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VALIDITY AND EFFECTIVENESS OF PHYSICS LEARNING PACKAGE BASED ON GUIDED-INQUIRY MODEL

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Abstract. The aim of this research is to know the validity and effectiveness of physics learning package based on Guided Inquiry. This research uses development method with Plomp and Nieven research design. Physics learning package that have been developed and then validated by three expert validators from UNESA. Validated sections include Syllabus, RPP Scenario, Student Book, and Student Worksheet. The result of validated, the first is Syllabus that has a high validity with 3.79 average score. Second, the validity score of RPP Scenario is 3.71 with high valid category. Third, the Student Book has a validity score of 3.47 with valid category. Last, Student Worksheet has validity of 3.71 with high validity category. The result of effectiveness can be seen before and after using learning instrument that developed. Before using the developed learning instrument, the student's Science Process Skills score averaged 29.2, while after using the developed instrument, the student's Science Process Skills score was 85.7. Based on the results of the validity and effectiveness of the instrument shows that the instructional instrument of physics based on Guided Inquiry is very suitable to be used in learning to improve student's Science Process Skills.

Keywords: *validity, effectiveness, guided inquiry.*

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INTRODUCTION

Indonesia's low quality of education has been widely recognized by various parties, especially by experts and observers of education. In the field of MIPA, the quality of education in Indonesia is also low [1]. The results of the TIMSS (Trends in International Mathematics and Science Study) survey measuring the scientific inquiry ability showed that the average score of Indonesian students' science achievement in 1999 was 435, making Indonesia the 32nd place out of 39 countries, in 2003 on the order 37 out of 46 countries with an average score of 420, as well as the results in 2007 are in the order of 35 out of 49 countries with an average score of 427, and the results of the 2011 survey also show relatively similar results, which are in the order of 39 of 41 countries with the average score of 406 while the average international score has reached the score of 500 [2] [3].

Researchers have also tested the Science Process Skills (KPS) of X-MIPA 4 class students as much as 28 students in SMA Negeri 1 Pasuruan. The result is that there are three KPS indicators that have values under 70%, ie indicate hypotheses, operational definitions, and describe the graph and interpret the data. There is even one KPS indicator that is under 60%, ie states the hypothesis. It shows that the Science Process Skills is not perfectly mastered by the students.

Based on these data, evaluation of various aspects of learning needs to be done for improvements such as aspects of input, process, and output [4]. From the input aspect, the current Curriculum 2013 has been implemented which is a refinement of the previous curriculum. Physics learning is directed to develop the ability of thinking and problem solving both qualitatively and quantitatively by using mathematics and can develop knowledge, skills, and confidence [5]. From the process aspect, that physics learning should use various approaches, strategies, methods, or learning model [6]. A learning approach that can be used for example the science process skills. If the process standard is well implemented, then the educational output is in accordance with what is stipulated in the competency standards of graduates covering knowledge, score, attitude, and skills [7] [8].

The way that can be used in helping students to improve the science process skills is to maximize the learning model and learning package used [9] [10] [11] [12]. According, Inquiry Learning model

is a learning model that emphasizes the process of discovery, although still with the guidance of teachers [13] [14] [15]. Based on the description of the problems above, the authors want to develop a learning packages as a support for students to improve the Science Process Skills (KPS

METHOD

2.1 General Background of Research

This research is conducted in State Senior High School 1 Pasuruan (SMAN 1 Pasuruan, East Java, Indonesia). The research's scope is the senior high school students of 10th grade who took physics subject in school year 2017/2018. The aim was to analyse validity and effectiveness of physics learning package based on guided-inquiry to improve Science Process Skills of Senior High School Student. The validity score assessed by professional validator. While the effectiveness will be determined based on; 1) significant improvement on score between pre-test and post-test of students' science process skills on senior high school physics subject; 2) N-gain average determined at least on low improvement criteria.

2.2 Sample of Research

The samples of the research were 15 students of State Senior High School 1 of Pasuruan (East Java, Indonesia) using One Group Pre-test Post-test Design, namely: group-1 (class X-MIA 3 before using learning packages that developed), group-2 (class X-MIA 3 after using learning packages that developed). Each group consists of students on physics subject in academic year 2017/2018.

2.3 Instrument and Procedures

The students' science process skills were measured by using Science Process Skills Assessment Sheet (SPSA). SPSA is formed based on the measureable science process skills indicator such as: 1) formulating the general problem, 2) writing observation result, 3) formulating a specific problem, 4) stating hypothesis, 5) identifying a variable, 6) writing variable operational definition, 7) writing experiment procedure, 8) organizing the experiment result, 9) analysing the experiment result, and 10) making a conclusion [16] [17]. The materials of physics subject in this research were chosen according to Guided-Inquiry Teaching Model characteristics which are Newton's Law. This research used one group pre-test and post-test design, O1 X O2 [18]. The initial learning has started with conducting the pre-test (O1). Every senior high school students are required to work SPSA. After the pre-test, the teacher will apply

Guided Inquiry Teaching Model and physics learning devices on each group (X). The implementation of Guided-Inquiry Teaching Model has been conducted in five meeting on physics subject. Learning packages of physics consist of syllabus, lesson plan, student work sheet, students' textbooks, teachers' textbooks, SPSA, model observation sheets, students' activity sheets, and questionnaires of respond. After the implementation of Guided-Inquiry Teaching Model ended by conducting the post-test (O2) using SPSA, every student was required to finish SPSA on the post-test.

2.4 Data Analysis

The students' science process skills on senior high school physics subject is analysed based on a determined assessment before and after using Guided-Inquiry Teaching Model. The students' data on science process skills pre-test, post-test and n-gain were analysed advance using Microsoft Excel. The score of students' science process skills was based on these indicators; 1) formulating the general problem, 2) writing observation result, 3) formulating a specific problem, 4) stating hypothesis, 5) identifying a variable, 6) writing variable operational definition, 7) writing experiment procedure, 8) organizing the experiment result, 9) analysing the experiment result, and 10) making a conclusion. N-gain was determined using this equation: $n\text{-gain} = (\text{score post-test} - \text{score pre-test}) / (\text{maximum score} - \text{pre-test score})$, with the criteria: (1) if $n\text{-gain} \geq .7$ (high), (2) if $.3 < n\text{-gain} < .7$ (moderate), and (3) if $n\text{-gain} \leq .3$ (low) [19].

RESULT AND DISCUSSION

The result of the research showed on Table 1, Table 2, and Table 3 with the explanation as follows:

Table 1. The validity scores of learning packages based on guided inquiry.

No	Name	Validity Score	Category
1.	Syllabus	3,79	Very Valid
2.	Learning Scenario	3,71	Very Valid
3.	Student's Book	3,47	Valid
4.	Worksheet	3,71	Very Valid
5.	Affective Assessment Sheet	3,58	Valid
6.	Cognitive Product Assessment Sheet	3,71	Very Valid
7.	Cognitive Process Assessment Sheet	3,33	Valid
8.	Psychomotor Assessment Sheet	3,44	Valid

Table 1 showed the validity score of learning packages of guided-inquiry. Based on the data above, it is show that the all of parts of learning packages based guided-inquiry has a valid category. It can be concluded that the overall learning packages that developed can be used properly by teachers to introduce the science process skills to students. This is appropriate with the Nieveen says that the validity of the content of learning packages is related to the needs (need) and state-of-the-art. This learning packages also has the validity of the construct that is the validity associated with consistency between the components of learning packages are logically designed [20].

Table 2. The average scores of pre-test, post-test and n-gain of students' science process skills on senior high school physics subject.

Student's Number	Pre-Test	Post-Test	N-Gain	Category
1.	14	30	0,21	Low
2.	23	60	0,55	Medium
3.	36	90	0,91	High
4.	31	80	0,83	High
5.	35	70	0,64	Medium
6.	17	80	0,73	High
7.	20	80	0,86	High
8.	34	100	1,00	High
9.	33	85	0,91	High
10.	33	75	0,74	High
11.	31	80	0,83	High
12.	33	60	0,82	High
13.	16	80	0,32	Medium
14.	51	85	0,23	Low
15.	31	100	0,66	Medium

Table 2 showed that all of average student's science process skills indicators on pre-test were on the low category, whereas after the implementation of physics learning with Guided-Inquiry Teaching Model, it showed that average score of science process skills has improved. The general n-gain student's science process skills indicator was on the high category with the score 0.72. The positive result is existed because the implementation of physics learning with Guided-Inquiry Teaching Model has been improved the student's science process skills. The results are also supported by similar research by Nurul Azizah (2014) [21], Juhji (2016) [22], Annur Dewi Ulya (2013) [23], Fatmi Nuraini and Sahyar (2013) [24], and Astuti Kusuma Yani (2014) [25].

CONCLUSION

Guided-Inquiry Teaching Model is a specific model which developed to improve students' science

process skill of students in senior high school. The results of the study prove that: 1) There is an improvement in science process skills; 2) Average score of n-gain science process skills of high school students' is 0.72 (high category). Therefore, the Guided-Inquiry Teaching Model has been proven to be effective in improving students' science process skills on senior high school physics subjects especially Newton's Law.

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