JOURNAL OF BALTIC SCIENCE EDUCATION

ISSN 1648-3898

THE EFFECT OF KAYEU LEARNING OUTSIDE THE CLASSRROM PRIMARY SCIENCE MODULE ON INTRINSIC MOTIVATION OF INDIGENOUS LEARNERS

Cindy Wong Chyee Chen, Kamisah Osman

Abstract. *In order to motivate indigenous learners to learn science and instil their positive attitude towards the subject, conducive and simulative learning environment need to be specifically designed for them. This research is aimed to determine the effect of Kayeu Learning Outside the Classroom (LOC) primary science module on intrinsic motivation of indigenous learners. The treatment group (n=38) used the Kayeu LOC primary science module while the control group (n=35) used the conventional module, which are materials mandated by Ministry of Education (MOE). Three-point Likert scale intrinsic motivation questionnaire consisting of general and science constructs was administered before and after T&L to both groups. Analysis of MANOVA repeated measures showed there were no significant effects of the groups and time on the intrinsic motivation, and there was no significant interaction effect between time and the groups on intrinsic motivation. However, follow-up simple interaction analysis found that there is a significant main effect of the time and significant effect of interactions between time and the groups on the general construct.*

Key words: *indigenous learners, intrinsic motivation, Learning Outside the Classroom (LOC), primary science, teaching module.*

Cindy Wong Chyee Chen, Kamisah Osman
National University of Malaysia, Malaysia

Introduction

In the 21st century, education plays a very important role in producing human capital that is capable of utilizing the knowledge and skills that can contribute to the society and the country's wealth. According to Min and Mi (2015) through education in schools, individual's gap can be reduced and the level of competence among learners can be increased. This, according to Trilling and Fadel (2009) is to prepare the learners to face the future that requires knowledge and skills in job application that is highly competitive. Despite the importance of science education nowadays, many learners are often not interested in school science (Brianzoni & Cardellini, 2015). Therefore, factors that seek to promote the involvement of students in learning science and factors that affect science learning process should be studied and reviewed so that a nation of highly competent and consistent high achievers can be realized. This research focuses on intrinsic motivation as it was found to be highly relevant and it is also one of the main factors affecting the academic performance of learners (Gottfried, 1985, 1990; Gottfried & Gottfried, 1996) and has been regularly reviewed in academic achievement (Schiefele, 1991; Steinmayr & Spinath, 2009). Intrinsic motivation involves the feeling of fun in the learning process at school (Gottfried, 1985) and it arises from the individual needs to achieve a certain level of competence (Deci & Ryan, 1987). In addition, intrinsic motivation is believed to affect cognitive development of the learners and also roles played by the learners in the school (Deci & Ryan, 1992; Gottfried, 1990; Gottfried, Fleming, & Gottfried, 2001).

Review of the related literature reveals that many studies that have been carried out in Malaysia gave an indication that the level of motivation among learners in general and the indigenous learners in particular is still at a low level and is alarming. According to Kamisah, Zanaton, and Lilia (2007) and Zanaton, Lilia, and Kamisah (2006), Malaysia learners showed a negative perception and have little motivation to learning science. While the studies conducted on aboriginal dan indigenous learners in Malaysia, found that they

also show low motivation to learn at a non-satisfactory level (Abdul Shukor, Nuraini, Mohd Izam, & Mohd Hasani, 2011; Asnarurlkhadi, Maria, Zahid, Mariani, & Hanina Hallimatusaadiah, 2007). The learning process only occurs when they go to school and they show no motivation to do homework or revision. According to Mohammad Johdi and Abdul Razaq (2009), the lack of motivation in learning has contributed to the occurrence of dropout and truancy which directly affect their academic performance in school.

Furthermore, the attitude of indifference and lack of awareness among parents about the importance of education for their children also contributed to the existence of low motivation to learn. Such parental attitudes directly affect the children for not caring about and not seek education. Hence, the academic achievement among indigenous learners in Malaysia always lags behind when compared with the mainstream learners. The achievement gap also includes science achievement (Subahan, 2009). Although there are a number of programs for indigenous learners, which are considered successful, but they still do not bring sufficient and lasting results. Until now, the different levels of educational attainment in Malaysia still exist as reported in studies conducted by Nur Bahiyah, Maryati, Azman, and Mohd. Najib (2013) and Ramle, Wan Hasmah, Amir Zal, and Asmawi Mohamad (2013). Despite various efforts and initiatives undertaken by various parties such as the Ministry of Education (MOE) and schools, the indigenous learners' motivation still has not reached a satisfactory level. This is very worrying because this will affect their academic performance in school and at the same time inhibit the future of the indigenous learners when they become teenagers.

The importance of motivation on education among indigenous or minority learners also encouraged the studies carried out abroad. The studies conducted in the countries Guatemala (McEwan & Trowbridge, 2007), New Zealand (Bishop, 2010) and Australia (Anderson, 2014) respectively also showed that minority learners have a low level of motivation. This directly affects their academic performance, in which the studies carried out in countries such as the United States, Canada and Australia have found that academic achievement of indigenous people or minorities are also at a low level (Assembly of First Nations, 1988; Cajete, 1988; Chigeza, 2011; Deyhle, 1983; Masters, 2009). This is because studies have shown that there is a significant positive relationship between intrinsic motivation and academic achievement (Delmas & Lessem, 2014; Gottfried, 1985, 1990; Hirst, Van Knippenberg, Chen, & Sacramento, 2011; Li & Shieh, 2016; Zhu & Leung, 2011; Zimmerman, 2008). The existence of this gap is not only in Malaysia but also throughout the world (Chigeza, 2011; Prout & Hill, 2012) where minorities and indigenous peoples are often associated with low academic performance. Furthermore, in most of the countries the learners are from families with high economic status and attend high performing school showed a higher science performance than learners who do not have this advantage (The Organisation for Economic Co-operation and Development [OECD], 2013).

Although many studies have been conducted regarding intrinsic motivation, but most of the studies focused on a higher age levels, which are 9 years old and above (Deci & Ryan, 1985; Gottfried, 1985; Ryan, Connell, & Deci, 1985). According to Gottfried (1990), not many studies conducted on the intrinsic motivation of children aged 8 and below. Many studies also show the motivation of children to study subjects in school decreases when they pass through the school (Fredrick & Eccles, 2002; Gottfried et al., 2001; Hong, Peng, & Rowell, 2009; Walker & Greene, 2009). Lack of motivation is not only led to a decline in academic performance, it will also lead to a higher dropout rate in school (Azzam, 2007; Glass & Rose, 2008; Scheel, Madabhushi, & Backhaus, 2009). Therefore, initiatives need to be thought out and worked intensively to improve and maintain the level of motivation among indigenous learners since the early stages of schooling.

A high level of education is crucial in ensuring a country's development towards becoming a modern and developed country. In order for Malaysia, a developing country to become a developed country, all communities should have a high level of education especially indigenous learners where many studies stated that their performance of education is low and are in an unsatisfactory level (Asnarulkhadi et al., 2007; Nur Bahiyah et al., 2013; Ramle et al., 2013). Thus, indigenous learners also should not miss in obtaining a relevant and high level of education. In the context of indigenous communities, the education gap that exists among indigenous and mainstream learners should be reduced or minimized. To achieve this progress, the level of motivation among indigenous learners in Malaysia should be increased to a high level and at the same time bring lasting success in the field of education. As mentioned by Rannikmae (2016), implementing and acknowledging the need for new pedagogies in science education has become extremely important to create opportunities for students to be involved actively in learning in a motivational way. Thus, intervention or modules that can determine and increase the level of motivation of learners, aged 8 years, especially among indigenous learners in primary schools is needed to improve academic achievement and reduce achievement gaps between different primary schools in Malaysia.

Research Aim

The research is aimed to determine the effect of *Kayeu* (which means 'plant' in one of the indigenous languages in Malaysia) LOC primary science module toward enhancing intrinsic motivation of indigenous learners in science education in Malaysia. The researchers recommend the use of the *Kayeu* LOC primary science module in the T&L of science in indigenous primary schools. It is believed that with the use of this module, it will give opportunity to implement alternative approach beside the conventional teaching strategies practiced in schools.

Methodology of Research

Research Design

.

This research employed quasi-experimental of the type pre-test post-test, non-equivalent control group design as shown in Table 1.

Table 1. Pre-test post-test, non-equivalent control group design.

Group	Test	Intervention	Test
Control	Pre-test	Conventional	Post-test
Treatment	Pre-test	*Kayeu* LOC primary science module	Post-test

This research was conducted in four schools in the rural part of Malaysia. Two schools served as control group using conventional module and two other schools as treatment group using *Kayeu* LOC primary science module during T&L. For the preliminary survey that was carried out during 2014 academic year, two sets of questionnaire created by researchers based on Primary School Standard Curriculum for Aboriginal and Penan (*Kurikulum Standard Sekolah Rendah, Kurikulum Orang Asli dan Penan, KSSR KAP)* to find out the difficulty level of topics in Year Two science subject. Five-point Likert scale questionnaire administered to four teachers teaching Year Two science and another set of Two-point Likert scale questionnaire administered to 59 Year Three learners in the indigenous schools. Based on the analysis, both the teachers (M=4.00) and the learners (47.5%) rated 'Plant' as the second most difficult topic in Year Two science subject after the topic 'Light and Dark'. This is surprising as the indigenous community live in interior areas and are surrounded by all kinds of flora and fauna. Therefore, 'plant' shouldn't be a problem in T&L to indigenous learners. However, this preliminary survey showed otherwise. Therefore, in this research, topic 'Plant' has been selected.

Respondents

In this research, the respondents were selected from 2015 academic year, who are Year Two learners (8 years old) from four indigenous primary schools in Malaysia. Due to the number of Year Two learners in each indigenous school is low, each of the control group and the treatment group need to be covered by two schools in order to make sure that the number of respondents are more than 30 for each group. This is to meet the minimum requirement of 30 respondents for each group in the experimental design and hence securing the generalisation of the study. Thus, a total of some 73 respondents participated in this research in which the control group consisted of 35 Year Two learners and the treatment group consisted of 38 Year Two learners. The schools selected are based on criteria such as the level of learners' competency (based on the results of the Primary School Achievement Test), school band category and total of Year Two learners in each school.

Instrument and Procedures

The learners' intrinsic motivation was measured by using intrinsic motivation questionnaire in Leibham's study (2005), adapted from the Youth Children's Academic Intrinsic Motivation Inventory (Y-CAIMI) instrument in the study by Gottfried (1990). However, only two categories in the instrument were selected for this study, namely

general construct and science construct. Initially, there are a total of 24 items (general construct = 13 items, science construct = 11 items), that uses four point scales which are "1 = Not True", "2 = Slightly True", "3 = More True" and "4 = Very True". Before pilot questioning, this questionnaire was given to two teachers teaching in indigenous primary school for comments regarding the format and the level of language used. After pilot questioning, the reliability of this instrument as a whole is below 0.70 which is considered low. Therefore, the items in the instrument were reduced to 18 items only which consists of general constructs (11 items) and science construct (7 items) in the form of a 3-point Likert scale of "1 = Not True", "2 = Not Sure" and "3 = True". Examples of items in general construct are "School work is not interesting" and "I do not like learning". Examples of items in science construct are "Science is not interesting" and "I would like to learn more about science". The reliability of this instrument is high with Cronbach alpha coefficient value 0.763 for general construct, 0.800 for science construct and 0.792 for whole.

The intrinsic motivation questionnaire administered to respondents in both groups before the session of T&L on plants as pre-test to determine the homogeneity level of intrinsic motivation between the control and treatment groups. A five-week period is required to complete the 'Plants' topic. At the end of the T&L, intrinsic motivation questionnaire is administered again to the respondents in both groups as post-test. Intrinsic motivation instrument was administered by the provisions of the same time taken before and after the T&L session on 'Plants' topic in both control and treatment groups.

Data Analysis

Quantitative data obtained from the intrinsic motivation instrument were analysed using descriptive and inferential statistics. All data were compiled and summarized in table form for easy analysis reports and presentations made. Descriptive analysis was conducted to determine the mean and standard deviation of intrinsic motivation pre-test. Independent samples T-test was performed on the data collected during the pre-test to determine the level of homogeneity of the intrinsic motivation between the two groups involved. In addition, MANOVA 2x2x2 repeated measures analysis was used to determine the effect of *Kayeu* LOC primary science module in enhancing intrinsic motivation. Repeated measures involves two study groups (Control and Treatment), two time (pre-test and post-test) and two constructs of intrinsic motivation (general and science).

Results of Research

The comparative analysis of the pre-test mean score for intrinsic motivation as a whole found that there is no significant difference between the groups in which the control group (M = 2.69, SD = 0.216) overcame the treatment group (M = 2.60, SD = 0.239) of 0.09. Table 2 shows the descriptive statistics mean score for intrinsic motivation pre-test according to groups.

Table 2. Descriptive statistics mean score for intrinsic motivation pre-test according to groups.

Groups	Mean (M)	Standard Deviation (SD)	N
Control	2.69	0.216	35
Treatment	2.60	0.239	38

Homogeneity of Intrinsic Motivation

Homogeneity analysis of the level of intrinsic motivation between the control and treatment groups using T-test Independent samples at the 0.05 significant level found that there was no significant difference in pre-test mean score of intrinsic motivation between control and treatment groups, $t = 1.617$ and $df = 71$, $p > 0.05$. The findings show the control and treatment groups were homogeneous in terms of intrinsic motivation before the study was conducted. The homogeneity between the two groups allows comparison to be performed on the effects of *Kayeu* LOC primary science module in the learning of 'Plants' topic among indigenous learners. Table 3 shows the analysis of the Independent-samples T-test of pre-test mean score for intrinsic motivation according to groups.

Table 3. Independent T-test pre-test mean score of intrinsic motivation according to groups.

Dependent Variable	t	df	p	Mean Difference
Pre-test intrinsic motivation	1.617	71	.110	.086

Effect of Module on Intrinsic Motivation

MANOVA repeated measures 2x2x2 analysis was used to analyse the data to determine the effect of *Kayeu* LOC primary science module in enhancing intrinsic motivation. Results are shown in Table 4 below. The findings showed that there was no significant main effect of group on intrinsic motivation [F (2, 70) = 0.273, p> 0.05] with an effect size of 0.008. Data also showed that there was no significant main effect of time on intrinsic motivation [F (2, 70) = 2.574, p> 0.05] with effect size of 0.069. The effect of the interaction between time with the group is also not significant to the intrinsic motivation [F (2, 70) = 3,039, p <0.05] with effect size of 0.080.

Table 4. Multivariate test.

Effect	*Pillai's Trace Value*	F	df1	df2	p	*Partial Eta Squared*
Group	0.008	0.273	2	70	0.762	0.008
Time	0.069	2.574	2	70	0.083	0.069
Group * Time	0.080	3.039	2	70	0.054	0.080

Significance level = 0.05

Although the three results above are not significant, further analyses were made to obtain a more detailed picture of the general construct and science construct. Results of the analysis as shown in Table 5 found that there was no significant main effect between groups on the general construct of intrinsic motivation [F (1,71) = 0.015, p> 0.05] with effect sizes of 0.000 and also science construct of intrinsic motivation [F (1,71) = 0.065, p> 0.05] with effect size of 0.007.

Table 5. Effects between subjects test.

Effects	Dependent Variable	Squared total	df	Mean squared	F	p	*Partial Eta* Squared
Groups	MI General	0.002	1	0.002	0.015	0.902	0.000
	MI Science	0.065	1	0.065	0.524	0.472	0.007

Table 6. Effect within subjects test.

Effects	Dependent Variable	Squared total	df	Mean squared	F	p	*Partial Eta Squared*
Time	MI General	0.452	1	0.452	5.054	0.028	0.066
	MI Science	0.129	1	0.129	0.911	0.343	0.013
Time *	MI General	0.396	1	0.396	4.423	0.039	0.059
Group	MI Science	0.457	1	0.457	3.239	0.076	0.044

Significance level = 0.05

Results in Table 6 show that there is a significant main effect of the time on the general construct of intrinsic motivation [F (1, 71) = 5,054, p <0.05] with an effect size of 0.066. Further descriptive analysis found that the pre-test mean score of general construct (M = 2,633, SD = 0.282) exceeds the post-test mean score of general construct (M = 2.526, SD = 0.369). This means that from the time of measurement aspect, the level of intrinsic motivation among indigenous learners generally have not been increased, but it decreased significantly. Figure 1 shows a graph comparing the mean score of the constructs of intrinsic motivation according to time.

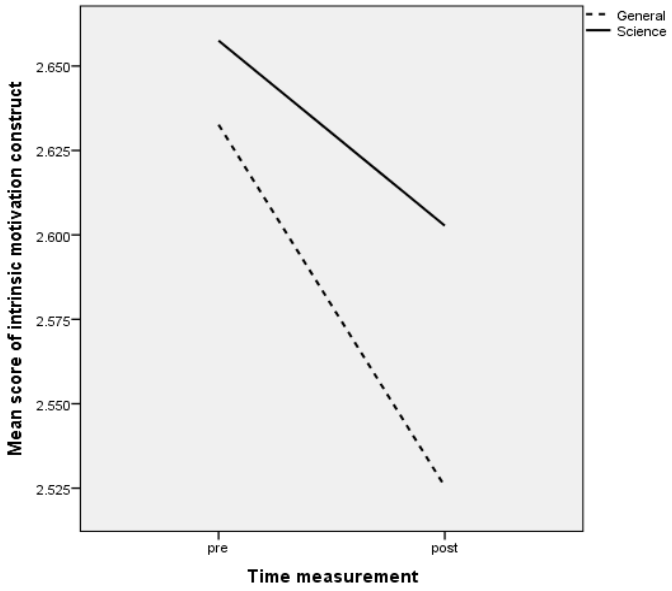

Figure 1. Graph comparing the mean score intrinsic motivation construct according to time.

The results in Table 6 also found that there is a significant interaction effect between time and group on general construct of intrinsic motivation [F (1, 71) = 4,423, p <0.05] with an effect size of 0.059. Further analysis using a paired T-test for control group general construct of intrinsic motivation was significant (t = 2.600, df = 34, p <0.05). While the paired T-test results for the treatment group general construct of intrinsic motivation were not significant (t = 0.127, df = 37, p> 0.05). Table 7 shows the results of paired t-test.

Table 7. Results of paired T-test for general construct of intrinsic motivation according to time and groups.

Construct	Group	Test	Mean (M)	Standard Deviation (SD)	t	df	p
General	Control	Pre Post	0.214	0.491	2.600	34	0.014
	Treatment	Pre Post	0.007	0.349	0.127	37	0.900

Significance level = 0.05

Figure 2 shows a graph comparing the mean score of the general construct of intrinsic motivation in accordance with the time and groups. The mean score of general construct of intrinsic motivation decreased from pre-test to post-test in both control dan treatment groups. Results also showed a significant decrease in general construct mean score for control group more than the treatment group. Thus, it can be said that although both *Kayeu* LOC primary science module and the conventional module did not improve general construct of intrinsic motivation among indigenous learners as a whole, for comparative purposes, it was found that *Kayeu* LOC primary science module is better than the conventional module used. Therefore, both conventional module and *Kayeu* LOC primary science module did not bring positive effect on the overall intrinsic motivation, general intrinsic motivation and science intrinsic motivation among indigenous learners.

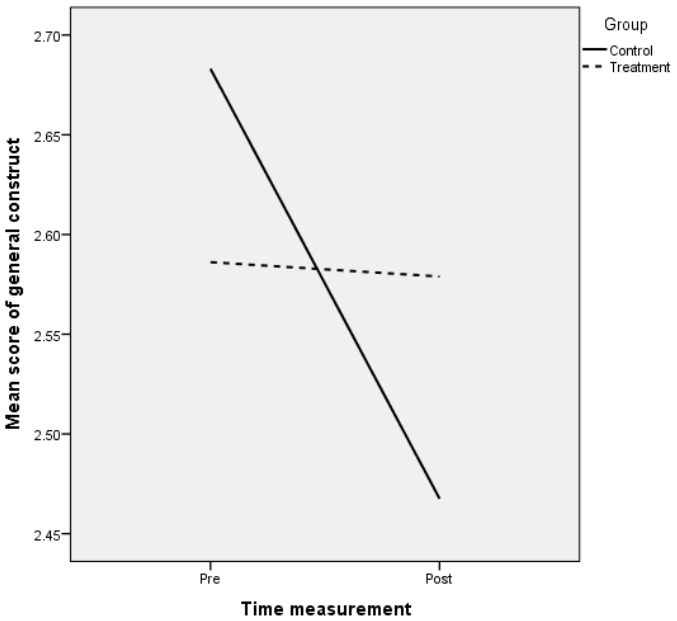

Figure 2. Graph comparing the mean score of general construct according to time and groups.

Discussion and Implication

The education sector in Malaysia is changing dramatically in the 21st century. MOE always strives to raise and improve the level of education among indigenous learners with programs and special curriculum. In order to improve the level of education, motivation among indigenous learners too should be increased. This is because studies have found that motivational aspects have an influence and impact on the learning process of learners in the school. Palmer (2005) also noted that motivation is a pre-requisite and co-requisite for effective learning in constructivism. Currently in Malaysia, as in many other countries of the world, indigenous or minority learners' motivation in learning is still at a low level (Abdull Shukor et al., 2011; Anderson, 2014; Bishop, 2014; McEwan & Trowbridge, 2007).

Failure to increase intrinsic motivation among indigenous learners with the used of *Kayeu* LOC primary science module in this research can be due to several reasons. One reason for the decline in the level of motivation is likely due to the change of strategy or approach to T&L used by teachers in the treatment schools that creates a negative impact on the motivation of these indigenous learners. This is because, the conventional approach that is more teacher-centred was applied to indigenous learners since they entered school. With the implementation of activities that are more learner-centred, this has brought something unusual for these indigenous learners. This was also reported in the study by Ayla (2016).

Other reasons may be related to the level of learners' motivation for learning as a whole. The studies conducted in Malaysia previously found that indigenous learners do not show enthusiasm and high motivation in the learning process and is at an unsatisfactory level (Abdull Shukor et al., 2011; Asnarurlkhadi et al., 2007). The learning process occurred only while they are in school. In addition, attitude of parents who are not interested in education is one of the contributors to the learners not having the motivation to do homework or revision. The situation of low motivation level among the indigenous learners also reported in studies conducted abroad in countries such as Guatemala (McEwan & Trowbridge, 2007), New Zealand (Bishop, 2010) and Australia (Anderson, 2014).

Although various programs and incentives have been implemented by the MOE, the level of motivation among indigenous learners in learning is still considered low in Malaysia. This is in line with the data collected from this research and also research carried out by Abdull Shukor et al. (2011). With these findings, we say that the efforts and initiatives that have been implemented all these years by MOE were not successful in enhancing motivation among indigenous learners. This has opened up opportunities to carry out more and intensive researches regarding

T&L in indigenous learners, where different, more practical and suitable approaches and strategies than previously applied should be studied and used in order to enhance motivation among indigenous learners. This is because the indigenous learners who live in remote and interior areas are totally different from mainstream and urban learners in the aspects of culture, environment, beliefs, family background and also upbringing. Therefore, different approaches and methods in the process of T&L should be considered and used to educate these indigenous learners.

These findings also bring us to make a proposal or suggestion to MOE, which is to update or enhance the KSSR KAP used. This may be accomplished by shifting the focus in cognitive learning as practiced by the mainstream learners to psychomotor and affective aspects of the learning process of the indigenous learners. More activities of T&L converge towards aspects of science process skills and science manipulative skills as indigenous learners do not master cognitive aspects that much. The attention span of the learners is limited and they also easily forget things they learned in school. The T&L approach that has more activities that are hands-on and practical learning of science can be applied to increase the level of excitement in science learning among indigenous learners. According to Ayla (2016), learners will want to learn more scientific topics should they learned that science knowledge is important for social and academic. The relevance of scientific knowledge and skills learned to everyday life will increase their motivation to continue studying science. With the executable transfer process, it is likely to be of interest to indigenous learners to go to school and thus enhance their motivation towards learning science.

In addition, approaches or strategies used in the new curriculum suggested above should be adapted to the culture and environment of these indigenous communities or indigenous knowledge should be integrated into their curricula. Modification or special curriculum provision and in accordance with the culture of minority, indigenous communities have occurred in countries such as Canada (Lewthwaite, Owen, & Doiron, 2015; Standing Senate Committee on Aboriginal Peoples, 2011) and New Zealand (Colleen, 2008). The approach implemented in rural areas overseas are like the Etnosemiotic Approach in Mexico (Gracia, Pacheco, & Ruiz, 2013), Culturally responsive and reciprocal approaches to pedagogy in New Zealand (Bishop, 2010), Cultural resources pedagogies in Australia (Chigeza, 2011), Child-centred approach in India (Smail, 2014), culturally based culturally responsive education and schooling in the United States and Canada (James & Renville, 2012), culturally responsive pedagogies (Savage et al., 2011) and Place-based Education (Lester, 2012). All of these T&L approaches stressed the importance of environmental, cultural experience of the indigenous learners. This is so that the indigenous learners can relate what they have learned in science to their daily lives. This in turn can increase their intrinsic motivation and the indigenous learners can see the relevance of education and science in their daily lives. According to Rannikmae (2016), it is not enough to introduce learners to new and updated developments in science, but they need to see its relevance in a societal sense, to have the opportunity to be actively involved in the process of learning. As reported by Ayla (2016), a review of the science curriculum that is more focused on things related to life directly affect the environment in the classroom and in turn have a positive impact on learner learning in Turkey.

Although our results showed that *Kayeu* LOC primary science module did not give a positive effect in improving intrinsic motivation among indigenous learners, it also indicated that *Kayeu* LOC primary science module is better than conventional module used. Therefore, some aspects of modifications and improvements can be conceived to overcome the weaknesses of the module in order to give positive outcomes. The blending of suitable strategies and pedagogies with curriculum that integrates culture and environment of the indigenous community in the new module can and should have more positive effect compared to the module used in this research. All these are in hope that the level of motivation among indigenous learners can be raised to a higher point.

To enable the modifications mentioned above is effectively applied, the human resources factor also plays a very important role. New and experienced teachers placed in indigenous schools must be exposed and trained in various skills and knowledge appropriate and relevant to the remote areas. Skills and the ability of teachers to relate to the science facts with daily lives of indigenous learners also play a very important role. Learners often believe what they learn in science has nothing to do with their daily lives. When learning is associated with issues they care about, and close to them, their motivation to learn science will increase (Ayla 2016). This directly reduces negative feelings towards science and enhances the confidence of indigenous learners in the science learning process in the interior part of Malaysia.

Conclusions

This research found several significant issues of teaching and learning in indigenous schools in Malaysia. One of the issues is indigenous learners are at risk of being left behind in the aspect of education. Some parties, especially

educators feel concerned with the low level of motivation in the process of learning science, as it will contribute to the increase in the dropout rate and the decline in science academic performance among indigenous learners.

Teachers' role in the process of T&L is also an important issue. The main task of a teacher is facilitating the learning process. Therefore, teachers teaching in indigenous schools should try new strategies of teaching and create conducive conditions to motivate learners and promote their interest to learn in order to achieve the optimal level of motivation and achievement. Descriptions on the findings in this research show that T&L of science in indigenous primary schools can be improved using alternative mode of teaching such as LOC primary science module which appears to be better than the conventional module. A clear understanding of how indigenous learners learn and professional development opportunities reviewing the learning sciences should be offered to all current and pre-service teachers and other educators who work with indigenous learners. Improvement and prompt actions to address this issue including issues related to teacher's role where suitable and practical approaches will motivate learners to be more interested in their science education.

With the limitations in our research, we also encountered questions in need of further research. T&L science module which integrates local culture and environment of indigenous knowledge that are suitable and practical for indigenous learner should be carried out. The module, can be a way to help and guide teachers in teaching science to indigenous learners too. In addition, using indigenous language in the process of T&L science for indigenous learners can be studied too. This method has been carried out successfully in Canada for First Nation's community and in New Zealand for Maori community. Further research is also needed to effectively blend learning experiences in formal and informal learning in order to significantly enhance the motivation in learning science for indigenous learners. This creates an opportunity for indigenous learners to learn science in a new way. In conclusion, several efforts to improve the T&L process need to be taken seriously in the hope of enhancing motivation toward learning science among the indigenous learners. Various teaching problems in indigenous schools need to be solved so that the learning process can be implemented effectively and they, too can contribute to achieving a high level of scientific literacy.

References

Abdull Shukor Shaari, Nuraini Yusoff, Mohd Izam Ghazali, & Mohd Hasani Dali. (2011). Kanak-kanak minoriti orang asli di Malaysia: menggapai literasi bahasa melayu [Aboriginal minority children in Malaysia: Achieve malay language literacy]. *Jurnal Pendidikan Bahasa Melayu, 1* (2), 59-70.

Anderson, R. (2014). Grade repetition risk for indigenous students in early schooling in Queensland, Australia. *Procedia Social and Behavioral Sciences, 114*, 744-748.

Asnarulkhadi Abu Samah, Maria Mansor, Zahid Emby, Mariani Mansor, & Hanina Hallimatusaadiah Hamsan. (2007). Kurikulum Bersepadu Orang Asli/Penan (KAP) – Satu Pendekatan Baru dalam pembangunan Pendidikan Komuniti Orang Asli/Penan [Integrated curriculum for Aboriginal / Penan (KAP) - A new approach in the development of Aboriginal community education / Penan]. In Seminar Kebangsaan Sains Sosial: Sains Sosial Teras Pembangunan Modal Insan [National Seminar on Social Sciences: Social Science Core Human Capital Development], 20-21 Mei 2007, Kuala Lumpur.

Assembly of First Nations. (1988). Toward a vision of our future. *Tradition and Education, 1*.

Ayla, C. (2016). Student motivation in constructivist learning environment. *Eurasia Journal of Mathematics, Science & Technology Education, 12* (2), 233-247.

Azzam, A. (2007). Why students drop out. *Educational Leadership, 64* (7), 91-93.

Bishop, R. (2010). Effective teaching for indigenous and minoritized students. *Procedia Social and Behavioral Sciences, 7* (C), 57-62.

Brianzoni, V., & Cardellini, L. (2015). Science education in Italy: Critical and desirable aspect of learning environments. *Journal of Baltic Science Education, 14* (5), 685-696.

Cajete, G. (1988). *Motivating American Indian students in science and math*. Las Cruces, NM: ERIC Clearinghouse on Rural Education and Small Schools.

Chigeza, P. (2011). Cultural resources of minority and marginalised students should be included in the school science curriculum. *Cultural Studies of Science Education, 6*, 401–412.

doi 10.1007/s11422-011-9316-8.

Colleen, M. (2008). Indigenous people: Emancipatory possibilities in curriculum development. *Canadian Journal of Education, 31* (3), 614-638.

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self determination in human behaviour*. New York: Plenum Press.

Deci, E. L., & Ryan, R. M. (1987). The support of autonomy and the control of behavior. *Journal of Personality & Social Psychology, 53*, 1024-1037.

Deci, E. L., & Ryan, R. M. (1992). The initiation and regulation of intrinsically motivated learning and achievement. In A. K. Boggiano & T. S. Pittman (Eds.), *Achievement and motivation: A social-developmental perspective* (pp. 9-36). New York: Cambridge University Press.

Delmas, M. A., & Lessem, N. (2014). Saving power to conserve your reputation? The effectiveness of private versus public information. *Journal of Environmental Economics and Management, 67* (3), 353-370.

Deyhle, D. (1983). Measuring success and failure in the classroom: Teacher communication about tests and the understandings of young Navajo students. *Peabody Journal of Education, 61* (1), 67-85.

Fredrick, J. A., & Eccles, J. S. (2002). Children's competence and value beliefs from childhood through adolescence: Growth trajectories in two male sex typed domains. *Developmental Psychology, 38*, 519-533. doi: 10.1037/0012-1649.38.4.519.

Garcia, I., Pacheco, C., & Ruiz, J. (2013). Incorporating an etnosemiotic approach for literacy education of the Zapoteca language in Mexican indigenous communities. *Procedia Social and Behavioral Sciences, 93*, 1869 – 1878.

Glass, R., & Rose, M. (2008). Tune out, turn off, drop out. *American Teacher, 93* (3), 8-21.

Gottfried, A. E. (1985). Academic intrinsic motivation in elementary and junior high school students. *Journal of Educational Psychology, 77*, 631-645.

Gottfried, A. E. (1990). Academic intrinsic motivation in young elementary school children. *Journal of Educational Psychology, 82* (3), 525-538.

Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (2001). Continuity of academic intrinsic motivation from childhood through late adolescence: A longitudinal study. *Journal of Educational Psychology, 93*, 3-13. doi:10.1037/0022-0663.93.1.3.

Gottfried, A. E., & Gottfried, A. W. (1996). A longitudinal study of academic intrinsic motivation in intellectually gifted children: Childhood through early adolescence. *Gifted Child Quarterly, 40*, 179-183.

Hirst, G., Van Knippenberg, D., Chen, C. H., & Sacramento, C. A. (2011). How does bureaucracy impact individual creativity? A cross-level investigation of team contextual influences on goal orientation–creativity relationships. *Academy of Management Journal, 54*, 624-641.

Hong, E., Peng, Y., & Rowell, L. L. (2009). Homework self-regulation: Grade, gender, and achievement-level differences. *Learning and Individual Differences, 19*, 269-276. doi:10.1016/j.lindif.2008.11.009.

James, A. B., & Renville, T. (2012). Ohiyesa's Path: Reclaiming native education. *Reclaiming children and youth, 21*(3), 27 – 30. Retrieved from www.reclaimingjournal.com.

Kamisah Osman, Zanaton Haji Iksan, & Lilia Halim. (2007). Sikap terhadap Sains dan sikap saintifik di kalangan pelajar Sains (Attitudes toward science and scientific attitudes among Science students). *Jurnal Pendidikan, 32*, 39-60.

Leibham, M. E. (2005). The impact of interest on elementary school children's selfconcepts, intrinsic motivation, academic achievement, and willingness to broaden knowledge. (Unpublished doctoral dissertation). Indiana State University.

Lester, L. (2012). Putting rural readers on the map: Strategies for rural literacy. *The Reading Teacher, 65*(6), 407-415. doi:10.1002/TRTR.01062.

Lewthwaite, B. E., Owen, T., & Doiron, A. (2015). Curriculum change and self-governing agreements: A Yukon First Nation case study. *International Journal of Multicultural Education, 17* (3).

Li, J. Y., & Shieh, C. (2016). A study on the effects of multiple goal orientation on learning motivation and learning behaviors. *Eurasia Journal of Mathematics, Science & Technology Education, 12* (1), 161-172.

Masters, G. N. (2009). *A shared challenge: Improving literacy, numeracy and science learning in Queensland primary schools*. Victoria: Australian Council for Educational Research.

McEwan, P. J., & Trowbridge, M. (2007). The achievement of indigenous students in Guatemalan primary schools. *International Journal of Educational Development, 27*, 61-76.

Min, K. K., & Mi, K. C. (2015). Design and implementation of integrated instruction of mathematics and science in Korea. *Eurasia Journal of Mathematics, Science & Technology Education, 11*(1), 3-15.

Mohammad Johdi Salleh, & Abdul Razaq Ahmad. (2009). Kesedaran pendidikan dalam kalangan masyarakat orang asli [Education awareness among indigenous communities]. In Abdul Razaq Ahmad & Zalizan Mohd. Jelas (Pnys). Masyarakat Orang Asli: Perspektif Pendidikan dan Sosiobudaya (Aboriginal Community: Education and Socio-Cultural Perspective), pp.47-58. Bangi: Fakulti Pendidikan, Universiti Kebangsaan Malaysia.

Nur Bahiyah binti Abdul Wahab, Maryati Mohamed, Azman Hassan, & Mohd. Najib Haron. (2013). *Penerapan elemen sekolah rimba Malaysia dalam kalangan murid orang asli* [Deployment of Malaysia jungle school elements among aboriginal students]. 2nd International Seminar on Quality and Affordable Education (ISQAE 2013). pp. 424-432.

Palmer, D. (2005). A motivational view of constructivist-informed teaching. *International Journal of Science Education, 27* (15), 1853-1881.

Prout, S., & Hill, A. (2012). Situating indigenous student mobility within the global education research agenda. *International Journal of Educational Research, 54*, 60–68.

Ramle bin Abdullah, Wan Hasmah Wan Mamat, Amir Zal W. A., & Asmawi Mohamad bin Ibrahim. (2013). Teaching and learning problems of the orang asli education: students' perspective. *Asian Social Science, 9* (12), 118-124.

Rannikmae, M. (2016). Some crucial areas in science education research corresponding to the needs of the contemporary society. *Journal of Baltic Science Education, 15*(1), 4-6.

Ryan, R. M., Connell, J. P., & Deci, E. L. (1985). A motivational analysis of self-determination and self-regulation in education. In C. Ames & R. Ames (Eds.), *Research on Motivation in Education: Volume 2. The Classroom Milie*u (pp. 13-51). New York: Academic Press.

Savage, C., Hindleb, R., Meyerc, L. H., Hyndsa, A., Penetitob, W., & Sleeterd, C. E. (2011). Culturally responsive pedagogies in the classroom: indigenous student experiences across the curriculum. *Asia-Pacific Journal of Teacher Education, 39* (3), 183–198.

Scheel, M., Madabhushi, S., & Backhaus, A. (2009). The academic motivation of at-risk students in a counseling prevention program. *Counseling Psychologist, 37*(8), 1147-1178.

Schiefele, U. (1991). Interest, learning, and motivation. *Educational Psychologist, 26*, 299-323.
Smail, A. (2014). Rediscovering the teacher within Indian child-centred pedagogy: Implications for the global Child-Centred Approach. *Journal of Comparative & International Education, 44* (4), 613-633.
Standing Senate Committee on Aboriginal Peoples. (2011). *Reforming First Nations education: From crisis to hope*. Ottawa, ON.
Steinmayr, R., & Spinath, B. (2009). The importance of motivation as a predictor of school achievement. *Learning and Individual Differences, 19*, 80-90. doi:10.1016/j.lindif.2008.05.004.
Subahan Mohd Meerah. (2009). Overcoming marginalized children learning through professional development of teachers. *Procedia Social and Behavioral Sciences, I*, 1759 – 1762.
The Organisation for Economic Co-operation and Development (OECD). (2013). *PISA 2012 results: Excellence through equity: Giving every student the chance to succeed (Volume II)*. PISA, OECD publishing.
Trilling, B., & Fadel, C. (2009). *21st century skills: Learning for life in our times*. San Francisco, CA: Jossey-Bass.
Walker, O. C., & Greene, A. B. (2009). The relations between student motivational beliefs and cognitive engagement in high school. *The Journal of Educational Research, 102*, 463-471. doi:10.3200/JOER.102.6.463-472.
Zanaton Haji Iksan, Lilia Halim, & Kamisah Osman. (2006). Sikap terhadap Sains dalam kalangan pelajar Sains di peringkat menengah dan matrikulasi [Attitudes toward science among science students at the secondary and matriculation]. *Pertanika Journal of Social Science & Humanities, 14*(2), 131-147.
Zhu, Y., & Leung, F. K. S. (2011). Motivation and achievement: Is there an East Asian model? *International Journal of Science and Mathematics Education, 9*, 1189-1212.
Zimmerman, B. J. (2008). Investigating self-regulation and motivation: Historical background, methodological developments, and future prospects. *American Educational Research Journal, 45*, 166-183. doi:10.3102/0002831207312909.

Received: *April 06, 2016* Accepted: *June 14, 2016*

Cindy Wong Chyee Chen	Currently a Doctoral Student (Science Education Programme) at the Faculty of Education, The National University of Malaysia, Malaysia. E-mail: chyeechen@yahoo.com
Kamisah Osman	Phd in Science Education from the University of Manchester, United Kingdom. Currently a Deputy Director at the National University of Malaysia, Center for Quality Assurance, and a Professor in Science Education at the Department of Teaching and Learning Innovation, Faculty of Education, the National University of Malaysia, Malaysia. E-mail: kamisah@ukm.edu.my