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Development of teaching materials for student worksheets based on guided inquiry methods for learning outcomes of students

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Abstract
The purpose of this study is to develop and produce a product in the form of student worksheets with the guided inquiry method that can be used in the learning process and to improve student learning outcomes. This research was categorized as development research. The research sample taken was the seventh-grade students of SMP Negeri 5 SATAP, East Likupang. The number of students studied was 30 students in the experimental class and 30 students in the control class. In this study, the developed worksheet of students with the guided inquiry method will increase the activeness and knowledge of students. This study uses the development of a 4-D learning device according to Thiagarajan. The development of this model has four stages, namely defining, designing, developing, and disseminating. The data taken from the research is science learning outcomes data measured by cognitive question instruments that have previously been tested for validity and reliability. Hypothesis testing was done by using paired sample t-test analysis with pretest-posttest control group design. The results showed that the development of teaching materials in the form of student worksheets with the guided inquiry method turned out to be able to improve the learning outcomes of class VII students. The development of teaching materials in the form of student worksheets by the guided inquiry method has received a good response from students seen from the aspect of activity with very high criteria and responses of students with very feasible criteria so that they can be applied in the learning process.

Keywords: development of student worksheets, guided inquiry method, learning outcomes

1. Introduction
Science learning is learning related to how to find out about nature systematically, so that science is not only mastery of collections in the form of facts, concepts, and principles but also a process. In other words, science can be interpreted as a process is a way of thinking or acting to deal with problems that exist in the environment by linking a process or work method so that the results of this activity are called the scientific process. After discovering the scientific process scientific findings will be obtained. The embodiment of the scientific process is in the form of scientific activities called scientific inquiry (Mulyasa, 2007) [2]. Scientific inquiry can be done through guided inquiry-based learning. Guided inquiry-based learning is learning that emphasizes the process of critical thinking and analysis to find and find answers to problems. So that guided inquiry-based learning can lead students to think more imaginatively and be able to develop their knowledge. Based on the results of observations and interviews with science teachers on January 14th, 2019, information was obtained that student worksheets used by students were student worksheets which only contained problem exercises that had an impact on the lack of learning outcomes of students who had not reached the completeness criteria minimal. Weaknesses of student worksheets that function as learning guides cannot be used to increase student activeness during the learning process. The teacher still acts as the center for providing information to students.
Whereas in the 2013 curriculum, which should play an active role in learning are students while the teacher is only as a facilitator or companion of students in learning. The above problems require researchers to design a worksheet of students who can improve students' knowledge and activeness of students. The form of student worksheets like this according to Prastowo (2015) [3] is included in the student worksheet which helps students find a concept. This type of student worksheet contains what students must do including doing, observing, and analyzing. Therefore, the teacher needs to formulate the steps that must be done by the students then the students observe the phenomenon of the results of their activities. Next, questions are given that can help students to associate the results of their observations with the concepts being studied.
Based on the results of research conducted by Y. Astuti and B. Setiawan, the application of the guided inquiry method in the classroom will gain a higher level of understanding of students than students who are only given conventional methods during learning. This is because, in guided inquiry learning, students get more activities so that students have the ability to think critically and creatively in interacting with the material being taught.
According to Roestiyah, the inquiry is a technique or method used by teachers to teach in front of the class. As for the teaching as follows the teacher divides the task of researching a problem into class. Students are divided into several groups and each group gets a specific task to do. Then they study research, study or discuss assignments in groups. After the results of the group work they discussed and then made a report and arranged well (Roestiyah, 2008).
The researcher chooses the material of interaction between living things and their environment to develop teaching materials for student worksheets because this material

explains the interactions between living things and population dynamics that occur in the environment. When learning on this material can give the impression of understanding students, students will be more aware of how all living things on this earth can survive and walk-in balance with their environment so that students have more caring and responsible attitudes towards the environment. The problem that appears in science learning is that the teacher only delivers science material as a product. This is not in accordance with the nature of science, namely in the form of attitudes, processes, products, and applications, and less teaches students in the process of thinking and finding their own knowledge through scientific performance.

Given the importance of teaching materials in the science learning process in the form of student worksheets, development is necessary. This is what encourages researchers to conduct research using the title "Development of Learning Materials for Student Worksheets with Guided Inquiry Method to Improve Learning Outcomes of Students".

This study aims to improve the learning outcomes of science students after using guided inquiry-based student worksheets and obtain positive responses from students seen from the aspects of activeness and responses of students after using the worksheet guided inquiry-based students.

2. Research Methods

This study uses research and development methods or "research and development" following the research stages of developing a 4D model according to Thiagarajan (1974) [5]. This research was conducted in March, taking place at SMP Negeri 5 SATAP, East Likupang, North Minahasa Regency. The target population is all of the SMP Negeri 5 SATAP students, East Likupang, and affordable population are all VII grade of SMP Negeri 5 SATAP, East Likupang. The object of research is validity, feasibility, and learning outcomes after the use of student worksheets.

To obtain data on the development of student worksheets by the guided inquiry method in this study, the following data collection tools (instruments) were needed:

1. The questionnaire method is used for the feasibility test and the validity test of the student worksheet, responses of experts, and students. The type of questionnaire for the feasibility test and the validity test of the practical guide is a checklist that is a series of statements (which are usually short) where the respondent just needs to put a checklist (√) in the place provided.
2. Observation methods are used to observe student activity during learning. Observations are carried out using observation sheets that contain observational instruments and refer to the prepared observation rubric.
3. Test method. The tests given were in the form of pretest and posttest which later would measure the comparison of learning outcomes of students using the worksheet products of students with the guided inquiry method that had been developed.

The analysis techniques used are as follows: (a) descriptive analysis (qualitative); (b) paired sample t-test. Descriptive analysis to describe the response of students and reviewers to the worksheets of students used. In addition, also to measure the activeness and responses of students after using the worksheets of students developed. Test paired sample t-test was conducted to test the research hypothesis. The data analyzed are as follows.

1. The validity of the student worksheet is processed from an assessment questionnaire and expert validation consisting of 3 experts.

$$NP = \frac{R}{SM} x\ 100\ \%$$

Arikunto (2010) [1]

Then calculate the average value of the validity of the three validators with the Arikunto (2010) [1] formula that has been modified as follows:

$$NA = \frac{V1 + V2 + V3}{3}$$

Arikunto (2010) [1]

2. The feasibility of student worksheets with the guided inquiry method is determined through the students' responses to the initial (small scale) trial. This test was carried out for 6 students of class VII of SMP Negeri 5 SATAP, East Likupang. This class is not used for the control class or the experimental class.
3. Learning outcomes of students is a comparison between the control class and the experimental class which is measured using a test instrument.
4. The activeness of students is based on the results of observations by science subject teachers by filling out the questionnaire provided.

Assessment of aspects of student learning outcomes can be seen from the value of the pre-test and post-test of students. The success that you want to see is how much the mastery of the concept of student increases between the control class and the experimental class which is measured using a test instrument on the material. These values are processed and analyzed by paired sample t-test.

a. If the value is P or Prob. Or Sig. (Significance) < value $\alpha = 0.05$ then reject H_0 (accept H_1).
b. If the value is P or Prob. Or Sig. (Significance) > value $\alpha = 0.05$ then accept H_0 (reject H_1).

Achievement of student activeness scores

Data on student activity in learning is obtained from data on student activities when learning in the classroom, student activities during discussions and during practicum. Data on student activity was analyzed by calculating the average value of the four activities of students. Process the value of each student activities by using the formula:

$$Average = \frac{the\ number\ of\ scores\ obtained}{maximum\ score} \times 100\%$$

Table 1: Criteria for Evaluating Student Activity

Interval	Criteria
81% - 100%	Very active
61% - 80 %	Active
41% - 60 %	Quite active
21% - 40%	Less active
< 21 %	Not active

Indicators of success in this study are a) Results of expert validation reached a score percentage > 62 %, b) Results of

student responses reached a score percentage > 62 %.
2) The activeness observation results reached a score of > 62.50 %. 3) The results of the character observation of students reached a score of > 62%.

3. Result and Discussion

The format of student worksheets used by researchers in compiling inquiry-based student worksheets is the format for writing student worksheets according to Andi Prastowo (2015) [3] that has been adapted to the needs of students and the ability of the author. The format is as follows:

Table 2: Format of Student Worksheets

1	**Front cover**	6	**Worksheet 2**
2	Editor	7	Worksheet 3
3	Preface	8	Worksheet 4
4	Table of contents	9	Competency Test
5	Worksheet 1	10	Back cover

Validation analysis of practicum guide experts

Student worksheets with the guided inquiry method then get validation by 3 experts. In this validation, the student worksheets were given to 2 postgraduate lecturers at UNIMA Science study program and 1 Science Teacher at SMP Negeri 5 SATAP, East Likupang. Expert validation shows that three validators provide an assessment of 86%. Based on the level of validity criteria and product revision means that the components in the worksheet of students get valid criteria from the assessment of the experts then the revision stage is carried out in accordance with the suggestions of the validators. The first revision of the student worksheet was done after looking at suggestions for improvement from the validator.

Feasibility analysis practical guide

This trial is a feasibility test conducted by the questionnaire method. Questionnaires were given to students at SMP Negeri 5 SATAP, East Likupang. The questionnaire was analyzed questionnaire responses of students. The initial trial was carried out before the field test. At this stage, the worksheet of the students with the guided inquiry method was given to 6 respondents who were eighth-grade students of SMP Negeri 5 SATAP, East Likupang. The average results of the percentage score obtained in the initial trial on the practicum guideline resulting from the development were 71.3% with eligible criteria. The second revision of the practical guiding prototype was carried out after the researcher carried out an evaluation of the results of the initial trial.

Analysis of test validity

Validity test is a test that is used to determine the validity of items. Questions that are valid results will be used as evaluation questions for the experimental class and control class, while invalid questions will be discarded and not used. Item questions are said to be valid if $r_{count} > r_{table}$. Based on the trial N = 30 with a significance level of 5% obtained $r_{table} = 0.361$ so that the item questions are said to be valid if $r_{count} > 0.361$. The results of these trials are summarized in the following table:

Table 3: Test results validity of item questions

Question Number	Validity Calculation
1	0.471
2	0.449
3	0.562
4	0.483
5	0.308
6	0.555
7	0.555
8	0.555
9	0.555
10	0.522
11	0.864
12	0.796
13	0.799
14	0.570
15	0.562
16	0.799
17	0.799
18	0.864
19	0.719
20	0.007
21	0.373
22	0.483
23	0.007
24	0.047
25	0.117

Test Reliability Analysis

Reliability test was used to determine the level of consistency of answers. For the reliability of the research instruments analyzed using the Cronchbach's Alpha formula.

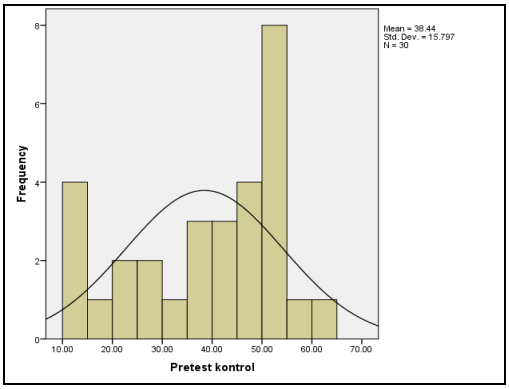
Table 4: Reliability Statistics

Cronbach's Alpha	N of Items
.889	25

Reliability test shows Cronchbach's Alpha number is 0.889 > 0.60 with highly reliable classification.

Hypothesis testing

Data on student learning outcomes obtained from the post-test value. One indicator of the success of using guided inquiry-based student worksheets is the learning outcomes of students achieving the minimum completeness value that has been set by the school which is 75. Comparison of the learning outcomes of the control and experimental classes can be seen in the Figure below:



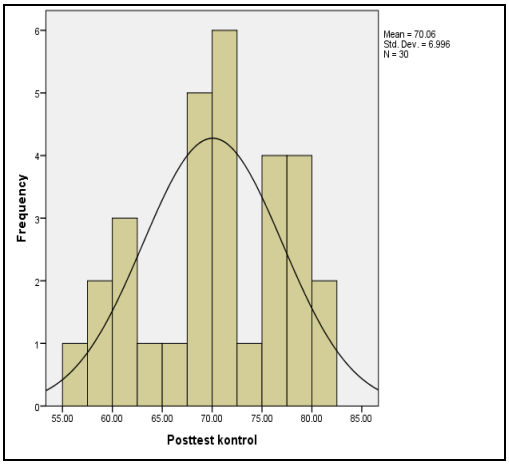


Fig 1: Histogram of Pre-test and Post-test of the Control Group

The results of the pre-test study obtained an average pre-test in the control group was 38.44 and the average post-test learning outcome assessment was 70.66. Paired Sample T-test results showed significance value (2-tailed) = 0.00 < 0.05. Therefore, it can be concluded that there are significant learning outcomes in the control group, but the average post-test learning outcomes of the control group have not reached the minimum completeness value that has been determined by the school, namely 75.

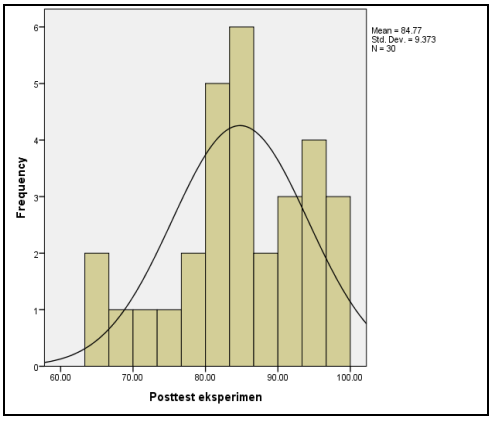


Fig 2: Histogram of Pre-test and Post-test of the Experimental Class

The results obtained by the average pre-test in the experimental group was 40.63 and the average post-test learning outcome assessment was 84.77. Paired Sample T-test results showed significance value (2-tailed) = 0.00 <0.05. Therefore, it can be concluded that there are significant differences in learning outcomes before and after being given treatment namely learning using the worksheet based on guided inquiry in the experimental group.

Analysis of activity of students

Assessment of student activity during learning carried out by observers. This assessment was carried out 4 times to 5 groups, each group consisting of 6 students. The following are the results of the overall observation that is 90.9% with very active criteria. The results of classical student activity assessment can be seen in Figure 3 below.

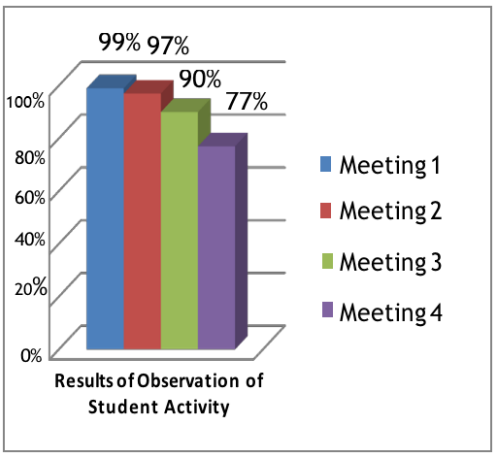


Fig 3

From the graph above it can be seen that the percentage of student activity in the first meeting with the investigation activities reached 99.3%, the second meeting with discussion activities reached 97.2%, the third meeting with discussion activities reached 90.2%, and the fourth meeting with simple experimental activities reaching 77%. From these data, it can be seen that learning with investigative activities can further increase the activity of students.

4. Conclusion

Based on the results of the study the conclusions are as follows

1. Development of teaching materials in the form of student worksheets based on the guided inquiry method can improve the learning outcomes of class VII students.
2. Guidelines for developing teaching materials in the form of student worksheets based on the guided inquiry method have received good responses from students seen from the aspect of activity with very high criteria and responses of students with very feasible criteria so that they can be applied in the learning process.

References

1. Arikunto S. *Manajemen Penelitian"*. Jakarta: Rineka Cipta, 2010.
2. Mulyasa E. *Menjadi Guru Profesional menciptakan Pembelajaran Kreatif dan Menyenangkan*. Bandung

Rosdakarya, 2007.
3. Prastowo A. *Panduan Kreatif Membuat Bahan Ajar Inovatif Menciptakan Metode Pembelajaran Menarik dan Menyenangkan*. Yogyakarta: Diva Press, 2015.
4. Roestiyah NK. *Strategi Belajar Mengajar*. Rineka Cipta. Jakarta, 2008.
5. Thiagarajan S, Semmel DS, Semmel MI. Instructional development for training teacher of exceptional children. Bloomington Indiana: Indiana University, 1974.
6. Astuti Y, Setiawan B. Pengembangan lembar kerja peserta didik (lks) berbasis pendekatan inkuiri terbimbing dalam pembelajaran kooperatif pada materi kalor: Jurnal Pendidikan IPA Indonesia, 2013.