

Development of Science Learning Devices with Guided-Inquiry through Teaching Question To Improve Students 'Learning Outcomes in Junior High School

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Abstract: *The guided inquiry model through teaching question is an model in learning activities combined with question strategies to assist students in carrying out scientific activities. This research tool was developed with the method of developing Dick and Carey devices. The research aims to improve student learning outcomes. Criteria for improving learning outcomes are obtained by comparing the student's pretest and posttest scores. The study was conducted for 4 meetings with 23 students of class VIII. The results showed that the validity level of RPP 3.43 (valid), Student Book 3.71 (very valid), LKS 3.5 (valid), ITHSB 3.68 (very valid), with practicality of learning through the Implementation of RPP 3, 94 (very good), with the effectiveness of learning through student activity 83% (very good), Student Response 87.20% (very good) and N-Gain students average 0.83 (High).*

Keyword: *Teaching Question, Guided-Inquiry, Learning Outcomes*

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I. Preliminary

Science learning in SMP / MTs emphasizes providing direct learning experiences through the use and development of process skills and scientific attitudes (KemenDikBud, 2014). According to Pudjiadi (1999, in the Kemdikbud Science Teacher's Book), IPA is defined as a set of knowledge about objects and natural phenomena that are derived from the results of the thoughts and investigations of scientists carried out by experimenting skills using scientific methods. Through this definition, someone who learns science is expected to use his skills in the scientific method namely formulating hypotheses, manipulation variables, response variables, controlling variables, making observations, collecting data, and making conclusions (Nur, 2013), so that it becomes a knowledge experience for that person . Learning science according to Zubaidah et al (2013a, in the Kemdikbud Science Teacher's Book), that students are required to learn actively, namely learning that must be done by students, not learning to be done by students. The teacher must prepare the learning that must be done by students. During the learning process, students are stimulated by curiosity, so that the learning process becomes more meaningful for students (Yusuf, 2004) and learning is not only an activity in the classroom but an active learning activity.

Based on the results of observations of researchers on the relation of student investigation activities with the learning outcomes of class VIII students in the chapter chapter on Motion in the Middle School St. Yustinus de Yacobis Krian in the 2015-2016 Academic Year, it was found that class VIII students were still weak in investigating activities, analyzing investigative data and drawing conclusions. Students have difficulty in working out the test questions with a standard problem of understanding, while the school requires the teacher to use standard understanding questions (C2) so that student learning outcomes tend to be less.

The Inquiry Approach is one approach in learning that emphasizes learning through research activities. In Permendikbud No. 65 of 2013, the Scientific Approach can be strengthened by implementing research / disclosure (discovery / learning). The advantages of using the inquiry approach include making something foreign become familiar (Gilbert & Fensham, 1982 in Ariesta, 2010), increasing students' intellectual potential, making intellectual decisions, having experience in learning discovery, learning outcomes can be remembered by students longer (Bruner in Dahar, 1989: 93).

II. Theoretical Basis

Inquiry is a thing or activity carried out by students where students can develop knowledge and understanding of an idea as has been done by world scientists (National Research Council, 2000). According to Arends (2012), a learning model on a particular approach in learning includes goals, stages, environment, and management systems. So in this study, learning with the inquiry approach used was classified based on learning

objectives, inquiry learning stages, learning environment, and learning management processes. The phase in inquiry learning includes Gain attention and explain the inquiry process, Present the inquiry problem, Have student formulate hypotheses to explain the problem or events, Encourage students to test the hypothesis, Formulate explanations and / or conclusions, Reflect on the problem the process is used to inquire into it

Teaching Question

Maker and Nielson (1996) encourage teachers to use questioning strategies to help students learn to explain, describe, and classify student thinking. The questions given by the teacher can give the teacher a view to see students' thoughts about what is known and unknown about the topic discussed (Hamiloglu, 2012). According to Strasser (1967) in Shaunessy (2005), the habits of teachers in asking and giving questions have a big influence on learning activities. The teacher asks questions to students so students can learn and choose the right learning resources (Gallagher & Gallagher, 1994). As stated by Bowker (2010) that teaching answers without questions or just giving material to students can eliminate students' learning experiences and can instill ideologies that are not appropriate.

Motivation is what makes students do, making students continue to do and determine in what direction students want to do (Nur, 2008: 3). Soemanto (1987) in Majid (2013), defines motivation as a change in energy which is characterized by affective encouragement and reaction to achieving goals. Motivation to learn is an internal process that is in someone who gives passion or enthusiasm in learning, contains an effort to achieve learning goals, where there is understanding and development of learning (Wlodkowski & Janes in Raina, 2011). Learning motivation will emerge in students when class conditions are focused and organized, and relevant learning topics on students' cognitive (Ross, et al, 2010).

Meaningful Learning

In teaching and learning activities in schools, information received by students in one day does not only come from one subject. Memorization, according to Nur, Prima, and Bambang (2008), is not a bad way to learn. The concept of meaningful learning initiated by Ausubel is the processing of new information that is associated with information that has been obtained previously (Nur, Prima, and Bambang, 2008).

This is supported by the statement of Trianto (2007), and Brophy (in James, et al, 2012) that learning will be more meaningful if students are able to experience what is learned for themselves, not just knowing it.

Constructivism

Constructivism learning theory coined by Piaget is defined as generative learning. The objectives of constructivism learning theory are as follows: Motivating students that learning is the responsibility of the students themselves, developing students' ability to ask questions and find solutions, helping students to develop understanding and understanding concepts, emphasizing learning in the learning process.

Discovery Learning

Jerome Bruner is one of the psychologists who plays an important role in curriculum development in the world (Arends, 2012). Learning Discovery is a model that emphasizes helping students understand a basic idea. This requires active students in learning activities. Bruner believes that a good learning starts from a knowledge found by students. Students who learn by finding themselves will give good results and good and deep understanding (Miswadi et al. 2010).

III. Research Methods

This research is a type of development research, namely research to develop science learning devices using the Dick and Carey development model. The learning devices developed are RPP (Learning Implementation Plan), Student Textbooks, LKS (Student Worksheets), and Research Instruments. The development of learning devices is oriented towards the inquiry approach to improve students' conceptual understanding. The research subjects in this development research are learning tools with an inquiry approach that has been developed. Meanwhile, the subject of implementation of this study was the eighth grade students of St. Catholic Middle School. Yustinus de Yacobis Krian 2018/2019 school year which numbered 23 students. This development research begins with the development of learning devices, while the implementation of learning devices that have been validated, tested in the odd semester of the academic year 2018/2019.

Device Development Phase



Figure 1 Procedures for Developing Dick and Carey Adaptation Devices

Data analysis technique

Learning tools consisting of RPP, Student Textbooks (BAS), LKS, and knowledge assessment instruments were analyzed for validity using qualitative descriptive data analysis (Ardianti, 2015). The difficulty level of BAS and LKS is calculated by the number of sentences in BAS and LKS that cannot be understood by students from the total number of sentences. The level of student activity is calculated by the equation: (Arifin, 2009). Individual completeness, completeness of the indicator is written as follows: The sensitivity of the item (S) is calculated using the Norman E. Gronlund formula:

The progress of Learning Outcomes is measured based on the results of the N-Gain score.

IV. Research Result

1. Student Book

The results of the development of learning devices in the form of Student Books that have been made by researchers are then validated by 2 validators with an average yield of 3.71 with very valid categories (Ratumanan & Laurens, 2006). The Student Book validation sheet instrument has a percentage of reliability of 92.75%.

2. Syllabus

The results of the development of learning devices in the form of syllabus that have been made are then validated with an average yield of 3.55 with very valid categories (Ratumanan & Laurens, 2006). in the form of adding indicators and selecting words in KI.4. The instrument for the syllabus validation sheet has a reliability percentage of 88.75%.

3. Learning Implementation Plan (RPP)

The results of the development of learning tools in the form of Learning Implementation Plans (RPP) that have been made are then validated by 2 expert validators with the average results of RPP validation are 3.43 with valid categories (Ratumanan & Laurens, 2006). RPP instruments have a reliability percentage of 85.75%.

4. Student Activity Sheet (LKS)

The average results of validation by 2 expert validators on the student activity sheet developed were 3.5 with valid categories (Ratumanan & Laurens, 2006). The LKS validation instrument has a reliability percentage of 87.5%.

5. Knowledge Test Instruments

The results of the validation of the development of the device in the form of knowledge tests by experts obtained an average value of 3.68 for the content aspect, with a very valid category, and the average for the aspect of language with a value of 3.45 valid (Ratumanan & Laurens, 2006). The instrument validation sheet for contents has an average reliability of 92.05% and for languages of 86.36%.

6. Student Attitude Observation Sheet

The results of the validation analysis of the student's attitude observation sheet by 2 expert validators obtained an average score of 3.65 with a percentage of 91.25% which was stated to be very valid (Ratumanan & Laurens, 2006).

Result for Learning Devices

1. Accuracy of Learning Implementation Plans (RPP)

In summary, the implementation of the lesson plan with guided inquiry in class VIIIA in the lesson plan in the first trial was carried out and the average overall implementation score was 3.94 with a very good category (Ratumanan & Laurens, 2006). The instrument for implementing RPP has an average reliability of 99%.

2. Student Activities

All student activities are carried out according to the guided inquiry model. The activity observation instrument has an average reliability of 83% and is in good category (Borich, 1994).

3. Student Learning Outcomes

Mastery and n-gain aspects of knowledge of students in class VIII averaged 0.83 and high categories (Hake, 1999). Not all questions developed have values above 0.30, there are 8 items that are declared insensitive, namely on items 1, 7, 10, 13, 14, 18, 20, and 21. The average completeness of the learning objectives is the knowledge aspect of 89.72%.

Complete learning indicators aspects of student knowledge

Indicator	Learning Objectives	Pretest		Posttest		Sensitivity	
		P	K	P	K	S	K
1	1a	83%	T	95,65%	T	0,13	Not Sensitive
	1b	22%	TT	95,65%	T	0,74	Sensitive
	1c	39%	TT	91,30%	T	0,52	Sensitive
2	2	52%	TT	95,65%	T	0,43	Sensitive
3	3	0%	TT	95,65%	T	0,96	Sensitive
4	4	9%	TT	91,30%	T	0,83	Sensitive
5	5a	74%	TT	91,30%	T	0,17	Not Sensitive
	5b	17%	TT	86,96%	T	0,70	Sensitive
6	6a	13%	TT	91,30%	T	0,78	Sensitive
	6b	78%	T	86,96%	T	0,09	Not Sensitive
	6c	9%	TT	82,61%	T	0,74	Sensitive
	6d	26%	TT	82,61%	T	0,57	Sensitive
7	7a	65%	TT	82,61%	T	0,17	Not Sensitive
	7b	87%	T	91,30%	T	0,04	Not Sensitive
8	8	22%	TT	100,00%	T	0,78	Sensitive
9	9a	43%	TT	86,96%	T	0,43	Sensitive
	9b	52%	TT	91,30%	T	0,39	Sensitive
10	10a	65%	TT	82,61%	T	0,17	Not Sensitive
	10b	30%	TT	78,26%	T	0,48	Sensitive
11	11	100%	T	86,96%	T	-0,13	Not Sensitive
12	12a	61%	TT	86,96%	T	0,26	Not Sensitive
	12b	4%	TT	100,00%	T	0,96	Sensitive

Description: P: Percentage K: Category S: Sensitivity Score

Progress of Learning Outcomes

The normality test was performed on pretest data aspects of student knowledge using the Shapiro Wilk test with a significance level of $\alpha = 0.05$. Hypothesis for normality test:

H0: Samples are from a normally distributed population

H1: Samples originating from the population are not normally distributed

with criteria if the value of Shapiro-Wilk count (W) > Shapiro Wilk Table, then H0 is accepted and H1 is rejected. The Shapiro Wilk table for 23 data at the significance level $\alpha = 0.05$ is 0.914. The results of the normality test obtained a W value from the pretest data in class VIIIA was $W = 0.974$. And the value of $W > 0.914$, this means that the sample of students is normally distributed.

Discussion Of Research Results

Learning tools developed in this study include: 1) Syllabus; 2) RPP; 3) LKS; 4) Student Books; and 5) Learning outcomes assessment instruments in the form of: student attitude assessment instruments, knowledge aspect assessment instruments, and performance assessment instruments.

This learning device was developed in reference to the development model of Dick and Carey (2009), to create a learning system design that is able to be used optimally in dealing with problems in learning.

The syllabus developed was validated by 2 experts, with an average score of 3.55 and a validity percentage of 88.75% with a very good category (Ratumanan & Laurens, 2006).

The results of the average validation of 2 experts on student activity sheets (LKS) which consists of seven have an average LKS validation from the seven aspects are 3.5 with valid categories (Ratumanan & Laurens, 2006), showing the worksheets developed are appropriate for use by teachers in learning. The revision is to replace the foreign word selection for junior high school students according to the validator's suggestion.

The knowledge test questions developed were 22 items that were adjusted to the learning objectives. The questions that have been developed are then validated by 2 experts. The validation results show that the average of these devices gets a score of 3.57 with valid categories (Ratumanan & Laurens, 2006). From these results, it can be concluded that the knowledge test developed is appropriate to be used as a teacher to measure the mastery of student knowledge in material style and motion. The improvement suggested by the validator is to replace the verb to correspond to the indicator and avoid choosing ambiguous words.

Student learning outcomes on aspects of knowledge are obtained using the pretest and posttest methods. The value obtained by students at the pretest is used to determine students 'initial knowledge of material style and motion, while the value obtained from the posttest shows the learning outcomes of students' knowledge after following the learning process using a guided inquiry model. The average N-Gain obtained after the learning activities in the Pilot I class is 0.83 in the High category (Hake, 1999). The results of the analysis showed that of the 22 questions developed there were 8 items that scored below 0.30 and were declared insensitive (Table 4.10). This is because the questions developed are in the category of Remembering (C1) and Understanding (C2) in Bloom's taxonomy, while the material of force and motion has been obtained by students at the time of Elementary School, so the possibility of students still remembering the material. Whereas the other questions are declared sensitive (Gronlund & Linn, 1995). Judging from the value of N-Gain obtained by 23 students who were the subjects of the study, these students experienced an increase from before learning with an average increase in the High category (Hake, 1999) and 100% of students declared complete. This shows that knowledge test questions with formulated learning objectives have good learning effects on learning outcomes.

The completeness of student learning outcomes that reaches 100% is caused by several things, including: 1) the availability of learning devices for students (Student Books, Student Worksheets, and Assessment Sheets) that are both good and reliable; 2) learning planning (RPP) prepared by the teacher before the implementation of planned learning in detail and systematically so that the learning process can run well; 3) students are actively involved in learning, learning with a guided inquiry model is student-centered learning, so students are actively involved in the entire learning process and the teacher only acts as a facilitator. Meinita (et al, 2014) and Sudarman (2012) state that inquiry learning models in students show performance, attitudes, thinking skills, critical thinking, and student participation in conducting investigative activities very high. This increases student understanding and student learning outcomes compared to students who do not get inquiry learning.

During the implementation of guided inquiry learning models found several obstacles or constraints, as follows: students have less academic ability and tend to be shy to ask, not familiar with the inquiry learning model, the time of implementation together with the race.

Close

The researcher can draw the conclusion that the use of teaching question strategies can improve students' abilities and beliefs in asking questions.

As for some suggestions based on the results of research conducted by researchers:

Teachers can give more attention to students who are weak, For students who are not familiar with guided inquiry learning, researchers coordinate with teachers in schools first, then jointly provide guidance, Ensure that research activities do not clash with school activities,

The next researcher explained clearly to students and teachers about learning with a guided inquiry approach using Teaching Questions. Other researchers need to train students to develop the skills needed in learning using the 2013 curriculum. LKS and textbooks are used when learning is shared with students before learning takes place.

For teachers more able to manage time during learning so that learning can run more effectively and efficiently. Students need to spend some time before the learning process begins to study learning material in order to get the outline of the material.

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