

## DEVELOPMENT OF LABORATORY STUDENT WORKSHEET BASED ON GUIDED INQUIRY IN THERMOCHEMISTRY TOPIC FOR XI GRADE SENIOR HIGH SCHOOL

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### Abstrak

Tujuan dari penelitian pengembangan ini adalah untuk mengetahui kelayakan LKS ditinjau dari kelayakan isi, kelayakan penyajian, kelayakan bahasa, dan kesesuaian dengan model pembelajaran inkuiri serta melihat hasil belajar siswa dan respon siswa setelah menggunakan LKS berbasis inkuiri terbimbing pada materi termokimia. Metode penelitian yang digunakan adalah metode *Research & Development (R & D)* oleh Sugiyono (2010). Penelitian ini merupakan deskriptif kuantitatif dengan rancangan penelitian menggunakan "*Pre-test Post-test Design*". Instrumen yang digunakan dalam penelitian ini adalah lembar telaah, lembar validasi, angket respon siswa, dan lembar soal pretest dan postes. Berdasarkan hasil penelitian, diperoleh rata-rata kelayakan isi, kelayakan penyajian, kelayakan bahasa, dan kesesuaian dengan model pembelajaran inkuiri adalah sangat baik dengan perolehan persentase berturut-turut 79%, 82,5%, 82,5%, dan 82% yang berarti LKS yang dikembangkan layak digunakan. Hasil belajar siswa diperoleh nilai rata-rata kelas adalah 3,03 dan dikatakan tuntas secara klasikal sebesar 81,25%.

**Kata kunci:** LKS berbasis inkuiri terbimbing, kelayakan, termokimia.

### Abstract

*The aims of this development research are to know the feasibility of worksheets in terms of content feasibility, presentation feasibility, language feasibility, conformity with inquiry learning model, student mastery learning, and student respon after using the worksheets based on guided inquiry in thermochemistry topic. Research methodology which was used is Research & Development (R&D) method by Sugiyono (2010). This research is descriptive quantitative research design using "Pre-test Post-test Design". The instruments used in this research are the study sheet, validation sheet, pre-study questionnaire, student questionnaire responses, and the pretest and post-test booklet. Based on the research results, obtained an average of content feasibility, presentation feasibility, language feasibility, and conformity with inquiry learning model are very good with the acquisition of the respective percentages of 79%, 82.5%, 82.5%, and 82%. It means that worksheet that developed is very good to be used. Student mastery learning obtained an average value of 3.03 and classical mastery learning is 81.25%.*

**Keywords:** Worksheet based guided inquiry, feasibility, thermochemistry.

### INTRODUCTION

There are two inseparable things related to chemistry, the chemistry as a product (facts, concepts, laws and theories of scientific findings) and chemistry as a process or scientific work. Chemistry is a branch of science that deals with how to find out about the systematic nature, so that the chemistry is not only a mastery of knowledge in the form of a collection of facts, concepts, or principles, but also a process of discovery [1]

Based on Law of national education ministry 22 of 2006 [2] on the content standards for elementary and secondary education units, chemistry learning objectives in school is to equip a number of knowledge, understanding, and ability of the students, as well as developing science and technology. Therefore, chemistry learning not only aims to deliver theories, but also develop the ability of science students. Achievement of learning goals in school chemistry also rely on the use of

learning strategies. One of the methods that can support learning as a process chemical is a practicing method.

Simalango [3] and Djamarah [4] revealed that through practicing methods students can experience direct contact with the object of the problem, so that students will better appreciate the symptoms caused and students have the opportunity to solve problems that they find, follow a process, observing a object to the conclusion that the learning of the student more meaningful. Through the practice students will gain experience of learning and easier to understand the concept that obtained.

Based on a survey that has done in several schools, found that there are some schools that rarely conduct practicing activities. This condition is caused by several things, namely, limited equipment and lab materials are available in the school laboratory, where do lab inadequate, and the subject matter that is solid so reduced teaching hours for practicing. In addition, although there is a lab, lab work done yet provides the opportunity for students to participate actively in conducting experiments to find the concept itself. As a result, students do not understand the significance of the chemistry as a process and less motivated in practicing activities. This was due to lab procedures used generally only contain direct instruction as in the cookbook. Therefore, the need for the development of worksheets that can train students have the opportunity to find a concept, build his own knowledge and a more active role in the learning process with the implementation of inquiry approach.[5].

Lab student worksheet that developed based guided inquiry because learning strategies such as deemed suitable by the topic thermochemistry. When students carry out practical work and do questions in worksheets, students are required to find their own desired concept. Based on research, lab worksheets based guided inquiry on thermochemistry have not been developed in the market. Based on that reason researcher develop a lab worksheets based guided inquiry on thermochemistry topic. The title of the

research conducted by researchers is the "Development of laboratory Student Worksheet Based Guided Inquiry On Thermochemistry Topic of XI grade Senior High School".

This research is done with some following problem states :

1. How is the feasibility of worksheet in terms of content, presentation, language, and conformity with inquiry learning model ?
2. How is the student mastery learning and responses after using worksheet based on inquiry ?

## METHOD

The research methodology that used was *Research & Development (R&D)* method that was explained by Sugiyono. *Research & Development (R&D)* by Sugiyono (2010) have ten processes: 1) potential and problem, 2) collect data, 3) product design, 4) design validation, 5) design revision, 6) product test, 7) product revision, 8) implementation test, 9) product revision, and 10) massal production [6]. Based on Sukmadinata that was modified that process into three processes: 1) first study, 2) product development, and 3) product test [7], so, the realization of this research was definded until product test.

This research was done in XI grade of SMAN 1 Krian Senior High School by *pretest-posttest design*. *Pretest-posttest design* was research design that gave student test before and after use the product (worksheet) that have been developed. Those test were used to know the student's critical thinking skill differences in the learning activity by using the worksheet. The design can be formulated as:

O1→X→O2

Specification:

O1= first test (*pretest*)

O2= final test (*posttest*)

X= treatment (given guided inquiry worksheet)

Learning devices that used in this research are a syllabus, lesson plans,

textbook, and worksheets. Then, for research instrument used in this research are a study sheet, validation sheet, student responses questionnaire sheet, and achievement test.

Techniques of collecting data include the study questionnaire, validation questionnaire, and student responses questionnaire, evaluation techniques such as tests of student learning outcomes.

Percentage of data validation questionnaire by lecturers and chemistry teacher is obtained by calculating the Likert scale scores by (Riduwan, 2012) [8]

Table 1. Likert Scale.

Assessment	Score
Very good	4
Good	3
Bad	2
Very bad	1

[8]

The data that obtain were analyzed by using equation :

$$P(\%) = \frac{\text{sum of collected data score}}{\text{criteria score}} \times 100\%$$

The results are interpreted in accordance with the interpretation criteria scores are summarized in the following table

score interpretation in the table below:

Table 2. Score Interpretation

Percentage (%)	Criteria
0 – 20	Very bad
21-40	Bad
41-60	Medium
61-80	Good
81-100	Very good

[8]

Based on criteria above, the media was feasible if the validation percentage  $\geq 61\%$ . For the result of student questionnaire responses and observational student activity are analyzed quantitatively using Guttman scale as the table below:

Table 3. Guttman Scale

Answer	Score
Yes	1
No	0

[8]

Data were analyzed using equation 1. Criteria for feasibility of student response and observational student activity using criteria Table 2. Based on that criteria the media was feasible if the percentage  $\geq 61\%$ . For the learning outcomes analyzed the individual or classical completeness. Student which complete the study if get score  $\geq 75$ . While classical completeness will complete if 85% of student get score  $\geq 75$  [7]. The equation that used to calculate is

$$\text{Classical completeness} = \frac{\text{Amount of complete student}}{\text{Amount of student}} \times 100\%$$

Explanation

Criteria score = the highest score x number of questions in the questionnaire x number of respondents

Percentage obtained interpreted into criteria that can be seen in the table below:

Table 4 Criteria Score

Percentage	Criteria
0.01 – 20.99	so do not feasible
21.00 – 40.99	do not feasible
41.00 – 60.99	less feasible
61.00 – 80.99	Feasible
81.00 – 100.00	very feasible

Score results of this study interpreted the criteria in Table 5 as follow

Table 5 Conversion Scor

Knowledge Score	Predicate
3.67 – 4	A
3.34 - 3.66	A-
3.01 - 3.33	B+
2.67 - 3.00	B
2.34 - 2.66	B-
2.01 - 2.33	C+

Continue of Table 5 Conversion Scor

Knowledge Score	Predicate
1.67 - 2.00	C
1.34 - 1.66	C-
1.01 - 1.33	D+
0 - 1	D

## RESULT AND DISCUSSION

After getting advice from reviewer and media improvement have been made the next step was validating the media to know the feasible of the media. The result of validation assessment given by validator will be shown in following table 6:

Based on Table 5, the students said to be complete if the predicate B.

Table 6 the results of the worksheet validation

No	Feasibility criterion	Percentage %				Average %	Category
		V1	V2	V3	V4		
1	Content	60	80	88	88	79	Good
2	Presentation	60	70	100	100	82,5	Very good
3	Languange	60	80	95	95	82,5	Very good
4	Confirmity with inquiry model	60	76	96	96	82	Very good

Based on Table 6 percentage obtained validation of the feasibility of the content, presentation feasibility, feasibility language, and conformity with inquiry learning model are assessed by four each validator that the average percentage of the four validator for appropriateness of content, presentation feasibility, feasibility discussion, and conformity with inquiry learning model include: 79%, 82.5%,

82.5%, and 82% in the category of very decent.

The four validators are two from lecturer of chemistry department and two others from chemistry teachers. The validators are expert in their subject. They reviewed the student worksheet based on the validation sheet. The validation sheet contains content, presentation, languange, and confirmity with inquiry model

Table 7 Result Of Pretest And Postest

No	Name	Pretest Scor	predicate	Information	Postest scor	predicate	information	Gain
1.	AGF	1,6	C-	Not complete	2,4	B-	Not Complete	0,33
2.	DIF	2	C	Not complete	3,4	A-	Complete	0,7
3.	EHU	2,4	C+	Not complete	3	B	Complete	0,38
4.	EAK	1,8	C	Not complete	3,2	B+	Complete	0,64
5.	ITP	2	C+	Not complete	3	B	Complete	0,5
6.	IRM	1,8	C	Not complete	2,2	C+	Not Complete	0,18
7.	LG	1,6	C	Not complete	3,2	B+	Complete	0,67
8.	MAS	1,4	C-	Not complete	3	B	Complete	0,62
9.	MJ	3,2	B+	Complete	3,6	A-	Complete	0,5

Continue of Table 7 Result Of Pretest And Postest

No	Name	Pretest Scor	predicate	Information	Postest scor	predicate	information	Gain
10	MNK	2,4	B-	Not complete	3,2	A-	Complete	0,5
11.	RPS	1,6	C	Not complete	3	B	Complete	0,58
12.	TWU	2	C	Not complete	2,6	B-	Not complete	0,3
13.	YDA	1	D	Not complete	3,4	B+	Complete	0,8
14.	YBDS	0,8	D	Not complete	3	B	Complete	0,69
15.	YPL	1,8	C-	Not complete	3,2	B+	Complete	0,64
16.	Y	2,2	C+	Not complete	3,2	B+	Complete	0,56
Average		1,85	C	Not complete	3,03	B+	Complete	0,54

Whereas in Table 7 is a table of pretest and posttest result. Before using guided inquiry-based lab worksheets known 94% of students do not complete the thermochemistry topic. From 16 students who take the pre-test, which is not complete as many as 15 students. This is because prior knowledge of students related thermochemistry topic is low. There is one student stated finished working on the pre-test. This is because prior knowledge of students related thermochemistry topic have been good or form because the objective (multiple choice) so that there is a possibility of students who answered at random. Thoroughness of learning outcomes (products) in the classical student before using guided inquiry-based worksheets adalah 6%.

For post-test results, students who have completed after using guided inquiry-based lab worksheets as many as 13 of the total 16 students and students who do not complete 3 students. From 16 students who take the post-test, which is not completed by 3 students. This is because the ability in students is low. Completeness in the classical student learning outcomes after using guided inquiry-based lab worksheets is 81.25%. Scor gain obtained in the classical average to determine the improvement of student learning outcomes before and after the use of worksheets by 0.54 to get in on the medium category.

Research result of students' response to worksheet based guided inquiry has met assessed aspects of percentage 98.25%. Based on the results of the calculation can be drawn a conclusion that Chemistry worksheet considered feasible if the percentage is  $\geq 61\%$ .

#### **CLOSING Conclusion**

Based on the results of research and discussion that has been described previously, it can be concluded that:

1. Feasibility criteria of content, presentation, language, and confirmity with inquiry model gotten the percentage of each criteria are 79%, 82.5%, 82.5%, and 82% those percentage mean that the student worksheet is very good.
2. The results of student learning obtain an average value of 3.03 with a predicate class B + and completeness in the classical student learning outcomes after using guided inquiry-based lab worksheets by 81.25%.
3. Getting a positive response from students with a percentage of 98.25.

#### **Suggestion**

1. Product still require further development in order to produce a better product that able to deliver innovation in teaching chemistry.
2. Product has a good value but needs to be tested on a broader level to high

school students to corroborate evidence worksheet quality.

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