DEVELOPMENT OF A SMARTPHONE APPLICATION AND ITS EVALUATION ON ITS USABILITY IN FACILITATING SELF-DIRECTED LEARNING OF CLINICAL SKILLS AMONG UNDERGRADUATE NURSING STUDENTS

BY

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ABSTRACT

Introduction: Self-directed learning (SDL) has been proven effective to enhance learning experience and it is essential for the effectiveness of mobile learning interventions. Although a lot mobile-based interventions have been implemented in nursing education, it did not provide a consistent result on the improvement of knowledge and skill among nursing students. Many mobile learning interventions were built without implying the important elements of use behaviour of a technology.
Objectives: This study aimed to explore the important factors of perceived behavioral intention to use smartphone application, develop and evaluate the usability of a smartphone application prototype that facilitate SDL of clinical skills among undergraduate nursing students.
Methods: A sequential exploratory mixed-method design was used and adapted in this study. Phase 1 includes the qualitative aspect using in-depth, semi-structured interview to investigate the challenges of SDL of clinical skills among nursing students, at the same time, to explore the perception of using smartphone application to cope with the challenges. In Phase 2, a quantitative aspect utilizing survey instrument based on Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) was used to identify the significant factors that give positive effect on behavioural intention to use the smartphone application. In Phase 3, the relevant smartphone features were identified and mapped with its significant behavioral determinant using methodological triangulation followed by the development of smartphone application prototype. In Phase 4, usability studies and end-user perception were carried out to evaluate the prototype using observation, in-depth interview, and survey. Qualitative data was analyzed using thematic analysis meanwhile quantitative data was analyzed by performing PLS-SEM analysis.
Findings: The first interview findings suggested that undergraduate nursing student were lack of self-management skill, lack of desire of learning and lack of self-control skill. Meanwhile, in assessing their perception for adopting smartphone application for SDL of clinical skills, an additional factor which is self-management of learning was found. On larger scale study, the most significant factors that give positive effect on behavioural intention to use the smartphone application were habit, facilitating condition and social influence. On analysis of usability and end-user perception of the prototype, tasks completion rate, usability score and perceptions were good. But there is still a need of improvement in terms of navigability, flow process and interface design of the app. Likewise, the mobile features' improvement such as profile personalization, content credibility, interface design, and app notification, were indeed necessary.
Conclusion: This finding proves that the smartphone application developed based on UTAUT2 is useful in exploring needed mobile apps features and requirements in facilitating SDL of clinical skills among undergraduate nursing students.

ملخص البحث

المقدمة: وقد ثبت أن التعلم الذاتي التوجيه فعال في تعزيز خبرة التعلم، وهو ضروري لفعالية تدخلات التعلم المتنقلة. وعلى الرغم من تنفيذ الكثير من التدخلات المتنقلة في مجال تعليم التمريض، فإنها لم تحقق نتائج متسقة فيما يتعلق بتحسين المعارف والمهارات لدى طلاب التمريض. وقد بُنيت العديد من التدخلات التعلمية المتنقلة دون أن تنطوي على العناصر الهامة لسلوك استخدام التكنولوجيا.

الأهداف: وتهدف هذه الدراسة إلى استكشاف العوامل الهامة للنية السلوكية المتصورة لاستخدام تطبيقات الهواتف الذكية وتطوير وتقييم قابلية استخدام نموذج أولي لتطبيق الهواتف الذكية ييسر التعلم الذاتي التوجيه للمهارات السريرية لدى طلاب التمريض في مرحلة ما قبل التخرج.

المناهج: وقد استُخدم في هذه الدراسة تصميم استكشافي متسلسل للطريقة المختلطة وتم تكييفه. وتشمل المرحلة 1 الجانب النوعي باستخدام مقابلات متعمقة وشبه منظمة لبحث تحديات التعلم الذاتي التوجيه للمهارات الإكلينيكية لدى طلاب التمريض، في الوقت نفسه، لاستكشاف تصور استخدام تطبيقات الهواتف الذكية لمواجهة التحديات. وفي المرحلة 2، استخدم جانب كمي يستخدم أداة استقصاء تستند إلى النظرية الموحدة لقبول التكنولوجيا واستخدامها 2 لتحديد العوامل الهامة التي تعطي أثرا إيجابيا على النية السلوكية لاستخدام تطبيق الهاتف الذكي. وفي المرحلة 3، تم تحديد خصائص الهاتف الذكي ذات الصلة ووضع خريطة مع محدده السلوكي الهام باستخدام المثلث المنهجي يليه تطوير نموذج تطبيق الهاتف الذكي. وفي المرحلة 4، أجريت دراسات قابلية الاستخدام وإدراك المستخدم النهائي لتقييم النموذج الأولي

باستخدام الملاحظة والمقابلة المتعمقة والمسح. وقد تم تحليل البيانات النوعية باستخدام التحليل المواضيعي، في الوقت الذي تم فيه تحليل البيانات الكمية عن طريق إجراء تحليل لنظام الإدارة السليمة بيئياً.

النتائج: وتشير نتائج المقابلة الأولى إلى أن طالب التمريض في مرحلة ما قبل التخرج هو الافتقار إلى مهارات الإدارة الذاتية، والافتقار إلى الرغبة في التعلم، والافتقار إلى مهارات التحكم الذاتي. وفي الوقت نفسه، وعند تقييم تصورهم لاعتماد تطبيقات الهاتف الذكي من أجل التعلم الذاتي التوجيه للمهارات السريرية، وجد عامل إضافي هو الإدارة الذاتية للتعلم. وعلى نطاق أوسع، كانت أهم العوامل التي تؤثر إيجابياً على النية السلوكية لاستخدام تطبيقات الهاتف الذكي هي العادة، مما يسهل الظروف والتأثير الاجتماعي. وفيما يتعلق بتحليل قابلية الاستخدام وإدراك المستخدم النهائي للنموذج الأولي، كان معدل إنجاز المهام ودرجة قابلية الاستخدام والتصورات جيدة. ولكن لا تزال هناك حاجة إلى تحسين من حيث قابلية التطبيق للملاحة، وعملية التدفق، والتصميم البيني. وعلى نحو مماثل، كان تحسين السمات المتنقلة، مثل إضفاء الطابع الشخصي على الصورة، ومصداقية المحتوى، وتصميم الوصلات البينية، وإخطار التطبيق، ضروريا بالفعل.

الخاتمة: وتثبت هذه النتيجة أن تطبيق الهاتف الذكي الذي تم تطويره استنادا إلى UTAUT2 مفيد في استكشاف خصائص ومتطلبات التطبيقات المتنقلة اللازمة في تيسير تعلم المهارات السريرية الموجهة ذاتيا بين طلاب التمريض في مرحلة ما قبل التخرج.

APPROVAL PAGE

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DECLARATION

I hereby declare that this thesis is the result of my own investigations, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

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CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF STUDY

To fulfil the demanding roles often assumed by industries, it is necessary to prepare nursing students for high-skilled training. Students who are prepared for those roles must demonstrate their commitment to lifelong learning. According to Longworth (1999) lifelong learning can be defined as "the development of human potential through a continuously supportive process that stimulates and empowers individuals to acquire all the knowledge, values, skills and understanding they require throughout their lifetimes and apply them with confidence, creativity and enjoyment in all roles, circumstances and environments." Higher education has recognised the shift from a teacher-centred approach to a student-centred approach, placing learners as the centre of learning (Schreurs & Dumbraveanu, 2014).

One of the fundamental components of nursing is clinical competence. In nursing education, clinical skill training is essential as it combines theoretical and practical learning experiences, allowing students to combine their sensory, motor and cognitive learning processes (Haraldseid et al., 2016). It also helps to gain knowledge, skills and attitude for providing nursing care (Jamshidi et al., 2016). Nursing students spend most of their time in clinical environments. In Malaysia, there are 52 weeks of clinical practice that must be completed by a student. Besides, 78 out of 120 credit hours that must be fulfilled by the students in the curriculum must be in the areas of basic medical science, nursing science and behavioral science (Malaysian Nursing Board / Malaysian Midwives Board, 2018a). Therefore, the standards provided by the board indicate that fulfilling clinical skill training requirements is highly important.

1.2 SELF-DIRECTED LEARNING

Since nursing education is becoming more complex in terms of the acquisition of clinical skills, there are now emerging approaches to learning that are becoming popular, including self-directed learning. Outcome-based learning has sparked a shift to

independent and active learning strategies as part of nursing clinical skills training, such as simulation, online learning, and mobile learning. Nevertheless, there is still a debate on how much self-directed learning contributes to one's learning success.

1.2.1 Adult Learning

Adult learning, or andragogy, examines the process by which adults learn, which is in contradiction with pedagogy, the art and science of teaching children (Knowles, 1973). Knowles instituted four main assumptions that must be made to the mature learners, which are: 1) they become increasingly more self-directed; 2) they accumulate useful experience as a learning resource; 3) their motivation to learn becomes more job-oriented; and, 4) they expect education material to have an immediate application (Knowles, 1980).

The concept of learning among adults is self-directed, opposing the concept of children's education (such as the teacher is expected to be responsible for determining instructional content and method); they need the instructor to facilitate the movement towards self-directedness of learning. Adults usually learn from their set of experiences; thus the instructor is required to highlight the subject material. If adults realise the need or have an interest in assimilating new knowledge, they will become prepared to learn. Here, the facilitator is the helping hand that ensures the subject interest would become useful for adult learners. Therefore, adults will believe that education needs to be directly applicable and will immediately help them to achieve full potential in their lives (Knowles, 1980).

1.2.2 Self-Directed Learning

Self-directed learning (SDL) is defined as, "… a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 1975). SDL has been an important area of study among adults and has shifted the focus of education from teacher-directed to self-directed.

SDL promotes self-control in the learning process and provides space and opportunities for the learner to interact with people outside the classroom to reach the learning goal (Hsieh & Hsieh, 2019). For any university student to engage in continuous learning, the capacity to self-direct in one's learning is an important element. The benefit of acquiring this ability can allow the students to understand their strengths and use their skills to plan, manage and assess education for themselves. However, being self-directed "does not necessarily mean learning on your own" (C. Lee et al., 2017).

1.2.3 Self-Directed Learning in Nursing Education

Self-directed learning (SDL) has been a popular concept among researchers in health professional education (Murad et al., 2010). In the field of nursing, the self-directed learning concept in nursing education is not new (Nolan & Nolan, 1997). An early study of the SDL readiness of students identified in the nursing literature was a controlled experimental study conducted by Wiley (1983) using the Self-Directed Learning Readiness Scales (SDLRS). The learner's readiness to engage in SDL is defined as ''the degree the individual possesses the attitudes, abilities and personality characteristics necessary for self-directed learning" (Wiley, 1983, p. 182). SDL is a method of instruction that can be defined in terms of the amount of responsibility the learner accepts for his or her learning (Fisher et al., 2001). A two-step Delphi technique was used to develop the SDLRS for Nursing Education (SDLRSNE), involving 11 nursing training experts to evaluate the validity of the structure and content of the items expressing self-directed readiness for learning in the first step, followed by the administration of scale to 201 nursing students in the second step (Fisher et al., 2001). Eventually, this study managed to include items from three sub-scales: self-management, learning desire, and self-control.

Self-management is a structure for the ability of the students to achieve their study objectives and efficiently use their available learning tools. This sub-scale includes elements such as the ability to manage time efficiently, use systematic and methodical learning methods, establish learning times, prioritise, and follow additional understanding, find further data and methods and solve problems (El et al., 2017). Then, the desire for learning subscale is applied to assess the motivation of learning and

whether or not they can reflect on this motivation. It also implies the preference of the students in assuming responsibility for learning (El et al., 2017). Meanwhile, the self-control subscale is used to determine the ability of the students to self-evaluate and determine their learning goals and results. This means that the learner is the one who takes control of the learning context for them to achieve the targeted learning goals. In this sense, control did not mean independence, but rather cooperation or collaboration with other people within the context of the study (El et al., 2017).

1.3 MOBILE TECHNOLOGY IN LEARNING

1.3.1 Technology

Technology is an enabler or vehicle for the dissemination of knowledge. It is an encompassing term that deals with the use and knowledge of the tools and crafts of humanity. Technology is a broad concept that refers to the use and knowledge of instruments and crafts, and how the capacity to control and adapt to the environment is affected by these tools and crafts.

1.3.2 Mobile technology

The use of smartphones has become increasingly popular as a platform for Internet access, and there is no sign of slowing down in terms of their use. In particular, the use of the Internet in Malaysia has contributed as accurate as 93.1 per cent to smartphone users. As the number of mobile broadband subscribers in Malaysia reached more than 36.2 million in the second quarter of 2018, it is not surprising that the demand for smartphone applications has rapidly increased (Malaysian Communications and Multimedia Commission, 2018).

Malaysia, along with Singapore and Thailand, is the top three countries in Southeast Asia known for having the highest Internet penetration, accounting for more than 80 per cent of the total population (ASEANUP, 2019). This statistic reflects the motivation of society to discover new opportunities in different disciplines of knowledge. By inculcating 12.1 per cent of the total internet users in Malaysia who are

full-time students, as reported by the Malaysian Communications and Multimedia Commission or MCMC (2018), smartphone technology is viewed as a high stake in the potential for a radical revolution in education and as a response to the government's push for an industrial revolution 4.0 (IR4.0).

Mobile technology has steadily improved over the years from a mere communication tool to a tool that can perform almost the same as that of a computer device. In this sense, the smartphone application helps students to connect with educational content ubiquitously and has a significant impact on learning performance. On the other hand, Mobile learning or m-learning is a popular subset of e-learning in distance learning due to the breakthrough of mobile technology reengineering. A bigger screen size, longer battery life, better data processing, and a larger memory system are the features of mobile technology that make it a powerful learning tool.

1.3.3 Mobile learning

M-learning has broadened the possibilities of e-learning and distance learning by enabling the use of mobile wireless communication technology to create an environment for teaching and learning within educational institutions regardless of time, location or on the move (Althunibat, 2015; Singh et al., 2016). Researchers value m-learning by highlighting its important characteristics such as mobility, access, ubiquity, and convenience (Baran, 2014).

Since the early 2000s, most researchers have been making inroads into m-learning research. This is where the number of publications has begun to increase, and more researchers have been attracted to the m-learning projects. Since then, topics such as readiness, perception, benefits, and challenges to mobile learning have been explored and reviewed. Many researchers, particularly those known to study mobile learning, agreed that self-directed learning is essential for the effectiveness of mobile learning and the success of lifelong learning (Waard, 2017). In addition, it has been reported that the effectiveness of mobile learning can also be linked to the design of the system (Pedro et al., 2018). The application of design-based research has influenced the research methodology of mobile learning studies as the effectiveness of mobile learning has also depended on the design and application of the technological intervention.

Several scholars have carried out an analysis on the use of design-based analysis as a research technique in conducting various research studies from the past 20 years (Jayatilleke et al., 2018; Krull & Duart, 2017). Significant results from these studies have shown that the majority of the researchers performed studies in the area of design-based research on technological interventions and applications. For example, the technological intervention applications reported by Jayatilleke et al. (2018) were the most researched field in the early 2000s. Meanwhile, a more recent review of design-based research by Krull & Duart (2017) revealed that mobile learning applications and systems are the most researched areas. This concludes that design-based research is highly recognised by researchers in learning.

1.3.4 Mobile learning in nursing education

Nursing education is one of the programs that offer a wide range of practical experience in their curriculum, now surpassing traditional conservative teaching techniques by evolving through contemporary academic resources online (Terry et al., 2016). In response to many challenges from the clinical learning environment (Baraz et al., 2015), technology affordances are in concurrence with learning environments from retrieving and sharing information to instant access and interaction with faculty and peers, making it plausible that students may be using various technologies to facilitate and augment their learning experiences and effectively meeting academic challenges.

Besides, teaching methodologies have been empowered by technologies. Advanced and outcome-based learning has been adopted as an important learning strategy. There is therefore a great deal of pressure on nursing education institutions to become more dynamic to engage this fast-growing educational technology in their curriculum. With the growing dependence of younger generations on mobile devices, especially Generation Y that is defined as a unique group of people with “the most technically literate, educated, and ethnically diverse” (Eisner, 2005), the authority must take this opportunity to associate these qualities into nursing educational interventions.

Mobile learning has been a significant component of university education and learning processes. The interactive environment between instructors and students, according to Akour (2010), results in the traditional idea of the classroom being

manipulated. Mobile interventions driven by modern technology advancements, such as wireless internet and mobile technology, can be used to enhance the knowledge and practice of nursing education as they work dynamically (C. Chang et al., 2018). As more literature suggests increasing the efficiency of mobile-enhanced learning in the prevention of resource limitation and improving opportunities for students to learn, we must explore the potential of mobile technology to encourage the acquisition of knowledge and the practice of clinical skills among undergraduate nursing students.

1.4 NURSING EDUCATION SYSTEM IN MALAYSIA

1.4.1 Malaysian Nursing Body

The Nursing Board Malaysia (NBM) is an administrative body governing the practice of nursing in Malaysia under the Nursing Division of the Ministry of Health of Malaysia. In addition to addressing issues relating to complaints from the public and private sectors, it fulfils its roles in the registration of nurses, as well as the processing of annual practice certificates and temporary practice certificates. NBM also works in accrediting the course curricula, monitoring the adequacy of learning facilities and providing continuous professional education opportunities for all Malaysian registered nurses alongside the education sectors (Malaysian Nursing Board / Malaysian Midwives Board, 2018b)

1.4.2 Malaysian Nursing Education System

Malaysia's nursing education system has introduced a two-tier system, one of which is run by the Ministry of Education and the other by the Ministry of Health (MoH). The first system is subject to the standards of the Malaysian Qualifications Framework (MQF), whereas the latter is subject to the MoH Directive and not to the MQF standards. Registered nurses shall obtain their basic nursing qualification from one of the above-mentioned systems provided either by the MoH hospital program or the university or private college nursing program.