AN EVALUATION OF CONTENT CREATION FOR PERSONALISED LEARNING USING DIGITAL ICT LITERACY MODULE AMONG ABORIGINAL STUDENTS (MLICT-OA)

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ABSTRACT

ICT in the Malaysian education system serves as a tool to accomplish the National Education Blueprint 2015-2025. Under this blueprint, privileged groups such as the aborigines or Malaysian aboriginals will be given equal opportunity in education. However, a specific classroom teaching method is required to maintain the aboriginal students' focus and attention on their learning experiences due to their unique paradigm of learning. This study used the Partial Least Square (PLS) and Structural Equation Modelling (SEM) tool to examine the factors influencing personalised learning and digital self-learning ICT literacy module. It also measured the impact of personalised learning and digital ICT literacy module among secondary aboriginal students. This study involved 92 aboriginal students who participated in a transferable skills and ICT programme held in a public university in Malaysia. Results show that personalised learning positively supported the use of a digital ICT literacy module as a teaching and learning approach. Therefore, this study suggests that the digital ICT literacy module is an adaptive educational resource for personalised learning to meet the learning needs of aboriginal students.

Keywords: Aboriginal, Personalised Learning, ICT Module, Learning Style, digital self-learning module.

INTRODUCTION

In 1990, the Education for All (EFA) movement was initially launched by UNESCO, UNICEF, UNDP, and World Bank at the World Conference on Education For All. This global movement comprises six internationally agreed education goals to meet the learning needs; one of them is to provide equal access and opportunity to those who are unlucky, isolated, marginalised groups, and those belonging to ethnic minorities. The launch of EFA is seen as a paragon to minimise the educational inequality for aboriginal students in Malaysia. Aborigines, which literally means aboriginal people or also known as Orang Asli (Arman, 2007), is said to be Malaysia's aboriginal inhabitants or the first native people who inhabited the Malay Peninsular before the establishments of the Malay sultanates (Masron et al., 2013). They have a variety of cultures, traditions, beliefs, and languages. The aboriginal people of Peninsular Malaysia are separated into three main tribal groups, namely Semang (Negrito), Senoi and Proton Malay (Aboriginal Malay), and consist of 19 ethnic groups (Bellwood, 1997; Nicholas, 2000; JHEOA, 2002; Nicholas, 2005; Tarmiji et al., 2013), which make up only 0.6% of the total Malaysian population (Figure 1). The zones are based on the differences in origin, speech language, and also their physical forms (Department of Statistics Malaysia, 2010).

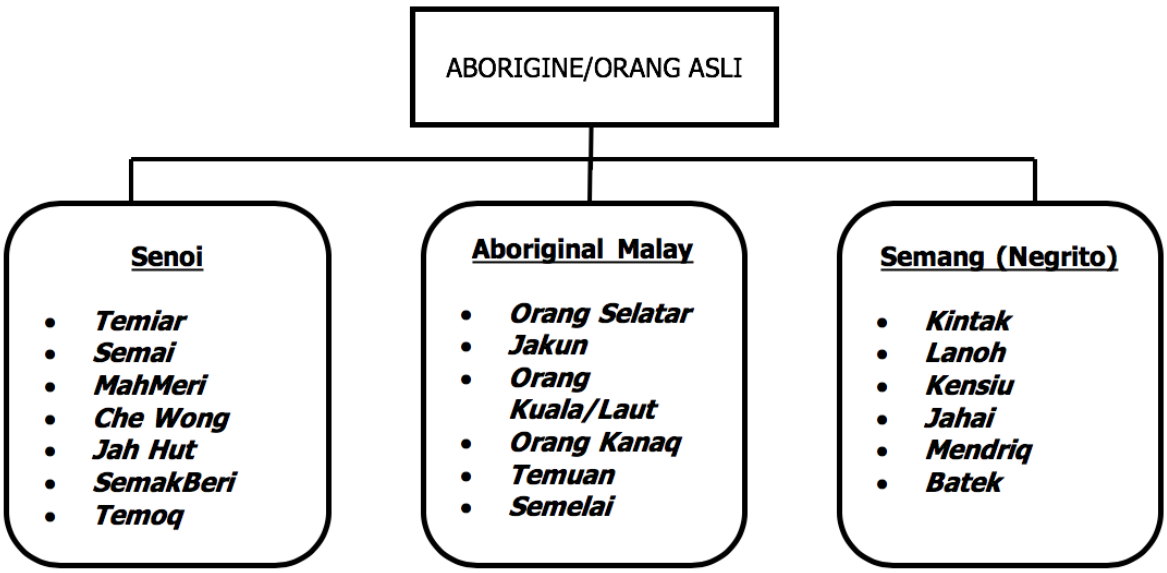

Figure 1. Categories of Aboriginal People ethnic groups in Peninsular Malaysia

The Malaysian government has provided assistance in developing aboriginal students' education by providing educational assistance to inculcate their interest in the school system. However, there are some of them who are uncertain and refuse to continue schooling. Unlike other mainstream students, this study will also determine whether in such a situation, these communities will still be able to receive lifelong education (Hamilton, 2015) through personalised learning.

The latest developments in information and communication technology (ICT) have played an important role in education as in other areas of life (Sahin & Kisla, 2016). Similar to other communities located across the globe, issues related to the use of ICT in education are also found in aboriginal students (Wan Amir 2011; Kutay & Mooney, 2008; Eady, 2008). Innovation and transformation in any education system can only take place if practitioners and students are empowered to move beyond the confines of the traditional classroom paradigm (Boudreau, 2011). In the context of aboriginal students, the issues are related to the extent of their engagement in ICT exploration and application. Sufficient engagement is necessary for a smooth process of education transformation, which is believed to contribute to higher family income via the entrepreneurship programmes and tourism sectors developed by the government. In this context, the government has been upgrading and expanding the communication infrastructure to improve the accessibility of information for aboriginal communities (Heidi Norman, 2014; Wee et al., 2013; Kutay & Mooney, 2008; Eady, 2008).

Although facilities such as computer laboratories, the additional subject of ICT education and the provision of ICT centres are provided; due to insufficient training, unclear explanation and promotion of ICT offered by the centres, these facilities and services seem incapable to meet the learning needs of the aboriginal students and support a pathway for them to attain a higher family income.

In addition, previous studies suggested that the methods and concepts taught in classrooms were incompatible with the culture, traditions, way of life, beliefs, as well as language of the aboriginal students (Zanariah & Fadzilah, 2011; Roman et al., 2011). It was found that most aboriginal students still had potential to drop out from school due to boredom and lack of interest. The students became uninterested in the school curriculum due to their own experience, as well as their parents' and extended family's experience which showed that the education experience did not address their needs. Such negative education experience resulted in apathy and lack of interest in education among the aboriginal students while their family members also did not value the experience. Aboriginal students and their family members believed that they can still make a living by extracting forest products for their own use and to trade (Zanariah & Fadzilah, 2011). Following the unique characteristics and problems faced by aboriginal students, personalised learning may provide learning experiences with more choices on how they are going to learn a lesson. It may also assist the student's exploration and application of ICT in education.

The next section of this paper discusses the research context and conceptual model in relation to the existing literature on personalised learning and relational constructs such as access, delivery media, engagement, learning environment, and reflection. For the usefulness of digital self-learning, there are three relational constructs which are flexible learning, learning content, and assessment. This is followed by an explanation of the research method used, an assessment of goodness of measures, the construct validity, convergent validity, discriminant validity, and reliability of the constructs. The subsequent sections deal with data analysis, path analysis, and hypotheses testing. The last section is on discussion and conclusion as well as several suggestions for future researches.

RESEARCH CONTEXT AND RESEARCH MODEL

This paper constitutes the part of a larger research which examines personalised learning environment and determines the usefulness of digital self-learning ICT literacy module for aboriginal students in Peninsular Malaysia.

Personalised Learning

Personalised Learning (PL) has been described from multiple perspectives with various definitions and design directions (Zhou, 2013; Henri & Charlier, 2010). PL is defined as a portable and ubiquitous learning space that allows students to learn and connect with multidisciplinary viewpoints, engage in critical and creative practices, as well as nurture and develop their learning identity (Che Ku Nuraini, et al. 2014). According to Grant and Basye (2014), personalised learning is a comprehensive management system that facilitates communication, online delivery, curriculum mapping, examination, and student traffic monitoring all inside a secure workspace that seamlessly interfaces with an institution's administrative information system. This is in conjunction with Boudreau (2011) who defined PL as serving flexible facilities which support the learning community with a network of associated shared workspaces, resources, communication tools, and specific PLs. It is expected that personalised teaching and learning will address the needs of the learners more efficiently (Che Ku Nuraini et al., 2014; Henri & Charlier, 2010). Nowadays, students prefer more customisable and interactive systems for their learning as highlighted by McLoughlin and Lee (2010), who argued that digital age students wish for an active learning experience that is social, participatory, and supported by rich media. The researchers used a grounded theory approach to uncover some core dimensions of PLs which included subject, rules, objects, delivery media or tools, learning environment, engagement community, and reflection. Under this subject, they identified key concepts such as access, literacy, autonomy, and empowerment. The details of the dimensions are as mentioned below.

Access

Access dimension is about how aboriginal students access and process information. Therefore, it is also an individual's right to obtain and use the information collected or generated by others. The aboriginal students will transform the information into useable knowledge. Here, we enclosed some access definitions by teachers, facilitators, and educators. When we asked them a question about the definition of access, their answers were all different. Some told us that the aboriginal students needed pictures illustrated with text or written step-by-step instructions. Some said they needed to do their own research online. Nowadays, learners will take place to derive their own learning and they know the best access to information which suit their learning preferences.

Delivery Media

Nowadays, educators deliver instruction through multiple forms of media. Technology has made personalised learning more approachable and challenging, forcing schools to draw a clear line about where to separate good pedagogy from tools that facilitate it (FitzGerald, 2017; Wong, 2008). If instructional materials have really become individualised to the extent that the video describes, there will be a need for someone to be present to help students navigate the technical aspects of performing the work as demanded by the system (Jordan & Duckett, 2018). Additionally, the instructor will have a role in keeping students on task and in providing support when learners fail to reach the standards pre-programmed into the adaptive learning system. There may also be an increased role in making sure that each student is completing their own work, rather than the work of peers (Sarrab et. al, 2016). Technology tools can offer a personalised learning environment in which students collaborate, interact with software and digital modules, create products, conduct research as well as communicate with others outside their schools (Moeller & Reitzes, 2011).

Learning Environment

Learning environment refers to the whole range of components and activities within the learning process. The learning environment relies on computer-supported systems such as learning management system; a combination of various educational technologies like communication module (Good & Lavigne, 2017). Besides that, a learning environment is the place where teaching and learning take place in the most effective and productive manner. With personalised learning, comes a focus on helping each student progress through a given curriculum at their own pace (Gu et al., 2017). At its best, personalised learning can shift the measure of academic progress from time spent in a classroom to competencies mastered. Differentiating instruction often means setting up students to work alone or in groups (Orlich et al., 2016).

A diverse situation may exist in the classroom at any given time. Students differ in abilities and interests, therefore teachers are most likely to employ different strategies. Teachers must be sensitive to positive or negative interactions and ought to immediately undertake an instant revision or adjustment in methodology when necessary. Overall, this PL concept refers to individual perspective to achieve learning outcomes through a conducive learning environment perspective. The smoothness of Personalised Learning (PL) in a learning domain requires the application of the correct and effective PL concept (Hwang et al., 2012; Zhang et al., 2003).

Engagement

Active students are encouraged to adapt to a personal learning environment and community. The students have different ways when it comes to how they are comfortable engaging with the content. Some teachers told their students that the best learning is by doing hands-on activities. Others stated that the students learned best by working alone and reflecting on their learning. The rest of the students expressed their need to collaborate with others. Because of these situations, a classroom proceeding also accommodates different types of learners. For instance, students who are visual learners can excel in a classroom setting where theatrical presentations, storytelling or movies contribute to the lessons. Hands-on learners may also do well in classrooms and other places (Harasim, 2017; Mike, 2014).

Reflection

A teacher provides various methods of discussion to pique students' interest and maintain their engagement with the lesson content. For example, teachers can carry out peer discussion activities. The lesson plan is universally designed to meet the needs of diverse students to obtain meaningful learning (Council for Exceptional Children 2011; Casper & Leuichovius 2005; CAST 2009). After the learning process, the students expressed what they knew and understood. Some students felt better writing down what they learned. Others felt better creating and building things that demonstrated what they learned. The rest stated that they felt more comfortable presenting in front of others. All in all, students knew the best way to express what they understood in their learning process (Harasim, 2017).

Conclusion for Personalised Learning

The Personalised Learning concept measures five dimensions which are access, learning environment, delivery media, engagement, and reflection. Personalised learning is a term used to describe classrooms where engagement and purpose are a part of the fabric of the classroom. The different learning needs of the students are met by accommodating and personalising their education. Technology is often used to facilitate the personalisation of the student's learning environment.

E-learning is the use of Internet technologies to enhance knowledge and performance. The e-learning technology that was developed for this research is a digital module of ICT for the Aborigines (mLICT-OA) which offers learners' control over content, learning sequence, pace of learning, time, and often media, allowing them to tailor their experiences to meet their personal learning objectives. In diverse ICT education contexts, a digital module appears to be at least as effective as traditional instructor-led methods such as lectures.

The Use of Digital Self-Learning ICT Literacy Module

Nowadays, students choose to read and respond to their learning using digital media such as reading notes using a digital module on chat lines, Facebook, Instagram, and texting. Therefore, they acquire considerable prior knowledge and expertise in the subject matter, placing their engagement and comprehension at a high level. The tricks to being a good reader, regardless of the medium, are to engage with suitable tools, and have a flexible learning environment. The use of a digital ICT literacy module was found to be helpful for students (Alias et al., 2011). They should learn and think of ingenious ways to learn which are accessible to them. To concur with the prominence of the proficiency in using and managing digital technologies, its assessment has become the component for monitoring students' skills and knowledge development (OECD, 2004). The assessment incorporates three aspects as mentioned below.

Flexible Learning

Flexible learning is a principle of practice in formal education, concerned with increasing flexibility in the requirements, time and location of study, teaching, assessment as well as certification (Pinter, 2017; Harasim, 2017). Offering students choices in how, what, when, and where they learn; the pace, place, and mode of delivery is steered towards flexible learning. It focuses on four areas where flexibility can be enhanced (i) Technology enhanced learning: including mobile learning, learning spaces, digital literacy, and learning analytics, (ii) Employment: including work-based and work-placed learning, flexible working, and the global context, (iii) Institutional systems and structures: including administrative, financial, and support systems, as well as academic regulations and processes and (iv) Pedagogical approaches: including learning, teaching, and assessment methods (Sarietjie & Corene, 2017; Higher Education Academy, 2017).

Learning Content

Good learning material engages learners by catering to their physical location. That means leveraging, not fighting against their consumption habits; fitting into their busy schedules; and, above all, being effective

(Ozturk, Ozturk, & Ozen, 2018). If you are trying to create better content for your 21st century employees, these five tips are a good place to start (Sarietjie & Corene, 2017; Kramer, Neugebauer, Magenheim & Huppertz, 2015; Huang et al., 2012). The topics, themes, beliefs, behaviours, concepts, and facts are often grouped within each subject or learning area under knowledge, skills, values, and attitudes, which are expected to be learned and form the basis of teaching and learning (Gu et al., 2017).

Assessment

Educational assessment is the systematic process of documenting and using empirical data on the knowledge, skill, attitudes, and beliefs to refine programmes and improve students' learning. Assessing students' performance can involve assessments which are formal, low stakes, individual or collective. The key points of carrying out assessments are the teachers should set meaningful goals in their teaching and learning process where their students feel prepared to learn new material from the textbook, without classroom review, and the students' reactions to various teaching methods, materials, and assignments.

Relationship Personalised Learning (PL) and Digital Self-Learning ICT Literacy Module (mLICT)

PL functions as an approach to develop digital self-learning modules and technologies which comprises all different tools used in everyday life for learning (Attwell, 2007). A digital self-learning module allows learners to engage in learning interactions through activities such as sharing, searching, and reflecting their peers. By selecting applications which support their personal needs, learners may potentially turn the understanding and ideas of ICT literacy into personal needs, active, and collaborative learning experience. The analysis of learning interactions also considers the learning needs which emerge during the learning process, the tools and applications that are used to support those needs, the types of learning activities, and the contexts in which the activities take place.

PURPOSE OF THE STUDY

This study aims to develop and evaluate a digital self-learning ICT literacy module for aboriginal students (mLICT-OA) in order to improve their experience and empower them through their own exercise of choice by means of personalised learning.

OBJECTIVE OF THE STUDY

The study aims to evaluate the following objectives:

i. Identifying whether personalised learning (PL) is influenced by the five attributes of access, learning environment, delivery media, engagement, and reflection.
ii. Identifying whether a digital ICT literacy module for the aborigines (mLICT-OA) is influenced by the three attributes of enrichment assessment, flexible learning and learning content.
iii. Identifying whether personalised learning (PL) is influenced by the digital ICT literacy modules for the aborigines (mLICT-OA).

To conclude, this study aims to answer the following hypotheses:

i. The Personalised Learning concept in measuring five attributes which are access, learning environment, delivery media, engagement, and reflection.
ii. The use of mLICT-OA in measuring three attributes which are enrichment assessment, flexible learning, and learning content.
iii. Personalised learning (PL) has a direct positive effect on the use of digital ICT literacy modules for the aborigines (mLICT-OA).

METHODOLOGY

The methodology contains three main elements which involves the method of data collection, instrument, sampling, and data analysis.

Data Collection

Data collection is known as the scales of measurements in research. In the levels of measurements there are types of validity which are construct, face and creation. For the purposes of this paper, data collection began in 2015 after finished the pilot study, rely on structured data collection instruments that fit diverse experiences into predetermined response categories. They produce results that are easy to summarize, compare, and generalize. This research is using questionnaire to get the data. Paper-pencil-questionnaires can be sent to a large number of respondents and saves the researcher time and money. Respondents are more truthful while responding to the questionnaires regarding controversial issues in particular due to the fact that their responses are anonymous. Questionnaire often use rating scale. A rating scale is more useful when a behavior needs to be evaluated on a continuum. They are also known as Likert scales (Leedy & Ormrod, 2001).

Instruments

Instruments are tools for collecting data. We used questionnaires to collect data. Using the questionnaire technique, we can get answers through written answers. This instruments contains three parts:

Part A - Demographic (Respondent Information) which requires respondents to identify themselves as gender, age, race, ethnicity, frequency of computer technology, program of study and student participation in the program and the use of ICT literacy. Respondents are required to provide answers related to themselves by checking the boxes provided. These are questions in the form of categories. Each item in this section is measured at the nominal level and no scoring is provided.

Part B - This questionnaire contains of 30 questions on personalized learning contains five constructs measured namely access, learning environments, delivery media, engagement and student reflection. This questionnaire was adapted from the rubric by Buchem, Attwell & Torres, 2011, p 10-11). The items are based on the theories found in Clements & Douglas (2008) and Shelton & Hedley (2002).

Part C – This part contains of 25 questions about the usability of learning modules for different students in terms of learning style. These items were developed and adapted from Mat Salleh et al. (2015). There are three attributes involved in this questionnaire: flexible learning, learning content and enrichment assessment.

The questionnaire was administered to all participants. Students were asked to respond to these items on a five-point Likert Scale ranging from "strongly disagree", "disagree", "little bit agree", "agree", and "strongly agree".

Sampling

92 students were selected for this study among 352 aboriginal students from Kampung Orang Asli Batu 12, Gombak. The students chosen for the study had been selected by JAKOA Gombak's secretary, based on their personality and their parents' consent of allowing their children to attend the transferable skills programme known as *'Program Pemindahan Ilmu Pendidikan & ICT*' which was held on March 18 and 19, 2015 in Universiti Kebangsaan Malaysia (UKM). The selection was based on the various parts of the Proto-Malays.

Data Analysis

The data from the questionnaires were analysed using the Statistical Package for the Social Science (SPSS) version 17.0. Data analysis using SPSS involves descriptive statistics. Descriptive statistics is used to demonstrate the frequency of describing respondents' backgrounds, respondents learning styles and ICT skills. Furthermore, data analysis using Winsteps software which is a Rasch measurement model was used to ensure the validity and reliability of the built-in instrument is legitimate.

The Smart PLS 3.0 (Ringle, Wende, & Will, 2015) software is used to test the hypotheses of the relevance and impact of hypotheses (Hair et al., 2014) on personalized learning environments and self-directed learning module. In addition, PLS's approach was a modeling technique that does not require normal scattered data (Chin & Newsted, 1999). In order to get the map of relationships among the variables, the structural equation modeling (SEM) method was applied using the Smart PLS 3.0 software. Due to the fact that the result of the multivariate test on the variable was non-normally distributed, a bootstrapping method was applied and a resample was set to 5000. The first step in SEM techniques, PLS have the ability to take into account the errors of constructs and to examine the importance of simultaneous structural models. The second step, PLS was appropriate for testing and measuring complex models. The relationship between constructs and sub-constructs were checked individually (Wold, 1982).

FINDINGS

Evaluation of ICT Literacy Module and Personalised Learning Approach

The first step in the analysis of the Partial Least Square(PLS) technique was to analyse the measurement model and to determine the extent of the indicators (specific questions) on the theoretical load which produced constructs (Joreskog & Yang, 1996). An inspection measurement model was made to ensure the items measured the designed constructs, thus ensuring that the instrument can be trusted.

Measures and Assessment of Goodness of Measures

A questionnaire using a five-point Likert scale was used to gather data for each construct of the research model. All instruments were adapted from previous literatures and were modified to measure the performance.

Goodness of Measures

The two main criteria used for testing goodness of measures are validity and reliability. Reliability is a test of how consistently a measuring instrument measures whatever concept it is measuring whereas validity is a test of how well an instrument that is developed measures the particular concept it intends to measure (Ramayah et al., 2011; Sekaran and Bougie, 2010). We used Cronbach's alpha coefficient to assess the inter item consistency of our measurement items. Table 5 summarises the loadings and alpha values. As seen from Table 1, all alpha values are above 0.6 as suggested by Nunnally and Berstein (1994).

Table 1. Result of reliability test

Model construct	Measurement items	Cronbach Alpha	Loading range	Number of item
Access	AA1,AA2,AA4	0.600	0.721-0.778	3 (6)
Learning environment	AB10,AB7,AB9	0.725	0.760-0.830	3 (6)
Delivery Media	AC11,AC12,AC13,AC15,AC16	0.817	0.709-0.832	4 (6)
Engagement	AD17,AD18,AD20,AD21	0.787	0.732-0.808	3 (6)
Reflection	AE22,AE23,AE24,AE26	0.818	0.662-0.885	3 (6)
Flexible Learning	BA4, BA5, BA6, BA7	0.826	0.778-0.864	5 (9)
Learning content	BB10,BB11, BB12, BB14	0.828	0.754-0.863	4 (5)
Enrichment assessment	BC16,BC18,BC20	0.732	0.791-0.882	5 (9)

Construct Validity

Construct validity testifies to how well the results obtained from the use of the measure fit the theories on how the test is designed (Sekaran and Bougie, 2010). This can be assessed through convergent and discriminant validity. First, the researchers looked at the respective loadings and cross loadings from Table 1 to assess if there are problems with any particular item. The researchers then used a cut off value for loadings at 0.5 as significant (Hair et al., 2010). If any item has a loading of higher than 0.5 on two or more factors,

it will be deemed to have significant cross loadings. From Table 2, it can be observed that all the items measuring a particular construct load highly on that construct and load lower on the other constructs, thus confirming construct validity.

Table 2. Loadings and cross loadings

Items	Access	Environment	Media	Engagement	Reflection	Flexible	Content	Assessment
AA1	0.778	0.456	0.498	0.367	0.415	0.332	0.392	0.499
AA2	0.735	0.276	0.519	0.446	0.392	0.321	0.344	0.362
AA4	0.721	0.309	0.539	0.437	0.438	0.375	0.306	0.424
AB10	0.408	0.830	0.574	0.689	0.618	0.584	0.578	0.537
AB7	0.315	0.819	0.446	0.492	0.565	0.446	0.551	0.602
AB9	0.399	0.760	0.544	0.432	0.581	0.464	0.465	0.523
AC11	0.597	0.631	0.805	0.597	0.673	0.561	0.591	0.609
AC12	0.509	0.518	0.832	0.470	0.510	0.418	0.445	0.484
AC13	0.519	0.514	0.790	0.518	0.578	0.450	0.430	0.489
AC15	0.648	0.354	0.662	0.430	0.455	0.470	0.397	0.372
AC16	0.381	0.428	0.709	0.447	0.560	0.481	0.498	0.525
AD17	0.367	0.429	0.386	0.732	0.455	0.467	0.540	0.415
AD18	0.492	0.561	0.605	0.808	0.669	0.589	0.557	0.510
AD20	0.479	0.511	0.505	0.785	0.594	0.531	0.557	0.472
AD21	0.400	0.598	0.520	0.797	0.647	0.603	0.586	0.574
AE22	0.446	0.683	0.649	0.650	0.823	0.703	0.637	0.580
AE23	0.540	0.600	0.670	0.632	0.885	0.614	0.582	0.610
AE24	0.465	0.613	0.572	0.614	0.844	0.586	0.567	0.605
AE26	0.330	0.455	0.467	0.576	0.662	0.491	0.482	0.451
BA4	0.321	0.520	0.439	0.536	0.549	0.781	0.520	0.413
BA5	0.425	0.579	0.575	0.658	0.659	0.864	0.691	0.523
BA6	0.413	0.359	0.470	0.494	0.535	0.778	0.568	0.437
BA7	0.331	0.556	0.538	0.588	0.662	0.818	0.653	0.446
BB10	0.380	0.612	0.537	0.618	0.610	0.646	0.863	0.583
BB11	0.399	0.484	0.476	0.592	0.590	0.660	0.810	0.568
BB12	0.204	0.562	0.424	0.453	0.546	0.549	0.754	0.505
BB14	0.510	0.503	0.586	0.651	0.542	0.589	0.820	0.630
BC16	0.536	0.589	0.599	0.574	0.617	0.528	0.536	0.822
BC18	0.533	0.611	0.625	0.548	0.674	0.478	0.571	0.807
BC20	0.323	0.466	0.366	0.411	0.402	0.355	0.600	0.791
BC18	0.533	0.611	0.625	0.548	0.674	0.478	0.571	0.807
BC20	0.323	0.466	0.366	0.411	0.402	0.355	0.600	0.791

Note: Highlight values are loadings for items which are above the recommended value of 0.5

Convergent Validity

Next, the researchers tested the convergent validity which is the degree to which multiple items measuring the same concept are in agreement (Ramayah et al., 2011). As suggested by Hair et al. (2010), the researchers used the factors of loadings, composite reliability, and average variance extracted to assess convergence validity. The loadings for all items exceeded the recommended value of 0.5 (Hair et al., 2010). Composite reliability values (Table 3 and Table 4) depicted the degree to which the construct indicators indicated the latent, construct ranged from 0.789-0.891, which exceeded the recommended value of 0.7 (Hair et al., 2010). The average variance extracted (AVE) measures the variance captured by the indicators relative to measurement error and it should be greater than 0.50 to justify the use of a construct (Barclay et al., 1995). The average variance extracted was in the range of 0.555-0.681 (Table 3 and Table 4).

The results of the measurement model show that all the eight constructs; access, learning environment, delivery media, engagement, reflection, flexible learning, learning content, and enrichment assessment are all valid measures of their respective constructs based on their parameter estimates and statistical significance (Chow & Chan, 2008).

Table 3. Results of the measurement model for Personalised Learning

Model construct	Measurement Item	Loadings	AVE[a]	CR[b]
Access	AA1	0.778	0.555	0.789
	AA2	0.735		
	AA4	0.721		
Learning Environment	AB10	0.830	0.646	0.845
	AB7	0.819		
	AB9	0.760		
Delivery Media	AC11	0.805	0.581	0.873
	AC12	0.832		
	AC13	0.790		
	AC15	0.662		
	AC16	0.709		
Engagement	AD17	0.732	0.610	0.862
	AD18	0.808		
	AD20	0.785		
	AD21	0.797		
Reflection	AE22	0.823	0.653	0.881
	AE23	0.885		
	AE24	0.844		
	AE26	0.662		

Table 4. Results of measurement model for Use of mLICT-OA

Model construct	Measurement Item	Loadings	AVE[a]	CR[b]
Flexible Learning	BA4	0.781	0.658	0.885
	BA5	0.864		
	BA6	0.778		
	BA7	0.818		
Learning Content	BB10	0.863	0.660	0.886
	BB11	0.810		
	BB12	0.754		
	BB14	0.820		
Enrichment Assessment	BC16	0.822	0.651	0.848
	BC18	0.807		
	BC20	0.791		

a. Averagevarianceextracted (AVE) = (summation of the square of the factor loadings)/{(summation of the square of the factor loadings) + (summation of the error variances)}

b. Composite reliability (CR) = (square of the summation of the factor loadings)/{(square of the summation of the factor loadings)+(square of the summation of the error variances)}

Discriminant Validity

The next step was to test the discriminant validity. The discriminant validity was used to analyse and find out the construct which is independent of the other constructs (Chin & Newsted, 1999). The discriminant validity of the measures (the degree to which items differentiate among constructs or measure distinct concepts) was assessed by examining the correlations between the measures of potentially overlapping constructs (Ramayah et al., 2011). Items should load more strongly on their own constructs in the model and the average variance shared between each construct and its measures should be greater than the variance shared between the construct and other constructs (Compeau et al., 1999).

According to Fornell &Larcker (1981), discriminant validity fulfils the conditions if the square root of each value AVE for each construct is greater than any of the other constructs. For the discriminant based on the validity of this study, it was found that all the constructs are in the highest and every item that exists in this study can be applied to the actual study. In this study, the AVE is greater than the value of the underlying correlation and discriminant validity has fulfilled the conditions. Overall, the discriminant validity can be accepted for this study and so does the support level of discrimination between the constructs of personalised learning modules and usability among the aboriginal students. In other words, the external model is acceptable.

Hypotheses Testing

The researchers proceeded with the path analysis to test the three hypotheses generated. The results are presented in Figure 2 and Table 5. The R^2 value was 0.738, suggesting that 73.8% of the variance in personalised learning can be explained by the use of the module. Based on the reports in Table 5, it is shown that the first hypothesis (H1) is supported by the five dimensions of personalised learning. This personalised learning approach is defined as a concept that involves learning with the access to knowledge, environment, delivery media/tools, students' engagement, and reflection. Thus, H1 of this study is supported. Next, Figure 2 shows the construct of the usability of module that is supported by three dimensions, which are enrichment assessment, flexible learning, and learning content. Thus, H2 is supported. It pertains to the usability of the module application of cognitive load theory and minimalism theory. Next, looking at the third hypothesis (H3), it is shown that the hypothesis is accepted in which the personalised learning approach (PL) positively affects the use of the ICT literacy module among the aborigines (mLICT-OA) (β= 0.859, $p<0.01$). Thus, H3 of this study is also supported. Overall, in this study it is found that reflection is the most significant dimension of personalised learning while flexible learning (based on cognitive load theory) is the most important dimension in the usability of mLICT-OA.

Table 5. Path Coefficients and Hypothesis Testing

No	Hypothesis	Std Beta, β	Std Error	T-Value	Result
H1	PLE ->Delivery Media	0.841	0.051	16.558	Supported
	PLE ->Access	0.715	0.062	11.502	Supported
	PLE ->Engagement	0.863	0.027	32.217	Supported
	PLE->Learning Environment	0.831	0.042	19.927	Supported
	PLE -> Reflection	0.895	0.026	34.806	Supported
H2	Module ->Flexible Learning	0.907	0.020	46.327	Supported
	Module ->Learning Content	0.852	0.029	29.144	Supported
	Module ->Assessment	0.821	0.031	26.901	Supported
H3	PLE ->ICT Module	0.859	0.031	27.624**	Supported

*Note: **p<0.01(2.33), *p<0.05 (1.645)*

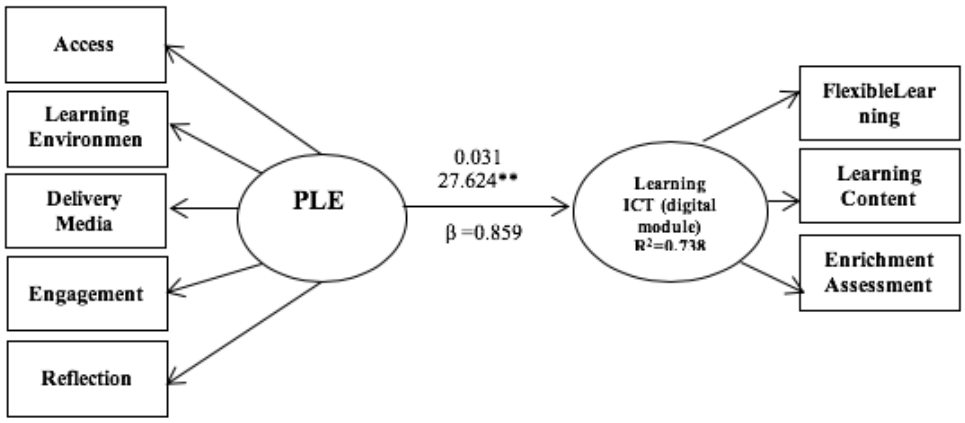

Figure 2. Personalised Learning and LICT-OA Module Measurement Model

DISCUSSIONS

This study supports conventional views of the influence of independent variables of personalised learning with five attributes on the perceived extent of usefulness of digital self-learning for ICT module among the aboriginal students in Peninsular Malaysia using the partial least square (PLS) technique in testing hypotheses.

This paper also examines the goodness of measure which is assessed by looking at the validity and reliability of the measures carried out using the PLS approach. The result shows that the measures used exhibit both convergent and discriminant validity. Next, to assess the reliability of the measures, Cronbach alpha values and composite repaper are looked at to examine the goodness of measure which is assessed by looking at the validity and reliability of the measures carried out using the PLS approach. The results show that the measures used exhibit both convergent and discriminant validity. Meanwhile, to assess the reliability of the measures, Cronbach alpha values and composite reliability values are studied. Both Cronbach alpha values and composite reliability values are at par with the criteria set up by other established researchers. In summary, the measures in the model are shown to be reliable.

The findings of this paper confirm the views that personalised learning has five core dimensions which include access, delivery media, learning environment, engagement, and reflection. While the study demonstrated that personalised learning is used purely for the purpose of workflow efficiency, it is also the best way to achieve high-level personalization among aboriginal students. This corroborates with the findings from Anderson (2006), Downes (2007), Buchem, Attwell & Torres (2011), Che Ku Nuraini et al. (2014). Overall, this personalised learning concept refers to the individual perspective to achieve learning outcomes through a conducive learning environment perspective. The effectiveness of a teaching and learning domain requires the application of the correct and effective teaching and learning concept.

The extent of personalised learning among the Aboriginal students has a significant impact on the digital self-learning ICT module. The findings are consistent with the concept postulated by Buchem (2012) about 'Antecedents-Consequences-Model (ACM)', that a personalised learning approach is essential to overcome as a tool to document and reflect on their learning. The digital self-learning ICT literacy module, coupled with personalised learning, would allow aboriginal students to demonstrate their capabilities as a reflective professional to practice and promote learning as a lifelong pursuit. The authors also believe that a personalised learning approach is useful in predicting personalised learning environments for aboriginal students. The concept of learning is compatible with their diverse lifestyle. The use of a digital self-learning module (mLICT-OA) for ICT learning has the potential to provide opportunities and experience to these aboriginal students to gain meaningful knowledge and practise ICT usage in their daily lives. The practical suitability and project work are based on individual needs to guide them towards entrepreneurship in parallel with the concept of personalised learning. The use of mLICT-OA would open their minds to achieve transferable skills through ICT experience.

In this context, the aboriginal students assume that the use of ICT literacy module can improve the quality of their learning and enable them to choose their own learning styles. By following the personalised learning approach, these students are able to control their personal learning environment wherever they are. One of the ways is to use the module as a self-learning media in accommodating them with diverse learning styles. Apart from the different cognitive styles, the formation of mental models is also likely to be influenced

by students' learning styles. This is because students' learning styles have been formed at the early stages of childhood and they subsequently form their own learning styles until adulthood (Razak & Ali, 2016). Pertaining to Table 5, the reflection attribute (responses or feedback) received by students towards learning is of paramount importance. Students believed that the concept of personalised learning becomes stronger when the involvement of students, teachers, and communities are seen as positively contributed, followed by teaching aids such as media presentation, a comfortable learning environment, and also information access.

The Cognitive Load theory and Minimalist theory were used during the development module. These theories explain how learning materials can help students to use them according to their respective situations and needs. More specifically, past study discussions in comparing the development of this modular material demonstrates that mLICT-OA benefits the aboriginal students as it facilitates the acquisition of the scheme and reduces students' cognitive burden. Findings in Table 5 show that the application of cognitive load theory is very imperative and it is the most important element in developing the modules. This cognitive load theory is compatible with the aboriginal students' brain capacity as they are not able to receive a lot of things at one time. They also argued that the overall usability is important to ensure the use of the LICT-OA module (mLICT-OA) is able to meet the needs of students, followed by the application of the current minimalist theory in the development module. In short, students' high satisfaction in using the mLICT-OA would really impact the probability of a student to acknowledge a self-learning module. The introduction of the module illustrates the process and the different tasks focused on a task: searching for information, writing a document, doing an oral presentation, and e-portfolio. Thus, the adequate design approach of text and narration usage in the learning module should have a maximum impact on students' learning. This will assist them in the formation of accurate mental models and then formation of perfect schemas in the long-term memory. The overall learning goal of this self-directed learning module is the development of a personal approach for each student in building his or her personal PLE. Students can decide which tasks they want to deepen their knowledge of and how they wish to do so: either through a self-directed learning module using the documentation or via face-to-face workshops.

Finally, in line with the need for consideration of socio-cultural and equity issues in the aborigines' education, modification of the current computer module in schools is needed to suit the cultural condition of the students. Aboriginal students are introduced to the computer concept from basic fundamentals to more difficult concepts. In addition, the contents of the study materials are designed to suit the learning needs of the students; for example, segmentation of the materials, examples of layouts, headings and fonts as well as illustrations. Therefore, by identifying the most dominant learning style, a more accurate result in the construction of effective instructional strategies, curriculum, and pedagogy development can be delivered.

CONCLUSION

This study provides direct implications for literacy modules (mLICT-OA), which are attractive to aboriginal students in implementing their actual lifestyles into the tasks given. Therefore, this module has potential to promote aboriginal students' presence and to improve their ICT literacy skills using personalised ICT literacy learning. This digital module is also designed to demonstrate how their learning styles are different from other mainstream students. The discrepancy is apparent in the language preferences and the use of colours in their task completion. In summary, it is found that the use of the self-learning module as an ad hoc personal learning environment has contributed to a shift in the relationship between learners and the objective of learning while exploring the ICT literacy. The mLICT-OA has contributed to an increased sense of control over the surrounding construct knowledge by functioning as a powerful ad hoc personalised learning. The mLICT-OA is not only served as an on-demand personal learning environment but also an ad hoc PLE for the literacy. Personalised learning is to revolve around disciplines and areas which are relevant not only to informal, but also formal learning objectives. This learning environment proves that PLE as several Internet-based applications which are built on the ideological and scientific foundations of Blogging platforms 2.0, allows the creation and exchange of user-generated content (Kaplan & Haenlein, 2010). In conclusion, each teaching and learning activity has motivated students to increase their learning interest without boredom and are constantly monitored by coaches and facilitators. They are also assisted from time to time to be able to build and maintain their own hometown website for the purpose of marketing their forest products, handicraft, and their heritage. Therefore, this modular learning method contributes to the importance of the learning environment so that the aboriginal students are able to build a positive and relaxed learning environment.

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