DEVELOPMENT OF THE SYNTHESIS PROBLEM TEST INSTRUMENT WITH THE NEWTON II LEGAL MATERIAL CONCEPTUAL

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Abstract: Learning evaluation cannot be separated from the use of evaluation instruments. This instrument has an important role in knowing the extent of students 'ability to understand the material. In learning Physics, students have difficulty in working on questions and answering questions of synthesis. So from that, an evaluation tool is needed to measure students' understanding ability in answering synthesis questions. In this study a test instrument for synthesis questions will be developed using help in the form of Conceptual Scaffolding (CS) in answering the synthesis question. This research is an R & D study with a procedural model that adapted from the development of 4-D model devices, namely Define, Design , Develop, and Disseminate. Data analysis techniques used in this test instrument by looking at several aspects, namely the validity of the experts, the validity of each item, the reliability of the items, the distinguishing power and the level of difficulty of each item in question. The development of this test instrument obtained a feasibility value from the material expert validator of 82.3%, 86% expert evaluation, and physics teacher 82.8%. So that the development of this test instrument is included in the category of "very feasible". While students who can answer questions with categories can understand the concept as much as 70.85%. So that giving Conceptual Scaffolding questions in answering these synthesis questions can be applied to measure students' understanding of concepts.

Keywords: Test Instrument, Synthesis Problem, Conceptual Scaffolding (CS)

INTRODUCTION

An educator cannot be separated from the use of evaluation instruments. Instruments have functions and roles that are very important in order to know the effectiveness of the learning process (Arifin, 2012).

Physics subjects in high school are intended so that students are able to master the concepts of physics. However, in fact many students consider physics to be difficult. One of the causes of students' difficulties in learning physics is that students do not master physics concepts (Sa'diah, 2013).

Therefore to measure students' ability to understand concepts in answering questions about synthesis, a good evaluation tool or instrument is needed and helps students so that students can answer synthesis questions using two or more different concepts. So students are not mistaken in answering questions. .

This study uses the Conceptual Scaffolding (CS) method. Will be examined whether the CS method is feasible to use in answering questions of physics synthesis, especially the material of Newton's Second Law, and whether the test instrument used

with CS method can be used to measure students' understanding of concepts in answering synthesis questions.

Synthesis problems are "problems containing multiple concepts that are broadly separated in the teaching timeline to function effective problem solving skills among introductory students" (Ding, Lin. 2012). This shows that the synthesis questions in question are questions that contain two or more physics concepts.

Scaffolding is a mechanism for observing the process by which a student is helped to achieve learning potential in himself (Amiripour, 2012). It can be concluded that scaffolding is temporary assistance or support given by the teacher to students in learning in the cognitive domain, so students can reach their learning potential.

The hope, through this study, that the test instruments developed can be used to measure students' understanding of concepts in answering synthetic questions, and can help students answer synthesis questions.

APPROACH & RESEARCH METHOD

This type of research includes Research and Development (R & D), namely Research and Development with the final product evaluation instrument.

The procedure in this study uses a 4-D model development device (four D models).
1. Define (Defining)
2. Design
3. Develop (Development)
4. Disseminate (Dissemination)

RESULTS AND DISCUSSION

1. **Define (Defining)**
   a) Front-end analysis
      Students are still having difficulty in answering synthetic questions. Students are still confused about the steps that must be taken in answering the question of synthesis.
   b) Student Analysis (learner analysis)
      Students are not familiar with questions that contain two or more concepts that require students to answer the question directly.
   c) Concept Analysis (concept analysis)
      Next the researcher identified the indicators of learning and analysis of learning resources.
   d) Task Analysis (task analysis)
      The tasks given are individual tasks.
   e) Formulation of Learning Objectives (specifying instructional objective)
      The learning objectives are:
      1) Understanding Newton's Second Law

2) Applying the concept of Newton's Second Law to solve problems in everyday life

3) Explain the relationship between acceleration with mass and the resultant force acting

2. Design

a) Arrange Grids

The preparation of the grid is based on basic competencies and learning indicators.

b) Development of Reference Questions

Learning resources that have been collected as supporters in making questions.

c) Initial Product Design

The product is in the form of a test instrument using two CS questions in the form of multiple choices in one synthesis question. The synthesis problem is four questions, so there are eight questions about CS.

3. Develop (Development)

a) Expert appraisal

Following is the table of validation results from material experts, evaluation experts, and teachers.

Table 8. Results of Expert Validation

NO	PERCENTAGE	AVERAGE SCORE	CATEGORY	RATING
1	MATERIAL EXPERT	2.875	ENOUGH	
2	MATERIALEXPERTS 2	3.625	VERY GOOD	
				82.3%
3	MATERIALEXPERTS 3	3.375	GOOD	
4	EVALUATOR	3.8125	VERY GOOD	
5	EVALUATION EXPERTS2	3.444	GOOD	
				86%
6	EVALUATION EXPERTS3	3.0625	GOOD	
7	TEACHERS	3.3125	GOOD	82.8%

b) Developmental testing

The trial was conducted on 12 students of class X IPA Muhammadiyah 6 Yogyakarta as many as 12 people. Test the test instrument on 30 January 2018-27 February 2018.

4. Disseminate (Dissemination)

This study uses a limited test and is due to the limitations of researchers in terms of the use of time, cost, and ability in product development so that this stage is not carried out.

A. Data Analysis

1) Validity

The following is a table of the level of validity of an item about CSO and synthesis.

Table 9. Validity of CS Questions

Category Problem Item	Question Number	Number Problem	Amount	Number Percentage
Very High	1	Problem 1	1	12.5%
High	2	Problem 1	4	50%
	1	PROBLEM 2		
	1	PROBLEM 3		
	2	PROBLEM 4		
Enough	2	Problem 2	3	37.5%
	2	PROBLEM 3		
	1	PROBLEM 4		
Low	-	-	-	-
Very Low	-	-	-	-
Amount			8	100%

Table 10. Validity of Synthesis Questions

Question Category	Item Number	Problem Number	Amount	Percentage
Very High	1	Problem 1	3	75%
	1	PROBLEM 3		
	1	PROBLEM 4		
High	-	-	-	-
Enough	1	Problem 2	1	25%
Low	-	-	-	-
Very Low	-	-	-	-
Amount			4	100%

2) Reliability

Reliability of CS questions using odd-even methods obtained reliability results of 0.93 with a very high category. The synthesis problem using the Cronbach-Alpha formula obtained the reliability of 0.9013 with a very high category.

3) Distinguishing Power

The results of the different strengths of the CS test limited questions or the synthesis multiple choice questions based on the criteria for distinguishing questions can be seen in the table below.

Table 11. Differential Power of CS Problems

Question Category	Item Number	Problem Number	Amount	Percentage
Very Good	2	Problem 4	1	12.5%
Good	1	Problem 1	2	25%
	1	Problem 4		
Enough	2	Problem 1	3	37.5%

Question Category	Item Number	Problem Number	Amount	Percentage
	1	Problem 2		
	1	Problem 3		
	2	Problem 2		
Bad	2	Problem 3	2	25%
Amount			8	100%

Table 12. Distinguishing Power of Synthesis Questions

Question Category	Item Number	Problem Number	Amount	Percentage
Very Good	-	-	-	-
Good	-	-	-	-
Enough	1	Problem 2	2	50%
	1	Problem 4		
Bad	1	Problem 1	2	50%
	1	Problem 3		
Amount			4	100%

4) Difficulty level

The results of the analysis of the level of difficulty of the CS questions or the choice of multiple problem synthesis questions can be seen in the following table.

Table 13. Level of Difficulty of CS Problems

Question Category	Item Number	Problem Number	Amount	Percentage
Difficuld	-	-	-	-
Moderate	2	Problem 4	1	12.5%
	1	Problem 1		
	2	Problem 1		
	1	Problem 2		
Easy	2	Problem 2	7	87.5%
	1	Problem 3		
	2	Problem 3		
	1	Problem 4		
Amount			8	100%

Table 14. Distinguishing Power of Synthesis Questions

Question Category	Item Number	Problem Number	Amount	Percentage
Difficult	-	-	-	-
Moderate	-	-	-	-
	1	Problem 1		
Easy	1	Problem 2	4	100%
	1	Problem 3		

Question Category	Item Number	Problem Number	Amount	Percentage
	1	Problem 4		
Amount			4	100%

5) Student Understanding Analysis

Based on the value of students who have been obtained then the percentage is in accordance with the answers of students based on each problem to determine the understanding of students' concepts as follows.

Table 15. Percentage of Student Concept Understanding

No Problem	Understanding (%)	Understanding Enough (%)	Less Understanding (%)	Not Understanding (%)
1	50	25	8.3	16.7
2	83.4	0	8.3	8.3
3	75	8.3	16.7	0
4	75	0	16.7	8.3
AVERAGE	70.85%	8.325%	12.5%	8.325%

CONCLUSION

The development of this test instrument obtained a feasibility value from material expert validators of 82.3%, 86% evaluation experts, and physics teachers 82.8%. So the development of this test instrument was included in the "very feasible" category.

Test instruments that have been developed, students who can answer questions with categories can understand the concepts as much as 70.85%. So that the provision of Conceptual Scaffolding questions in answering these synthesis questions can be applied to measure students' conceptual understanding.

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