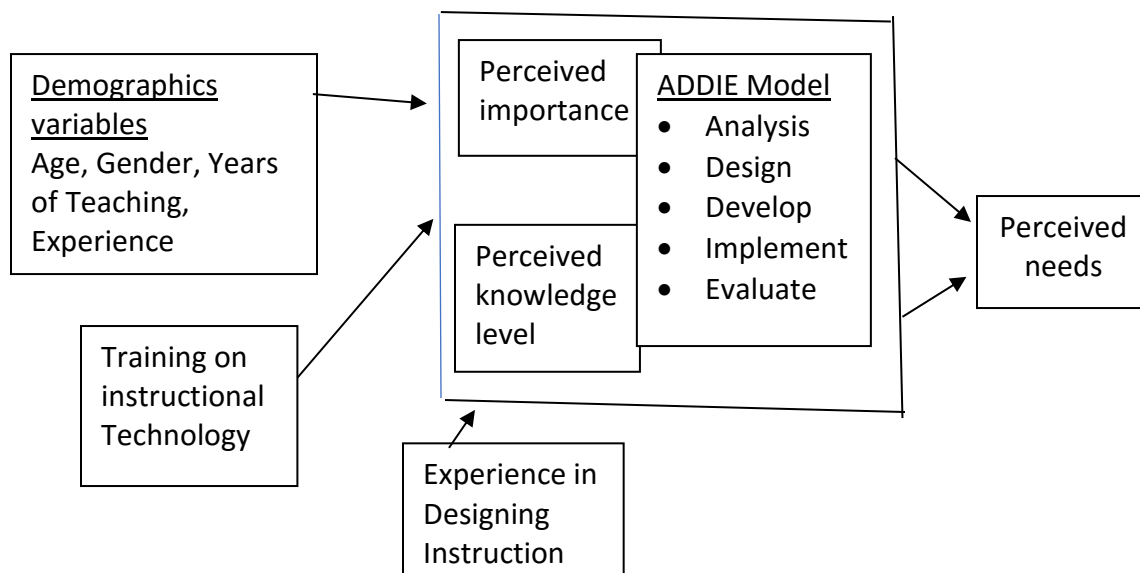


Figure 1. The proposed theoretical framework

Conclusion

This paper outlines the components of a framework for instructional technology competencies in tertiary education, as perceived by university lecturers. It is proposed that the ADDIE instructional design model be extended to include three learning theories, namely the Behaviourist, Cognitive, and Constructivist theories.

It is important to develop a sustainable curriculum that emphasizes on developing instructional technology competencies of Malaysian university lecturers to help resolve the problem of unemployable graduates.

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