

Learning Styles Integration in ICT Literacy Module (mLICT-OA) Development for Orang Asli Students

Intan Farahana Kamsin, Nor Syazwani Mat Salleh, Nur Khairunnisha Zainal, and Noor Hafizah Hassan

Abstract—The Orang Asli communities are an integral part of the sociocultural and economic life in Malaysia's society. Orang Asli students have different learning styles that are considered limited and are less skilled in the field of Information Communication Technology (ICT). These two are factors that hinder the advancement of education among them, thus resulting to them dropping out in higher education. Therefore, this conducted study aims to explore whether learning styles are an important aspect in the development of Orang Asli ICT literacy module (mLICT-OA). This is crucial to ensure students are able to engage in the teaching and learning process, and at the same time develop a meaningful learning environment. Quantitative research was conducted in Malaysia, which involved ninety-two (92) Orang Asli students. Data were analysed using the SmartPLS 3.0 software. Research findings show that learning styles are an important aspect that should be integrated into the ICT literacy module development for Orang Asli students. Therefore, this finding contributes by providing a research direction for improving Orang Asli students' capability in learning ICT by integrating their learning styles in mLICT-OA development.

Index Terms—ICT, module, Orang Asli students, learning styles.

I. INTRODUCTION

The Orang Asli are an indigenous native community and an entity of racial diversity in Malaysia. According to the Department of Orang Asli Affairs (JHEOA) (2008), there are 876 Orang Asli villages in Peninsular Malaysia, and they are divided into three main ethnic groups, namely Negrito, Senoi, and Proto Malays [1]–[3]. Dwelling differences among them contribute to the diversity of socioeconomic backgrounds, educational levels, cultures, lifestyles, and physical characteristics they possess [4], [5]. According to Noraida and Noor Ashikin [6], the Orang Asli community is still far from the mainstream of state development. This is because, they are still lagging in various aspects such as economy, social, and education, compared to other ethnic groups [7], [8].

The Orang Asli fear of engaging with 'outside' educational methods which are too unfamiliar for some of

them to accept [9]. This issue has contributed to the reading, writing, and counting skills of Orang Asli students to be significantly poorer than students in regular schools [10]–[12]. Based on a study carried out by Taylor *et al.* [13] and Hanafi *et al.* [12], it is shown that Orang Asli students also have low academic performance. Based on the Australian Government [14], Orang Asli students have low literacy, numeracy, and absenteeism. Meanwhile, a study done by BurrIDGE *et al.* [15], identified that Orang Asli students have low literacy and numeracy skills; but absenteeism rate to school is high, and low academic achievement performance.

Apart from lagging in economic, social, and educational aspects [4], Orang Asli students are also said to be lagging in Information Communication Technology (ICT) skills [16]–[18]. In line with the rapid pace of the digital age, ICT proficiency is one of the basic skills that need to be possessed in realising the government's goal to ensure an IT literate society by 2020. Accordingly, regardless of age and background, anyone should acquire such skills. Indeed, the Orang Asli students are no exception, and this supports the need for the 7th shift in the Malaysian Education Development Plan (2013-2025), which is 'Utilising ICT to improve the quality of learning in Malaysia'. Thus, ICT literacy modules that are appropriate to the teaching and learning processes of Orang Asli students are necessary, in ensuring that they acquire meaningful ICT skills through formal or informal educational processes [19].

ICT skills through a formal or informal education process is an aspect that needs to be emphasised in realising the 3rd leap – the Malaysian Education Development Plan for the Higher Education Sector (2015-2025), namely 'Appreciating lifelong learning'. Lifelong learning (LLL) is a process of democratisation of education that includes programs, such as knowledge acquisition, skills, and competencies; either formally or informally based on experience and training (National Higher Education Action Plan, 2011). This 3rd leap emphasises the importance of realising LLL, to ensure that the desire to cultivate LLL by 2025 can be realised and applied in the culture and lifestyle of Malaysians. LLL is important in the process of increasing the added value to society, as well as the largest contributor to the productivity and development of a country [20], [21].

One of the indicators of LLL is the use of ICT in teaching and learning. The use of ICT has been part of revolutionising the conventional teaching and learning process, which has changed the pattern of learning among students. In addition, ICT has also increased the importance of an open learning environment through virtual learning [22]. Therefore, having ICT skills is dire in changing the teaching and learning methods that were implemented previously. Accordingly, it

Manuscript received March 15, 2022; revised June 13, 2022. This work was supported by the APU Research Grant [RDIG/03/2021]

Intan Farahana Kamsin, Nor Syazwani Mat Salleh, and Nur Khairunnisha Zainal are with the School of Technology at Asia Pacific University of Technology and Innovation (APU), Malaysia (e-mail: intan.farahana@staffemail.apu.edu.my, Khairunnisha.zainal@staffemail.apu.edu.my, noor.hafizah@staffemail.apu.edu.my).

Nor Syazwani Mat Salleh is with the Faculty of Art, Computing & Creative Industry, Sultan Idris Education University (UPSI), Malaysia (e-mail: syazwani.ms@fskik.upsu.edu.my).

is becoming more of a necessary requirement for every individual to have ICT skills. This indicates that ICT plays an important role to meet the needs of LLL [23]. Computers act as a medium to support the teaching and learning process which has now begun to be integrated into the education and training system, mostly after the COVID-19 pandemic. Moreover, in the context of LLL, increasing the amount of information obtained through the Internet has become a major mode in the process of delivering learning materials [24]. Therefore, the matter of integrating technology into the teaching and learning process must be taken seriously [25], [26].

Therefore, to ensure Orang Asli students acquire meaningful ICT skills; developed ICT literacy modules should inhibit learning styles attributes. Mainly because, Orang Asli students have a unique learning style and their academical success reflects the approach applied by educators during the teaching and learning process [27]–[29]. Orang Asli students prefer a holistic approach during teaching and learning, i.e., prefer visible materials such as pictures, perform tasks in a group, and reflective learning, that is, students are given a specific amount of time in completing a given task [29]–[31]. Thus, the integration of learning styles in every activity carried out is a major factor for Orang Asli students in achieving success in education [32]–[34].

However, there is still a lack of integration of learning styles in teaching and learning processes involving Orang Asli students [15], [35]–[37]. This makes it difficult for Orang Asli students to achieve learning goals [11], [38] and they will become less interested in learning, and eventually, lose interest in going to school [11], [39]. With that, this research aims to explore whether learning styles are an important aspect in the development of the Orang Asli ICT literacy module (mLICT-OA). This could contribute to the development of a comprehensive mLICT-OA, that enables to engage Orang Asli students in teaching and learning process, and at the same time, develop a meaningful learning environment. The rest of the paper is organised as follows: The research methodology used in Section II; results and discussion are presented in Section III; and concluding remarks are given in Section IV.

II. METHODOLOGY

A. Sampling

Data collection for this study was carried out by obtaining a letter of approval and permission from the Department of Orang Asli Development (JAKOA) to conduct the study in an Orang Asli village. This process is followed by obtaining permission from the parents of Orang Asli students, based on the permission letter provided by the researcher. The subsequent phase involves the selection of Orang Asli students, conducted by the secretary of JAKOA via purposeful sampling. A total of ninety-two (92) Orang Asli students were selected, aged from the range of 13 to 19 years old; and the processes continued with the distribution of questionnaires to obtain feedback from Orang Asli students. Consequently, all ninety-two (92) Orang Asli students

completed the survey, and the feedback provided a comprehensive contribution towards exploring either learning styles is an important aspect in the development of Orang Asli ICT literacy module (mLICT-OA).

B. Pre-test

Pre-tests were conducted to ensure that the advocacy questionnaire was personalised accurately, clearly, and students understood the language and content being asked. The minimum number of respondents that can be used in this pre-test is 5 to 10 people. Therefore, this study involved ten Orang Asli students to assess the validity and reliability of the learning styles questionnaire. The questionnaire consists of three sections: Section A represents demographics; section B represents students learning styles, consisting of six constructs (auditory, kinaesthetic, tactile, visual, group, and individual) and twenty-two (22) questions; and section C represents Orang Asli ICT literacy module (mLICT-OA), which consists of three constructs (learning method, content, and activity).

The analysis process involved the use of the Partial Least Square (PLS) Statistical Equation Modeling (SEM) version 3.0. By using this software, a complete analysis of each variable and its related attribute can be conducted. Measurement scales using PLS are naturally focused on exploration concepts and the best choice to elaborate the data and validate the framework. A 500-time resampling (bootstrapping) process was carried out to ensure the significance of the analysed data. It is recommended that the values used in the resampling process to be higher than the values of respondents involved in a real study. In this study, the analysis consists of: i) reflective measurement model; ii) discriminant validity; and iii) hypothesis testing conducted. Fig. 1 shows the research methodology flow.

C. Content Validation

Content validation is to ensure the constructed items are correctly measuring what it is tasked to measure. This process is assessed by an individual with expertise in the field of study. Discussions were conducted along with language and technical experts. The evaluation process is judged by two experts in education, two computer training specialists, two educational technology specialists, and one pre-test was held involving Orang Asli students.

D. Instrument Validity and Reliability

There are two analytical processes that were carried out in this section. The first analysis explains, in detail, the reliability of the Alpha Cronbach instrument in each stage of preliminary studies that were carried out previously. SPSS 17.0 software is used in this analysis. For the first stage, Alpha Cronbach's analysis for the whole constructs were measured in advance to ensure all subconstructs were built to measure the exact construct. The value of the reliability coefficient of each construct was also viewed one by one, and then, recorded. The second analysis is the implementation of Rasch Measurement analysis using Bond & Fox software Steps 1.0.0, to test the validity of the developed item. Rasch measurement analysis involves two criteria: i) Item reliability, and ii) Item matching. Fig. 1 shows the flow of research methodology.

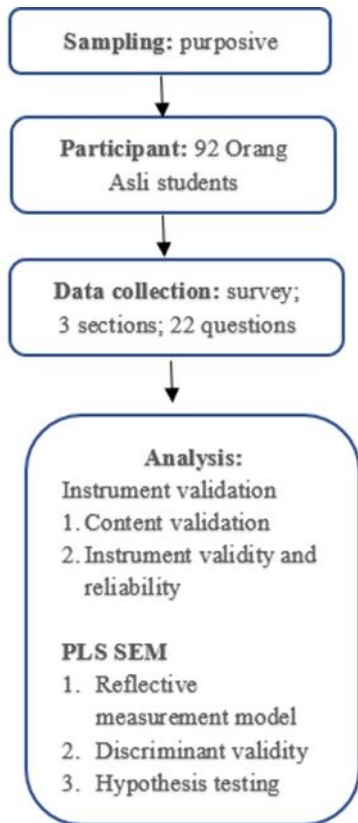


Fig. 1. Research methodology flow.

III. FINDINGS

A. Data Validity and Reliability

Alpha Cronbach’s reliability analysis shows 0.94 for the instruments. This indicates the constructed instruments are fit for the purpose. Whereas for the Rasch Measurement analysis, all items show PTMEA CORR is greater than 0.3 for item reliability. PTMEA CORR analysis is an important basic procedure for producing items that are completely parallel to other items, to measure the construct that you want to measure. For item matching analysis, all items outfit/infit MNSQ ranged in between 0.6 - 1.4, which shows items are in the suitability range of a productive item.

B. Reflective Measurement Model

Based on the data obtained from these reflective measurement models, the Average Variance Extracted (AVE) and Composite Reliability (CR) values have achieved convergent validity, because the AVE values for learning styles and ICT module constructs are greater than and equal to 0.5, and the CR values exceed 0.7 [40]. The CR reliability should be 0.7 or higher to indicate adequate convergence. The measurement for the reflective model was assessed based on the CR, convergent validity, and discriminant validity. For model validation purposes, the CR must be above 0.70. Convergent validity is assessed when the mean of the AVE for each construct exceeds the variance caused by the measurement error in the learning styles and ICT module constructs. Recommended value for AVE is > 0.50.

Table I and Table II show a summary of the convergent validity results and found the learning styles and ICT module constructs were valid based on parameter estimates and

statistical significance [41]. It shows the value of loading factors for all items is between 0.629 - 0.864, the value of AVE is between 0.553 - 0.681, and lastly, the value of CR is between 0.831 - 0.886 and acceptable [40]. This study shows the questionnaire can be used to measure the relevance diversity of learning styles and Orang Asli ICT literacy module (mLICT-OA) constructs among Orang Asli students.

TABLE I: CONVERGENT VALIDITY FOR LEARNING STYLES CONSTRUCTS

Constructs	Item	Loadings	AVE	CR
Visual	CA1	0.857	0.674	0.861
	CA2	0.818		
	CA3	0.785		
Auditory	CB4	0.841	0.681	0.865
	CB5	0.814		
	CB6	0.821		
Tactile	CC7	0.814	0.636	0.839
	CC8	0.842		
	CC9	0.733		
Kinaesthetic	CD10	0.818	0.590	0.851
	CD11	0.629		
	CD12	0.811		
	CD13	0.800		
Group	CE14	0.804	0.553	0.831
	CE15	0.760		
	CE16	0.718		
	CE17	0.687		
Individual	CF18	0.748	0.547	0.857
	CF19	0.703		
	CF20	0.804		
	CF21	0.679		
	CF22	0.756		

TABLE II: CONVERGENT VALIDITY FOR LEARNING STYLES CONSTRUCTS

Constructs	Item	Loadings	AVE	CR
Learning method	BA4	0.781	0.658	0.885
	BA5	0.864		
	BA6	0.778		
	BA7	0.818		
Content	BB10	0.863	0.660	0.886
	BB11	0.810		
	BB12	0.754		
	BB14	0.820		
Activity	BC16	0.822	0.651	0.848
	BC18	0.807		
	BC20	0.791		

C. Discriminant Validity

Next, discriminant validity is used to analyse and find out constructs that are independent of other constructs [42]. According to Hanafiah [40], discriminant validity qualifies if the square root of each AVE value for each construct is greater than that of any other construct (Table III). Based on this discriminant validity, it was found that all learning styles and Orang Asli ICT literacy module (mLICT-OA) constructs were in the highest values, and each item that existed in this

study could be applied to the actual study. Table III shows that the AVE value is greater than the values of all the correlations below it, and the validity of the discriminator has met its requirements. Overall, the discriminant validity is acceptable for this study, and in other words, an external model is acceptable.

TABLE III: HYPOTHESIS TESTING RESULT

No	Hypothesis	Std Beta, β	Std Error	t Value	Result
1	Learning style → Auditory	0.844	0.029	28.670	Supported
2	Learning style → Individual	0.624	0.077	8.114	Supported
3	Learning style → Kinaesthetic	0.869	0.033	26.419	Supported
4	Learning style → Group	0.805	0.042	19.335	Supported
5	Learning style → Tactile	0.823	0.041	19.945	Supported
6	Learning style → Visual	0.844	0.035	23.948	Supported
7	ICT Module → Learning method	0.853	0.028	30.450	Supported
8	ICT Module → Content	0.910	0.019	47.657	Supported
9	ICT Module → Activity	0.822	0.031	26.162	Supported
10	Learning style → ICT Module	0.266	0.147	1.81	Supported

IV. DISCUSSION

This study shows that, in the development of mLICT-OA, learning styles are an important aspect that should be integrated, to ensure students are able to improve their ICT skills. This finding could be reinforced with a study conducted by Rochecouste and Oliver [43], which found that Orang Asli students when given the opportunity to perform tasks by applying technological hardware, is practically capable in deepening ICT skills from the aspect of operating a computer, and in turn, they can easily understand how to access a website to obtain information. In addition, they were also excited when they managed to upload their pictures and videos into the website. They could even recommend improvements that should be implemented on the accessed sites.

The importance of Orang Asli students acquiring ICT skills practically can be seen in a study done by Frost et al. [44]. When the Orang Asli students that were involved in the study stated that the available computers in their schools did not work well and were slow to process the data, this creates a difficulty for them to understand and acquire detailed ICT skills among them. Besides, a study by Vodopivec and Bagon [45] on Orang Asli students who have learning problems, found that there was a high correlation against ICT learning with independent learning. Accordingly, students who have problems in learning involved in this study preferred a kinaesthetic learning style in teaching and learning processes which involved ICT.

While a study by Mehraj Ahmad Bhat [46] on Orang Asli students in five secondary schools, found that students could understand the learning process and ICT skills if they are given the opportunity to practice the ICT hardware provided or refer to tactile learning style attributes. This is due to the fact that students who inhibit tactile learning styles learn through the process of implementation. They prefer to practice the skills learned in problem solving as well assigned task.

However, despite the efforts made by the teachers in running teaching and learning processes based on students' learning styles, it is bound for several students to be unable to concentrate and comprehend information, no matter how skilled the teacher is. This is because, every student has their own distinctive abilities, as there are among them, those who can learn quickly, or intermittently, or those that take a long time. Accordingly, it is necessary for an educator to determine which learning style is their choice to provide appropriate teaching materials, either for mainstream students, or for aboriginal students [47]. Nevertheless, based on this study it shows how important the integration of learning styles attributes into the development of mLICT-OA has been identified, and this is in line with the previous study conducted.

V. CONCLUSION

To empower ICT skills among Orang Asli students, the learning style attributes among the Orang Asli should be given a consideration in the ICT literacy module development process. Due to limited modules of ICT literacy developed that includes the integration of Orang Asli students learning styles, it has affected the Orang Asli students in acquiring and improving their ICT skills. They feel demotivated, difficult to understand the knowledge delivered, and lag behind in terms of ICT skills [48]. The contribution of the study is closely related to the integration module developed based on learning styles that improve ICT skills among Orang Asli students. Past studies have shown that ICT skills among Orang Asli students is at a low level due to the teaching and learning process implemented with less emphasis on the learning style needs of the Orang Asli students [15], [36], [39]. Thus, every teaching and learning implementation should give emphasis to the learning style possessed by the Orang Asli students [49]. This ensures the implemented learning process is easy to understand and motivates them to learn. In addition, the learning materials injected with a learning style owned by the participants, became a main contributor to the process of better understanding them on the things learned [50], [51]. In connection with that is, based on this study, there is a relationship between learning styles in improving the level of ICT skills of Orang Asli students. Therefore, with this study, it shows how important it is to integrate learning styles in ICT literacy module to contribute towards a meaningful learning environment for Orang Asli students.

CONFLICT OF INTEREST

The authors declare no conflict of interest in this study.

AUTHOR CONTRIBUTIONS

Intan Farahana and Nor Syazwani conducted the research and analyzed the data, while Nur Khairunnisha and Noor Hafizah compile the analysis and wrote the paper. All authors had approved the final version.

REFERENCES

- [1] A. H. M. Adnan, D. S. M. Shah, M. H. M. Tahir, Salim, M. S. A. M. Salim, and A. M. Yusof, "The lived experiences and non-formal education of Malaysian 'Orang Asli' (native people) youngsters," *International Journal of Academic Research in Business and Social Sciences*, vol. 11, no.20, pp.682-695, 2021.
- [2] N. M. Shah, R. C. Rus, R. Mustapha, M. A. M. Hussain, and N. A. Wahab, "The Orang Asli profile in Peninsular Malaysia: Background & challenges," *International Journal of Academic Research in Business and Social Sciences*, vol. 8, no. 7, pp. 1157-1164, 2018.
- [3] Jabatan Kemajuan Orang Asli (JAKOA). (Jan. 30, 2022). *Statistik Penduduk Masyarakat Orang Asli Mengikut Sub, 2021*. [Online]. Available: <https://jadual-taburan-etnik-orang-asli-mengikut-negeri/>
- [4] UNESCO. (Jan. 30, 2022). *Basic Computer Skills*. [Online]. Available: <http://uis.unesco.org/en/glossary-term/basiccomputer-skills>
- [5] A. Rath *et al.*, "Cross-cultural adaptation and validation of Malay version of rapid estimate of adult literacy in dentistry (MREALD-30) among Orang Asli population in Malaysia," *BMC Oral Health*, vol. 21, pp. 1-11, 2021.
- [6] A. Jamalunlaili and C.B. Ahmad, "The effectiveness of resettlement of Orang Asli in Peninsular Malaysia," in *Proc. 7th Amer International Conference on Quality of Life*, 2019, vol. 4, no. 10.
- [7] A. F. Sawalludin, J. M. C. Lim, and M. I. M. Izzuan, "The struggle of Orang Asli in education: Quality of education," *Malaysian Journal of Social Sciences and Humanities (MJSSH)*, vol. 5, no. 1, pp. 46-51, 2020.
- [8] S. Renganathan, "Literacy and development for the Orang Asli in Malaysia: What matters?" *Prospects*, vol. 46, no. 3, pp. 479-490, 2016.
- [9] S. Renganathan. (Feb. 3, 2022). Teaching and engaging Orang Asli children. [Online]. Available: <https://www.nst.com.my/opinion/letters/2018/09/410516/teaching-and-engaging-orang-asli-children>
- [10] Y.S. Wan, *Education Policies in Overcoming Barriers Faced by Orang Asli Children: Education for All*, Kuala Lumpur: IDEAS Policy Research Berhad (IDEAS), 2020
- [11] B. Win, K. Wong, and C. Perumal, "Issues of teaching and learning in a primary school of Orang Asli: A case study of Sekolah Kebangsaan Senderut, Kuala Lipis, Pahang," *The Brunei Darussalam-Indonesia-Malaysia-Philippines East ASEAN Growth Area (BIMP-EAGA)*, 2013.
- [12] W. A. Wan Hanafi, S. Ahmad, and N. Ali, "Faktor budaya dan persekitaran dalam prestasi pendidikan anak Orang Asli Malaysia: Kajian kes di Kelantan," *Geografia: Malaysian Journal of Society and Space 10*, vol. 5, pp. 107-122, 2014.
- [13] E. V. Taylor, A. Lalovic, and S. C. Thompson, "Beyond enrolments: A systematic review exploring the factors affecting the retention of Aboriginal and Torres Strait Islander health students in the tertiary education system," *International Journal for Equity in Health 18*, vol. 1, pp. 1-191, 2019.
- [14] Australian Government, Closing the gap, 2020. (Feb. 3, 2022). [Online]. Available: <https://ctgreport.niaa.gov.au/sites/default/files/pdf/closing-the-gap-report-2020.pdf>
- [15] N. Burrige, F. Whalan, and K. Vaughan, "Indigenous education: A learning journey for teachers, schools and communities," *Springer Science & Business Media*, 2012.
- [16] S. R. Abdul Karim, N. M. Burhan, and H. Ismail, "The principles of Huetagogy as a medium towards lifelong learning in Orang Asli Islamic education," *Journal of Contemporary Social Science and Education Studies*, vol. 1, no. 2, pp. 185-201, 2021.
- [17] R. Hashim, K. S. Idris, Y. A. Ustadi, F. M. Merican, and S. F. S. Mohd. Fuzi, "Digital inclusion and lifestyle transformation among the Orang Asli: Sacrificing culture for modernity," *Asian Social Science 8*, vol. 12, pp. 80-87, 2012.
- [18] S. G. Sarjit. (Feb. 3, 2022). *Orang Asli's ICT Challenge, 2015*. [Online]. Available: <http://www.thestar.com.my/news/education/2015/11/29/orang-aslis-ict-challenge/>
- [19] N. Makwana. (Jan. 15, 2022). COVID-19: The need to boost digital literacy in indigenous communities, 2020. [Online]. Available: <https://www.news.uwa.edu.au/archive/2020061712161/covid19/covid-19-indigenous-perspectives/>
- [20] L. Anthonysamy, A. C. Koo, and S. H. Hew, "Self-regulated learning strategies in higher education: Fostering digital literacy for sustainable lifelong learning," *Education and Information Technologies*, vol. 25, no.4, pp. 2393-2414, 2020.
- [21] A. J. Head, M. V. Hoeck, and D. S. Garson, "Lifelong learning in the digital age: A content analysis of recent research on participation," *First Monday*, vol. 20, no. 2, 2015.
- [22] K. Stopar and T. Bartol, "Digital competences, computer skills and information literacy in secondary education: Mapping and visualization of trends and concepts," *Scientometrics*, vol. 118, pp. 479-498, 2019.
- [23] V. S. Tchamyou, A. A. Simplicio, and N. M. Odhiambo, "The role of ICT in modulating the effect of education and lifelong learning on income inequality and economic growth in Africa," *African Development Review*, vol. 31, no. 3, pp. 261-274, 2019.
- [24] F. G. K. Yilmaz and R. Yilmaz, "Learning analytics intervention improves students' engagement in online learning," *Tech Know Learn*, vol. 27, no.v2, pp. 449-460, 2022.
- [25] M. Laal, "Lifelong learning and technology," *Procedia-Social and Behavioral Sciences*, vol. 83, pp. 980-984, 2013.
- [26] E. G. Artacho, T. S. Mart íez, J. L. O. Mart ín, J. A. Ma. Mar ín, and G. G. García, "Teacher training in lifelong learning — The importance of digital competence in the encouragement of teaching innovation," *Sustainability*, vol. 12, no. 7, p. 2852, Apr. 2020.
- [27] P. R. Toulouse. (Feb. 20, 2022). What matters in indigenous education, implementing a vision committed to holism, diversity and engagement, in measuring what matters, 2016. [Online]. Available: <https://peopleforeducation.ca/wp-content/uploads/2017/07/MWM-What-Matters-in-Indigenous-Education.pdf><https://peopleforeducation.ca/wp-content/uploads/2017/07/MWM-What-Matters-in-Indigenous-Education.pdf>
- [28] N. S. Aziz and N. A. Rahman, "Use of ICT in indigenous primary school classroom: A case study of teachers' expectations and experiences," in *Proc. 2017 International Conference on Research and Innovation in Information Systems (ICRIIS)*, pp. 1-4, 2017.
- [29] J. Wilks, K. Wilson, and S. Kinnane, "Promoting engagement and success at university through strengthening the online learning experiences of Indigenous students living and studying in remote communities," *Indigenous Pathways, Transitions and Participation in Higher Education*, pp. 211-233, 2017.
- [30] M. S. Wan Mahzan, N. A. Alias, and I. S. Ismail, "Investigating the needs of developing a digital vocabulary learning material for Malaysian indigenous learners in ESL Classroom," *Journal of Nusantara Studies (JONUS)*5, vol. 2, pp. 282-302, 2020.
- [31] H. J. Boon and B. E. Lewthwaite, "Signatures of quality teaching for Indigenous students," *The Australian Educational Researcher 43*, vol. 4, pp. 453-471, 2016.
- [32] H. Yusof, "The motivation stimulating factors and the orang asli students' motivation: Is there a relationship?" *Turkish Journal of Computer and Mathematics Education (TURCOMAT) 12*, vol. 8, pp. 205-210, 2021.
- [33] R. Jorgensen, "Creating opportunities for vulnerable indigenous learners to succeed in vocational education," *ZDM*, vol. 52, no. 3, pp. 571-580, 2020.
- [34] T. Moore, "Governing superdiversity: Learning from the Aboriginal Australian case," *Social Identities*, vol. 26, no. 2, pp. 233-249, 2020.
- [35] M. N. L. Y. Abdullah and D. Primus, "The impact of institutional support and student engagement on educational outcomes of Orang Asli students at public universities," *Asia Pacific Journal of Education 41*, vol. 1, pp. 182-197, 2021.
- [36] R. Abdullah, W. H. Wan Mamat, W. A. Amir Zal, and A. M. Ibrahim, "Teaching and learning problems of the Orang Asli education: Students' perspective," *Asian Social Science*, vol. 9, no.12, pp. 118, 2013.
- [37] G. Vass, "'Aboriginal learning style' and culturally responsive schooling: Entangled, entangling, and the possibilities of getting disentangled," *Australian Journal of Teacher Education*, vol. 43, no.8, pp. 89-104, 2018
- [38] A. Britton, M. Redman-Maclaren, M. Ham, and R. Bainbridge, "What attributes make an alternate model of education for remote indigenous adolescents: A systematic literature review," *Australian and International Journal of Rural Education*, vol. 30, no.3, pp. 1-20, 2020.
- [39] S. Renganathan, "A pet rabbit, bunny': Teaching English to Orang Asli children, an indigenous community in Malaysia," *International*

Proceedings of Economics Development and Research, vol. 68, pp. 145, 2013.

- [40] M. H. Hanafiah, "Formative vs. reflective measurement model: Guidelines for structural equation modeling research," *International Journal of Analysis and Applications*, vol 18, no.5, pp. 876-889, 2020.
- [41] Y. A. Wang and M. Rhemtulla, "Power analysis for parameter estimation in structural equation modeling: A discussion and tutorial," *Advances in Methods and Practices in Psychological Science*, vol. 4, no. 1, 2021.
- [42] M. Sarstedt, J. F. Hair Jr, J. H. Cheah, J. M. Becker, and C. M. Ringle, "How to specify, estimate, and validate higher-order constructs in PLS-SEM," *Australasian Marketing Journal (AMJ)*, vol. 27, no.3, pp. 197-211, 2019.
- [43] J. Rochecouste and R. Oliver, "Introducing the teaching and learning benefits of the WWW in aboriginal schools: Trials and tribulations," *Indigenous Studies: Breakthroughs in Research and Practice*, pp. 77-86, 2020.
- [44] L. Frost, K. MacLeod, and G. Laronde, "Challenges in providing information and communication technology (ICT) education in aboriginal Canadian schools," *International Journal of Digital Society*, vol. 8, no. 1, pp. 1251-1259, 2017.
- [45] S. Bagon and J. L. Vodopivec, "Motivation for using ICT and pupils with learning difficulties," *International Journal of Emerging Technologies in Learning*, vol. 11, no. 10, 2016.
- [46] M. A. Bhat, "Learning by ICT in association to their learning styles: An attitudinal study of high school students," in *Proc. International Education Conference on Learning Technologies in Education*, 2015, pp. 343-353.
- [47] I. F. Kamsin, "Meneroka tahap kemahiran ICT dan Identiti Pelajar dalam kalangan Anak Orang Asli melalui Program Literasi ICT (PLICT)," Ph.D. dissertation, Universiti Kebangsaan Malaysia, 2021.
- [48] A. M. Marof and R. C. Anderson, "Social and psychological factors in L2 learning that influence indigenous students' academic achievement: A structural equation modeling analysis," *International Journal of Innovation, Creativity and Change*, vol. 10, no. 1, pp. 426-448, 2018.
- [49] J. Li, A. Brar, and N. Roihan, "The use of digital technology to enhance language and literacy skills for Indigenous people: A systematic literature review," *Computers and Education Open*, vol. 2, pp. 1-21, 2021.
- [50] H. A. El-Sabagh, "Adaptive e-learning environment based on learning styles and its impact on development students' engagement," *International Journal of Educational Technology in Higher Education*, vol. 18, no. 1, pp. 1-24, 2021.
- [51] M. N. A. Rahman, N. A. Muhamad, and M. A. Mansor, "Kecerdasan Kanak-Kanak Berasaskan Intelektualisme Orang Asli: Pendekatan Fuzzy Delphi," *JuKu: Jurnal Kurikulum & Pengajaran Asia Pasifik*, vol. 7, no. 1, pp. 1-8, 2019.

use, distribution, and reproduction in any medium, provided the original work is properly cited ([CC BY 4.0](#)).



Intan Farahana Kamsin is a lecturer in The School of Technology at Asia Pacific University of Technology and Innovation (APU). She received her PhD in the area of education (information technology & resources) from the Universiti Kebangsaan Malaysia (UKM). Her research interests are the Internet of Things (IoT), e-learning, education among the marginalized community, emerging technology for educational purposes. She is a member of Malaysian Higher Education Research and Policy Development Organization (PenDaPaT).



Nur Khairunnisha Zainal is a lecturer in the School of Technology at Asia Pacific University of Technology and Innovation (APU). Her research interests include all internet of things related areas, Information systems, Enterprise resource planning related trends and Business Analytics. She is a member of Center for Research and Development of IoT (CREDIT) at APU. She also participated in STEM program as facilitator educating younger generations (school students) with IoT technologies.



Noor Hafizah Hassan is a lecturer in the School of Technology at Asia Pacific University of Technology and Innovation (APU). She received her PhD in the area of Information technology specialized in information systems from the Universiti Teknologi PETRONAS (UTP). Her research interest is Information Systems. She is a member of Malaysia Association for Information Systems (MyAIS) and Persatuan Industri Komputer dan Multimedia Malaysia (PIKOM).



Nor Syazwani Mat Salleh a senior lecturer at the Faculty of Art, Computing & Creative Industry, Sultan Idris Education University (UPSI). Completed her PhD at Faculty of Education, Universiti Kebangsaan Malaysia (UKM). She has a bachelor degree in software engineering from Universiti Tun Hussein Onn Malaysia (UTHM) and a master in computer education from UKM. Her research interests are computer education and resources & information technology, personalized learning, art education and technology, visual communication and graphic design. She has published more than 15 articles in international journals, and presented her research in various national and international conferences.

Copyright © 2022 by the authors. This is an open access article distributed under the Creative Commons Attribution License which permits unrestricted