FOREST MATERIALS BASED LEARNING MODULE FOR INDIGENOUS PEOPLE: PROBLEM BASED LEARNING ORIENTED

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ABSTRACT

The total of indigenous people who live in 70 nations is more than 370 million. Most of them live in forest, their presence in the forest makes them seek and utilize materials from the forest. This study aims to develop a module based on forest material using the ADDIE model, and produce a valid module for indigenous people in terms of content, suitability, and potential effectiveness. This study was Research and Development (R&D) study using steps of ADDIE model. Module developed was assessed by experts that have academic background in chemistry, chemistry education, and science education. The result showed that module is valid (overall percentage score = 91.23), with content (percentage score = 95.6), suitability (percentage score = 87.43), and potential effectiveness (percentage score = 90.67). By obtaining valid module, hopefully it could be used widely in order to as media to share information how to use forest material appropriately and encourage to keep healthy especially after COVID19 pandemic.

Keywords: Module, Indigenous People, Problem Based Learning, ADDIE

1. INTRODUCTION

More than 370 million indigenous people live in 70 nations throughout the world, according to studies. Usually, indigenous people are considered descendants of people who lived in a nation or geographical region when the arrival of individuals of other cultures or ethnic backgrounds. Practicing distinctive traditions, the features of society, culture, economy and politics are different from those of the dominant societies they inhabit. During pandemics, the strong social and cultural determinants of health lead indigenous people to experience greater infections and more severe symptoms and deaths than the general population (Summers, Baker, & Wilson, 2018).In general, Indigenous People bear a higher burden of noncommunicable and infectious illnesses, (Allan & Smylie, 2015).

The majority of indigenous people live in forests that occupy about a third of the world's geographical area. Nearly all of it is home to indigenous and rural people with customary forest rights and have established traditional knowledge and ways of life that are aware of their surroundings in the woods. Communities have managed the environment for a long time. through their own traditional knowledge-based systems, for decades, people have followed the same customs, norms, and beliefs ('traditional use') (Chao, 2012).

There are several ways in which existing international definitions of forest differ from one another. For example, the Organization for Food and Agriculture defines forest based on the minimum height threshold of trees (5m), minimum crown cover (10%) and minimum extent of forest area (0.5 ha). According to this definition, the world's forest covers slightly under 4 billion hectares, or around 30% of the total land area. The United Nations Framework Convention on Climate Change (UNFCCC) defines

forest as having a minimum area of 0.01-1.0 ha, a minimum tree height of 2-5m, and a minimum crown, cover of 10-30%, while the United Nations Environment Program (UNEP) defines it as having a minimum area of 0.01-1.0 ha, a minimum tree height of 2-5 m, and a minimum crown, cover of 10-30% (FAO, 2006)

Forest peoples live in and hold customary rights to their forests, and who have evolved methods of living and traditional knowledge that are in sync with their forest surroundings. Forest peoples rely on the forest primarily and directly for sustenance and trade in fishing, hunting, shifting cultivation, wild forest product collection, and other activities. Survival International and the International Working Group on Indigenous Affairs are estimated at between 300 and 500 million indigenous populations from the International Labour Organization, comprising about five per cent of the world's population, over around ninety nations worldwide (Chao, 2012). The World Bank has extensively distributed a rough estimate that indigenous people make about 60 million of the 350 million people who live inside or near thick forests and rely on them for sustenance and revenue (Bhargava, 2006). This amount is more recently reported to be 350 million indigenous people depending on their living in the forest mainly. According to the World Bank, more than 1.6 billion people worldwide rely on forests for a variety of reasons, including food, fuel, livestock grazing, and medicine. An estimated 350 million people live inside or near dense forests, relying heavily on these regions for survival and income, while an estimated 60 million to 200 million indigenous people rely nearly entirely on forests (World Bank Carbon Finance Unit, 2009).

According to Hipolito (2019), the educator must be effective in order to provide quality education to indigenous people. Teachers frequently lack the necessary pedagogical subject expertise to include indigenous knowledge into Life Sciences classes (de Villiers, de Beer, & Golightly, 2016). With today's digital revolution, it's more important than ever to use learner-centered education to encourage self-directed learning. As a pedagogical method, Problem Based Learning encourages learners to create knowledge, acquire diverse abilities (such as problem-solving, critical thinking, and collaborative learning), and take responsibility for their own learning (Ribeiro, 2011). According to Seleke, Havenga, & De Beer (2019), participants were motivated and learned a variety of skills related to indigenous knowledge through the use of PBL as a pedagogical method. For example, Hipolito (2019) adopts the Indigenized Module enhanced the academic achievement of the Indigenous students. They earned a higher mean in their post-test than in their pre-test, resulting in a higher mean percentage score.

By existing study of Problem Based Learning module among indigenous people, and their behaviour always uses materials from forest. Thus, it needs to provide media that can help them use material from forest appropriately and help them aware with in this current situation, which hygiene and health are the most important things. Therefore, this study aims to develop a module based on forest material based on problem-based learning for indigenous people.

Objectives

Based on these existing issues, the objectives of this study are:

1. To develop module based on forest material using ADDIE model

2. To produce valid module for indigenous people in term of content, suitability, and potential effectiveness

2. RESEARCH METHODOLOGY

This study was Research and Development (R&D) by using ADDIE model as procedure in developing this module. ADDIE stands for Analysis, Design, Development, Implementation, and Evaluation Molenda (2003). The following Figure 1 shows ADDIE model structure.

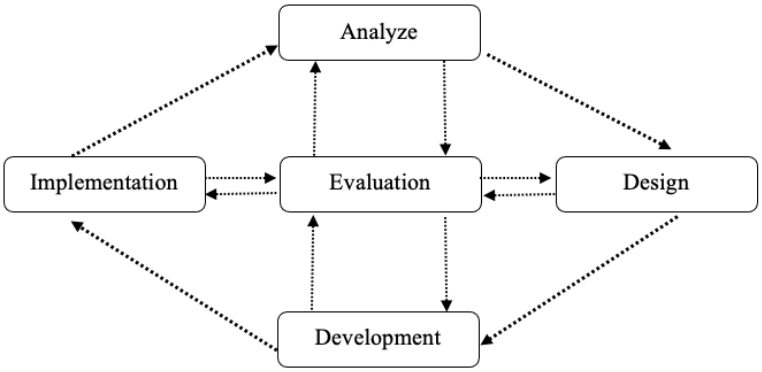

Figure 1. ADDIE Model

In this study, the researchers only followed Analyze, Design, Development, and formative Evaluation. That is because the objective of this study only developed module and limitations of study to implement this module. The following is the detailed information of activities using ADDIE model.

Table 1. Detailed information of activities based on ADDIE

Stage	Activities
Analyze	- Identify and analyze problem in current situation among indigenous people - Determine suitable concept to solve problem occurred
Design	- Design template of module - Determine model of learning that is suitable to be implemented - Design activities in module
Development	- Develop module based on result of design phase - Validation expert
Evaluation	Every phase conducted in developing this module was evaluated by using self-evaluation and experts' evaluation based on their comment.

Data was collected through validation experts, namely based on validators' assessment. The experts had academic backgrounds in chemistry, chemistry education, and science education. Data was in the form of percentage of validation score. Furthermore, data obtained was analyzed using percentage was compared to validation of criteria according to Saraswati et al. (2019) as shown by Table 2.

Table 2. Validity Criteria

Percentage	Validity Criteria
75.00 – 100	Valid
50.00 – 74.99	Quite Valid
25.00 – 49.99	Less Valid
0.00 – 24.99	Invalid

3. LITERATURE REVIEW

3.1 Indigenous people

Worldwide in some 90 nations there are over 370 million indigenous people (United Nations, 2009). Everlasting indigenous people live in wooded environments and depend on ecosystem products and services in different ways to fulfil their needs. It is similar to the traditional ecological knowledge concept in that it refers to “a cumulative body of knowledge, practises, and belief about the relationship of living beings (including humans) with one another and with their environment, evolving through adaptive processes and handed down through generations by cultural transmission” (Berkes, 2012).

Indigenous forest information in planning and management is still generally neglected (Cheveau et al., 2008). Simply changes to forestry regimes that take indigenous needs and perspectives into consideration will not be sufficient to achieve "indigenous forestry". To forest planning and management based on aboriginal values, traditions and knowledge, a paradigm change is necessary. Taking samples from different forest ecosystems worldwide. The setting depends not just on the environment but also on culture and indigenous understanding of forests. In fact, knowledge is integrated into the idiosyncratics of any culture, which affect the acquisition and application of information by people.

3.2 Problem Based Learning (PBL)

According to a study conducted in Australia, the value of Problem Based Learning in teaching and learning in Indigenous Australian subjects was proven. When applied to contemporary social concerns, PBL may deliver a socially transformative, emancipatory education experience and offer students the ability to see the world as the space where their actions might affect" (Ross & Hurlbert, 2004). An Australian research has conducted Problem Based Learning within indigenous students, the study combines regular lectures with PBL activities in the form of group presentation tasks. Students work with lecturer John as a resource to solve assigned activities in groups. One of the PBL initiatives in the Hunter Region focuses on Indigenous health (Mackinlay & Bradley, 2012).

One research that attempted to focus on the activities taking place in Problem Based Learning process studied the verbal exchanges of the whole PBL cycle, including the self-directed learning stage, in detail (Yew & Schmidt,2009). As learning theories imply that these learning activities are crucial in the learning process, the authors wanted to explore the extent to which PBL promotes specific learning dispositions toward constructive, self-directed, and collaborative learning. They observed all three behaviours, albeit to varying degrees, within the PBL cycle under investigation, with 53.3 % of episodes observed as collaborative, 27.2 % self-directed, and 15.7 % constructive.

Another research study conducted in Saudi Arabia (Al-Damegh and Baig,2005), the author compared the PBL method to the NPBL approach in terms of problem solving and self-directed learning skills in both teaching styles. There were 138 students on the Riyadh campus and 65 on the Al- Qassim campus. The findings revealed that 64 percent of PBL students correctly answered problem-solving problems, compared to 7.25 percent of NPBL students. Furthermore, 86 percent of PBL students participated in self-directed learning, compared to 20% of NPBL students. In the context of health in Saudi Arabia, and according to (Sumarni, 2015), PBL can help students become more engaged and successful in tackling difficult issues by improving their problem-solving abilities. PBL also necessitates the development of skills such as cooperation and reflection.

For that, this study is using the Problem Based Learning to develop a module by using forest foldable materials and make it usable and helpful to assist indigenous people's life.

4. RESULTS AND DISCUSSION

4.1 Development of module

To develop the module, ADDIE module was used which begin from Analyze, Design, Development, Implementation and Evaluation. However, this study only limited to Development as final step because this study only aimed to development of module.

a) Analyze

Health and hygiene have emerged as critical priorities, especially in the context of global health crises over the past five years. The world has faced recurring viral outbreaks, creating widespread concerns about safety and wellbeing. Indigenous communities, in particular, are significantly impacted, as many of them reside in remote forested areas with limited access to modern healthcare facilities and resources for maintaining hygiene.

This situation highlights the urgent need for tailored interventions that respect the close relationship indigenous peoples have with nature. Their traditional knowledge and dependence on natural resources present an opportunity to develop sustainable and practical solutions, such as a guideline for utilizing local resources to create disinfectants and other hygiene-related products. These initiatives not only address immediate health concerns but also empower indigenous communities by building their capacity to use their environment in ways that are both innovative and respectful of their cultural practices. The findings from this analysis underscore the importance of a structured approach to addressing these challenges. As a result, these insights are being incorporated into the subsequent Design stage of the module development process.

b) Design

In Design stage, the researchers aimed to give information about how to make natural disinfectant using materials that can be found easily in forest. Kodoh, et al. (2019) stated that “Sirih hutan” (forest betel) is one of common forest products among indigenous communities. In addition, Budiman, et al. (2020) found formula to produce natural disinfectant from betel and lime. According to historical accounts, lime originated on the Asian continent, specifically Malaysia, from whence it was carried to North Africa and Europe (most notably Spain) by the Arabs (Eckert and Eaks 1989). Because acid limes, like other citrus fruits, acid limes are non-climacteric; they do not exhibit a postharvest organoleptic ripening process (Wills et al.1984). Therefore, it needs the media to share that information easily and interestingly such as module. Module is learning media that students can use independently with or without instructor’s guidance (Septiani, D & Sumarni, 2014).

Furthermore, based on studies about indigenous people, such as Australian research has conducted Problem Based Learning within indigenous students, the study combines regular lectures with PBL activities in the form of group presentation tasks. Students work with lecturer as a resource to solve assigned activities in groups on presentations to discover genuine answers to issue scenarios presented (Berkes, 2012). According to Birgili (2015), Problem-based learning is a model of learning that is expected to produce the quality of human resources who can solve their existing real life problems. Thus, through activities designed based on Problem Based Learning, indigenous people can solve problem in this current situation. In order to indigenous people to access the module easily and interestingly, module was designed by using infographics.

c) Development

Module was developed based on the result of Design stage. The following Figure 2 shows Forest module.

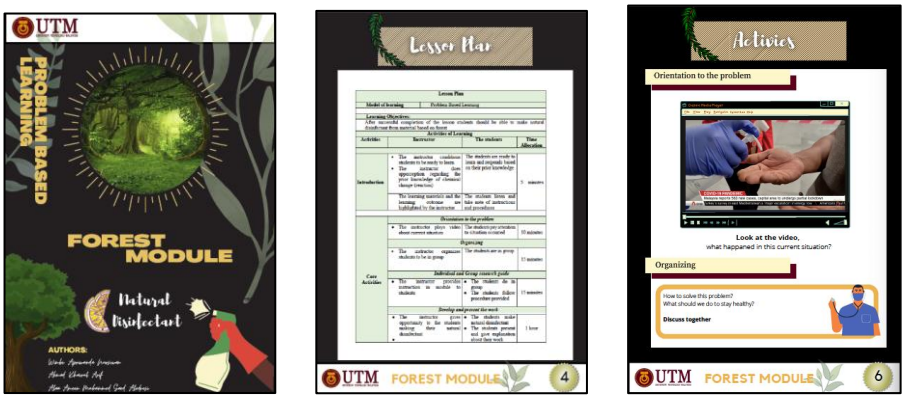

Figure 2. Forest Module (Cover, Lesson Plan, and Activities)

Figure 2 shows forest module developed. Module was equipped with lesson plan so that the future instructor can implement it among indigenous people worldwide. Furthermore, in the first step of activities, indigenous people will be provided with problems that make them aware of the current situation. All activities provided were arranged based on steps of Problem Based Learning. Module developed further was validated by experts.

d) Evaluation

In the developing module, the researchers used literature review to find suitable content, concepts, and activities and then self-evaluate before going to the validation process. After developing the module, validators evaluated the module quantitatively and qualitatively based on their comment to improve. Based on result, the validators suggested to explain more detail about how to using germ detector to be explained more detailed and explain more on how to prove the existence of virus or bacteria. Therefore, the researchers has amended it based on comments given.

4.2 Validity of Module

Validity of module aims to assess module whether the developed module can be used or not. In assessing module, there are 3 aspects of validity to be assessed, namely based on content, suitability, and potential effectiveness. The following Table 3 shows the overall score of validity for each aspect.

Table 3. Overall Validity Score

Aspects	Percentage of score	Validity Criteria
Content	95.6	Valid
Suitability	87.43	Valid
Potential Effectiveness	90.67	Valid
Average	**91.23**	**Valid**

Based on Table 3, average of percentage obtained is 9123. Based on Saraswati et al. (2019), it is valid if the percentage is around 75.00 – 100. Among aspects of validity of module, module was valid based on content (percentage of score = 95.6), suitability (percentage of score = 87.43), and potential effectiveness (percentage of score = 90.67). In detail, the following is the explanation of each aspect assessed in this study.

a) Content Validity

There are 10 items of assessment used by experts to validate module as shown by Table 4 below in content validity.

Table 4. Content Validity Score

Items	Percentage of score	Validity Criteria
The composition of the learning objectives in the Module is clear	100	Valid
The contents of the Module are complete in terms of teaching process	100	Valid
The contents of the Module are complete in terms of evaluation	84	Valid
The content of the Module can be used and applied easily	96	Valid
The Module contents are able to comply with the objectives stated	96	Valid
The objective of the Module can be achieved based on teaching activities and strategies	96	Valid
Teaching objectives stated to lead to the achievement of learning outcomes	96	Valid
The proposed activities used are suitable to be used in the stated situation	88	Valid
The learning objectives stated for each activity are appropriate with the suggested activity and assessment	100	Valid
The teaching objectives could achieve module goals	100	Valid
Average	**95.6**	**Valid**

Based on Table 4 above, there are 4 indicators that obtained the highest score (percentage of score = 100). That means all validators strongly agreed that the composition of the learning objectives in the module is clear, the contents of the module are complete in terms of teaching process, the learning objectives stated for each activity are appropriate with the suggested activity and assessment, and the teaching objectives could achieve module goals. Furthermore, for indicator of the content of module can be used and applied easily, module contents are able to comply with the objectives stated, the objective of the module can be achieved based on teaching activities and strategies, and teaching objectives stated to lead to the achievement of learning outcomes obtained percentage of score = 96. Also, the proposed activities used are suitable to be used in the stated situation, and the contents of the module are complete in terms of evaluation with percentage of score is 88 and 84 respectively.

Based on explanation above, module developed has been valid in terms of content. Content validity is used to determine whether the content of module is appropriate or not. The importance of content validity is due to the coherence of content in module with materials and expected learning objectives, so that it can be useful to assess the expected of knowledge (Cohen et al., 2007; Novikasari, 2016).

b) Suitability Validity

Beside content, to investigate whether module developed can be suitable to be implemented, suitability validity is also carried out, and the result of suitability validity can be shown in Table 5.

Table 5. Suitability Validity Score

Items	Percentage of score	Validity Criteria
Model of learning is suitable to be used in this Module	92	Valid
The Module is suitable to be used with the target sample	88	Valid
Suggested teaching media such as models, diagrams, and so on fit the module	92	Valid
Model of learning is applied well in this Module	92	Valid
The teaching strategies suggested in the Module is practical to be used for indigenous people	80	Valid
The proposed activities used a suitable strategy to trigger the activeness for participation among indigenous people	84	Valid
The scope and sequence of topics in the module are compatible with the developmental needs of the indigenous people	84	Valid
Average	**87.43**	**Valid**

Based on Table 5, the highest percentage of score for suitability validity is 92. It indicates that the model of learning is suitable to be used in this module. It suggested that teaching media such as models, diagrams, and so on fit the module, and the model of learning is applied well in this module. Next, module is suitable to be used with the target sample with percentage of score is 88. Also, the proposed activities used a suitable strategy to trigger the activeness for participation among indigenous people, and the scope and sequence of topics in the module are compatible with the developmental needs of the indigenous people with the same percentage of score for two indicators is 84. Lastly, the teaching strategies suggested in the module is practical to be used for indigenous people with percentage of score = 80. Thus, based on overall score obtained, this module has been valid in term of suitability to be implemented among indigenous people.

c) Potential Effectiveness

The following Table 6 is the result of validity for potential effectiveness.

Table 6. Potential Effectiveness Validity Score

Items	Percentage of score	Validity Criteria
The materials and equipment that were used in this Module are affordable and easy to use	92	Valid
The purpose of the Module is clear and easy to understand	92	Valid
The materials used in the proposed activity can be found in the forest	92	Valid
This Module will help assist Indigenous people effectively in their everyday life	88	Valid
Each topic in the module is arranged logically and coherently in the order of learning	92	Valid
The time allotted for the planned activities is appropriate in the stated situation	88	Valid
Average	**90.67**	**Valid**

Based on Table 6, the module is valid based on all indicators with the average score of 90.67. This score shows that this module is valid in term of potential effectiveness. The highest percentage score is 92, which indicates that the materials and equipment that were used in this module are affordable and easy to use, the purpose of the module is clear and easy to understand, the materials used in the proposed activity can be found in the forest, and each topic in the module is arranged logically and coherently in the order of learning. Furthermore, the result shows that this module will help indigenous people effectively in their everyday lives. The time allotted for the planned activities is appropriate in the stated situation with the same score, 88. Therefore, module developed is valid in term of potential effectiveness.

5. CONCLUSION

Forest module is module developed that consists activities based on Problem Based Learning (PBL). This module provides activities to encourage indigenous people to solve problem in current situation. The activities are about how to produce natural disinfectant using forest material that can be easily found in around them. The result shows that forest module is valid, with percentage score for content = 95.6, suitability = 87.43, and potential effectiveness = 90.67.

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