

## Development of Learning Book Based on Inquiry Guidenes the Topic Structure of Earth in Grade V of Elementary School Pucangsawit of Surakarta

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### ABSTRACT

The objectives of this research are: 1) to develop of learning book based on inquiry guidenes; (2) to investigate the feasibility of learning book based on inquiry guidenes; and (3) the effectiveness of learning book based on inquiry guidenes for the students achievement on the topic Structure of earth of Grade V of Elementary School Pucangsawit of Surakarta.

The research used the Research and Development (R&D) method, which referred to the model claim by Thiagarajan (4D), namely: (1) Define; (2) Design; (3) Development; (4) Disseminate. The respondents of learning book development included field testing respondents consisting 2 validators and 2 practitioners, limited- scale main field testing respondents consisting 5 students, and operational field testing respondents consisting of 22 students in class existing learning. The data of research were gathered through questionnaire, observation, in-depth interview, and test. They were analyzed by using the descriptive qualitative method. Meanwhile, the result of cognitive learning was analyzed by using normalized N-gain to investigate the effectiveness of the developed learning model; Paired Sample T test to investigate the students achievement prior to and following the model use; Independent t test and Anava, to investigate the difference of the result of existing learning class, module class, and that of aggregation class.

The results of research are as follows: 1) The product developed is the learning book which is in accordance with inquiry guidenes, it has student's work sheet, and it is contextual; 2) The result of learning book based on inquiry guidenes is feasible to be applied on the topic of Strucutre of Earth. The results of validation by experts of learning models on the developed module, practitioners, and students are 3.59 (very good), 3.47 (good), and 3.19 (good) respectively. Therefore, it is feasible to be used in Elementary School Pucangsawit of Surakarta. 3) The results of the effectiveness of the developed learning book based on Inquiry Guidenes are indicated by the average scores of the knowledge learning result obtained by the existing learning class, module class, and aggregation class, namely: 69.12, 75.69, and 81.64 respectively. In term of attitude learning result, the aggregation class has more students who obtain the very good score (22.3) than the learning book class (16.5) in each aspect. In term of skill learning result, the average score of the students of the aggregation class is higher than that of the module class. Based on the results of research a conclusion is drawn that the characteristics of the developed Inquiry Guidenes-based learning book, it has student's work sheet, and it is contextual. Therefore, it is feasible and effective to improve the student's achievement on the topic Structure of Earthof Grade V of Elementary School Pucangsawit of Surakarta.

**Keywords:** Learning book, Inquiry Guidenes, Structure of Earth, and student's achievement.

## 1 INTRODUCTION

Education has an important role in creating quality of human. The quality of education in Indonesia has not experienced a significant increase, which led to education in Indonesia no longer competitive compared to the other countries.

Learning is a process of change in behavior results from the interaction of students with their environment. The interaction between students and their environment can develop the attitudes, knowledge, and skills. Learning is a process of seeing, observing

and understanding a thing (Ilahi, 2012). Offender learning there are two kinds of teachers as facilitators of learning and students as learners. Learning is a peak experience in acquiring knowledge related to changes in behavior.

Changes in student behavior must be planned deliberately through learning activities. Learning is a process that aims to facilitate students to have specific competencies such as knowledge, skills, and attitudes required to perform a task or job. Learning is only done by transferring knowledge from teachers to students will lead to a given concept will not last long in the memory of students.

Science or natural science is one of the requirements in the mastery of science and technology. Amalia Sapriati (2009) describes in the book Learning science in elementary school that Bruner learning model and its application in primary science teaching is an information processing activities that finding needs to recognize and describe symptoms that exist in our environment. So Bruner proposed model of learning is often called discovery learning model. Models present invention can change the motivation to learn search praise from the outside (external motivation) to the inner satisfaction (motivation from within). Model invention also equip students or learners with practical procedures to solve problems, procedures or steps that have owned it will be able to help solve their problems.

The quality of the learning process is influenced by the teaching materials and learning atmosphere. One material that can be developed to meet the needs of students is learning materials. Instructional materials are printed teaching materials are prepared in accordance with the requirements for the purposes of student learning. Teaching materials are made in a creative, innovative, and challenging can empower student learning outcomes. This is in accordance with Absari (2012) which states that a challenging learning can make students active so improve student learning outcomes.

Instructional materials should have high adaptability to the development of science, technology, and flexible. So that teaching materials are made to understand the students, teaching materials using simple language, easy to understand, as well as the term used is a generic term. Use of instructional teaching materials can condition more learning activities well planned, independent, and finished with a clear result. Learners can do an activity to learn anytime and anywhere.

In line with the above problems, the data midterm test results even in Class VA SDN Pucangsawit Surakarta in 2015/2016 decreased when compared with the results of general tests odd semester of 2015/2016. In general tests odd semester in Class VA SDN Pucangsawit get a scoring average of 73.91 while in the middle of the semester test results get a scoring average of 55.00 with a minimum completeness criteria (KKM) 68. The results of the analysis of absorption into guidelines that the material selected as the material structure of the earth in development research.

Low midterm test results even in the material structure of the Earth based on interviews of teachers and students caused by the material structure of the earth are so elusive recitation by students. Based on interviews of teachers and students in schools found that teachers have implemented various learning models include lectures, question and answer, discussion, cooperative, and projects to enable students in the classroom, but students are still difficult to be invited active learning. Students simply use the worksheets as a learning resource in the learning process. LKS used in schools contain only the subject matter and issues. The material contained in LKS presented directly without guiding students to discover and connect with the facts of

daily life. This causes the students are less active in building the knowledge so that students often forget about the principles and concepts of the material ever studied. Problems found in SDN Pucangsawit can be overcome with the use of a model of learning that can involve students actively invented the concept in the process of learning as well as student centered learning oriented. Student involvement in the process of building knowledge will produce meaningful knowledge and does not quickly disappear. Students will be more interested in learning science because students are directly involved in the discovery process. Learning with the invention directly effects in deeper to build students' knowledge. According to Susanto (2006) elections guided inquiry approach is expected to help students achieve success in learning and make learning more meaningful. However, the reality on the ground there are many teachers who use traditional teaching pattern that is only taught using lecture method and unidirectional (teacher talk, students listen). This fact indicates that most teachers teach in the classroom in the same manner and using a monotonous way. Students only be explained through lectures and rarely facilitate experiments to train students with the thinking of students (Suardana, 2007). This confirms that the students receive lessons in theory only. Students are not given the chance to develop in other aspects so that the development process of thinking, scientific attitude and psychomotor skills in students is limited.

Sagala (2009) states that the learning approach is the path that will be taken by teachers and students in achieving specific instructional purposes. Based on these opinions learning approaches is the activity of teachers in choosing learning activities that aim to facilitate teachers in providing learning services and also facilitate students to facilitate teaching students to understand the material presented teachers to achieve the learning objectives. Sementaraitu, Sanjaya (2009: 127) suggests the approach can be interpreted as a starting point or our view of the learning process. The opinion was expressed approaches someone refers to the perspective of the learning process.

Based on the description of the background of the above, it is necessary to study with the title: "Development of Guided Inquiry Learning Material Based on Student Learning Outcomes Structure Earth Class V SD Pucangsawit Academic Year 2015/2016"

The aim of this study was as follows:

1. Provide guided inquiry-based teaching material on the material structure of the earth.
2. Knowing the feasibility of developing material guided inquiry-based teaching materials in the material structure of the earth.
3. Knowing the effectiveness of development material guided inquiry-based teaching materials in the material structure of the earth.
4. Knowing the student learning outcomes in the material development of teaching materials based guided inquiry on the material structure of the earth.

Product instructional materials with guided inquiry-based learning in the material structure of the Earth have the following specifications:

1. Textbooks developed is printed instructional materials in the form of guided inquiry-based learning materials for students and teachers at SDN Pucangsawit material structure of the earth.
2. Development of teaching materials that are integrated with guided inquiry learning syntax.

3. Guided inquiry learning teaching materials adapted to the KTSP.

## 2 METHODS

Wina Sanjaya (2008) explains that according to Hilgard, "Learning is the process by which an activity originates or changed through training procedures (Whether in the laboratory or in the natural environment) as distinguished from changes by factors not attributable to training". For Hilgard, learning is a process of change through activities or procedures training exercise either in the laboratory or in the natural environment.

Learning is not just accumulating knowledge. Learning is a mental process that occurs within a person, leading to the emergence of behavioral change. Mental activity was due to the interaction with the environment conscious individuals. Learning is a very fundamental thing for humans. Learning can be done anywhere. In Thomas Suharmanto (2006: 13) Yusuf Hadi Miarso states that learning is a process of communication.

Based on the opinion of the above it can be concluded that learning is a process of change that occurs in a person.

Curriculum developed by this model is geared to educate students to have the ability to investigate the (inquiry) and find (discovery). Learning so that children can develop intellectual skills then the subject matter need to be presented with the stage of cognitive development of children which includes the step enaktif, iconic and symbolic.

The research method developed is a method of Research and Development with the development of teaching materials guided inquiry-based science. The study design is consistent with research that developed Thiagarajan et al (1974: 5). The steps of this study is known as the 4D model (Define, Design, Development and Dissemination).

Where research is SDN Pucangsawit Surakarta with an address at Ir. Sutami Street Pucangsawit RT 01 / XV District of Jebres Surakarta. As for the time of the study took place in February 2016 until August 2016.

Sample the development of science education involves one expert from the Sebelas Maret University background doctorate (S3) and 1 senior teacher friend. Limited test sample 5 Pucangsawit Surakarta school student chosen at random. The trial use of the product in class VA and VB grade students as a control group.

### 1. Define

The preliminary study stage researchers identified problems in the implementation of science teaching in class V. According Mulyatiningsih (2011:194) in the development of teaching materials is done by defining stages: 1) Analysis of the curriculum; 2) Analysis of the characteristics of the students; 3) Analysis of the material. The findings obtained as a basis the next step which is the design of products to be made. Observations carried out on learning activities in the classroom and questionnaire analysis of the needs of students and science teachers. The goal can dig up information on the state of schools in improving student learning to achieve quality.

The problems that arise are used as the basis for designing a teaching material that can help students in learning coherent and intact. So in this research, the development of teaching materials guided inquiry-based science in the material structure of the earth class V SD.

## 2. Design

Product design is a step to develop teaching materials guided inquiry- based science learning in which describes the material using the steps that correspond to guided inquiry.

Materials development process begins with the development of the syllabus, lesson plans, teaching materials in accordance with the lesson plan that had been developed, cognitive assessment sheets, and grating about pretest- posttest form of multiple choice questions, the assessment sheet affective, and psychomotor assessment sheet.

## 3. Development

The development phase is to produce learning science teaching materials that will be used for field testing. This stage includes validation of design by validator followed by revisions based on input from students on limited testing, and test the effectiveness in large classes.

### a. Design Validation

Validation of the design is intended to provide an assessment of all the components being developed include the teaching materials developed. This stage aims to get advice is to know the truth of the content and format as well as teaching materials for improving the enforceability of learning materials through validation activities of teaching materials that have been produced at the planning stage (design) done by one person matter experts and peers. Validation peers science teacher to know the content and format of writing legibility. Besides validated also by two science teachers to determine the possibility integrated science teaching. The results of this validation generate teaching materials draft II.

### b. Trial Limited

Limited test module guided inquiry-based science teaching is done in SDN Pucangsawit as many as five students from class VA. The purpose of this trial is to operationalize the IPA teaching materials based guided inquiry. The results of the various data and input from limited test will be used as teaching materials to produce a revised draft II III.

### c. Trial Large Classes

Trial instructional materials science learning real draft III trials conducted in SDN Pucangsawit Surakarta. The purpose of this trial is to operationalize learning science teaching materials based guided inquiry. Various data and questionnaires obtained in the trial will be used as the third revision and produce teaching materials in science classes improve learning outcomes SDN VA Pucangsawit Surakarta.

## 4. Disseminate

This stage is the stage of the use of the modules that have been developed in this research that science teaching materials that have been developed on a larger scale. In this study applied in working group of teachers (KKG) forum.

Design test products aims to gain direct result of the use of teaching materials guided inquiry-based science conducted after validation by experts in media and subject matter experts (lecturers and teachers). Experiments conducted to get feedback, suggestions, improvements that build on revising the science teaching materials.

### 1. Test Products

The trial of the investigational product is needed in the planning and execution of research. The trial of the investigational product used in science teaching materials based guided inquiry was Randomized Control group pretest- posttest were presented as follows:

Table 1 Test Product

Class	Pretest	Treatment	Posttest
Test Product (R)*	T1	Xa	T2
Base Line (R)	T1	Xb	T2

(R(R))\* Randomized assignment is meant placement at random. So Randomized Control Group means the selection of test groups of products / Xa and group base line / Xb selected at random

## 2. Research Subjects

The subject of research in the development of research are:

- Validation of the design of teaching materials carried by one person and one person doctorate teachers, whose job is to test the feasibility of teaching materials in accordance with the rules of the Ministry of Education (2008).
- Validation of teaching materials tested on a limited group consisting of 5 students with a background VA class students parallel / almost the same.
- Testing the effectiveness of teaching materials developed on student achievement VA applied to the class as many as 22 students of the class as a class product testing VA and VB class as the control class. The sampling technique was conducted by random sampling technique.

## 3. Type Data

The type of data in this study are primary data and secondary data. The type of primary data in this study is data about the feasibility of teaching materials guided inquiry-based science. Data obtained from the results of expert validation (Lecturer S3 education) and a science teacher (educated S1). The data in the form of assessment scores from material aspects and aspects of the display module. Secondary data is in the form of the test, the data pretest-posttest group and baseline testing of products used in pretest- posttest.

The method of collecting data on research and development are:

Observation sheet to determine the condition of the school methods Questionnaire.

### **Questionnaire needs teaching materials**

Questionnaire is a list of questions to teachers and students about the needs of teaching materials, this is done on a preliminary study.

### **Questionnaire for validation sheet teaching materials**

These instruments are used to obtain data on the assessment of the validator of the module. The results of this study as a basis for improvement of teaching materials before tested. Questionnaires prepared using Likert scale. Preparation of a questionnaire based on the grating and before use has been corrected in advance by experts.

Questionnaire responses of students and teachers to the teaching materials

Questionnaire of students and teachers used to determine the response of students and teachers on science learning activities. Filling this questionnaire conducted after the end of the whole process of learning. Preparation of the questionnaire has been carried out based on the lattice that have previously been validated in advance by

experts.

### **Problem learning achievement test**

The tests used No 2 in the form of question pretest and posttest in the form of multiple choice. Pretest is a test that is done before students use science teaching materials while the goal was given pretest and posttest was to determine the effectiveness of science teaching materials used. Before the test questions used, previously validated in SDN Pucangsawit Surakarta.

### **Level of difficulty**

Level of difficulty about the proportion of subjects who answered the specific test items correctly. The proportion of subjects who answered the item correctly describes the ratio of number of students who answered correctly items ( $\sum x^i$ ) all the total number of students (N). Figures showing the items were difficult or easy it is to-i is called the index of difficulty of items all i (Pi). Difficulty index items all i mathematically written  $P_i = \frac{\sum x^i}{N}$ . Classification difficulty index items is  $P < 0.03$  items difficult,  $0.3 < P < 0.07$  items were, and  $P > 0.07$  items easily.

### **Different power**

The problem is distinguishing about the ability to distinguish between high student achievement and lower-performing students. Distinguishing items defined as the difference between the proportion of correct answers in the top group and the proportion of correct answers in the bottom group. The proportion of correct answers in the group, is the ratio of the number of students who answered correctly in the top group ( $\sum A$ ) and the number of student groups on (nA). The proportion of correct answers at the bottom of the group, is the ratio of the number of students who answered correctly lower group ( $\sum B$ ) and the number of students under group (nB). Power is different, mathematically written.

$$DB = \frac{\sum A}{nA} - \frac{\sum B}{nB}$$

Classification index difference is about  $0.4 < DB < 1.0$  good about the different power,  $0.3 < DB < 0.39$  about being different power,  $0.2 < DB < 0.29$  about being different power and  $-1, 0 < DB < 0.19$  different power problem worse.

### **Validity**

The validity of the test is the precision of a measuring instrument perform measuring function, thus providing a corresponding measuring results to be measured. The validity of the items was determined using:

$r_{pbis}$  : correlation coefficient biserial

$M_i$  : mean score of subjects who responded well to the point all i

$M_t$  : mean score of all subjects

$p$  : the proportion of subjects who answered correctly on the grain to-i

$q$  :  $1 - p$

Criterion validity of the matter is if  $r_{pbis} = r_{tabel}$ , hen the question is valid and if  $r_{pbis} \leq r_{tabel}$ , hen the question is not valid.

### **Reliability**

Reliability is the ability of a measuring tool provides a consistent and stable

results. Reliability matter is determined by using the formula:

$$KR_{20} = \frac{J}{J-1} \left[ \frac{1 - \sum Pi(1 - Pi)}{S^2X} \right]$$

Information :

Pi : he proportion of subjects who answered correctly on the grain

to- $s^2X$  : variant of test scores

J : The number of test items

Reliability criteria are  $KR_{20} \leq$  reliability is very low  $0,2 \leq KR_{20} \leq 0,39$  lower reliability  $0,40 \leq KR_{20} \leq 0,59$  reliability sufficient,  $0,6 \leq KR_{20} \leq 0,79$  reliability high and  $KR_{20} \geq 0,8$  is very high reliability

### 1. Analysis Questionnaire

Questionnaire data analysis techniques to do the steps as follows: a. All data are tabulated, then calculates a percentage score for each component using equation  $Ps = s/N \times 100\%$ . Ps is the percentage score, the scores obtained S and N is the number of maximum scores.

#### b. Average conversion into value criteria

The quality of science teaching materials development results are known to alter the original data in the form of a score converted into qualitative data (data interval) with a scale of four. Data were analyzed include: validation experts, peers, student response, the response of teachers and scores affective and psychomotor student..

Table 2. Criteria Value Average Total Score Each Component

Percentage (Ps)	Category
$76 \% \leq Ps \leq 100\%$	Very Good
$51 \% \leq Ps \leq 75\%$	Good
$26 \% \leq Ps \leq 50\%$	Not Good
$0 \% \leq Ps \leq 25\%$	Very Not Good

Based on the results of the conversion the score into categories the values obtained instructional media products developed.

### Analysis of Learning Outcomes

#### a. The effectiveness of instructional materials in teaching

Analysis fatherly determine the effectiveness of learning, use gain score normalized ( $\langle g \rangle$ ) to pretest-posttest grade baseline and product testing. Gain normalized score is a good indicator to show the effectiveness in learning. The calculation of gain score normalized using the following equation (Hake, Richard R., 1999: 4)

$$\langle g \rangle = \frac{\langle Sf \rangle - \langle Si \rangle}{(\text{max score} - \langle Si \rangle)}$$

With  $\langle Sf \rangle$  s the average scorefinal (posttest) and  $\langle Si \rangle$  is the average score of initial (pretest) class. Criteria  $\langle g \rangle$  is normalized

$\langle g \rangle > 0,70$  = normalized *gain score* high

$0,70 > \langle g \rangle > 0,30$  = normalized *gain score* medium

$\langle g \rangle < 0,30$  = normalized *gain score* low

#### b. Differences in learning outcomes

To examine differences in learning outcomes made a hypothesis and tested by t-



test statistics. The use of t-test statistical techniques require prerequisites that must be met, among others, data normality and homogeneity. Normality test is used to determine whether the data were normally distributed or not. Normality test of the two classes is done with Spironov Kholmogorov test using SPSS 18.0 for windows with a significance level of 0.05. Hypothesis in posttest data normality test is as follows: Ho: the sample comes from a population that is normally distributed Hi: samples come from populations that are not normally distributed Decision-making criteria, namely:

- 1) If the significance value less than 0.05 then Ho is rejected
- 2) If the significance value greater than 0.05 then Ho is accepted

Homogeneity test is done to look at the data comes from the same variance or not. This test uses Levene test statistics with SPSS 18.0 for Windows with a significance level of 0.05. The hypothesis of homogeneity testing of data posttest this study are as follows:

Ho: The second variance homogeneous population

Hi: The second variance is not homogeneous population

Decision-making criteria, namely:

- 1) If the significance value less than 0.05 then Ho is rejected
- 2) If the significance value greater than 0.05 then Ho is accepted

### 3 RESULTS

#### a. Validation presentation book

Expert presentation of the book involved in the assessment a lecturer of Sebelas Maret University. Aspects validated by expert presentation module is a general presentation of the organization, presentation considering the significance and usefulness, involving students actively, general display, variations in the delivery of information, content of book, and pay attention to the code of ethics and copyright. The results of expert validation of the complete book presentation in attachment 4, and visualized in Table 3

Table 3. Validation Results expert

No	Aspect Rate	Value	Category
1	Public Organizing	3	Good
2	Presentation	3	Good
3	Involving students actively	3	Good
4	Display	3,5	Good
5	Variation	3	Good
6	Content	4	Very Good
7	Code of Ethics and Copyright	4	Very Good
Average		3,25	Good

Based on Table 3 shows that the value obtained from the expert presentation of the product on the organizational aspects of the public presentation gets a value of 3;

presentation aspect consider the significance and usefulness scored 3; aspect involves students actively scored 3; aspect common to see scores 3.5; aspects of the variation in the delivery of information to get a value of 3; aspects of content in the book to get a value of 4; and pay attention to the code of ethics and copyright scored 4. The average value obtained from expert validation serving of the product is 3.25 goes into a good qualifying.

Tabel 4 Data Description Learning Outcomes pretest and posttest

No	Comparison	Aggregation Class		Book Based Class	
		Pretes	Postes	Pretes	Postes
1	Maximum Value	62,50	92,50	60,00	95,00
2	Minimum Value	25,00	57,50	45,00	60,00
3	Average Value	39,10	75,56	53,27	81,64
4	Standar Deviation	7,44	7,59	4,89	7,54

Table 4 based on the average value of a book based class before using book- based learning is 39.10 with a standard deviation of 7.44; The maximum value of 62.50; and a minimum value of 25.00. While the value after learning by using book-based average of 75.56 with a standard deviation of 7.59; The maximum value of 92.50 and a minimum value of 57.50. In the aggregation class average value before learning to use the model, modules, and media is at 53.27 with a standard deviation of 4.89; maximum value of 60.00 and a minimum value of 45.00. Meanwhile, after learning the value of using the model, modules, and the average media student scores be 81.64 with a standard deviation of 7.54; a maximum value of 95.00 and a minimum value of 60.00.

The calculation result t test no difference between student learning outcomes in the classroom knowledge with students in grade aggregation module (sig 0.00<0.05). The average result of learning pengetahuansiswa aggregation class higher than the class module. The average grade obtained aggregation is 81.64, while the module class has an average of 75.56.

#### 4 CONCLUSIONS

1. The books are developed using models or research and development Research and Development (R & D)
2. Eligibility test book after module validation by experts presenting scored with both categories; by subject matter experts to get a value of 3.62 in the category very well; on expert learning device to get the value of 3.87 in the category very well; the value obtained from the teacher practitioner is fit in either category; and a given value amounted to 3.19 students get into either category. After field operational tests overall modules developed good and decent.
3. Inquiry Guidenes book-based can improve the effectiveness of learning outcomes characterized by increased knowledge of learning outcomes; there are differences in learning outcomes before and after the learning book using Inquiry Guidenes; there are differences in learning outcomes of knowledge with an average grade module (75.69) is better than the existing classroom learning (69.12), but the average module

grade lower than grade aggregation (81.64); learning outcomes in the classroom aggregation attitude better than the class of the module; and there was no difference in the outcomes of learning skills.

## 5 ACKNOWLEDGEMENTS

Application of the product in the form of book based learning produced findings was follows:

1. At the first meeting a lot of students who asked about the formulation of the problem and hypotheses, because students are not familiar with using the book - based learning Inquiry Guidenes.
2. Students acquire direct experience of the scientific work. Which consists of formulating a problem, make hypotheses, designing experiments, make observations according to plan, and concluded the observed data.

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