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Development of the Research Based Learning Module for Making Natural Foot Sanitizer on the Topic Eubacteria for Class VII IPA Middle School

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ABSTRACT

This study aims to produce a teaching material product in the form of an RBL module for making foot sanitizer as a companion in learning science on the topic Eubacteria for class VII IPA. Learning at school about Eubacteria, students have not been asked to create products. 21st century skills make students have superior human resources. Based on the results of interviews with class VII students, learning at school in science subjects only took notes and held the LKS book. The data were collected using media expert validation test questionnaires, material expert validation test questionnaires, science teacher response questionnaires and student response questionnaires. Based on the results of the assessment from the media expert validator 1 obtaining a score of 80% in the "decent" category, the media expert validator 2 obtaining a result of 83% in the "very feasible" category. The results of the assessment of the material expert validator 1 were 91.6% in the "very feasible" category, the material expert validator 2 obtained 90% results in the "very feasible" category. The results of the teacher's responses obtained a value of 79.5% in the "appropriate" category and student responses obtained a value of 85.8% in the "very feasible" category.

Keywords: Module, RBL, Foot Sanitizer, Eubacteria

INTRODUCTION

Foot odor is a trivial problem but can cause discomfort in worship. In addition, smelly feet can also cause a lack of confidence in appearance. Factors that cause foot odor are feet including parts of the body that can produce excessive sweating from daily activities and relatively high temperatures. As a result, the feet become damp because they are covered in socks and shoes. The sweat produced by these apocrine glands in the process of secretion, when infected with bacteria on the feet can cause an unpleasant and pungent odor (Ade, et al: 2020). Staphylococcus epidermidis bacteria is the main factor causing foot odor (Ara, K., Et Al: 2006).

Efforts that can be made to prevent foot odor is by maintaining personal hygiene. One of them is by using a foot sanitizer. Foot sanitizer is a liquid preparation that functions as an antiseptic on the feet, and can inhibit the growth of bacteria on the feet without having

to rinse it with water. The use of foot sanitizer is more practical and is preferred by the general public. Using a sanitizer is preferable to washing with soap and water in various situations and at service points (Fenti: 2020). Basically, foot sanitizer can be made from natural ingredients in the environment. Plants in the surrounding environment have the potential to be used as the main ingredient in the manufacture of foot sanitizers because they contain antibacterial properties such as saponins, flavonoids, tannins, alkoloids (Keerthana Kesavan and Others: 2018). Some plants that have antibacterial properties, namely lime, cherry, betel leaf, aloe vera, Parijoto, coffee.

Through the learning process at school efforts to maintain cleanliness and protect oneself from bacteria is one of the goals of learning science at the junior high school level. This learning is contained topic of Eubacteria, besides students can get to know various kinds of bacteria students can also apply this learning by keeping themselves and their environment clean. In learning at the junior high school level students are required to have 21st century skills. One of the competencies that can encourage 21st century skills by junior high school level students is creativity and innovation contained in 4C (Creativity and Innovation, Collaboration, Communication, Critical Thinking and Problem Solving). In the 4C skills, the creative and innovative thinking means that students can find new ideas and innovate in implementing these ideas (I Wayan: 2019), and can create or produce a product. This creativity is one of the efforts to anticipate foot odor by making foot sanitizers. Students can make foot sanitizer using materials in their surroundings with the guidance of the teacher.

One learning model that can apply the learning above is RBL. RBL (Research Based Learning) is a learning model that leads to analysis, synthesis and evaluation (Ratna: 2018). In implementing RBL students can become active in learning. This makes students have a strong understanding of basic concepts and methodologies, can solve problems actively, logically and systematically, and students have a scientific attitude which includes facts, is open and honest (Arifin: 2010). Through the RBL (Research Based Learning) model students can be encouraged to do research in making foot sanitizers with natural ingredients found in their surroundings.

Stages in Research Based Learning learning include the exposure stage or knowledge introduction stage through literature study, the experience stage includes implementation and independent learning, the capstone stage is the final project preparation stage (Estuhono, Festiyed, And Bentri: 2018). The application of Research Based Learning-based learning models includes a learning by doing approach that makes students more active in this regard, including seeking information, compiling hypotheses, collecting data, analyzing data, concluding data that has been compiled.

Puspitasari et al suggested the stages in research-based learning through five stages as follows: Identification of research journals, Tracking the progress of research journals, Reviewing research journals, Discussion of journal review results, Formulation of research topics to encourage student skills (Poppy et al: 2017). This step is in line with what Dafik put forward, namely determining the fundamental problems, compiling a research plan, collecting data, analyzing data, testing the results of the analysis and presenting the results of the analysis (Dafik: 2015).

Learning by using the RBL model can be applied in the form of modules. Modules as a means to facilitate teachers in guiding students. Module is a teaching material used in learning whose content is relative and specific (Lasmiyati: 2014), and can master the competencies being learned (Elfita et al: 2021). Teaching materials are a very important tool in the learning process (Insih: 2020). Teaching materials that are developed and packaged in an attractive way can grab students' attention. This allows students to understand and answer curiosity about the problems being faced in the teaching and learning process. In the development of teaching materials, there will be benefits for teachers and students, namely teaching materials can save the teacher's time in the teaching process. The teacher as a facilitator for students. Modules can improve the teaching and learning process to be more effective. Students can become independent learners and facilitate students in learning. Modules can be studied anytime and anywhere by students. Students learn at their own pace (Ina Magdalena And Others : 2020). So this research develops modules using the RBL model.

Based on previous research conducted by Lasmiyati and Idris stated that the use of teaching materials in the form of modules for junior high school students showed an increase in conceptual understanding and an increase in students' interest in learning (Lasmiyati: 2014). Research conducted by Nina et al., that the development of RBL-based modules for 4C skills is proven to improve student learning outcomes and as a learning resource and can improve 4C skills in students (Nurhasanah et al: 2021). Other research also states that implementing RBL-based modules can improve students' abilities and be effective in improving 4C skills (Rani: 2021).

METHOD

This study uses the Research and Development (R&D) method. R&D development is used in the development of research results or research products. Research activities in this method are carried out by seeking information according to user needs (need assessment), while development activities are carried out by producing a learning device product (Iis: 2008). This study will use the 4D development steps proposed by Thiagarajan including, Define, Design, Development, Desseminate (S Thiagarajan: 1974). This stage is carried out by distributing the final products that have been tested. In this study, the dissemination stage was not carried out due to time constraints in preparing the final report so that this research was simpler. Which is then simplified according to what was done by Rewatus et al, only up to the developer or 3D Define, Design, Development stage (Antonius: 2020).

1. Define

   The initial stage is Define. At this stage conducting analysis, research and gathering information on the needs of researchers through literature studies. Analysis carried out to find ideas or ideas that can create products that will be developed according to needs. This activity includes formulating goals, setting a sequence of lessons on a limited scale (Wina: 2015).

2. Design

After carrying out the analysis activities that need research, design activities are carried out. By designing a product that will be developed in this case in the form of an RBL Module for making natural foot sanitizers . The design of this RBL Module includes topic of Eubacteria, pictures, student activities, practice questions.

3. Development

Initial product development is carried out by preparing the materials needed in this case in the form of RBL Modules and validation assessment tools by experts.

RESULT AND DISCUSSION

Defining Stage (Define)

At this stage the researcher looks for problems related to science learning. This stage also aims to be able to determine and explain a series of needs in learning science. The research was carried out by looking for the needs of students, namely by reviewing the literature/literature study so that it can be used as a guideline and produce various information related to the product being developed. This Define stage includes initial-end analysis needs, student analysis, task analysis, concept analysis, formulation of learning objectives (Albert: 2019).

Front-end Analysis (Initial-Final Analysis)

Defining the problems encountered in the learning process so that it requires the development of teaching materials through observation and interviews. This analysis can make it easier for researchers to provide guidelines and can be an alternative in solving problems and making it easier to choose teaching materials. Problems that mosques or places of pilgrimage often get are visited by pilgrims with different foot conditions which can cause foot odor. In addition, there are problems encountered in learning science. Researchers conducted interviews with science subject teachers at MTs Ma'ahid Kudus and made direct observations. This stage resulted in the unavailability of teaching materials related to research in everyday life. This causes students to lack 4C skills so that students are passive and 21st century skills are still not the main focus in learning science.

Learner Analysis (Student Analysis)

At this stage it aims to identify students who will be the main focus in product development. Based on the results of analytical interviews with students at MTs Ma'ahid Kudus especially class VII, it was found that in learning the classification of living things, the Eubacteria sub-topics, students tended to only listen to the teacher, and only hold on to LKS books, which had limited material. From these interviews it can be said that the ability of 21st century skills, namely 4C, is still not the main focus in science learning.

Task Analysis

At the task analysis stage, the researcher arranges the main tasks that will be mastered by students according to Basic Competency. The topic presented in this study is Eubacteria which is associated with research in everyday life. The results of this task analysis are compiled and contained in several parts of the module. It is intended that the module can be mastered by students. In this task analysis, students develop the skills of 4C students, one of which is creative, and students can determine fundamental problems and

know the stages of research. This is in line with the research of Rani HotmaidaRumahorbo et al, which states that learning using research methods can develop 4C skills in students so that they can foster learning opportunities for students (Rani and Gingga: 2021).

Concept Analysis

At this stage the researcher analyzes the Basic Competencies and Indicators that must be achieved by students. This stage is carried out so that there are no misunderstandings in the concept of IPA on the topic Eubacteria. So, researchers will develop the RBL module by raising topic of Eubacteria. In the analysis of this concept that will be discussed in the module, namely the definition of Eubacteria, the characteristics of Eubacteria, mountainous bacteria and harmful bacteria, as well as the steps for making foot sanitizer as a solution to the problem of foot odor.

Specifying Instructional Objectives

At this stage the formulation of learning objectives aims to formulate learning objectives based on Basic Competency. The learning objectives to be achieved in the RBL module for making natural foot sanitizer are students being able to identify the types of bacteria that cause foot odor through analysis of research journals, students are able to anticipate the dangers of bacteria that cause foot odor in places of worship through making foot sanitizer from natural ingredients in the surrounding environment.

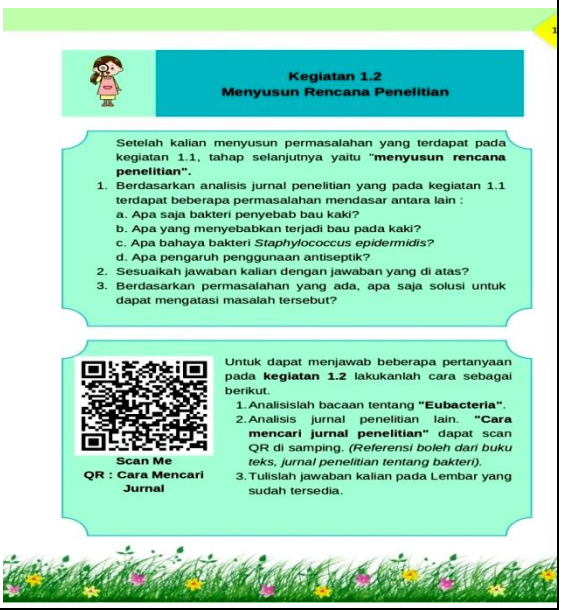
Design Stage (Design)

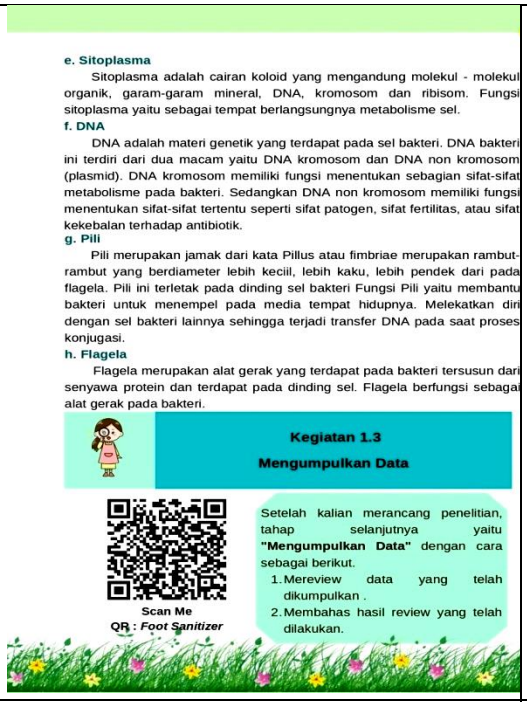
After carrying out the analysis activities that need research, design activities are carried out. By designing a product that will be developed in this case in the form of an RBL Module for making natural foot sanitizers . so that the design process must comply with RBL module systematics. The design of this RBL Module includes topic of Eubacteria, pictures, student activities, practice questions.

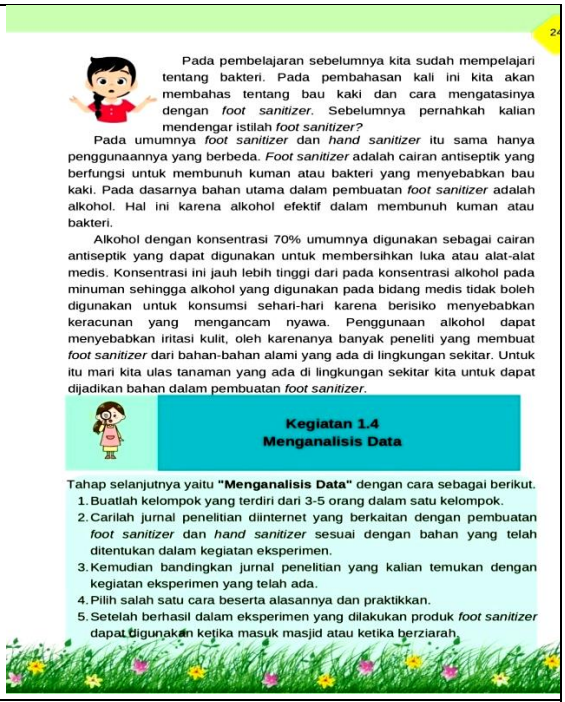
Initial Product Design

At the initial design stage the product is a design designed for the activities to be carried out in the module. The initial draft of the module at this stage is the RBL module for making foot sanitizers made from natural Eubacteria . The selection of the RBL model aims to be able to encourage students to develop 21st century skills. The RBL learning model is said to be effective in developing the 4C abilities, including, learning constructs student understanding, learning is achieved through real experiences, developing patterns of social interaction, and developing prior knowledge (Rumahorboand Prananda: 2021). An overview of the initial draft of the RBL-based module is presented in Table 2.1 as follows.

Table 2.1 Overview of the initial draft of RBL module product design

<table>
<tr>
<td>1. RBL syntax define the problem activity
Students are asked to determine the basic problem from the QR code for bacterial hazard that is already available in Activity 1.1.
 
</td>
<td>2.RBL syntax develop a research plan activity
Students are asked to find solutions or solve problems from Activity 1.1 by looking for some references from research journals.
 
</td>
</tr>
<tr>
<td>3. RBL syntax collecting data activity
Students are asked to review the data that has been collected and discuss the results of the review.</td>
<td>4. RBL syntax analyze data activity
Students are asked to look for research journals related to the manufacture of foot sanitizer/hand sanitizer then practice how to make foot sanitizer from natural materials around the environment.</td>
</tr>
</table>



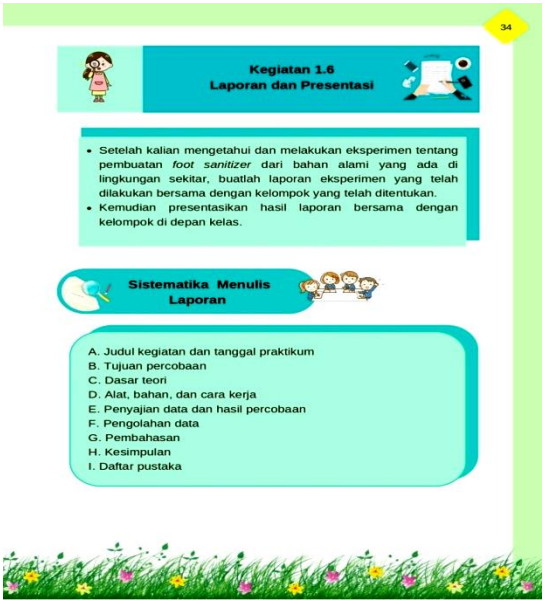


5. RBL syntax test the results of the analysis activity

Students are asked to carry out organoleptic tests on the foot sanitiser products that have been made.

6. RBL syntax reports and presentations activity

Students are asked to write reports on the results of experiments that have been carried out and then present the results of these reports in front of the class.



Development Stage (Develop)

Expert Validation

On the filling data validation sheet refers to the Likert scale to measure the affective domain. For each instrument item that uses a Likert scale, it has a gradation from very

positive to very negative in the form of words. The following is a Likert scale table (Riduwan: 2016).

Table 3.1 Assessment criteria using the likert scale

Number	Criteria	Information
5	SS	Strongly agree
4	S	Agree
3	N	Neutral
2	TS	Don't agree
1	STS	Strongly disagree

Analysis of validation questionnaire data is given to expert validators which is carried out by providing responses and the validator providing suggestions related to the product being assessed so that these suggestions can become data or input in product improvement. So that the RBL Module for making Foot Sanitzer is said to be valid if it has a high level of validation category. This can be obtained through the following equation (Riduwan: 2016).

$$N = \frac{\text{score obtained}}{\text{max score}} \text{ x } 100$$

In this case the RBL foot sanitizer Module category can be said to be valid if it is based on the final value obtained on a scale (0% -100%), so that it can be seen in table 3.2 (Niken et al: 2020).

Response score	Information
81% - 100%	Very Worth it
61% – 80%	Worthy
41% - 60%	Less Eligible
21% - 40%	Not feasible
0% - 20%	Very Unworthy

Table 3.2 Validation criteria.

The validator consists of two media experts, two material experts. Each validator assesses according to predetermined criteria. Based on the results of the analysis and accumulated values obtained from the media expert validator at the validation test stage, which has been carried out by the RBL module for making natural foot sanitizer, topic of Eubacteria, can be seen in Table 3.3.

1) Media Expert Validation Results

The following are the results of Media Expert 1 and Media Expert 2 Validation.

Table 3.3 Media expert validation results

Validators	Aspect	Score	Percentage	Criteria
Media Expert 1	Module Cover Design	32	80%	Worthy

Validators	Aspect	Score	Percentage	Criteria
	Module Content Design	32	80%	Worthy
Average		32	80%	Worthy
Media Expert 2	Module Cover Design	32	80%	Worthy
	Module Content Design	34	85%	Very Worth it
Average		33	83%	Very Worth it

2) Media Expert Validator Advice

After the validator provides an assessment, the validator provides suggestions or input for the product produced.

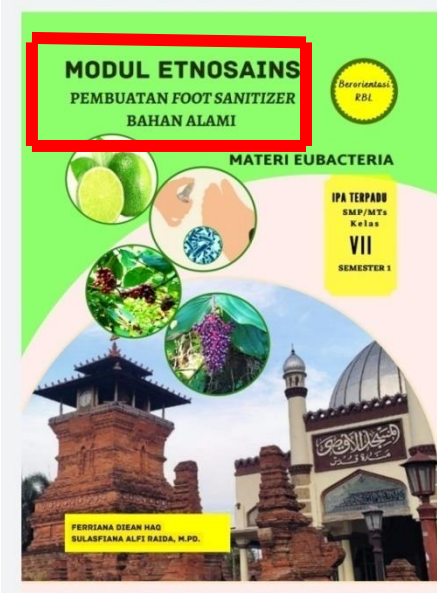
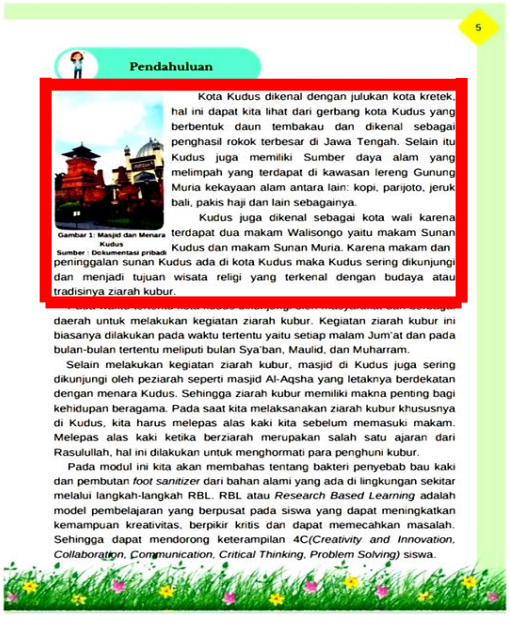
Table 3.4 Media expert validator suggestions

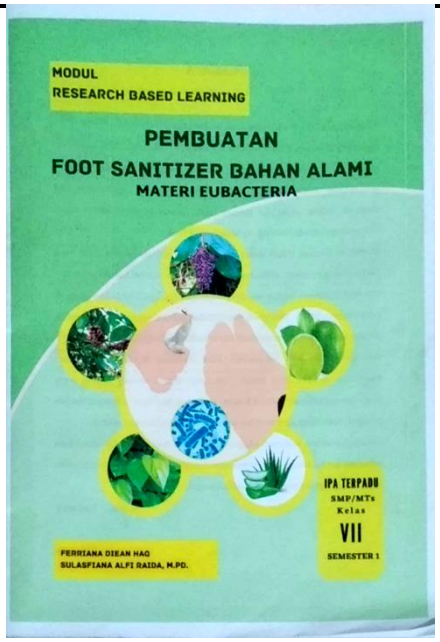
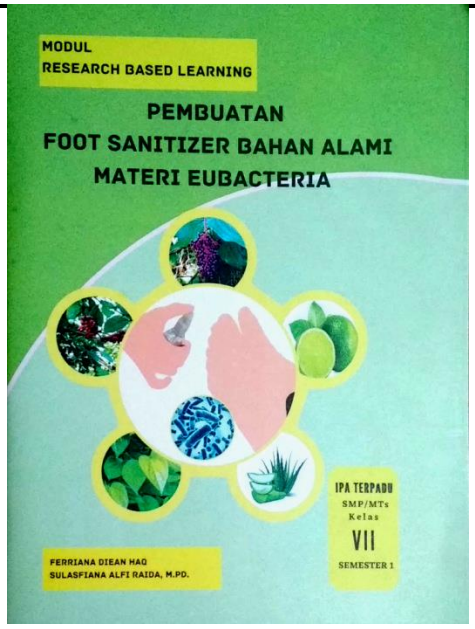
Validators	Suggestion	Repair
Media Expert Validator 1	Graphically it is very good, the ethnoscience section needs to be reviewed	Have reviewed/eliminated material on ethnoscience
Media Expert Validator 2	Use A4/A5 paper size	The module size has been enlarged
	Add healthy living steps (legs)	Already added healthy living steps to the module

3) Product Revision

After the Validator provides an assessment and input, the researcher will make improvements to the product according to the suggestions from the validator as follows.

Table 3.5 Display of modules before and after revision

No.	Before repair	After repair
1.	Review the Ethnoscience section. 	Review the Ethnoscience section 
2.	Review the ethnoscience section 	Omitting the ethnoscience section 
3.	Use A4/A5 paper size	The module size has been enlarged

No.	Before repair	After repair
		
4.	Add healthy living steps (legs).	Already added healthy living steps to the module
		

Based on the results of expert validation, the material contains 4 aspects consisting of Content Aspects, Presentation Aspects, Language Aspects and RBL Aspects.

4) Material Expert Validation Results

At this stage the Validator provides an assessment of the product produced

Table 3.6 Material Expert Validation Results

Validators	Aspect	Score	Percentage	Criteria
Material Expert Validator 1	Fill	37	92%	Very Worth it
	Presentation	17	85%	Very Worth it
	Language	18	90%	Very Worth it
	RBL	38	95%	Very Worth it
Average		27.5	91.6%	Very Worth it
Material Expert Validator 2	Fill	34	85%	Very Worth it
	Presentation	20	100%	Very Worth it
	Language	16	80%	Worthy
	RBL	38	95%	Very Worth it
Average		27	90%	Very Worth it

5) Material Expert Validator Advice

After conducting an assessment of the product results, the validator then provides suggestions for deficiencies in the resulting product.

Table 3.7 Material expert validator suggestions

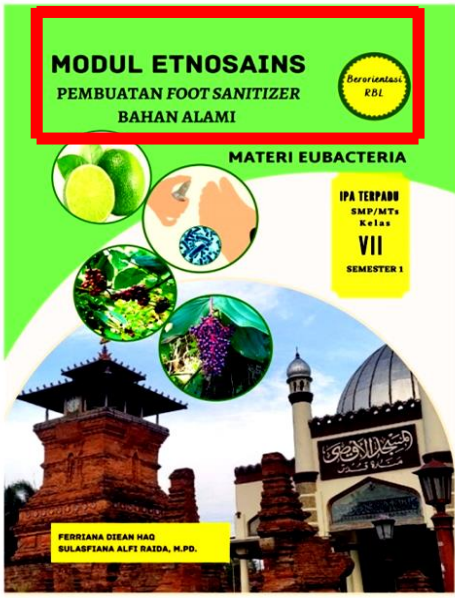
Validators	Suggestion	Repair
Material Expert Validator 1	Check the ethnoscience statement again.	It has been checked by eliminating statements about ethnoscience.
Material Expert	Fixed module (bigger writing).	Improvements have been made to the writing font by increasing the font size from 13 to 14.
	Additional information on the material to be made into foot sanitizer (can be in the form	Have added activities or assignments related to the benefits of the ingredients for making foot sanitizer.

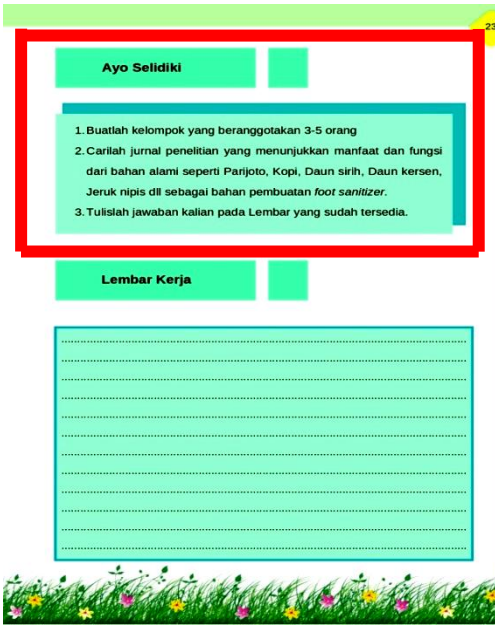
Validator 2	of assignment/literacy).	
	Equipped with international journals to support sources.	International journals have been added.

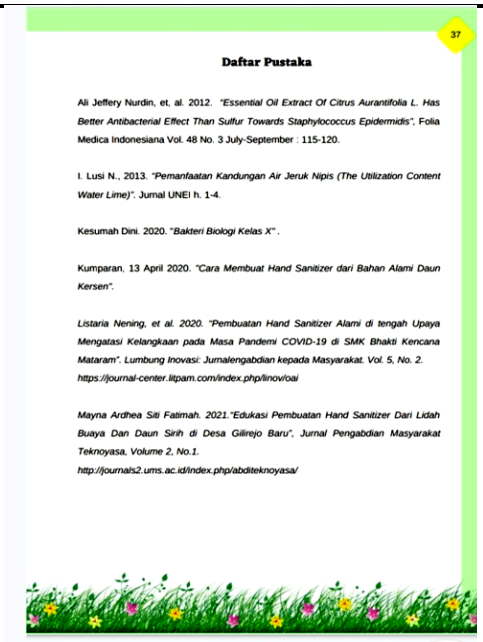
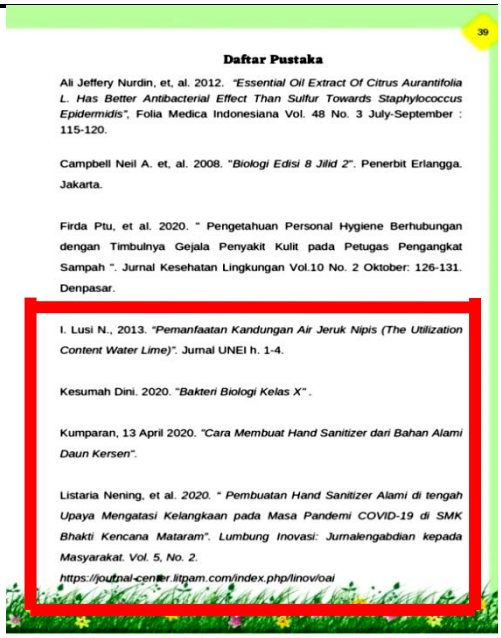
6) Product Revision

After the validator provides an assessment and suggestions for the product, the researcher makes improvements to the resulting product as follows.

Table 3.8 Module display before and after revision

No.	Before repair	After repair
1.	Check the ethnoscience statement again. 	It has been checked by eliminating statements about ethnoscience. 
2.	Fixed module instructions (larger text).	Improvements have been made to the writing font by enlarging the module guide image and changing the module size to 14.

No.	Before repair	After repair
		
3.	Additional information on the material to be made into foot sanitizer (can be in the form of assignment/literacy).	Have added activities or assignments related to the benefits of the ingredients for making foot sanitizer.
		
4.	Equipped with international journals to support sources.	International journals have been added.

No.	Before repair	After repair
		

7) Science Teacher Response

This stage is carried out with an assessment of the filling out of the questionnaire that has been given. In this assessment there are 6 aspects namely module content aspect, presentation aspect, language aspect, RBL aspect, cover design aspect, module content design aspect.

8) Science Teacher Response Results.

After the product has been validated by an expert validator and the product has been repaired, a feasibility test is carried out by the science teacher on the product produced.

Table 3.9 Science teacher response results.

No.	Aspect	Score	Percentage	Criteria
1.	Fill	31	77.5%	Worthy
2.	Presentation	16	80%	Worthy
3.	Language	16	80%	Worthy
4.	RBL	32	80%	Worthy
5.	Module Cover Design	32	80%	Worthy
6.	Module Content Design	32	80%	Worthy
	Average	26.5	79.5%	Worthy

9) Science Teacher Advice

The following are suggestions or input given by the Science Teacher on the products produced.

Table 3.10 Suggestions or input from science teachers.

Respondents	Suggestion
Science teacher	The design and contents of the modules are good, although maybe a bit heavy for class VII
	Many experience "new material" by reading this RBL module.

10) Student Response

Student responses were carried out using a questionnaire consisting of 2 aspects. There were 28 students who responded to the RBL module which can be seen in Table 3.11.

Table 3.11 Student response results

Aspect	Response	Score	Percentage	Criteria
Convenience	28 students	958	85.5%	Very Worth it
Attractiveness	28 students	364	86.6%	Very Worth it
Average		661	85.8%	Very Worth it

CONCLUSION

Based on the development of the RBL module for making natural foot sanitizer on the topic Eubacteria in class VII IPA that has been carried out, it can be concluded that the validation results show that the media expert validator 1 obtains a value of 80% in the "decent" category, the media expert validator 2 obtains 83% results in the "very feasible" category ". The results of the assessment of the material expert validator 1 were 91.6% in the "very feasible" category, the material expert validator 2 obtained 90% results in the "very feasible" category. The results of the teacher's response obtained a value of 79.5% in the "appropriate" category and student responses obtained a value of 85.8% in the "very feasible" category. Thus the RBL (Research Based Learning) module for making natural foot sanitizer can be declared to have good or very feasible feasibility and can improve students' 4C skills.

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