LEARNING EFFECTIVITY OFELASTICITY AND HOOKE'S LAW MATERIALSUSINGGUIDED INQUIRY-BASED STUDENT WORKSHEET

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ABSTRACT: This development research aims to develop guided inquiry-based elasticity material worksheet for the students of XI IPA class. This research was conducted to describe the attractiveness, convenience, benefit, and effectiveness levels of guided inquiry-based student worksheet at Senior High School 5Bandar Lampung with XI IPA 1 class with a total of 36 students as experimental group and XI IPA 2 class with a total of 35 students as control group. This research used research and development (R&D) design. The researchers only used eight development procedures which was conducted by researchers, namely potential and problem, data collection, product design, design validation, design revision, product trial, and product revision. The final product produced was 89% interesting, 90% very easy, and 88% beneficial with the improvement of student learning outcomes. The result of effectiveness test showed that student worksheet developed as learning media had a value of *N-gain* with moderate category and can be concluded 'effective' with Criteria of Minimal Completeness (KKM) of XI IPA class at Senior High School 5 Bandar Lampung that has been determined, namely 78.

Keywords: development research, student worksheet, guided inquiry.

1. INTRODUCTION

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble values, and skills needed by themselves, society, nation and state (Ismawati & Mulyaningsih, 2014) and physics is a branch of Natural Sciences (IPA) that underlies the development of technology to gain real knowledge and understanding. Physics Learning is carried out in scientific inquiry to cultivate thinking ability, to work and to be scientific as well as to communicate as one of the important aspects of life skills. Physics lessons is often a subject that is not in demand because of many mathematical equations, number of physics concepts that must be mastered and the very little linkages with daily life (Popov, 2006).

Teaching and learning process basically expects students to play an active role in finding knowledge, concepts, theories, and conclusions instead of collecting information or fact only, meaning that teachers only direct teaching and learning activities centered on students(Astuti & Setiawan, 2013). In fact, there are still many teachers who use the lecture method only and there are many lessons that are centered on the teacher. In formal education, teachers and students play an important role in the teaching and learning process which is an activity of reciprocal

interaction in instructional situations (Maretasari, et. al, 2013). By providing direct experience to students, which aims to develop the potential of students in accordance with the expected competency standards (Permana et. al, 2013).

The problem of students in the learning activities today is the difficulty of students in receiving, responding, and considering the materials delivered by the teacher, so it requires an appropriate media and can be used as a solution. The available learning media is now very diverse, therefore it takes a medium that can give students a learning directly. To create learning in accordance with process standards, it is necessary to use student worksheet that optimizes learning activities (Pariska et al,2012).

To obtain learning media that can facilitate students, student worksheet can be made by using a particular approach and method. Student worksheet with guided inquiry method can help the students to understand the learning materials more easily and can provide the learning experience directly to the students (Retnosari et al, 2015). The inquiry learning model is a teaching that requires students to pro cess messages so as to gain knowledge, skills and values (Dimyati dan Mudjiono, 2010:173).Inquiry method is not only used and directly produces learning products, but it takes stages Mandaelis et al, (2015:2).The main purpose of the inquiry model is to consider the intellectual, think critically, and be able to solve problems scientifically which is the hallmark of a scientific approach.

Scientific learning not only views learning outcomes as the final estuary, but the process of learning is important. In this case the students are regarded as the subject of learning is no longer the object of learning so it needs to be actively involved in learning, the teacher only served as a facilitator who guides and coordinates learning activities(Ismawati and Mulyaningsih, 2014). In accordance with what has been stated by (Nurlailiyah, et al, 2014)that learning by using scientific approach is a student-centered learning approach. Learning which is in accordance with a scientific approach consists of five steps including observing, asking, trying, reasoning and communicating.

The results of requirement analysis of basic competence (BC) or physics subject of XI IPA class, odd semester. According to BC 1.3 Elasticity and Hooke's Law, it was obtained that 80% of physics teacher in Senior High Schools 5 Bandar Lampung who were 5 people, needed student worksheet with Elasticity and Hooke's Law, this was based on observation that physics learning process at Senior High School 5 Bandar Lampung especially on Elasticity and Hooke's Law materials still used the lecture method, the teacher still dominated the delivery of learning materials in front of the class by writing on the blackboard so that the students only acted as the recipient of the materials, so that the learning process became monotonous due to the lack of students' involvement and the students tend to be less active in asking or answering questions from the teacher.

From the questionnaire analysis of physics learning needs addressed to 5 physics teachers, it obtained a total score of 78.57% and the questionnaires results of the needof XI IPA 1 students at Senior High School 5 Bandar Lampung with a total respondents number of 34 students obtained a total score of 79.62% which means that guided inquiry-based student worksheet needs to be developed to help teachers in physics learning and help students simplify the understanding of material concepts in the learning process. Based on the description above, the authors conducted a research entitled "Learning Effectivity Of Elasticity And Hooke's Law Materials Using Guided Inquiry-Based Student Worksheet". The formulation of the problems in this development research are: (1) How is the development product of guided inquiry-based

student worksheet? (2) How is the attractiveness, convenience and expediency level of guided inquiry-based student worksheet? (3) How is the effectiveness of guided inquiry-based student worksheet?

The purposes of this research are:(1) To produce valid guided inquiry-based student worksheet products. (2) To describe theattractiveness, easiness, andexpediency of the guided inquiry-based student worksheet (3) To describe the effectivenessof the guided inquiry-based student worksheet.

2. RESEARCH METHODS

This development research used a development model which was derived from development procedure (Sugiyono (2009: 408). The stages taken were limited to the 8th stages only, namely (1) Potentials and Problems, (2) Data Collection, (3) Product Design, (4) Design Validation, (5) Design Revision, (6) Product Trial, (7) Product Revision, and (8) Usage Testing. This was due to the limited time and cost of the research. The research design used was yang *Pretest-Posttest Control Group Design* (Sugiyono, 2009: 112-113). Before the treatments were given to the experimental and control groups, both groups were given a pretest to see that the groups were not significantly different.

Data Collection Technique

This research used questionnaire and test data, the list of instruments can be seen in table 1 as follows:

Table 1. List of Instruments

Activity	Subject	Instrument
Pre-research	Physics Teachers and students of Senior High School 5 Bandar Lampung	Questionnaire analysis of material needs, student worksheet, and materials
Design Test	Lecturer of Educational Technology	Design Expert Test Questionnaire
Material Test	Lecturer of Physics	Material Test Questionnaire
Field Test	Students of Senior High School 5 Bandar Lampung	Questionnaire of attractiveness, easiness, and expediency of student worksheet. Written test of student worksheet's effectiveness.

The conformity data of learning materials and designs on the products was obtained from material and design experts through expert validation tests. The conformity data was used to determine the level of eligibility of the product generated. The data of attractiveness, easiness, and expediency of student worksheet productswere derived from field test which was conducted directly to the students. While, the data of effectiveness level of products obtained were derived from the written test before and after the products were used.

3. RESULTS AND DISCUSSION

The results of the pilot research (pre-research) provided information related to teaching materials and the potentials that exist at Senior High School 5 Bandar Lampung. The fact was

that the school do not have teaching materials in the form of guided inquiry-based student worksheet in physics learning yet. The distribution of questionnaires concerning on analysis on student needs for teaching materials developed with data sources of 34 students of XII IPA classes at Senior High School 5 Bandar Lampung showed that 79.62% of students require guided inquiry-based student worksheet. The results of the questionnaire analysis of the disclosure of teacher needs for teaching materials developed showed a percentage of 78.57%, meaning that it needed to develop a guided inquiry-based student worksheet. The results of the questionnaire on student worksheet material needs developed by 5 physics teachers at Senior High School 5 Bandar Lampung showed that 80% of teachers needed the student worksheet of BC 1.3 Elasticity material for XI IPA class students.

The stage of information gathering was carried out through literature review and field study. In the literature review, concepts or theories related to products that will be developed in research on learning, student worksheet teaching materials, guided inquiry model and scientific approaches can be studied both from books, internet, and from scientific journals as a basis for helping teachers in the learning process and for improving student learning outcomes. While the field study was data collection with the learning process carried out so far, the learning process which was believed to be able to improve student learning outcomes was the learning that used guided inquiry-based student worksheet teaching materials. Based on the analysis of the results of the questionnaire material needs of physics student worksheet that BC 1.3 Elasticity material is the material in the product developed. The developed student worksheet design is as follows:

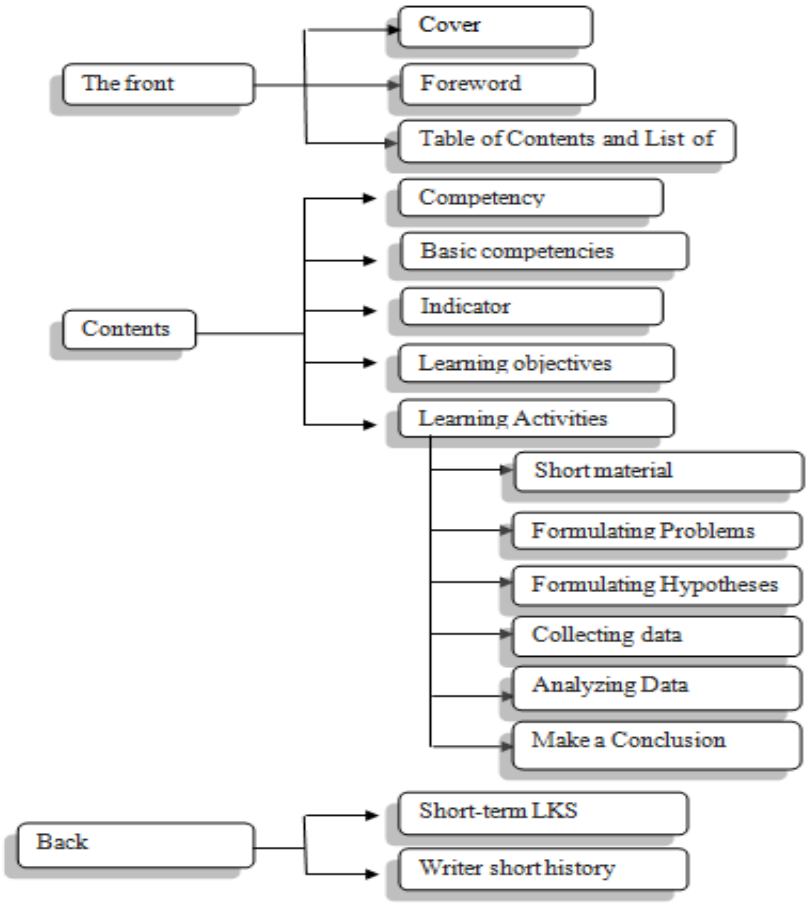

Figure 1: The Format of Development Student Worksheet

The product that has been made is called product prototype 1 whose effectiveness is not proven yet. The validation and reliability were conducted inthis test instrument by using SPSS software. It showed that the number of valid questions is 20 questions. The result of the test instrument after being validated can be tested by using bivariate person correlation formula with the help of SPSS program. In the validity test, it is valid if the value of r count> r table at 5% significance value, otherwise,it is invalid if the value of r count <r table at 5% significance value. That validation results showed that all values of r count> t table at the significance value of 5%. Therefore, it can be concluded that all valid questions that can be used as test instruments.

Reliability test was carried out by using alpha formula, significance test was done at level α = 0,05. The test instrument can be said to be reliable if the alpha value is greater than r table (0.361).

Table 2. The Results of Reliability Test

Cronbach's Alpha (r count)	*r table*	*N of Items*	*Information*
0, 818	0,361	20	reliable

The reliability test results shows data 0.818 based on the value of reliability coefficients. It can be concluded that the test instrument data were reliable or consistent so that it can be used as a test instrument. The design validation test of this research by design experts consists of material experts and design experts was conducted by two lecturers namely Mr. Abdurrahman, M.Si as a lecturer of an material expert test lecturer and Dr. Herpratiwi, M.Pd. as a design expert test lecturer. Based on student worksheet expert validation which has been developed, it can be used with revision.

Table 3. Summary of expert validation results

No	Rated Aspects	Suggestions for Improvement	Improvement
1.	Eligibility, conformity of content	Student Worksheet builds students' ability to formulate problems	Student worksheet has presented and directed students' ability in formulating the problem
2.	Eligibility, conformity of content	Not only phenomena, facts, concepts, laws, theories / materials according to the formulation of the problem in the student worksheet	Already displayed conformity between phenomena, facts, concepts, laws, theory with the formulation of the problem on the student worksheet
3.	Eligibility, conformity of content	The hypothesis has not yet reached the creative aspect but the analysis phase	It has been fixed for the hypothesis only until the analyzing stage
4.	Eligibility, conformity of content	Student worksheet's presentation not only find but also build concept	It has been shown not only to find but to build the concept of activities on student worksheet

5.	Illustration	Include source image, image size, color writing, writing size, sharpen the type of student worksheet and indicators	Already displayed image source, image size, writing color, text size and type of student worksheet and indicators

The expert test results both material and design were obtained by the criteria of the valid developed student worksheet and could be used with revisions. Based on the suggestions from the validator, then revisions were made to produce prototype 2. After expert test validation, the researchers made a product revision based on expert suggestions that led to the better student worksheet products developed. This revision was conducted to refine the products that had been developed in accordance with real conditions before being tested. Revisions were made based on suggestions and input from expert test lecturers.

The results of the prototype 2 were tested one on one before being used for trials in the experimental group. One-on-one test was conducted on 10 students of class of XI IPA 5 Bandar Lampung who were taken randomly, one-on-one test was conducted using developed worksheets. In the one-on-one test, the researchers gave a brief explanation of the student worksheet and then students carried out activities according to the student worksheet procedure and provided opportunities for students to ask questions about things that are not clear.

Based on the one-on-one test that has been done, the results of the questionnaire analysis of attractiveness, easiness, and expediency 89% was obtained from the students and 91% was obtained from the teachers. Based on the results of one-on-one test and information from students and physics teachers that led to the better student worksheet products developed. This product revision was done to refine the products that have been developed in accordance with the real conditions in the field before being tested.

The implementation of the usage trial was carried out on students of class of XI IPA 1 Senior High School 5 Bandar Lampung as the subjects of the research. To test the effectiveness of the student worksheet at the stage of use testing with the *pretest-posttest control group design* method analyzed by the *Independent t-test*. While the level of product effectiveness based on the average gain value was normalized (*N-gain*). Usage testing was done by testing the effectiveness of the purpose of describing the effectiveness of student worksheet as teaching material on the Elasticity material, as well as questionnaires in the experimental group to obtain data on the attractiveness, easiness, and expediency of student worksheet development results tested to experimental group that have used student worksheet during learning physics. The researcher chose two classes randomly, namely class of XI IPA 1 as the experimental group and class of XI IPA 2 as the control group. Before the implementation of physics learning, both in the experimental class and in the control class, the researchers conducted the Pretest. The implementation of learning in the experimental class using development student worksheet namely guided inquiry-based student worksheet on elasticity and in the learning control group using conventional student worksheet on elasticitymaterial which was commonly used in schools.

The control group is XI IPA 2 class with 35 students. In the control group, the learning on elasticity material was given by using ready-made student worksheet teaching materials from publishers rather than the results of teacher-made student worksheets and not based on guided inquiry. At the end of learning, students were given posttest after the learning was complete. The experimental group was XI IPA 1 class with 36 students. It was treated by using student worksheet guided inquiry-based development product. Learning follows the stages of guided

inquiry as stated in the Syllabus and lesson plans. At the end of learning in the experimental group, the posttest was conducted to find out the final learning outcomes of students in the material of elasticity using guided inquiry-based student worksheet. After that, the experimental group fills out a set of student responses to the development worksheet that has been used.

The results of the *pretest-posttes*t value in XI IPA 1 and XI IPA 2 classes were then tested for normality and homogeneity to determine the equivalence of students' initial level of ability.

Table4. Descriptive Statistical Data of *Pretest-posttest* of Experimental and Control Groups

		Experimental Group		Control Group	
		pretest	**postest**	**pretest**	**postest**
N	*Valid*	**36**	36	**35**	35
	Missing	**0**	0	**1**	0
Mean		**51,39**	81,25	**48,71**	64,29
Median		**50**	85	**50**	65
Std.Deviaion		**12,341**	10,871	**11,902**	12,841
Range		**65**	40	**60**	55
Std.Error of mean		**2,056**	1,796	**2,0119**	2,170
variance		**152,302**	116,250	**141,681**	164,916
Minimum		**20**	55	**20**	40
Maximum		**85**	95	**00**	95
Sum		**1850**	2925	**1705**	2250

Based on Table 4, the average value between the *pretest and posttest* of the experimental group is 29.86, while the difference in the average value for the control group is 15.58. This shows that the average value of the experimental group is better than control group's. The researchers gave the *pretest-posttest* questions to the students to find out the results of the students' initial and final learning on the Elasticity and Hooke's Law materials. The result data of *pretest-posttest* of experimental and control groups can be displayed on the bar chart in Figure 2.

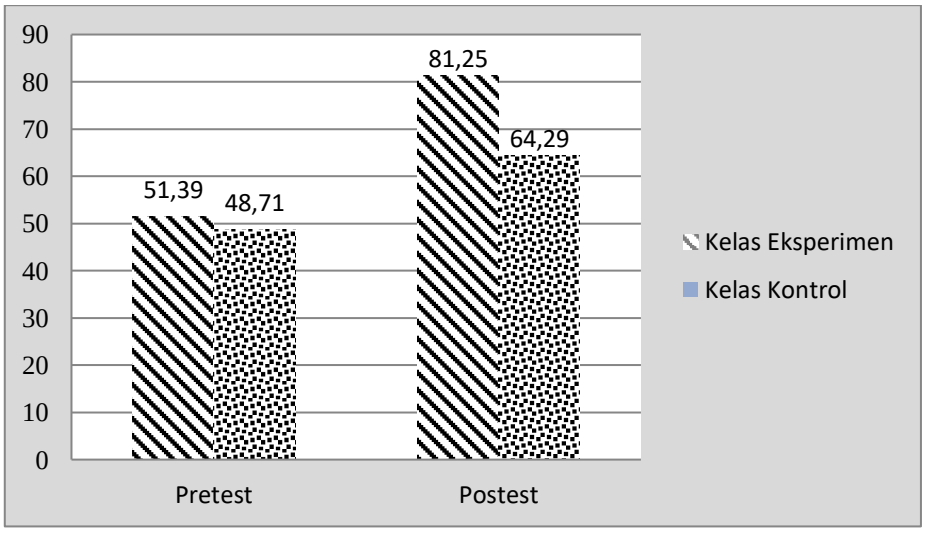

Figure2. Bar Diagram of *Pretest* and *Posttest* Mean Value Data of Experimental and Control Group

Table 5. Normality test results of *pretest-postest* data of experimental and control

Group	Sig.(2.tailed) pretest	Sig.(2-tailed) postest	Conclusion
Experimental	0,529	**0,289**	Sig ≥0,05 = Normal
Control	0,471	**0,404**	Sig ≥ 0,05= Normal

The test results of the *pretest-posttest*data homogeneity showed a significance value of 0.884 and 0.419. Because the value of Sig. (Significance) or probability value ≥ 0.05, then H_0 is accepted, meaning that both groups have the same or homogeneous variance. Based on the *pretest-posttest* data normality and homogeneity test, the experimental and control groups were homogeneous and normally distributed data, then the parametric hypothesis test was performed to see the difference in the average posttest data of the experimental group and the control group namely t-test (*Independent sample t-test*) with the second assumption of *Equal Variance Assumed*. Data from the calculation of the posttest t-test can be seen in Table 7.

Table7. The Difference of Mean of *Pretest* Data of Experimental and Control Groups

		t-test for Equality of Means		
		t	**df**	**Sig.(*2-tailed*)**
Pretest	***Equal variances assumed***	0,929	69	0,356
	Equal variances not assumed	0,930	68,996	0,356
Posttest	***Equal variances assumed***	**6,036**	**69**	**0,000**
	Equal variances not assumed	**6,020**	**66,315**	**0,000**

Based on Table 7, it can be concluded that the results of the pretest of the experimental and control group does not differ at α = 5%, the funds in Table 8 show that at significance α = 0.05 the value of Sig (2-tailed) = 0,000. This shows that the Sig (2-tailed) value <0.05 then $H_0$is rejected and H_1 is accept, so it can be concluded that there is a significant difference between the average posttest value of the experimental group students with the average Posttest value of the control group students. Knowing whether there is a significant influence between the use of conventional student worksheet teaching materials on student learning outcomes on the material of Elasticity and Hooke's Law. To test the differences in the average pretest and posttest data of the control group, paired t-test can be used. The data from the calculation of paired t-test can be seen in Table 8.

Table8: Paired t-Test Results of Control Group

Pair	Group	Mean	t	Df	Sig.(2-tailed)
Pritest-Posttest	**Control**	**-15,57**	**-9,228**	**34**	**0,000**
	Experimental	**-29,86**	**-14,807**	**35**	**0,000**

The results of the paired t-test in Table 9 show that the Sig. (2-tailed) value is 0,000 which shows the Sig (2-tailed) value <0.05, so it can be concluded that H_0 is rejected so that there can be

significant differences (significant) between the mean value before learning using conventional student worksheet (*pretest)* with student learning outcomes after learning using conventional student worksheet teaching materials (*posttest*) on the material of Elasticity and Hooke's Law. The mean posttest value is greater than the pretest value so there is an increase in learning outcomes with an average increase of 15.57.

The results of attractiveness, easiness, and expediency of development student worksheet can be seen in Table 19 and Figure 15. It showed values for attractiveness of 89% which means interesting, 90% which means very easy, and 88% which means useful according to the criteria of validity and product revision (Arikunto, 2006) and score assessment of attractiveness test, easiness test, and expediency test (Sugiyono, 2009).

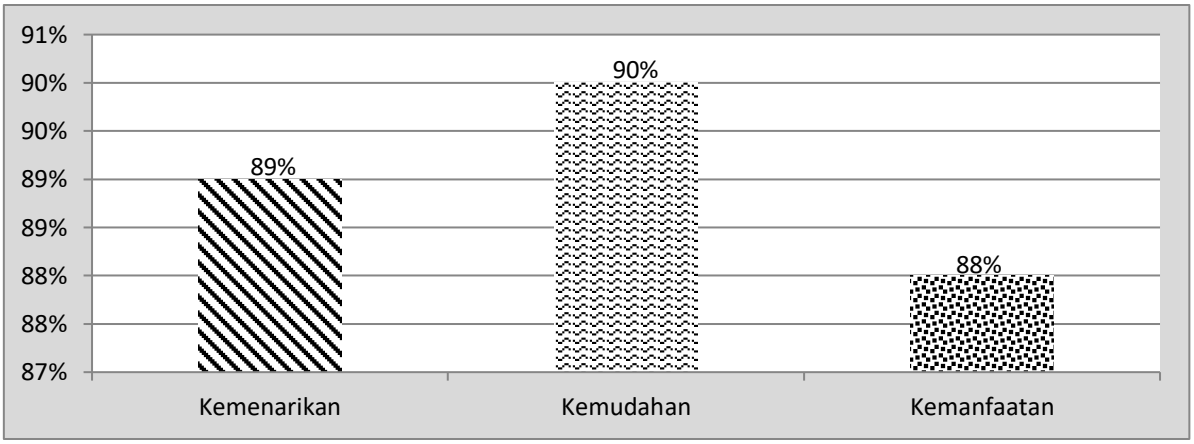

Figure 3. The Results of Attractiveness, Easiness, and Expediency Test

The results of the pretest and posttest can determine the value of the effectiveness of this development student worksheet product which was equal to 0.52 based on the effectiveness analysis formula and the classification of the average Gain value criteria.

$$\mathbf{(g)} = \frac{(\boldsymbol{Sf}) - (\boldsymbol{Si})}{\boldsymbol{Sm} - \boldsymbol{Si}}$$

Table 9. Mean Value of *Normalized Gain*and Its Classification

Mean of N-gain	**Classification**	**Effectiveness Level**
$\langle \boldsymbol{g} \rangle \geq 0{,}70$	High	Effective
$0{,}30 \leq \langle \boldsymbol{g} \rangle < 0{,}70$	Moderate	Quite Effective
$\langle \boldsymbol{g} \rangle < 0{,}30$	Low	Less Effective

Source: Hake, (1998)

Based on table 9, the mean of*N-gain*of learning outcomes of the experimental and control group are in the moderate category, but the mean of*N-gain* of experimental groupis higher than the control group's, which is 0.62 for the experimental group, while control group of 0.31 and

histogram which displays comparison of *N-gain*of student learning outcomes in the experimental and control groups can be seen in Figure 4.

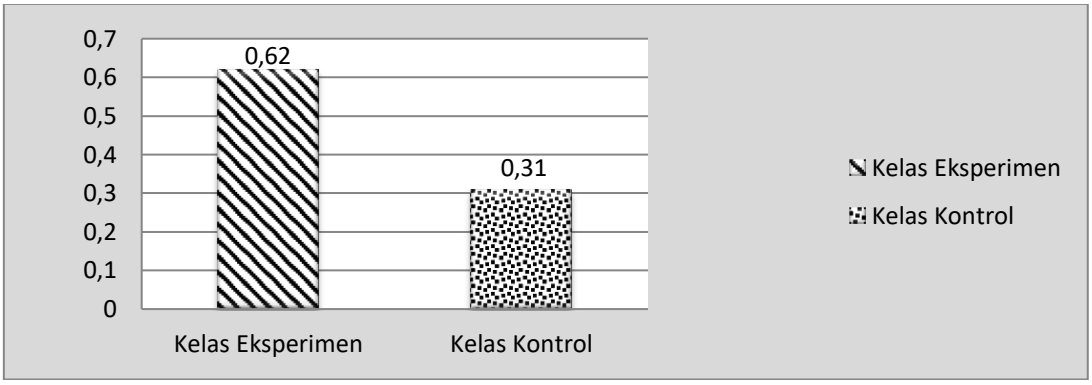

Figure 4. Comparison of*N-gain*Mean of Learning Outcome of Experimental and Control Groups' Students

The comparison of the *N-gain* of the students' learning outcomes in the experimental and control groups shows that the *N-gain* of the experimental groupis higher than the control group's N-gain. So it can be stated that the increase of learning outcome of experimental group or class whose learning using student worksheet product of development is higher than the increase of learning result of control group. So it can be stated that student worksheet product developed can improve student learning outcomes on Elasticity and Hooke's Law materials.

Hypothesis Formulation:

H_0: $\mu_1 \leq \mu_2$ (The mean of achievement valueofexperimental group's studentsissmaller or equal to control group's).

H_1: $\mu_1 > \mu_2$ (The mean of achievement value of experimental group's students is bigger Than control group's).

After implementing*pretest and posttest* in experiment and control groups, the data of learning result namely mean value in experimental group's learning by using teaching material of development student worksheet was obtained, while control group used teaching material of conventional student worksheet. Based on the difference test of *posttest*mean in Table 10, it can be seen that at the significance of $\alpha = 0{,}05$, we get the value of Sig (2-tailed) = 0,000. This shows that the value of Sig (2-tailed) <0.05 then $H_0$is rejected and H_1 is accepted, so it can be concluded that there is a significant difference between *posttest* mean of experimental group's students with *posttest*mean value of control group. Then it can be concluded that the mean value of students' achievement of experimental group is greater than the control group's.

4. DISCUSSION

The research and development carried out is to produce a product in the form of guided inquiry-based student worksheet with Elasticity and Hooke's Law materials for high school/MA students which are packaged in an interesting, easy, useful and effective way to be used as an alternative teaching material at school. Based on the analysis of the questionnaire results of the need for instructional materials developed, it showedthat 79.62% of students need guided inquiry-based student worksheet and 78.57% of teachers need developed guided inquiry-model student worksheet, and 80% of teachers need student worksheet teaching materials namely Elasticity and Hooke's Law materials. Therefore, researchers develop guided inquiry-based

student worksheet teaching materials of Elasticity and Hooke's Law. It is similar with the statements of (Chodijah et al, 2012) and (Wijayanti, A., 2014).

Physics learning uses guided inquiry-based student worksheet which can help students to master knowledge and concepts through activities of observing or identifying problems, formulating problems, formulating hypotheses, analyzing data, and concluding and applying them in daily life so that they can optimize the process of learning physics material of Elasticity and Hooke's Law.It is in line with the research conducted by (Chodijah et al, 2012). The examples of student answers in completing guided inquiry-based student worksheets on the material of Elasticity and Hooke's Law relating to guided inquiry stages can be seen in Figures 5 and 6:

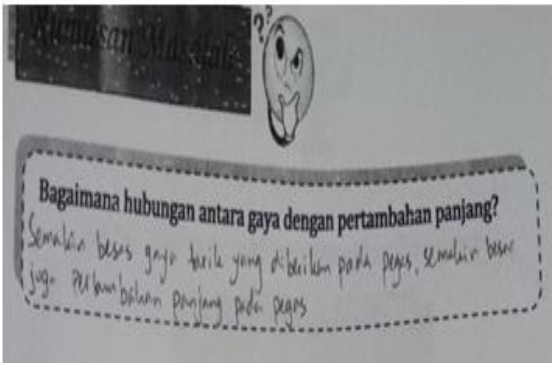

Figure5.An example of student's answer to problem formulation

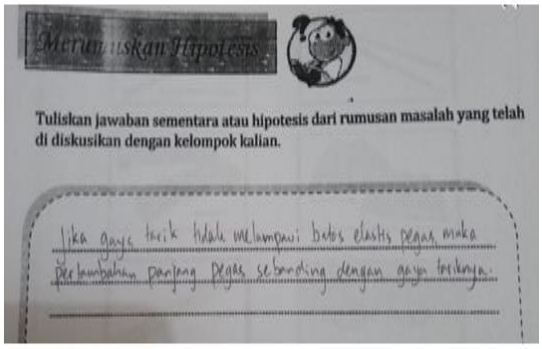

Figure6. An example of student's answer to hypothesis formulation

After students are given phenomena or problems related to elasticity and Hooke's law in daily life, with theirown group, the students discuss what answers are appropriate for the formulation of the problem. Formulation of the problem students are guided to form hypotheses and start designing or assembling experiments given in the student worksheet. Each student in their group is expected or guided to conduct experiments and arrange experiments so that each student has competence in physics learning.After students get data from the experiment, students are guided to analyze the data that has been obtained with their group by discussing it.

The product of the development of guided inquiry-based student worksheet has the advantage of making students more active and facilitating similar learning (Putri, BK and Widiyatmoko, 2013) but has weaknesses that have not been tested in larger groups so that trust only applies to small scope namely the place of research. The attractiveness, easiness and expediency are obtained by conducting one-on-one test products and using trials (field tests). The one-on-one test phase is carried out on 10 students and uses guided inquiry-based student worksheet material of elasticity, then students are given a test questionnaire to assess the level of attractiveness, easiness, and expediency of the student worksheet with the "Yes" and "No

Based on the results of the one-on-one test questionnaire on students obtained 89% and 91% of teachers.The attractiveness, easiness, and expediency in full can be seen in appendix 15. The trial phase of use (field testing) was conducted on students of XI IPA class in Lampung Province as many as 36 students. Based on the results of the use trials carried out on 36 students of XI IPA 1 class of Lampung Province, it was found that guided inquiry-based worksheets were developed interesting with a score category of 89%. What makes this LKS interesting to use, among others, is the positive attitude of students at each stage of guided inquiry in learning activities, attractive covers, the selection of clear images, the suitability of the colors used, and the selection of fonts, as well as display design of student worksheet that is able to display students' interest in learning in harmony with research (Retnosari, dkk, 2015).

Based on the results of the use trials (field tests) that have been conducted on 36 students of XI IPA 1 class of Senior High School 5 Bandar Lampung,it is known that guided inquiry-based student worksheets developed are very easy to use with a score category of 90% based on the assessment carried out by the user. What makes guided inquiry-based student worksheets easy, among others, from aspects of the content and language of the student worksheet, namely the use of the language used can be clearly understood so as to facilitate the use of student worksheet, easy terms, instructions or guidelines for use can be understood by users and questions in the student worksheet, it can be understood that the meaning is clearly in line (Retnosari, G. Dkk, 2015), thus the developed student worksheet can be used easily.

Based on the results of the use trials (field tests) conducted on 36 high school students in Lampung Province, it is found that guided inquiry-based worksheets developed were useful to use with a score category of 88% based on the assessment carried out by users, that worksheets contains a set of basic activities to be carried out by students to maximize understanding in efforts to establish basic abilities according to indicators of achievement achieved. The initial knowledge of students' knowledge and understanding is empowered through the provision of learning media in each experimental activity so that the learning situation becomes more meaningful, and can impress well on student understanding. Because the nuances of concept integration are one of the impacts on learning activities, the content of each worksheet students in each activity are attempted to reflect that.

Factors that make this student worksheet useful to use, including aspects of the content and language of the student worksheet, which help to increase students' interest in learning, help learn material easily and independently, and help assess mastery of competencies through competency tests. The results of this study are also similar to research (Oktari, S et al., 2015) with research on Development of Guided Inquiry-BasedStudent Worksheets on Temperature and Heat Material. The attractiveness ofproduct can be seen from the aspect of appearance and contents of developed student worksheet has met the display aspects including the use of letters of good size, shape, type, and color in the student worksheet as well as interesting layouts and images. In the aspects of the contents of the student worksheet developed, it has presented interesting problems so students are interested in learning the material.

The ease of products from the aspect of content and language, student worksheet developed has fulfilled the content aspects in the form of coverage of student worksheet contents, clarity of content of worksheets, and flow of presentation. Product utilization is seen from the aspect of its function, student worksheet used has fulfilled aspects of usability functions that can help to increase interest to study the material presented, help to improve understanding of concepts, help achieve learning objectives and evaluation and can be used to assess mastery of competencies.

The effectiveness of student learning outcomes can be determined based on the *N-gain* value of student learning outcomes. In the experimental group and the control group, the meanof pretest scores are 51.39 and 48.71 respectively. While the mean value of the experimental group and control group posttest are 81.25 and 64.29, respectively. The difference in *posttest* mean can be seen in the significance of $\alpha = 0.05$ and the Sig value (2 -tailed) = 0,000. The significance value (2-tailed) <0.05 then H_0 is rejected and $H_1$is accepted, so it can be concluded that there is a significant difference between the mean of posttest value of the experimental group students with the mean of Posttest value of the control group students.

The mean value of *N-gain*in control group is 0.31 and the average value of *N-gain* experimental group is 0.62 with the medium category means that the level of effectiveness is quite effective to improve student achievement and students in the experimental group are able to use guided inquiry stages. In this case, the scientific approach is inline with Maretasari, E. et al (2012).

5. CONCLUSION

From the results of the research and discussion that have been carried out, it can be concluded that:
(1) Guided inquiry-based teaching material student worksheet products on elasticity material that has been validated expertly and is suitable for use in physics learning in XI IPA class. (2) From guided inquiry-based student worksheet withelasticity material, it was obtained that the percentage of attractiveness by 89% with category of 'attractive' from the aspect of appearance and content of student worksheet, the percentage of easiness of 90% with category 'easy' of aspects of student worksheet content, and percentage of expediency of 88% with 'useful' category,student worksheet function as teaching material that can optimize the process of learning physics and improve the results of physics learning for students of XI IPA class. (3) guided inquiry-based student worksheetwith elasticity material is stated to be quite effective in improving students' physics learning outcomes with the achievement of effectiveness test results obtained by the average *N-gain* value is 0.62 in the medium category.
Suggestion

The suggestions from this development research are: (1) Because guided inquiry learning requires longer time than ordinary learning, the teacher should take into account the time needed in learning. (2) The teacher is expected to be able to make a guided inquiry-based student worksheet on elasticity material as an alternative to design active, innovative and fun learning in order to produce better learning outcomes, on a wider group scale, namely in other classes. (3) Teachers are expected to reduce their involvement in learning activities, so students will play an active role in learning activities.

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