

Development of Guided Inquiry-Based Science Modules for Elementary School Students

Indah Nur Palupi^{1,*} Lilik Bintartik¹ Arda Purnama Putra¹

¹ *Elementary School Teacher Education, Faculty of Education, State University of Malang, Indonesia*

*Corresponding author. Email: nurpalupii@gmail.com

ABSTRACT

The purpose of this research and development is to produce a guided inquiry-based science module by strengthening the character of curiosity in the style material in class IV SD Kebonduren 1 which is valid according to the material expert, instructional material expert and user, attractive and practical according to students. This research and development use the R&D model by Borg and Gall. Data collection techniques through interviews and questionnaires. Validation results Material experts, instructional materials experts and users each get an average rating of 88%, 89.1%, and 95% with a very valid category, and product test decisions can be used without revision. The assessment of attractiveness and practicality in product trials and usage trials yielded 96.8% and 99% results. With very interesting and very practical categories, product test decisions can be used without revision. From the results of the validation and the results of the trial it was concluded that the Guided Inquiry-Based Science Module with strengthening the character of curiosity in the style material in class IV SD Kebonduren 1 is very valid, interesting and practical, so it is worthy of use in learning.

Keywords: *Guided Inquiry, Modules, Elementary School Students*

1. INTRODUCTION

One of the contents in the education curriculum in Indonesia, especially at the elementary school level (SD), namely Natural Sciences (IPA). As the name implies, IPA studies all components in nature including living or inanimate objects. Learning science in elementary schools provides an opportunity to nurture student curiosity scientifically so that science learning can be carried out through simple observation, discussion and investigation that involves students directly.

The learning principle is following with the Graduation Competency Standards (SKL) and Content Standards (SI), namely that students are told to find out, from the teacher as the only learning source to learning based on various learning resources (Permendikbud No.22 of 2016). But in reality, in the field science learning in elementary schools is still not able to develop students' thinking skills. The implementation of the learning process that takes place in the classroom is only directed at the ability of students to remember and accumulate various information without being required to understand and find out for themselves about the information obtained to relate it to situations in everyday life. In the learning process, most teachers are only

fixated on textbooks as the only source of learning, teachers still use conventional methods such as lectures and question and answer. Teachers have not provided space for students to think critically and creatively in science learning.

Through interviews with grade IV teachers at SDN Kebonduren 01, Blitar Regency, several problems were found in science learning, namely that various learning methods and models had not been implemented, many were still using lecture methods, question and answer, and assignments. In these schools, there are also very few teaching materials that teachers can use as guidelines in teaching and learning resources for students. teachers have difficulties when learning science, students find it difficult to focus on lessons and tend to play alone. Because there is only 1 teaching material in science learning, namely the government's theme book lack of development of material in learning so that the material covered in basic competencies cannot be fully achieved.

Students tend to memorize material without understanding it more deeply, which makes students forget the material given more quickly. Yet according to Sulistyorini (in Susanto, 2013), there are nine aspects developed from a scientific attitude in science learning,

namely: curiosity, wanting to get something new, an attitude of cooperation, not giving up, not being prejudiced, introspective, responsible, free-thinking and self-discipline. Therefore, it is necessary to solve problems that are appropriate from existing problems and can be used as solutions in implementing ideal science learning.

Based on the conditions described above, a solution can be given in the form of developing module teaching materials as handling of science learning problems. The module can be interpreted as a printed learning unit. According to Wena (in Andriadi et al, 2018) all activities that make it easier for students to achieve a series of learning objectives, namely modules. According to Majid (in Andriadi et al, 2018), modules are books written with the aim that students can learn independently or without teacher supervision. According to Lubis, et al. (2015), the module was developed because of its superiority, namely by using modules to make students learn according to their own abilities because the abilities of each student in one class vary.

Furthermore, students can learn independently. The module facilitates students to study anytime and anywhere so that students can easily manage their study hours and increase student motivation. By using the module students can find out and measure their own learning outcomes, if the scores obtained are still low, students can repeat the material that has not been mastered.

The modules are arranged based on guided inquiry because in the 2013 curriculum one of the approaches suggested in science learning is inquiry. According to Schmidt's opinion (in Amri and Ahmadi, 2010) which means that inquiry is a process of obtaining information by making observations and/or experiments to find answers or solve problems to questions or problem formulations using critical and logical thinking skills. From this understanding, the guided inquiry approach is an approach that requires students to carry out a series of investigations, explorations, searches, experiments, searches, and research that are very suitable to be carried out in science subjects.

In the 21st century, values and character-based education has begun to be encouraged in the world of education. Therefore, the government made innovations in the field of education. This innovation is the issuance of the 2013 curriculum policy (K13). Learning outcomes developed in K13 are not only based on knowledge, but also on skills and attitudes. One of the characters developed is curiosity. Curiosity is a way of thinking, attitude and behavior that reflects curiosity and curiosity about everything that is seen, heard and studied in more depth (Ministry of National Education, 2010).

Previous research conducted by Yulfa (2018) entitled "Development of an Inquiry-Based Science Module on

the Properties of Light for Grade V students of SDN Kandungan 02, Blitar Regency". The percentage of the validity of the material expert's assessment was 96% and the media expert's assessment was 97%. From the evaluation of material experts and media experts, it can be seen that the module is in a very valid category.

Based on this experience, the researcher will develop a science module based on the guided inquiry on style material for solutions to science learning problems at SDN Kebonduren 1, Blitar Regency.

2. METHOD

This research uses research and development (R&D). The stages of research and development methods according to Borg and Gall in Sugiyono (2015); (1) potential and problems, (2) data collection, (3) product design, (4) product validation, (5) product revision, (6) product testing, (7) product revision, (8) testing usage, (9) product revision (10) mass production. Each stage is described as follows.

2.1. Potentials and Problems

This research is based on the potential and problems of learning science in grade IV SDN Kebonduren 1, Blitar Regency. To find out the potential and existing problems, an interview was conducted with the teacher on December 16, 2019. Then a solution to the problem was decided.

2.2 Data Collection

The first stage carried out in data collection is looking for a theory about the module followed by an analysis of the needs of teaching materials. The analysis of the teaching material needs was obtained from the results of interviews with class IV teachers related to teaching materials in science subjects.

2.3 Product Design

The product design stage begins with collecting module materials then compiling the module format. Module materials are obtained from student books, Electronic School Books (BSE) and journals. The formulation of the science module format based on guided inquiry style material is arranged as follows: (1) cover, (2) introduction, (3) instructions for use, (4) table of contents (5) concept map, (6) basic competencies and learning objectives, (7) learning materials, (8) experimental/experimental activities, (9) summary (10) evaluation questions, (11) assessment (12) key answers to evaluation questions, (13) reflection, (14) bibliography. After the final product is finished, it is followed up by making a product validation instrument for material experts, teaching materials experts, users and student response questionnaires.

2.4 Product Validation

Product validation has the aim of assessing the product design that has been made feasible and ready for use or not. Product validation is carried out by material experts, teaching material experts and teachers as product users. The results of the calculation of the percentage of validity are interpreted and interpreted as in Table 1.

Table 1. Criteria for categorization of validation results

No	Achievement Level (%)	Category	Test Decision
1	85,01-100,00	Very Valid	Test Decision Category
2	70,01-85,00	Quite Valid	Can be used, but needs minor revisions
3	50,01-70,00	Less Valid	It is recommended not to be used, because it needs major revisions
4	01,00-50,00	Invalid	Not allowed to be used

Source: Akbar (2013)

2.5 Product Revision

The results of the validation and suggestions from each validator are used to revise the product so that the product being developed is even better and ready to be tested on a small scale of students.

2.6 Product Trial

Product trials were conducted on students of SDN Langon 01 with a sample size of 3 students. The sample criteria used were 1 smart student, 1 intermediate student, and 1 student with less ability. The test results of this product are used to revise the product.

2.7 Product Revision

After testing the product, it turned out that there were still weaknesses in the product. The weaknesses found in the module made the researcher make the second stage of improvement/revision according to the situation, conditions during the trial and from the results of the student questionnaire. After the revision has been

completed, the product is tested on a larger scale than the previous trial.

Table 2. Criteria for categorization of validation results

No	Achievement Level (%)	Category	Test Decision
1	$P \geq 85$	Very attractive / practical	Can be used without revision
2	$70 \leq P \leq 85$	Quite interesting / practical	Can be used, but needs revision
3	$50 \leq P \leq 70$	Less attractive / practical	Can be used with major revisions
4	$P \leq 50$	Not attractive / practical	Not to be used

Source: Yamasari (in Yuliana 2017)

2.8 Trial Use

Usage trials are the next stage of a revised product after product testing. The trial for the use of this module was carried out in class IV SDN Kebonduren 1, Blitar Regency on March 12, 2020. The use trail was carried out to class IV totaling 25 students. After learning to use the module students are asked to fill out a questionnaire to find out student responses related to the attractiveness and practicality of the module. The results of the calculation of the percentage of attractiveness and practicality are interpreted and interpreted as in Table 2.

2.9 Product Revision

At the time of testing the use, there were still deficiencies in the module, so that the researchers made improvements / revisions to the third stage. Repair the product according to the situation, conditions when testing usage. So that products that have been repaired / revised and declared fit for use in learning can then be mass produced.

2.10 Product Trial

At this stage, limited mass production is carried out in collaboration with the school. Products are made immediately after going through the last revision stage and given directly to the school.

Table 3. Recapitulation of Science Module Validation Results Based on Guided Inquiry

No	Aspects assessed	Average Percentage			Average	Category
		Expert Material	Expert teaching materials	User		
1	Material Feasibility	93,75	-	100	96,9	Very Valid
2	Presentation Feasibility	83,3	83,3	100	88,9	Very Valid
3	Language Feasibility	75	-	75	75	Sufficiently Valid
4	Appearance Feasibility	-	95	100	97,5	Very Valid
5	Stimulation of curiosity characters	100	-	100	100	Very Valid
Total =		352,05	178,3	475	458,3	
Average (%) =		88,01	89,1	95	91,66	
Category =		Very Valid	Very Valid	Very Valid	Very Valid	

Table 4. Recapitulation of Student Response Questionnaire Results

No.	Aspect	Percentage of Assessment (%)		Average (%)	Category
		Product trial	Trial use		
1	Withdrawal	94,4	99,33	96,8	Very Attractive
2	Practicality	100	98	99	Very Practical

3. RESULT

The results of interviews with grade IV teachers at SDN Kebonduren 01, Blitar Regency, found the potential, namely the high enthusiasm for learning of grade IV students. In addition, several problems were found, namely the teaching materials used for student learning resources were only thematic books from the government so that learning often used the lecture method which tended to inform students. In the learning also lacks development of science material. Students' desire to know is less developed so that students are not interested and less active in learning, this can be seen from students who rarely ask questions in learning.

Furthermore, the data collection stage, starting with the analysis of the curriculum used. At that elementary school, the 2013 curriculum was used. After that, a search for theories about modules was carried out. Furthermore, the teaching material analysis is carried out, assessing the basic science competency in class IV 3.4 and 4.4. then material from relevant sources from student textbooks, electronic book (BSE) and journals. After the references are collected, the third stage is continued by collecting reference.

It is continued with the preparation of the material. The third stage is product design, product design, namely the product design stage. product design steps are as follows; (1) developing material by adjusting the basic competencies to be achieved, (2) making activity steps following the basis of guided inquiry by strengthening the character of curiosity, (3) determining the appropriate cover design and layout, (5) determining the size of the module namely A4 size, (6) compiling the module using Microsoft Word, Adobe Illustrator and Photoshop applications with color design and in accordance with the material relationship between style and motion in events in the surrounding environment. The end of this stage is to create a validation instrument for material experts, teaching material experts, users, and student response questionnaires.

After the initial product has been made, product validation is carried out. Product validation aims to assess the product design that has been made feasible and ready to use or not. Product validation is carried out by material experts, teaching material experts, and teachers as product users. Validation generates numbers as well as suggestions and comments for product improvements. The recapitulation of the validation results is presented in Table 3.

After going through the product validation stage, a product revision is carried out. The results of validation and suggestions from each validator are used to revise the product so that the product being developed is even better and ready to be tested on students in product trials. The product trials used were small group trials.

The next stage is product testing. The trial was conducted on students of SDN Langan 01 with a sample size of 3 students with different criteria. The sample criteria to be used are 1 smart student, 1 intermediate student, and 1 student with less ability. The test results of this product are used to revise the product.

After testing the product, it turned out that there were still weaknesses in the product. The weaknesses that were found from the guided inquiry-based science module made the researcher make the second stage of improvement /revision according to the situation, the conditions during the trial and the results of the student questionnaire. After the revision is complete, the product will be tested with a larger learning scale than the previous trial.

Usage testing is the next stage of a product that has been revised during product testing. The trial for the use of the science module based on guided inquiry was conducted in class IV SDN Kebonduren 1, Blitar Regency on March 12, 2020. The trial was conducted on the fourth-grade students of SDN Kebonduren 1, Blitar Regency, total of 25 students. After learning to use the module students are asked to fill out a questionnaire to find out student responses related to the attractiveness and practicality of the module. A recapitulation of the results of the student response questionnaires on product trials and usage trials is presented in Table 4.

4. DISCUSSION

The validity of the science module based on guided inquiry is based on the validation results of material experts, teaching materials experts, and users. Validation includes 5 aspects, namely: (a) feasibility of material, (b) feasibility of presentation (c) feasibility of language, (d) feasibility of appearance, and (e) stimulation of curiosity characters. The results of the validation of the science module based on guided inquiry from material experts, teaching materials experts, and users were 88%, 89.1% and 95%, respectively. With very valid categories and test decisions can be used without revision.

Based on Table 3, the module has been validated by material experts which includes 4 aspects of assessment,

namely material feasibility, presentation feasibility, language and curiosity character stimulation. In the aspect of material feasibility, it gets 93.75% results with a very valid category by material experts. This aspect assesses (1) the suitability of basic competency, learning objectives and learning materials, (2) clarity of material, (3) currentness of material, (4) suitability of guided inquiry learning syntax. Material experts suggest adding tables to each activity to process data so that students can be encouraged to analyze data in each activity, this is following Sanjaya (in Siatatava, 2013) in the guided inquiry learning step, there is a stage of collecting data.

In the aspect of presentation feasibility, it got 83.3% results with a fairly valid category by material experts. This aspect assesses (1) presentation technique, (2) module presentation, and (3) module completeness. Improvements are material that has not been presented from easy to difficult. By presenting the material coherently from easy to difficult will help students understand the material presented. However, the material has been presented systematically and is following the syntax of guided inquiry learning, this is in line with the opinion of Prastowo (2012) which states that the module is made systematically using simple language, according to the age and level of student knowledge so that students can learn independently with minimal guidance from teacher because the teacher is only a facilitator in learning.

The language feasibility aspect obtained 75% validation results with a fairly valid category from material experts. This aspect assesses 2 indicators, namely (1) conformity with language rules and (2) communicative. The material expert gave suggestions for improvement in composing sentences. Sentences that are too long need to be simplified so that they are clearer and easier to understand. Then the sentence structure as well as the spelling and usage of EYD are correct. The language used is still wordy and poorly understood by students, but the choice of words used does not create multiple meanings, and the module encourages students to be skilled in asking questions. This is following with the opinion of Sani, et al (in Yulfa, 2018) explaining that inquiry learning encourages students to formulate questions from investigations or investigations they carry out in finding new knowledge.

Based on Table 3, the module has been validated by teaching material experts which include 2 aspects of assessment, namely aspects of presentation feasibility and appearance feasibility. The feasibility aspect of the presentation got validation results of 83.3%, the category was quite valid by the teaching material expert. This aspect assesses (1) presentation technique, (2) module presentation, and (3) module presentation completeness. Teaching material experts provide comments and suggestions, namely that the material has not been presented from easy material first to difficult material.

In the aspect of display feasibility, the results are 95% very valid category. This aspect assesses (1) module size, (2) module cover design, (3) module core design, (4) presentation of text or writing and (5) presentation of questions. Improvements are on the cover, The picture used as the cover has not focused on describing the contents of the module, so the cover needs to be rearranged to make it easier for students to know what to learn. In addition, the column name and no. student attendance need to be reduced. The font on the cover is very attractive and the font size is easy for students to read. This is in line with the opinion of Setiautami (2011) that books for students to fulfill the legibility aspect require a font that has a simple, friendly design, and has an open round character shape.

User validation was carried out by the fourth-grade homeroom teacher at SDN Kebonduren 01, Blitar Regency. The aspects that are assessed by the user include aspects of material feasibility, aspects of presentation feasibility, language aspects, aspects of appearance feasibility and curiosity characters. From the validation results found deficiencies in the module. In the language aspect, there is one indicator of assessment, namely communicative which gets a score of 3 by the user.

Weaknesses in this aspect there are many mistakes in the affix "di", the word "above" is the wrong word that is correct, namely "in front". In accordance with the objectives of developing a science module based on guided inquiry valid according to the user, the assessment carried out by the user (teacher) is analyzed using the Akbar formula (2013) and produces a validity level of 95%. So that this development is in a very valid category with the test decision that can be used without revision. But to further improve the product, users (teachers) provide very constructive suggestions and feedback.

The assessment of aspects of product attractiveness and practicality is found in the student response questionnaire on the implementation of product trials and usage trials. The attractiveness aspect of assessing (1) the science module based on guided inquiry is interesting and fun (2) the shape and size of the letters in the module is interesting, (3) the pictures in this module are interesting, (4) all students like the experimental activities contained in the module This, (5) all students like to like learning using this module, (6) by using a guided inquiry-based science module all students want to learn other material. Whereas in the practical aspect of assessing (1) the shape of the letters used in this module is easy to read, (2) the images presented in the module clarify the material, (3) the questions presented in the module are easy to understand, (4) students are easier to understand the style relationship material and movement through guided inquiry-based science modules.

Based on Table 4. The results of the aspects of attractiveness and practicality in the product trials were

respectively 94.4% and 100%. very interesting and very practical categories with test decisions can be used. In the implementation of the trial using the aspects of attractiveness and practicality, respectively obtained results of 99.33% and 98%. Very interesting and very practical categories with test decisions can be used. The average attractiveness and practicality ratings in product trials and usage trials obtained results of 96.8% and 99%. So it can be stated that the guided inquiry-based science module falls into the very practical category with test decisions that can be used without revision.

Science module based on guided inquiry by strengthening curiosity in material style, there are several advantages and disadvantages of the product. The advantages of this module are the color design and the completed pictures in every activity that is very interesting, the activities in the module are easy to understand by students, this is evident in the results of student response questionnaires, the activities in this module use the steps of a guided inquiry approach that encourages students to ask questions and develop skills. ability to think systematically. In addition, the science module based on guided inquiry encourages students' curiosity to dig deeper into the learning material. The weakness of this product is that it requires expensive production costs because this product is designed in full color and the effective use of each student holds 1 module.

5. CONCLUSION

Based on the results of the material expert validation, it was found that the feasibility level in terms of the material was 88% which could be interpreted that the science module based on guided inquiry was feasible from the aspects of the feasibility of material, presentation, language and curiosity character. The results of the validation of teaching materials experts found that the feasibility level in terms of teaching materials was 89.1% which could be interpreted that the science-based inquiry module was feasible in terms of presentation feasibility and appearance feasibility. Validation by grade IV teachers at SDN Kebonduren 01 Blitar Regency as users, got an average score of 95% for all aspects, with very valid categories, the test decision can be used without revision.

Based on the results of the product trial, the attractiveness and practicality of the module reached a percentage of 94.4% and 100% respectively with a very attractive and very practical categories. The results of the trial using inquiry-based science modules show that the attractiveness and practicality of the module reach 99.33% and 98%, respectively, in the very interesting and very practical categories. The average attractiveness and practicality assessments in product trials and usage trials obtained results of 96.8% and 99% with the very attractive and very practical categories of product test

decisions can be used without revision. With the use of guided inquiry-based science modules in learning to get a very good response from students, students actively participate in learning material relations between styles and movements using modules. As well as the character of student curiosity is developed through this guided inquiry-based science module.

It can be concluded that the science module based on guided inquiry by strengthening the character of curiosity in the style material in grade IV SDN Kebonduren 01 Blitar Regency got very valid, very interesting and very practical results. Therefore, the product is suitable for use in the learning process. This module has several advantages of color design and is equipped with pictures in every very interesting activity, the activities in the module are easy for students to understand, the activities in this module use the steps of a guided inquiry approach that encourages students to skillfully ask questions and develop the ability to think systematically. Besides that, the guided inquiry-based science module encourages students' curiosity to dig deeper into the learning material. The results of this study are expected to be developed in further research with different materials. So that it adds quality science teaching materials.

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