

IMPLEMENTATION OF FOREST STEM MODULE BASED ON MORAL  
VALUES IN INDIGENOUS EDUCATION

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## **DEDICATION**

This thesis is dedicated especially to my father, who taught me that learning and gain more knowledge is a part of jihad. It is also dedicated to my mother, who taught that the value of knowledge is priceless.

Brothers, sister and sister-in-law who always provide assistance, support, undivided spirit and encouragement for me to keep going further.

My supportive supervisor, Dr Norhasniza binti Ibrahim who always guide and motivation to complete this project report.

My companion in Universiti Teknologi Malaysia who are always sharing valuable ideas, information and experiences.

Only Allah S.W.T could repay all of your deeds.

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## **ABSTRACT**

This study is highlighting the use of module as a teaching material for teachers in teaching STEM for Indigenous Education. Although Indigenous students have high knowledge with the flora and fauna, inappropriate teaching techniques and teaching materials have increasing the education gap between the STEM and the Indigenous students. Moreover, the implementation of moral values could not be done effectively. Thus, the objective of this study is to develop a Forest STEM Module based on wilderness to inculcate moral values for Indigenous students. This module is using a constructivist learning theory that merging the 5E Instructional Model and 8 Aboriginal Ways of Teaching and Learning to create an active learning environment. The developed Forest STEM Module is evaluated by 17 STEM experts qualitatively through an open-ended survey. The responses are analyzed using content analysis and Inter-rater Reliability (IRR) test. This research found out that the overall satisfaction of this quality module is 76.47% for IRR test indicating a sufficient amount of agreement from experts that the Forest STEM Module is appropriate to be used as a teaching material for Indigenous Education. Therefore, this Forest STEM Module could be used for educators to increase the motivation and academic achievement in STEM for Indigenous students.

## **ABSTRAK**

Kajian ini menyoroti penggunaan modul sebagai bahan pengajaran kepada guru-guru dalam mengajar STEM untuk Pendidikan Orang Asli. Walaupun pelajar Orang Asli mempunyai pengetahuan yang tinggi terhadap flora dan fauna, teknik pengajaran dan bahan pengajaran yang tidak sesuai telah meningkatkan jurang pendidikan antara STEM dan pelajar Orang Asli. Selain itu, pelaksanaan nilai-nilai moral tidak dapat dilakukan dengan berkesan. Oleh itu, objektif kajian ini adalah untuk mengembangkan modul Forest STEM berdasarkan hutan belantara untuk menanamkan nilai moral bagi pelajar Orang Asli. Modul ini menggunakan teori pembelajaran konstruktivis yang menggabungkan Model Instruksional 5E dan 8 Cara Pengajaran dan Pembelajaran Orang Asli untuk mewujudkan persekitaran pembelajaran yang aktif. modul Forest STEM yang dikembangkan telah dinilai oleh 17 pakar STEM secara kualitatif melalui tinjauan terbuka. Respons dianalisis menggunakan analisis kandungan dan ujian Inter-rater Reliability (IRR). Penyelidikan ini mendapati bahawa kepuasan keseluruhan modul kualiti ini adalah 76.47% untuk ujian IRR yang menunjukkan jumlah persetujuan yang mencukupi dari para pakar bahawa modul Forest STEM sesuai untuk digunakan sebagai bahan pengajaran untuk Pendidikan Orang Asli. Oleh itu, modul Forest STEM ini dapat digunakan untuk pendidik untuk meningkatkan motivasi dan pencapaian akademik dalam STEM untuk pelajar Orang Asli.

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## **LIST OF ABBREVIATIONS**

4C	-	Communication, Collaboration, Critical thinking and Creativity
ADDIE	-	Analyze, Design, Develop, Implement and Evaluate
HOTS	-	Higher Order Thinking Skills
IRR	-	Inter-rater reliability
KAP	-	Curriculum for Orang Asli and Penan
K9	-	Comprehensive Special Model School Programme
LOTS	-	Lower Order Thinking skills
NPE	-	Malaysian National Philosophy of Education
NSF	-	National Science Foundation
PBL	-	Problem-based learning
STEM	-	Science, Technology, Engineering and Mathematics
ZPD	-	Zone of Proximal Development

## LIST OF SYMBOLS

%	-	Percentage
n	-	Number of respondents

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## CHAPTER 1

### INTRODUCTION

#### 1.1 Introduction

Indigenous or aborigines is a term for the ethnic group that is believed to be the ‘original or first peoples’ in the area, wherein Peninsular Malaysia, it can be called as *Orang Asli* (Joseph, 2008; Seong, 2016; Shamsudin & Mahadir Naidu, 2019). This minority community has a population approximately 1% of the Malaysian population (Malaysian Ministry of Rural and Regional Development, 2005; Renganathan, 2016). There are 18 sub-tribes of the Indigenous peoples in Malaysia where the three main tribes are Proto Malay, Senoi and Negrito and each tribe have their own uniqueness in terms of language, lifestyle and customs (Wahab, Mustapha & Ahmad, 2016b; Abd Rahman *et al.*, 2018).

Indigenous peoples are a community that preserve the flora and fauna and have great skills in managing natural sustainability (Shamsudin & Mahadir Baidu, 2019). According to Lambin *et al.* (2019), Indigenous peoples in Malaysia have a belief that they are forbidden to cause any harm to the forest as it is considered as taboo and if they disobey their belief, it will be affecting their lives. Thus, the forest is inseparable from their lifestyle as it is the main resource area to survive (Abd Rahman *et al.*, 2018). Although they have knowledge on using the natural resources in the forest, they are unable to apply it in STEM-related subjects in school causing their poor achievement in science-related subjects (Houge, 2016). The factors that cause both younger generations of Indigenous peoples to have poor knowledge in education are including their parents’ low education background; language and cultural barriers; poverty and socioeconomic factors; teachers’ guidance and lack of attendance in school (Rozniza Aznie *et al.*, 2018). Houge (2016) also pointed, these factors causing the younger generation of Indigenous peoples are barred from ensuring any Science, Technology, Engineering and Mathematics (STEM) courses in school.



In Malaysia Education Blueprint 2013-2025 (MOE, 2013a), in order to develop a society with high scientific thinking skills, the Ministry of Education has provided an Inclusive Education Programmes for Indigenous peoples' education. Another effort in changing Indigenous peoples' mentality and temperament on the importance of education in their community is administering *Kelas Dewasa Ibu Bapa Orang Asli Dan Penan* (KEDAP) (Salleh & Ahmad, 2009; Rosniza Aznie *et al.*, 2018). Indigenous Education in Malaysia also emphasized the local context, holistic culture and the moral values for the younger generation to preserve the culture and passed it to the future generation (Shamsudin & Mahadir Naidu, 2019). Abd Rahman *et al.* (2018) stated, for Indigenous students, the educators need to cater to many fun-learning instructional methods in teaching STEM-related subjects to prevent them to be bored. They also highlighted, one of the approaches is by providing a module as a learning material for guiding students to learn Chemistry topics (Abd Rahman *et al.*, 2018). Therefore, the module developed needs to contain the STEM, environment-related and also able to inculcate some moral values to the Indigenous students.

## **1.2 Background of the Study**

According to Aboriginal Peoples Development Strategic Plan 2011-2015 and population census in 2010, there were estimated to be 178,197 Indigenous peoples in Malaysia (Rozniza Aznie *et al.*, 2018). Majority of them are living in the forest and using the natural resources for survival where they have a high skill in hunting, cultivating and recognizing plants in the forest which shows their close relationship with the wild. Notwithstanding, they are still lagging on today's education. and may inhibit the goal of Malaysia in producing a society that can think critically and scientifically (MOE, 2013a).

### **1.2.1 Factors of Poor Education Among Indigenous People**

There are many factors why Indigenous students have low interest in education (Wahab *et al.*, 2016b). Firstly, teachers are not implementing environmental education

in teaching other subjects except science-related subjects which show a lack of sensitivity for Indigenous Education in improving the community's understanding (Abd Rahman *et al.*, 2018). Abd Rahman *et al.* (2018) pointed, Indigenous peoples in Malaysia has a shallow understanding of STEM Education although they encounter STEM Education in their daily routine. In order to master STEM subjects, the learner needs to have a high understanding skill. According to Ismail *et al.* (2017), understanding skills require active involvement in evaluation, arranging and consulting the information that has been read through any reading materials. However, for Indigenous people, low linguistic skill to Malay language and English causes an education gap for them to master subjects in school which lead to low motivation in learning science (Linsah & Mahamod, 2018). This will result in poor scientific skills and manipulating skills, causing them to have difficulties in scoring high for science subjects (Haslinda *et al.*, 2015).

While, today's latest trend in education is 21<sup>st</sup>-century learning skills which emphasize 4C's (critical thinking, communication, collaboration and creativity) to all student, Indigenous students still unable to achieve it because the learning method used in an urban area unsuitable for them (Linsah & Mahamod, 2018). Another factor that has been stated in most researches that causing the Indigenous peoples unable to reach the 21<sup>st</sup> century skills is due to the socioeconomic factor, where the parents unable to send their children to school causing a high number of Indigenous students' dropout (Md Isa, Sobri & Hashnuddin, 2018; Wahab *et al.*, 2016b; Rabahi, Yusof & Awang, 2016). This can be proved on the statement by Wahab *et al.* (2016b), where nearly 34% of Indigenous students are unable to further their study in secondary school due to their family low income and other related factors.

This shows that teaching strategy is very crucial for students' learning process and their understanding of scientific concepts. In order to improve students' learning process, Malaysia's Ministry of Education has implemented Science, Technology, Engineering and Technology (STEM) Education in 2017 which changes the traditional teaching and learning methods into project-based learning and collaborative learning (Nur Amelia & Lilia, 2019). However, according to Wahab *et al.* (2016b), among all ethnic groups, Indigenous peoples are placed at the bottom for the level of achievement

in Malaysia. Compared to foreign Indigenous students in PISA 2014, Indigenous students from other countries such as Australia are more interested in pursuing STEM Education compared to Malaysia's Indigenous peoples (Md Isa *et al.*, 2018). McKinley (2016) highlighted, if Indigenous peoples are able to master STEM Education and able to relate to their knowledge about the wild, they will be able to manipulate the natural resources in a better way such as commercialization of medical herbs and managing the ecosystem more effectively.

### **1.2.2 Moral Values in Indigenous Education**

Value education is one of the vital elements that need to be implemented in all disciplines including STEM subjects (Arsad, Osman & Embi, 2017). National Education Philosophy which was revised in 1996 is focused on holistic development for Malaysian people to produce a society who “intellectually, spiritually, emotionally and physically” which means all Malaysian civilians need to pose high moral requirements, responsibility and a good human being (MOE, 2013a). In Malaysia, skills and moral values were emphasized in Primary School Standard Curriculum (KSSR) and Secondary School Standard Curriculum (KSSM) in order to develop good attitude learners towards themselves, family, society and environment (Arsad *et al.*, 2017). For an example, moral values such as courteous, responsibility, respectfulness, and honest were sown through textbook, module and lesson planning to produce a good citizen (Tan, Mahadir Naidu & Jamil, 2018).

However, according to research by Pa and Tapsir (2013), although moral values were being underlined in the curriculum, it was not really giving much attention in STEM-related subject may due to educators thinking STEM subjects as a neutral, objective and values are not important to be taught (Arsad & Osman, 2019). According to Ismail *et al.* (2017), Şahinkayasi and Kelleci (2013) and Arsad and Osman (2019), the implementation in the classroom is still low as the cognitive domain is more prioritized compared to the affective domain and lack of assessment to measure either the moral values are being cultivated or not. In Maslow Hierarchy of Needs Theory, human needs are arranged in orderly manner which is a psychological need, safety

needs, love or belonging need, self-esteem and lastly, self-actualization. (Haslinda *et al.*, 2015). Based on Maslow theory, psychological needs are vital for people to know the importance of learning, thus it will lead to the raising of their awareness towards themselves, society and the surrounding (Haslinda *et al.*, 2015). This proves the importance of cultivating moral values to all peoples including among Indigenous.

### **1.2.3 Indigenous Teaching and Learning Models**

Research shows that there are few teaching and learning models for Indigenous. For instance, 8 Aboriginal Ways Framework (Yunkaporta, 2009a) and Pedagogical practices for engaging Indigenous students with science teaching. These models provide guidelines in developing a STEM module based on the wilderness that is able to apply the moral values for Indigenous students (Said *et al.*, 2019). 8 Aboriginal Ways pedagogical model was developed by the Regional NSW Department of Education which acts as a learning tool for Indigenous peoples (Windslade, 2018). According to Yunkaporta (2009a), this framework consists of eight interconnected pedagogies which are story sharing, learning maps, non-verbal, symbol and images, land links, non-linear, deconstruct or reconstruct and community links. These pedagogies are proposed for a better engagement for Indigenous learners in learning (Department of Health, 2014).

The second model is the Pedagogical practices for engaging Indigenous students with science teaching. According to Hackling *et al.* (2015), there are four levels to gain students' interest in learning science which can be shown in Figure 1.1 below. Based on Figure 1.1 below, the first level is the green zone which related to relationship building and students' responsibility in learning; the second level is in the yellow zone, where, providing hands-on science activities to allow a better learning engagement; the third level which is in the beige colour is involving various teaching and learning methods to escalate the learning engagement; and the last level is the blue zone, where, educators able to connect the science activities with real-life situations using Culturally Responsive Pedagogies (Hackling *et al.*, 2015).

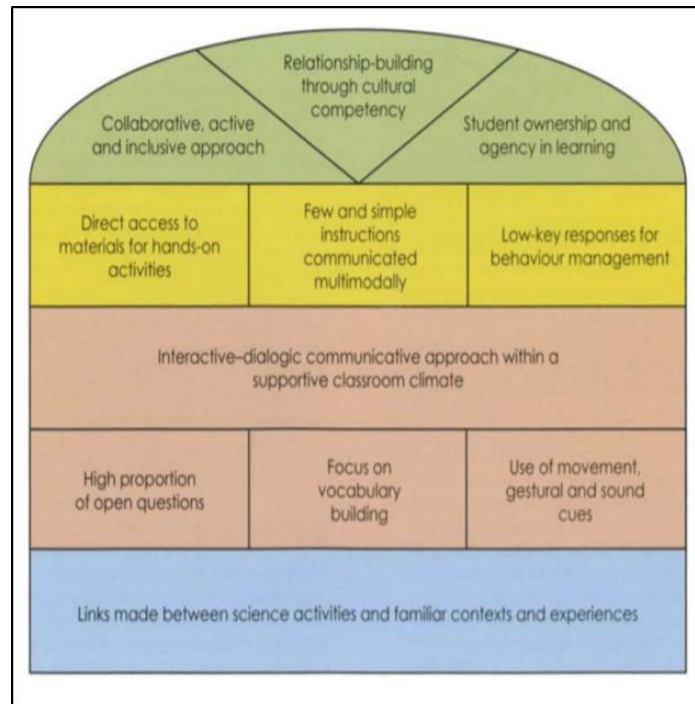


Figure 1.1 Pedagogical Practices for Engaging Aboriginal Students with Science Learning Levels (Source: Hackling *et al.*, 2015)

Although both frameworks are suitable for learning engagement for Indigenous communities, there is still a gap in cultivating moral values among them to produce a society that is not only great in knowledge but has admirable morals. As such, the requirement in developing a STEM module is needed to guide Indigenous peoples in improving their understanding of STEM-related subjects by relating nature with scientific concepts and to assist in enhancing their lifestyle. Moreover, the module also needs to be able to implant moral values for Indigenous peoples in order to create a community that appreciates the wild and able to maintain the culture for future generation (Wahab *et al.*, 2013a). Thus, the development of Forest STEM Module which is a module inspired by STEM based on wilderness may be a huge help in raise awareness about the importance of the moral values to the Indigenous Education.

### 1.3 Problem Statement

Indigenous peoples have a close relationship with the forest. They also consumed a better knowledge in conveying the facts, ethics and wisdom on the ecosystem in their lives (Lambin *et al.*, 2019). Thus, they need a piece of advanced knowledge in managing the natural resources in order for them to obtain the lessons on the importance of the flora and fauna and also nurtures the moral values based on the wild. However, they are not being trained well in the current education system on the relationship of their knowledge on flora and fauna with STEM-related subjects resulting low understanding in STEM subjects and they unable to apply their knowledge on the wild for advance used in their lifestyle (Joseph, 2008; Hogue, 2016; Shamsudin & Mahadir Naidu, 2019). Poor understanding in relating nature with science concepts inhibits their level of thinking which causes them still at lower-order thinking skills level (LOTS) (Wei, Peng & Salleh, 2017).

Furthermore, an uncondusive school environment, curriculum and subjects that do not include environmental education in Indigenous Education caused poor school achievement (Shamsudin & Mahadir Baidu, 2019). According to Chyee Chen and Osman (2017b), the role of a simulative and conducive learning environment is vital in ensuring effective learning among Indigenous students. Thus, using a module using the element of wilderness which is more related to their way of living in teaching and learning is a great help in creating a conducive learning environment for Indigenous students (Yew, Ramlan & Ahmad, 2019).

Moreover, cultivating moral values in education is important to develop individuals rich in the manner and civil alongside an intelligent and able to think scientifically. According to Nor, Sukimi and Nor (2018), some Indigenous informants agreed that education was not just useful in advancing their standard of living, it also needed for them to be exposed with various values in order to adapt in the present era. However, past research on planting moral values is still not widely known to be implemented in STEM-related fields compared to other fields (Arsad *et al.*, 2017). Nevertheless, not all moral values are being pursued among students today and most

students were unable to define all moral values which lead to a serious issue in education (Othman, Suhid & Roslan, 2015).

Therefore, providing a STEM module based on wilderness named as Forest STEM Module allows the application of moral values in Indigenous Education needs to be done. Based on this module, the moral values will be the core that underlying the STEM module based on wilderness which is suitable for the latest education trend. The STEM modules based on wilderness were provided to produce a community that has high scientific reasoning, rich in moral values and able to help in transforming Malaysia from a developing country into a developed country.

#### **1.4 Objectives of the Study**

The objectives of this study are as follows: -

- (a) To develop a Forest STEM Module based on wilderness to inculcate moral values for the Indigenous Education based on the ADDIE Model.

#### **1.5 Research Questions of the Study**

The specific research questions of this study are: -

- (a) What are the difficulties of indigenous students in learning STEM in the ADDIE's Analysis phase?
- (b) What is the design of the Forest STEM Module suitable for applying moral values among the Indigenous students in the ADDIE's Design phase?
- (c) What are the activities developed in the Forest STEM Module in the ADDIE's Development phase?

- (d) What is the expert assessment of the Forest STEM Module in the ADDIE's Evaluation phase?

## 1.6 Theoretical Framework

The theoretical framework regulating the design and the development for this Forest STEM module is shown in Figure 1.2 below.

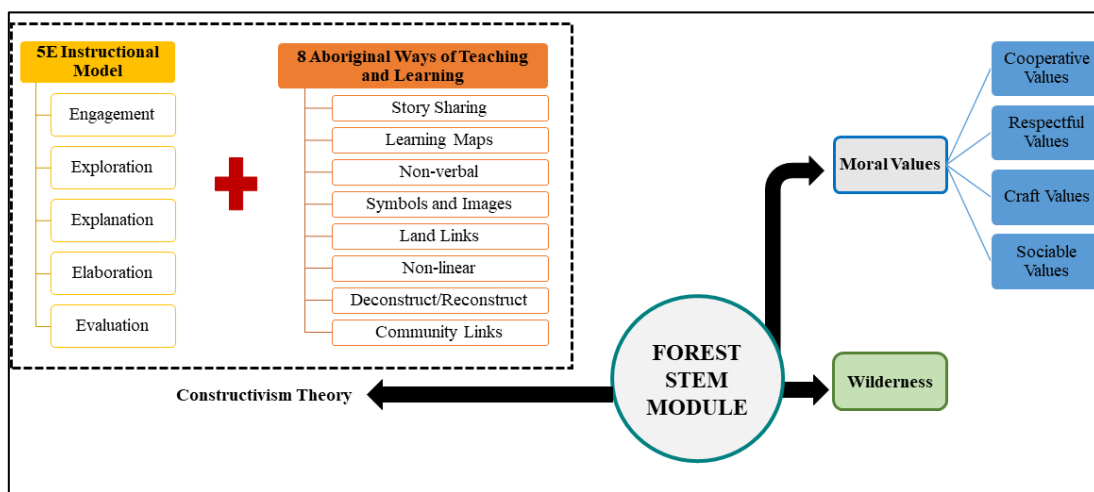


Figure 1.2 Theoretical framework regulating the design and development of the Forest STEM Module

Based on Figure 1.2 above, the development of Forest STEM Module is based on the constructivist learning theory. This theory could be viewed as a concept which outlined the learning experience and how a person builds their own knowledge based on what has been discovered (Samat et al., 2019). Jones and Brader-Araje (2002) explained this theory as shifting the focus from students' knowledge as a product to knowledge as a learning process (student-centred) where students construct their own learning based on their prior knowledge. Moreover, the STEM Module could be used as scaffolding or teaching guidance for teachers to educate STEM for Indigenous students (Vygotsky, 1987) Therefore, to provide a STEM module for Indigenous students, 5E Instructional Model by Bybee (2019) merged with the 8 Aboriginal Ways



of Teaching and Learning (Yunkaporta, 2009a) are selected as teaching strategies in the module.

According to Bybee (2019), 5E Instructional Model is an inquiry learning that allow students to discover their own learning with an active learning environment. Samat et al. (2019) highlighted, when the learners are involved in an active learning environment and discover their learning, it will lead to meaningful learning and improve the understanding of STEM concepts. On the other hand, 8 Aboriginal Ways of Teaching and Learning is focusing on embedding cultural pedagogy to increase the engagement on learning STEM subjects for Indigenous students (Bilton et al., 2018a). 8 Aboriginal Ways of Teaching and Learning is relating the components of culture, language, geographic location and sustainability in STEM-related subjects to improve Indigenous students understanding (Rosnon & Talib, 2019).

Moreover, this STEM Module is focusing on utilizing wilderness in the teaching strategies and also focusing on the inculcation of moral values for Indigenous students. STEM module based on wilderness is an informal learning approach that utilized the forest and their resources as locations and learning materials in teaching STEM integrated subjects (Wahab *et al.*, 2013a). It is also because, the Indigenous mostly lived in the forest which is remote from the urban area and they are more familiar with the wild (Lambin *et al.*, 2019). Thus, using the wild as the main focus in this module could reduce the education gap for Indigenous students and to allow students to have meaningful learning in STEM-integrated subjects (Wahab *et al.*, 2013a).

Moral values are one of the fundamental elements in education (Chyee Chen & Osman, 2016a). This is because, fostering moral values through a module could improve the Indigenous students' awareness in appreciating the nature, culture and to strengthen the bond among the Indigenous students with the educators (Wahab & Nordin, 2021). Thus, the inculcation of moral values is included in this module to produce an intellectual Indigenous student with rich in manner (Arsad & Osman, 2019). Some of the moral values from the Malaysian National Philosophy of Education

(NEP) will be emphasized in this module are respectful values, cooperative values, craft values and sociable values (Sabilan, 2018).

### **1.7 Rationale of the Study**

Most researchers are looking into teaching and learning strategies to improve Indigenous Education and to increase Indigenous students' attendance in school. However, moral values are crucial in preserving their tradition and appreciating the ecosystem while learning. Thus, this research is more focused on applying the moral values such responsibility, cooperative and environmental awareness while providing them with a STEM module based on wilderness which was designed using 5E Instructional Model and 8 Aboriginal Ways of Teaching and Learning.

### **1.8 Significance of the Study**

Teaching strategy is important for students' learning process and understanding of scientific concepts. It can be supported by Burgess *et al.* (2019), who explained, effective learning approaches lead to improvement in students' learning and academic performance. However, for Indigenous Education, the teaching and learning used for Indigenous students mostly deemed unfit to improve their learning process. Indigenous in Malaysia have high knowledge on plants and animals due to their location (Lambin *et al.*, 2019) which need to be included in teaching and learning in STEM subjects to show the connection of STEM concepts with their prior knowledge (Bybee, 2019).

In addition, the mastery of learning STEM disciplines will help the Indigenous to improve their standard of living (Nor *et al.*, 2018). Hence, using a module as a teaching and learning strategy using the element of wilderness will reduce the education gap among the Indigenous students and a good solution for STEM educators to teach them. A research was done by Kasim and Ahmad (2018) on the development of STEM modules in teaching science topics conclude that using a module as a

learning tool helps in improving students' understanding. However, the development of learning modules for Indigenous Education in Malaysia that are related to STEM based on wilderness is not widely common. Therefore, this study can be used as a reference for Indigenous Education in Malaysia.

## **1.9 Scope and Limitation of Study**

The scope of this research is to underline the development of Forest STEM Module based on wilderness for the inculcation of moral values and to identify the suitability of the Forest STEM Module to the Indigenous Education. The module uses the 5E Instructional Model and 8 Aboriginal Ways of Teaching and Learning strategy to teach Acid and Bases topic. The research was limited to chapter 6 of Acid and Bases and included in Form Four Chemistry subject. The sample for the present study is limited which composed of teachers and module experts due to the purposive sampling technique which is controlled to 17 people to evaluate the Forest STEM Module. Secondly, the past study has relied on quantitative analysis for data collection and thus, the result is restrictive. Therefore, the qualitative methodology for data collection should be adopted simultaneously in order to analyze a wider point of view of the present study compared to quantitative analysis. Lastly, due to the spreading of the Covid-19 globally has forbid the social activity to all people in the world (Osman, 2020). Thus, the implementation of the Forest STEM Module in the Implementation phase of the ADDIE Model could not be carried out for Indigenous students.

## **1.10 Definitions of the Key Terms**

### **1.10.1 Indigenous People**

Indigenous people or Aborigines or known in Malaysia as *Orang Asli* is defined as an 'Original People' that inhabited the Malay tropical forest since the 8<sup>th</sup> century (Wahab *et al.*, 2016b). Sawalludin, Min and Ishar (2020) also defined the Indigenous people as *primaeval* inhabitants who reside in Peninsular Malaysia which

comprises 18 ethnics that can be differentiated based on language and social-cultural identities. Other definition of Indigenous or *Orang Asli* is the ‘first people’ or the descendants of earlier inhabitants in Peninsular Malaysia from 5,000 years ago and resides in rural and remote areas such as forest (Nordin, Hassan & Danjuma, 2018). Thus, Indigenous could be summarized as the descendants of original people that reside in remote areas far from modern development.

### **1.10.2 Science, Technology, Engineering and Mathematics (STEM)**

STEM is an acronym which stands for Sciences, Technology, Engineering and Mathematics subjects. Whereas, the STEM Education could be defined as a combined area of Science, Technology, Engineering and Mathematics where the subject areas can be taught separately or connect the areas with each other (Dugger, 2010; Akaygun & Aslan-Tutak, 2016).

#### **1.10.2.1 STEM Based on Wilderness**

According to the National Geographic Society (2012), the wilderness is an undisturbed area from urban human development and a natural ecosystem for plants and animals. Hawes, Dixon and Bell (2018) also described wilderness as an inland water body remote from infrastructure and landscape disruption and an area that has been inhabited by the Indigenous society which predominantly a hunter-gatherer and have a wilderness-based lifestyle. Hence, STEM based on wilderness or in Malay, this term can be said as *STEM Belantara* is a learning area that links STEM concepts with nature or forest in teaching and learning (Wahab *et al.*, 2013a). In this research, STEM based on wilderness could be specified as utilizing all resources in the wild for example location, soil, water and plants in teaching and learning to allow a better understanding in STEM-related subjects.

### **1.10.3 Moral Values**

Moral values or noble values can be viewed in many perspectives. According to Hasan, Hamzah and Awang (2014) as cited in Arsad *et al.* (2017), moral values can be viewed as human life practice dwelling with positive and cultured or civilized aspects which lead to a rich culture in one's life. Meanwhile, Clement (2013) defined moral values as an inner belief of a person which is associated with social values that lead to certain social actions and conduct. Therefore, in this study, the moral values can be illustrated as students' positive attitudes and civilized belief inculcated based on the National Philosophy of Education (NPE) when learning Chemistry concepts.

### **1.10.4 Module**

There are many definitions of modules from different researchers. A view by Bakare (2020) stated a module is a unit of curriculum based on the progress of students' level of competencies. Meanwhile, for Fajarini, Soetjipto and Hanurawan, (2016), a module can be defined as a teaching material which the contents are arranged in order and easy to understand for students based on their level of knowledge to allow students' independent learning. A module is a "*self-contained, independent unit of a planned series of learning activities*" which is designed in the form of a booklet to guide students to achieve learning objectives (Anyanwu, Nzewi and Akudolu, 2004; Bakare, 2020). The last view is by Oristian (2007) as cited in Bakare (2020) where the module is viewed as a piece of well-organized information that includes clear objectives, contents, activities and assessment. Hence, it can be concluded that a module is an organized teaching material as guidance for students.

### **1.10.5 Forest STEM Module**

Forest STEM Module is a teaching module used in this study. The ADDIE Model is used as the guidance in designing and developing in an organized manner (Uzunboylu & Koşucu, 2017). The Forest STEM Module used a STEM Education

based on the wild where uses the resources from the wild as teaching materials in teaching and learning Chemistry for Indigenous students. This module also implements the 5E Instructional Model by Bybee (2019) and 8 Aboriginal Ways of Teaching and Learning (Yunkaporta, 2009a) to improve Indigenous students' engagement in learning Chemistry topic and to create an active learning environment. Moreover, moral values also being implemented in the teaching and learning for the Forest STEM Module.

### **1.11 Conclusion**

To reduce the education gap between the Indigenous students and the STEM, this research decided to build a STEM Module exclusive for Indigenous students. Thus, this research aims to develop a Forest STEM Module based on wilderness to inculcate moral values using the ADDIE Model. The constructivist teaching strategies used in the Forest STEM Module are 5E Instructional Model and 8 Aboriginal Ways of Teaching and Learning for Indigenous Education.

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