

DEVELOPING ANTIMICROBIAL MEDICINAL PLANTS POCKETBOOK BASED ON LOCAL WISDOM OF MUKO-MUKO AND SERAWAI ETHNICS

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ABSTRACT

The using of teaching materials based on local wisdom is still limited. This study aimed to develop a pocketbook based on research results of antimicrobial medicinal plants from Muko-muko and Serawai ethnics as supplementary teaching materials for senior high school students. This study was the Research and Development (R&D) model by Sugiyono that consisted of five stages, namely: potential and problems analysis, data collection, product design, design validation, and design correction. The designed pocketbook was validated by learning source expert and material expert. The data obtained were analyzed using statistical descriptive (percentage). The validation data score from learning source expert was 93.40% and material expert was 98.86% which were recognized as 'very good'. Thus the developed pocketbook is valid as supplementary teaching materials in biology learning for senior high school.

Keywords: *Antimicrobia, ethnic, local wisdom, pocketbook*

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INTRODUCTION

Biology is a subject taught in senior high school. One of core competencies of biology learning is "understanding; applying; analyzing factual, conceptual, procedural knowledge based on his knowledge of science, technology, art, culture, and humanities with the insights of humanity, nationality, state and civilization on the causes of phenomena and events; and applying procedural knowledge to specific areas of study in accordance with his talents and interests to solve problems (Kemendikbud RI, 2016).

Learning biology is not only limited to the concept, but it needs to emphasize the national identity, especially the diversity of culture and local wisdom. The forms of learning that can be done by teachers such as connecting between the concepts with local knowledge through the use of additional teaching materials that integrate between the environment, culture, and concepts (Parmin, Sajidan, Ashadi, & Sutikno, 2015). Integration of local wisdom with the concept of learning will not reduce students understanding of the science concept but can increase students' understanding of learning materials (Ameyaw, 2011).

The results of preliminary studies of local wisdom of students on antimicrobial medicinal plants show that 75% of senior high school (SHS) students do not know the types of plants that have potential in treating microbial diseases and about 50% of students do not know the potential of local wisdom exist in Bengkulu Province in utilizing the plant as a medicine. The limited knowledge of students about antimicrobial medicinal plants due to the limited source of information. Some students only get information about medicinal plants from their parents as well as some of the textbooks. The limited information contained in the high school book also affects the students' learning outcomes on biodiversity materials and their utilization. Only about 57% of students who achieve the minimum value of mastery.

Based on need analysis of teaching materials from students and teacher in Bengkulu, it showed that students and teachers need a supplementary teaching materials beside textbooks. The teaching materials should be designed with characteristics: simple, colorful, and handy. Based on the need analysis for the teaching materials, the researcher tries to bridge the problem between the student's knowledge of antimicrobial medicinal plants with the reading

source which only give little information about the medicinal plant by developing a pocketbook.

Research conducted by Ummah, Wibowo, and Aminatun (2016) shows that pocketbook is a teaching material that is effective, lightweight, colorful, not burdensome to be brought by students, and can improve students' caring attitude to the environment. Yasin (2016) has also developed a potency-based pocketbook on biodiversity material of genes, species, and ecosystems of the study results indicating that the pocketbook is worthy of use as a biology learning resource of X Grade of SHS. Wulandari, Prihandono, and Handayani (2016) developed a pocketbook on the material of the human senses system in junior high school level. The Pocketbook effectively improves students' responses to science learning (biology). Muhammad, Taiyeb, and Azis (2015b) have developed pocketbook on respiratory system materials at the SHS level, which fall into the category of valid, practical, and effective. Sofiana and Ayu (2017) developed the pocketbook to increase preventive behavior for soil-transmitted Helminthic infections. There are differences between the mean of knowledge and attitude, but the mean of behavior before and after the pocket book is similar.

However, based on the research that has been done, there is no pocketbook developed based on the local wisdom of certain tribe's communities in utilizing antimicrobial medicinal plants. Therefore, researchers were interested in developing pocketbook. This study aimed to develop a pocketbook based on research results of antimicrobial medicinal plants from Muko-muko and Serawai ethnics as supplementary teaching materials for SHS students.

METHOD

This study was Research and Development (R & D) model by Sugiyono (2008). It aimed to create a pocketbook as supplementary teaching materials for biology subject of X Grade at the SHS. This model was chosen because the development model is suitable to be implemented in the development of research-based teaching materials.

This development model consists of 10 stages. However, because of the process developing takes a long time to process the

identification of plants in the field, this study was limited to 5 stages, including analyzing potential and problems, collecting data, designing products, validating the design, and correcting design.

The subject of this study were biology expert, teaching materials expert, and users (teacher and students). This research used the quantitative descriptive method. Quantitative data were score validation of teaching materials from biology expert, teaching materials expert, and users. Quantitative data in the form of validation score will be translated into qualitative data which is descriptive based on the recommendation of validator and user.

The instrument used in this study were interview and validation sheet. Interview sheet used to obtain data on antimicrobial medicinal plants present in the field and to get information about need analysis of teaching materials. Data on medicinal plants may be part of the plant used as medicines and information on how to cultivate the plant into medicine. Data on medicinal plants documented with camera and then all of the samples related to the literature. Validation sheets are used to validate the pocketbook that has been developed. Score validation results were analyzed by using Formula 1 from Arikunto (2013).

$$P = \frac{\sum x}{\sum xi} \times 100\% \quad (1)$$

P = validity percentage

$\sum x$ = total number of score per item

$\sum xi$ = total number of ideal score per item

100% = constants

The percentage of validity, the criteria, and decision making of teaching materials can be seen in Table 1.

Table 1. Validity, criteria, and decision making

Validity Scale (%)	Criteria	Decision
86-100	Very strong	Feasible and no revision
71-85	Strong	Feasible with minor revision
56-70	Moderate	Quite feasible with mayor revision
41-55	Weak	Less feasible with mayor revision
25-20	Very Weak	Not feasible and mayor revision

The results of teaching materials legibility test were calculated by Formula 2 from Sudijhono (2010).

$$P = f / N \times 100\% \quad (2)$$

P = percentage of student response

f = number of students who answered Yes/ No

N = total number of students

The result of the score percentage was converted based on criteria, it can be seen in Table 2.

Table 2. Criteria of student's response

Score percentage (100%)	Criteria
76-100	Very good
51-75	Good
26-50	Quite good
≤ 25	Not good

Based on the expert validation score and legibility test by the students and teacher, it can be known how the revision of teaching materials that needs to be done. Recommendations for improvement of teaching materials from validators or students can be suggestions on materials improvement, layout, language, writing, display, and so forth.

RESULTS AND DISCUSSION

The pocketbook was developed based on information of antimicrobial medicinal plants which are daily used by Muko-muko and Serawai ethnic. This pocketbook has a role as supplementary teaching materials for X Grade students on the topic "Biodiversity and Its Utilization". Pocketbook content serves information about the biodiversity of antimicrobial medicinal plants from Muko-muko and Serawai ethnic. It means the content of materials teaching in the pocketbook emphasized to the local wisdom of Indonesia Ethnic.

Antimicrobial plants data contain any pieces of information about the name of plants, the morphological features, the content of active compound, the treated disease, the infectious microorganisms, and the ethnic user. The pocketbook was developed by using five stages, including potential and problems analysis, collecting data, designing product, validating the design and correcting design. Processing development of pocketbook is described by following steps.

Potential and problems analysis

In the first phase, it is necessary to analyze the need for teaching materials by involving teachers and students. Material requirement analysis is done by using questionnaire and interview technique. Questionnaires are used to identify students' knowledge of medicinal plants as well as the criteria for instructional materials needed to help students achieve their learning outcomes. Interviews were also conducted on teachers who aimed to obtain information on issues related to the use of teaching materials by students.

Analysis of teaching materials demand was performed by distributing questionnaires to fifteen numbers of high school students who have been studying Indonesia Biodiversity topic. The result showed that students need teaching materials which provide information about utilization of biodiversity, mainly medicinal plants to treat diseases caused by the infectious microorganism. This teaching materials role as supporting materials that serve as reading material to increase students' knowledge on biodiversity topic.

The required teaching materials supposed have characteristics practical, handy, colorful and completed with pictures of biological studies object exist surrounding student environment. Therefore, a pocketbook based on the local wisdom of antimicrobial medicinal plants used by the Muko-muko and Serawai ethnic in Bengkulu province was developed.

Collecting data

Development of teaching materials first began with collecting data about antimicrobial medicinal plants from Muko-muko and Serawai ethnic. Data were collected by interviewing "battra" (traditional healer) to obtained information about names of plants which are frequently hereditary used as antimicrobial medicines, along with field observation to collect samples. The result showed there are 41 species to threat 19 kinds of infectious diseases by the microorganism. These data were also equipped with original pictures to be presented in the pocketbook.

Designing Product

The designing product was conducted as the following procedure: (a) Analysing curriculum and learning lesson for X Grade. The curriculum encompasses appropriate competencies to describe learning the material

on the topic diversity of antimicrobial medicinal plants from Muko-muko and Serawai ethnic. The suitable learning material that presented information about these antimicrobial medicinal plants is "Biodiversity and Its Utilization". (b) Formulating indicators and objectives in learning. Indicators and objectives learning were formulated based on fundamental competencies and analyzed learning materials. (c) Determining information submitted in the pocketbook. The presented information in the pocketbook contains data of medicinal plants that had been collected when data collection stage, including antimicrobial plant species, actively compound content, treated disease, infectious microorganisms, and ethnic of the user. (d) Designing a pocketbook. Designed pocketbook consist of appearance and content. Appearance design including the cover, color, font, and layout. Whereas content design including information as presented based on pocketbook systematic writing. Systematic of pocketbook can be seen in Table 3.

Table 3. Systematic of pocketbook

No.	Systematic of pocketbook
1	Cover
2	Preface
3	Contents
4	Mapping of teaching materials
5	Utilization of Indonesia biodiversity as antimicrobial medicine resource
6	Description of antimicrobial medicinal plants
7	Glossary
8	References
9	Biography

Validating design

Validating design aimed to evaluated or assessed the pocketbook. Pocketbook assessment includes material (content), display (layout), language, and graphics. The designed pocketbook was validated by material expert and learning source expert. The result of validation can be seen in Table 4.

Validation result from learning source expert and material expert revealed that pocketbook of antimicrobial plants from Muko-muko and Serawai ethnic was categorized as good and not required major correction. Although the validation score indicates that the pocketbook of medicinal plants has been valid, there are several things that need to be fixed. Pocketbook repair suggestions based on the validator's score can be seen in Table 5.

Table 4. Percentage of assessment results from validator

Aspects	Percentage (%)	
	Learning source expert	Material expert
Material	-	97.72
Display	100	100
Language	84.37	-
Graphic	95.83	-
Average	93.40	98,86
Criteria of Validity	Very good	Very good

Table 5. The suggestion of pocketbook improvement based on validation score

Validator	Average score	Suggestions
Learning Source Expert	93.40	1) Additional information on the morphology of antimicrobial medicinal plants is required. 2) A clear source of information on the active compounds found in medicinal plants is required. 3) The use of language and sentences is simplified Pocketbook display improvements needed to make it look more colorful and attractive
Materials Expert	98.86	Materials need to be presented shorter, clearer and lightweight to read.

Pocketbook legibility test results by students of X Grade showed a very good response (see Table 6).

Table 6. Pocketbook legibility test results

User	Response (%)	Criteria	Recommendations
Student 1	100	Very good	-
Student 2	100	Very good	-
Student 3	81.81	Very good	Display needed to improve to be more colorful.
Student 4	81.81	Very good	Use a simple language. 1) Uses simple and clear language. 2) Use interesting display and the highest resolution of the picture.
Teacher	80.98	Very good	3) Use presentable picture and font.

Based on the validation score and legibility test results, pocketbook is suitable to be used as a supplementary teaching materials. However, prior to use in learning activities, it needs to be improved based on suggestions from validators and users.

Correcting design

Correcting design was conducted base on validators and students recommendation, i.e. cover and layout. Correcting design aimed to fixed the pocketbook (the changes can be seen in Figure 1, Figure 2, Figure 3, and Figure 4.



Figure 1. Design of pocketbook cover before revision



Figure 2. Design of pocketbook cover after revision

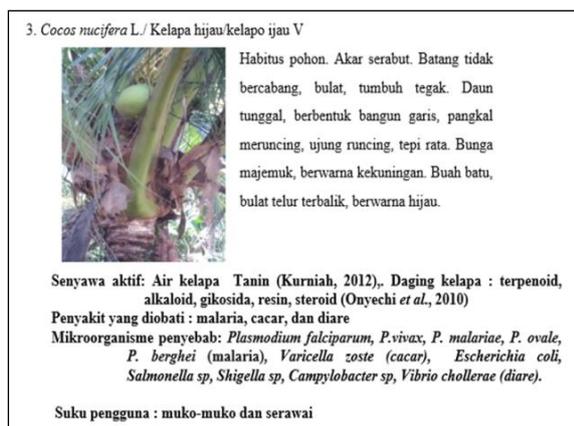


Figure 3. Design of layout pocketbook before revision



Figure 4. Design of layout pocketbook after revision

Data of antimicrobial medicinal plants that were collected from an interview with battra then were arranged to be a pocketbook. Pocketbooks that have been designed are then validated by validators and users. Based on the validation results, pocketbook assessment scores fall into either category, but it needs to be improved on the pocketbook.

Before the revision, there are still shortcomings in the preparation of pocketbook including seen from the aspects of materials, language, and appearance. Before the revision, the display pocketbook still looks ordinary and

less attention to students because the selection of colors and images used tends not interesting. After the revision, done improvements by adding color ornaments to make it look more interesting. This is in accordance with the opinion of Ummah, Wibowo, and Aminatun, (2016) which states that the pocketbook is a material that is colorful, need to be designed with a more attractive appearance and comes with the selection of colors and images tailored to the writing. So it can attract students' attention to use it.

With regard to the material and language aspects found in the pocketbook, before the revision there is still the presentation of material that has not been in accordance with the learning objectives and language used is still difficult to understand students. After the improvement, the material presented in the pocketbook is further adjusted to the basic competency that the teacher wants to achieve and presented with a short language, clearly easy to understand but does not reduce the weight of the material set by the curriculum. This is in accordance with the opinion Prastowo (2013) which states that a good teaching material presents comprehensive courses and appropriate to student basic competences, validity content is justified, presented with an attractive appearance and use clear and understandable language.

Development pocketbook as teaching materials for high schools based on local wisdom has its own uniqueness because it is able to raise the values of local culture and potency of a region. Development a pocketbook research-based antimicrobial medicinal plants from Muko-muko and Serawai ethnic is one effort to raise local potency by means education. Tanjung and Fahmi (2013), states that education is not only limited to learning activities in schools but can be developed by using teaching materials contain noble values based on local wisdom.

Legibility test students showed students response to pocketbook antimicrobial medicinal plants was very good. Students considered that pocketbook was attractive, handy, practical and easy-to-use. These students satisfaction due to validation processed by the expert validator, which it's scoring for content, layout, language, and presentation of pocketbook were good. According to (Depdiknas, 2008), the pocketbook is a book with a small size, lightweight, and ease to stored in the pocket, so

it is practical to carry and read. Pocketbook antimicrobial medicinal plant is one kind of teaching materials that are practically used by students except for textbooks. It is in accordance with the characteristics of the pocketbook itself.

The main characteristic of this pocketbook was developed based on the local wisdom of Muko-Muko and Serawai ethnic in utilizing plants as medicinal ingredients. Therefore the content in it is contextual, appropriate for students environment. The topics presented in the pocketbook are compatible with the curriculum in high school, i.e. Indonesia Biodiversity topic. This is in accordance with Basic Competency 3.2 which contained in the X Grade of SHS. It is "Analyze various levels of biodiversity in Indonesia, threat, and conservation (Kemendikbud RI, 2016)

The main purpose of developed pocketbook is to assist students to improve their learning outcomes of biodiversity. Although not yet tested its effect on student learning outcomes, but the pocketbook is quite feasible and has the potential to improve student learning outcomes. According to Muhammad, Taiyeb, and Aziz (2015), the using of pocketbook proved to improve the score of student learning outcomes.

Pocketbook antimicrobial medicinal plants is a teaching material which is developed by promoting multicultural education derived from Muko-Muko and Serawai ethnic in using plants as medicines to treat diseases due to infection of microorganisms. Pocketbook is considered to have a positive impact not only on student learning outcomes but also on the traditional knowledge of multicultural students. This is in accordance with Komalasari (2011) which states that teaching materials developed by utilizing local potentials can help students find the relationship between the concept of knowledge and the environment so that students have long-lasting memory, meaningful and comprehensive knowledge.

The learning process that facilitates students to embed the concept on long-term memory signifies that the learning process is meaningful and is an undeniable desirable condition in education (Ramadani, Fauzi, Sukmawati, & Corebima, 2015; Sukmawati, Ramadani, Fauzi, & Corebima, 2015). A teaching material with multicultural content is a type of teaching materials which able to help students recognize their local wisdom. Therefore, this developed teaching materials similar to this pocketbook is

needed by teachers and students at the school. This statement is in accordance with Rokhman and Yulianti (2010), who states that teachers and students need teaching materials that contain multicultural values nearby to the student's environment and the teacher itself.

Pocketbook medicinal plants based on the local wisdom of the Muko-muko and Serawai ethnic in addition to functioning as teaching materials can also serve as reading materials that help students to understand the cultural values that surround their lives. As we know that students' knowledge of the local wisdom of medicinal plants is getting less. Therefore, teaching done through the use of local wisdom-filled teaching can help overcome the problem. This is in accordance with the opinion of Albantani and Madkur (2018), which states that teaching based on the value of local wisdom can educate students to be able to overcome the problems that exist around the students.

Development of teaching materials based on local wisdom is expected to provide a new finding or innovation in producing teaching materials based on local wisdom, so preservation of local cultural values that characterize Indonesia nation can be maintained through the using of teaching materials in schools. It is according to Tanjung and Fahmi (2015), one of the efforts that can be done to reestablish local native values is by education.

Developing pocketbook which has the content local wisdom of ethnics in Indonesia does not only serve as a teaching materials to support achievement of student learning outcomes but can influence the knowledge of the local wisdom of students about medicinal plants daily used by ethnics in Indonesia, as the result motivated students to aware their environment. This statement is in accordance with the opinion of Ardan (2016) who states that using teaching materials based on local wisdom will affect the student's attitude to maintain their environment. Furthermore, teaching materials based on local potency will also influence knowledge of the local wisdom of the particular community, especially regarding the use of traditional medicines.

Traditional knowledge about medicinal plants plays an important role in the development of herbal medicines. Motaleb (2010) suggests that knowledge the using of medicinal plants is decreasing because of lack of adequate documentation and limited of knowledge transfer between generations. The

development of pocketbook antimicrobial medicinal plants from Muko-muko and Serawai ethnics was expected to improve students' knowledge on the local wisdom of the community. It is in accordance with research conducted by Fitriyanti, Faisal, Safitri, and Eriawaty (2016), that revealed the use of teaching materials based on local wisdom on students can influence students' knowledge of local cultural values that occur in the dynamics of human relations with the environment.

The developed pocketbook is a type of instructional material other than a textbook that provides additional information about the concept of learning (Muhammad et al., 2015b; Sofiana & Ayu, 2017; Wulandari et al., 2016). The main difference is seen in the size and presentation of the material. Pocketbook made smaller than the size of textbook and learning materials are prepared based on the results of research on the local wisdom of Muko-muko and Serawai ethnic in the use of medicinal plants. Teaching materials other than textbooks developed based on local wisdom have higher effectiveness than textbooks. This is in accordance with Tanjung, Daulay, and Ghafari (2018) which states that local potency-based teaching materials have higher effectiveness values to improve student learning outcomes compared to textbook use.

Based on evaluation validity of pocketbook and recommendation from validators, it indicated that the pocketbook was good and appropriate as teaching materials for high school students in biology subject. This is in accordance with Yasin (2016) which states that pocketbooks developed based on local potential are suitable for use in biology learning in the X Grade for upper secondary students. This opinion is also supported by Abadi, Asih, and Jupri (2018) which states that teaching materials based on local potentials are in great demand by students, able to improve learning ability, and students' knowledge.

From the development of pocketbook based on local wisdom in the use of medicinal plants, these teaching materials have the potential to assist teachers in achieving learning objectives according to the demands of the curriculum and competency standards. This is because the material presented in this pocketbook raises the issue of the utilization of biodiversity for tribal communities in a particular area without eliminating the demands of the curriculum and learning objectives that have been formulated

by teachers. This is in accordance with the opinion of Kidman, Yen, and Abrams (2013) which states that the importance of putting local wisdom and knowledge in the curriculum of science learning because it can strengthen the sense of student nationalism.

Various studies have reported the development of learning sources as well as learning media is essential in biology learning (Fauzi, 2017; Miharja, 2015; Ummah et al., 2016; Widiensyah, Indriwati, Munzil, & Fauzi, 2018; Yasin, 2016). Through such efforts, various problems related to the learning process could be resolved. Moreover, the development of learning resources is not only aimed at the context of formal education. Sometimes, various research and development in biology education field also develop media for community (Setyawan, Rohman, & Sutomo, 2015). Through this kind of effort, academicians and teachers not only facilitate learners in the schools but also educate the community, save the environment, and explore the local wisdom.

CONCLUSION

The antimicrobial medicinal plants pocketbook based on local wisdom of Muko-muko and Serawai ethnic was developed. The validation data score from learning source expert was 93.40% and material expert was 98.86% which were recognized as 'very good'. Thus the developed pocketbook is valid (usable) as supplementary teaching materials. The effectiveness of the pocketbook for improving students' knowledge, character, and other 21st-century skills are needed to study by next researchers in the form of class action research, quasi-experiment, and some others.

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