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Development Book Based on Constructivism for Basic Education in Primary School Teacher Education Program

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Abstract. The objectives of this research are: 1) to develop of book for basic education in the constructivism-based; (2) to investigate the feasibility of book for basic education in the constructivism-based; and (3) the effectiveness of book for basic education in the constructivism-based for the students' achievement STKIP Muhammadiyah of Blora Central Java. 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 book for basic education included field testing respondents consisting 2 validators and 2 practitioners, limited scale main field testing respondents consisting 10 students, and operational field testing respondents consisting of 30 students in class existing learning. The data of research through questionnaire, observation, in-depth interview, and test. The data analysed by using the descriptive qualitative method.

Keywords: Educational Basic, Constructivism-based, Teaching Materials

1. Introduction

The Primary School Teacher Education Program aims to prepare students to become elementary school teachers. The students study all elementary school subject matter such as Mathematics, English, Indonesian, Civic, Social Sciences, Science, Arts, etc. Not only academic understanding, the students also required to understand character and character personality development such as manners, discipline, smart, and social spirit. Elementary school teachers are responsible for building student personalities from an early age. Primary school teachers provide a useful foundation of knowledge so that students are ready for education next. As a researcher, the learning process is very decisive in making students who are prospective elementary school teachers who are motivated in learning, so the researchers are require to be able oriented to the right learning model. This model aims to provide patterns and clear steps in the development of the material undertaken. However, to be more focused, the learning material developed should use a learning model in accordance the conditions and development of students. One component that influences learning is the selection of media proper learning. The learning material must first be developed by completing it with intact in the form of book. Book are a source of learning, namely everything something that makes it easy for students of their knowledge information, experience, and skills in the teaching and learning process. Based on the

descriptions above, the researchers are interested in conducting research development with the title Development of Basic Education Subject Book In the Constructivism-Based Primary School Teacher Education Program.

2. Methods

The Research and Development model used in this study is in accordance with the flow of Thiagarajan namely 4-D (Four-D Models). Thiagarajan development flow consists of four stages, namely the stage of define, design, develop and disseminate. In the define stage, it is carried out by initial analysis, student analysis, analysis assignments, analyze concepts and formulate learning objectives. At the design stage, the preparation of instruments, selection of book, format selection and initial product design. The develop stage includes the stage of expert assessment and development trials. The disseminate stage is the stage of using a device that has been developed on a scale for example in other classes, at other universities, and by other lecturers. This research want to produce book for basic education subjects based on constructivism for elementary school teacher education students that have never existed in previous studies that will be tested on students of primary school teacher education study programs at STKIP Muhammadiyah of Blora.

2.1. 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 book based guided inquiry was Randomized Control group pretest- posttest 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			

2.2. Research Subjects

The subject of research in the development of research are: Validation of the design of book carried by one person and one person doctorate teachers, whose job is to test the feasibility of book. Validation of book tested on a limited group consisting of 10 students with a background A class students parallel / almost the same. Testing the effectiveness of book developed on student achievement A applied to the class as many as 30 students of the class as a class product testing A and B class as the control class. The sampling technique conducted by random sampling technique.

2.3. 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 book guided inquiry-based science. Data

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obtained from the results expert validation (Lecturer Education from other University) and two lecturer from STKIP Muhammadiyah of Blora. 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 questionnaire.

2.3.1. Questionnaire needs book

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

2.3.2. Questionnaire for validation sheet book

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 book 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 book 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 previously been validated by experts.

2.3.3. 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 book while the goal was given pretest and posttest was to determine the effectiveness of science book used.

2.3.4. 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 answer correctly items all i ($\sum x^i$) 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 $Pi = \frac{\sum Xi}{N}$. Classification difficulty index items is P <0.03 items difficult, 0.3 <P <0.07 items were, and P> 0.07 items easily.

2.3.5. Different Power

The problem is distinguishing about the ability to distinguish between high student achievement and lower-performing students. Distinguishing items define 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.

2.3.6. 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:

$$r_{pbis} = \frac{Mi - Mt}{S} \sqrt{\frac{p}{q}}$$

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 $r_{pbis} \leq r_{tabel}$, the question is not valid.

2.3.7. Reliability

Reliability is the ability of a measuring tool provides a consistent and stable results. Reliability matter is determined by using the formula:

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

Note :
Pi : the proportion of subjects who answered correctly on the grain to-i
2X : variant of test scores
J : The number of test items
Reliability criteria are KR20 < reliability is very low 0,2 < KR20 < 0,39 lower reliability 0,40 < KR20 < 0,59 reliability sufficient, 0,6 < KR20 < 0,79 reliability high and KR20 > 0,8 is very high reliability.

2.4. Analysis Technique

2.4.1. Analysis Questionnaire

Questionnaire data analysis techniques to do the steps as follows:

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All data are tabulated, then calculates a percentage score for each component using equation Ps = s/N x 100%. Ps is the percentage score, the scores obtained S and N is the number of maximum scores.

2.4.2. Average conversion into value criteria

The quality of book 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

Table 2. Criteria Value Average Total Score Each Component

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

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

2.4.3. Analysis of Learning Outcomes

Analysis fatherly determine the effectiveness of learning, use gain score normalized (<g>) 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

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

With <Sf> s the average score final (posttest) and <Si> is the average score of initial (pretest) class. Criteria<g> is normalized

(<g>) > 0,70 = normalized gain score high
0,70 > (<g>) > 0,30 = normalized gain score medium
(<g>) < 0,30 = normalized gain score low

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. Normal test is used to determine whether the data were normally distributed or not. Normal test of the two classes is done with Kholmogorov Spirnov 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 normal distributed

Decision-making criteria, namely:

If the significance value less than 0.05 then Ho is rejected

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:

If the significance value less than 0.05 then Ho is rejected

If the significance value greater than 0.05 then Ho is accepted

3. Results

3.1. Validation presentation book

Expert presentation of the book involved in the assessment a lecturer. 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 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 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.

Table 4 Data Description Learning Outcomes pretest and posttest

No	Comparison	Aggregation Class		Book Based Class	
		Pretest	Posttest	Pretest	Posttest
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

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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 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

The books are developed using models or research and development Research and Development (R & D) Eligibility test book after module validation by experts presenting scored 3.25 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 3.42 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.

Constructivism-Based Book 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 Constructivism-Based Book; 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.

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Application of the product in the form of book produced findings as follows: 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. 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. Directorate of research and community service (DRPM) has funded this research in 2020. Lecturers in STKIP Muhammadiyah of Blora of support and motivation in this research.

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