

**PENGEMBANGAN STUDENTS WORKSHEET FOR LABORATORY
BERORIENTASI INKUIRI PADA MATERI MATTER CHANGES KELAS VII DI
SMP RSBI**

**THE DEVELOPMENT OF STUDENTS WORKSHEET FOR LABORATORY WITH
INQUIRY ORIENTATION TO MATTER CHANGES TOPIC FOR
SMP RSBI**

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ABSTRAK. *Penelitian ini bertujuan untuk mengetahui kelayakan Students Worksheet for Laboratory pada materi Matter Changes untuk SMP RSBI yang dinilai berdasarkan penilaian oleh dosen kimia, guru kimia, dan ahli bahasa serta ahli media terhadap kriteria isi, kesesuaian dengan model pembelajaran inkuiri, penyajian, kebahasaan dan kegrafikaan. Desain penelitian ini menggunakan desain Penelitian dan Pengembangan atau Research and Development (R & D) yang dibatasi pada tahap studi pengembangan. Instrumen yang digunakan yaitu lembar telaah, dan lembar validasi. Metode pengumpulan data menggunakan kuisioner. Penilaian Students Worksheet for Laboratory dilakukan oleh 2 dosen kimia, 1 guru fisika yang mengajar materi kimia, 1 ahli bahasa. 1 ahli. Metode analisis data dilakukan secara deskriptif kuantitatif dari persentase untuk mengetahui kelayakan dari Students Worksheet for Laboratory yang dikembangkan. Siklus inkuiri yang digunakan meliputi tahap inquisition, acquisition, supposition, implementation, summation dan exhibition. Hasil penelitian menunjukkan bahwa Students Worksheet for Laboratory yang dikembangkan telah layak digunakan karena telah memenuhi kriteria kelayakan isi, kesesuaian dengan model inkuiri, penyajian, kebahasaan, dan kegrafikaan masing-masing dengan persentase berturut-turut sebesar 83,33%; 80,56%; 80,25%, 80,00%, dan 91,29%.*

Kata Kunci: *Students Worksheet for Laboratory, inkuiri, Matter Changes, kelayakan.*

ABSTRACT. *This research was conducted to know the feasibility of Students Worksheet for Laboratory with inquiry orientation to matter changes topic for SMP RSBI. Feasibility of Students Worksheet for Laboratory evaluated from assessment by Chemistry lecturer, Physics teacher who teach chemistry matter, specialist lecturer of English, and specialist lecturer of media. Design of Research relate Research and development (R & D) method. The instruments of this research are research sheet, and validation sheet. Data aggregation methods were using questionnaire. Students worksheet for laboratory assessment conducted by two Chemistry lecturers, one chemistry teachers, a specialist lecturer of English, a specialist lecturer of media. A method of data analysis was done descriptively quantitative of percentages to determine the feasibility of students worksheet for laboratory. This inquiry cycle that used compose of inquisition, acquisition, supposition, implementation, summation and exhibition steps. The results showed that students worksheet for laboratory have been developed has met feasibility criteria for suitability of material, inquiry orientation, language, graph, and presentation of students worksheet for laboratory, each with a row percentage of 83,33%; 80,56%; 80,25%, 80,00%, and 91,29%.*

Key words: *Students Worksheet For Laboratory, inquiry orientation, Matter Changes, feasibility*

INTRODUCTION

Kurikulum Tingkat Satuan Pendidikan (KTSP) is the operational curriculum which is developed and is implemented in each educational unit. KTSP consists of educational objectives of educational unit level, the structure and content of the curriculum unit level of education, educational calendar and syllabus. (Depdiknas, 2006: 5)[1]. In the KTSP, there are several groups of subjects one of subjects is science and technology. Natural Sciences is one of the subjects of a subjects group in science and technology. Science education and inquiry directed to inquiry and do so that help the students to gain the deeper understanding of nature (Depdiknas, 2007)[2]. Science learning should be carried out scientific by scientific inquiry to develop the ability to think, work and communicate scientific as well as being an important aspect of life skills. Therefore, learning science in junior high school emphasis directly through the use and development of science process skills and attitudes (Depdiknas, 2007)[2]. Learning model of inquiry is an approach of teaching which try to lay down the fundamental and improvement of scientific thinking. Rustaman said that, by introducing inquiry approach to students so that help students to improve: (i) the definition of science concept, (ii) an appreciation to know science, (iii) understanding about science essence. (iv) a skill that needed for research in life by them self, (v) disposition to use the skills, abilities, and attitudes associated with science"[3]

Currently there are some schools that are RSBI (beginner international school),

one of them is SMP Negeri 1 Surabaya. According to interviews with the teacher in physics subjects which are also teach chemistry materials in SMP 1 Surabaya, curriculum that used is the KTSP curriculum and integrated with RSBI of Ministry of Education curriculum. In the science learning in RSBI use English as introduction language, a number of 63% eighth grade students have difficulties in learning chemistry using English. Because many chemical terms in English are different meanings in English in general. In science subjects, there is chemistry material, one of them is Matter Changes topic. Based on introduction study questionnaire, 74% of students of SMP Negeri 1 Surabaya Matter Changes topic is chosen because it was felt the most difficulties by the student. Based on the reason, the title which is taken in this study is **"The Development Of Students Worksheet For Laboratory With Inquiry Orientation To Matter Changes Topic For SMP RSBI"**

EXPERIMENTAL SECTION

Students Worksheet for Laboratory with inquiry orientation uses design research and development. This method consists of three stages: introduction study phase, development study phase, and the evaluation phase. However, this study is limited to the development study phase which is on the limited trial of the product followed by a revision of the product. While in the widespread trial phase and the evaluation phase is not done. Design of research and development of Students Worksheet for Laboratory with inquiry orientation on the Matter Changes topic can be seen in the image below:

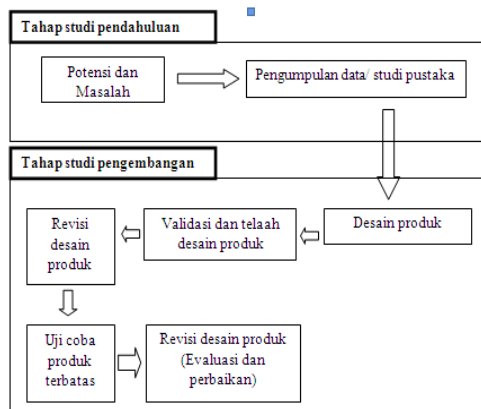


Figure 1. The research design research design research and development (Sugiyono, 2011) [4]

The instruments that used are: the review sheet, the validation of content sheet, the compliance with inquiry learning model, and presentation sheet, linguistic validation, and validation graphic sheet. This study uses questionnaires for data collection method. Data validation results of the Student Worksheet for Laboratory is analyzed by using descriptive quantitative method. The analysis is conducted on every aspect contained in the validation sheet. The percentage of the data is obtained by this questionnaire Likert scale calculations in Table 1.

Table 1. Likert Scale

Value	Assessment Scale
Not include	0
More less	1
Less	2
God	3
Very good	4

Table 3. Details of Students Worksheet for with inquiry orientationLaboratory

NO	INQUIRY STEPS	<i>STUDENTS WORKSHEET FOR LABORATORY</i>		
		1	2	3
1	Title	The Effect of Household Chemical to The Physical	Depurating Water Through Filtration	Physical and Chemical Changes in Our Life

(Adopted from Riduwan, 2010)[5]

The formula that used in the calculation of the validation of each criterion results, to obtain the percentage is:

$$P(\%) = \left(\frac{\sum \text{total score all of validator each of criteria/criteria score}}{\sum \text{total score all of validator each of criteria/criteria score}} \right) \times 100\%$$

$$\text{Criteria score} = \frac{\text{highest score} \times \sum \text{aspect}}{\sum \text{validator}}$$

The results of validation sheet analysis is used to determine feasibility of Students Worksheet for Laboratory which is developed by using interpretation scores. Interpretation score shows the percentage of validation assessment of the Students Worksheet for Laboratory by the validator as follows:

Table 2. Score Interpretation

Persentase	Kategori
1% - 25%	More less
26% - 50%	Less
51% - 75%	Good/Feasible
75% - 100%	Very Good

(Modified from Riduwan, 2010)

Based on these criteria, Students Worksheet for Laboratory on material Matter Changes this study is feasible if the percentage is $\geq 51\%$.

RESULTS AND DISCUSION

Here are presented the details of each of the Students Worksheet for Laboratory in Table 3.

NO	INQUIRY STEPS	<i>STUDENTS WORKSHEET FOR LABORATORY</i>		
		and Chemical Properties in The Environment.		
2	Inquisition a. Phenomenon title	Ecoton Detected Nauseated Fish in Jagir River	Surabaya Threatened by Clean Water Crisis	Earth Hour Surabaya, This is My Act!
3	Acquisition Questions to determine students' initial thoughts	After you read the phenomenon, what is your opinion about that? What do you know about that?		
		Maybe about the causes, the effects or the way to solve the problem?	Relates with the causes that affected by the human activities. Has water in good condition? How do you get the pure water from that water?	How do you do to celebrate it? Do you turn on the candle? Can you observe the candle? What are changes that happen on candle?
	a. Statement to formulate the problem.	So, from the phenomenon and from your knowledge about it, you can make the problem formulation. So the problem formulation that appropriate are:		
4	Supposition a. Questions about the hypothesis of the formulation of the problem is made.	Based on your problem formulation, now state your hypothesis. Your hypothesis are:		
5	Implementation a. Title of the experiments	The Effect of Household Waste into the envirnment.	Depurating Water Through Filtration	Physical and Chemical Changes in Our Life.
	b. Experiments variables	Independent, control and respond variable.		

NO	INQUIRY STEPS	STUDENTS WORKSHEET FOR LABORATORY			
6	Summation				
	a. The object being observed.	Color of the gills of fish, number of fish operculum, the pH of the water, the physical properties of other fish like fish movements, eye color.	Color before and after filtered water, smelly water before and after filtered	The length of the wick, wick, colors, masses of candles, the changes that occurred during the experiment	
	b. Fill in the tables of experimental results.	State color of the gills of fish, number of fish operculum, water pH and physical properties of other fish like fish movements, eye color before and after hatching some form of treated domestic waste such as detegen, bleach and cooking oil.	The color and the odor of the water before and after filtering using two different types of materials.	The mass of wax, length of wick, changes in wax before and after burned in an interval of 3 minutes for 12 minutes.	
	c. Things were analyzed	Effect of household waste for fish physical properties and chemical properties of the solution.	The difference in results (filtrate) produced using two different types of materials.	physical and chemical changes that occur before and after the candle was burned.	
	d. Conclusion	What is your conclusion about the observation? My conclusion is:			
7	Exhibition				
	a. The command creates and presentation of the	In group, make the simple presentation about your observation. Remember that all of your result such as your problem formulation, hypothesis,			

NO	INQUIRY STEPS	STUDENTS WORKSHEET FOR LABORATORY		
	results of the experiments in groups....	observation result, analysis, and also your conclusion must include in your presentation. Make your presentation as well as you can!		
8	Ammount of excercise questions	6	5	9
9	Environmental Problem that given	Place of defecation along the river.	Garbage piled up in the river. The process of corrosion on the body.	. The process of corrosion on the body.

Table 4. Result of Validation of Students Worksheet for Laboratory

No	Assessed Criteria	Prese ntage (%)	Criteria
1.	Content	83,33	Very good
2.	Compliance with inquiry learning model	80,56	Very good
3.	Presentation	80,25	Very good
4.	Linguistic	80,00	Very good
5	Graphic	91,29	Very good

Based on the validation of the chemistry lecturer and physics teacher who teach chemical material that the Students Worksheet for Laboratory that developed have been fulfill content criteria with a percentage of 83.33%, and in the category of very good because it is in the interval 75% -100%. These results indicate that the Students Worksheet for Laboratory with inquiry orientation have been developed fulfill the content criteria as the existing content in BSNP (2010) for Students Worksheet for Laboratory containing material with the accuracy of the concept, procedure accuracy and appropriateness of materials and practical activities with Competency Standards and the Basic Competency to

be achieved, as well as indicators of material relevant to the subject of learning to sub matter Changes in the material that has been written with the words - words that operations that can support science learning in junior RSBI Class VII.

Based on the validation of the chemistry lecturer and physics teacher who teach chemical materials in Table 4 Students Worksheet for Laboratory with inquiry orientation have been developed fulfill compliance with inquiry learning model criteria with the percentage of 80.56%, and in the category of very good because it is in interval 75% -100%. These results indicate that the Students Worksheet for Laboratory with inquiry orientation have been developed fulfill the criteria of compliance with inquiry learning model because Students Worksheet for Laboratory contains materials that use the phases of inquiry learning by Llewellyn (2005), as the Inquisition, Acquisition, Supposition, Implementation, summation, and Exhibition phases.

Phases of inquiry learning model by Llewellyn (2005) [6] can be analyzed as follows:

1. Inquisition phase

Phase inquisition on Worksheet for Laboratory Students helping students to initiate an inquiry of students through the initial inquiry and asking questions. This is shown through phenomena concerned about the

problems that exist in the environment and then given a question related to the phenomenon at a later stage. As described in Table 4. Students Worksheet for each Laboratory has a different phenomenon.

The phenomenon of the Students Worksheet for Laboratory 1 is Ecotox Detected in Jagir Nauseated Fish River. This phenomenon contains many drunken fish and plant waste because household waste. This phenomenon can be understood through a practicum student is The Effect of Household Chemical into the Environment.

The phenomenon of the Students Worksheet for Laboratory 2 is Singapore Threatened by Clean Water Crisis. This phenomenon provides for the Surabaya river water polluted by some of the waste from both industry and households. Students are asked to think how to get clean water from the river in Surabaya. This phenomenon can be understood through the practicum students are Depurating Through Water Filtration.

The phenomenon of the Students Worksheet for Laboratory 3 is Earth Hour Singapore 2012, This is My Act!. This phenomenon provides for the celebration of Earth Hour 2012 in Singapore which is marked by a giant candle. Students are asked to think what are the changes that occur in the candles lit. This phenomenon can be understood through a practicum student is The Physical and Chemical Changes in Our Life.

2. Acquisition phase

At this stage students initially relied on knowledge of the issues that have been presented before.. Then the students were asked to think about possible solutions to these problems. According to the theory of

constructivism of Piaget, students initially using current knowledge to start learning a concept [6]. So at the acquisition stage of the Students Worksheet for Laboratory contains questions that help students to provide solutions to these problems.

In addition to containing about an early solution of the student, the acquisition phase of the Students Worksheet for Laboratory students are also asked to formulate the problem in the form of questions relating to environmental issues at this stage of inquisition..

3. Supposition phase

On the supposition stage students are asked to make predictions of the formulation of the problem that has students create. This stage contains the determination of the hypothesis to be tested in the experiment.

Phase supposition on Students Worksheet for Laboratory contains statements that help students to decide the hypothesis.

4. Implementation phase

On implementation phase in the Students Worksheet for Laboratory for helping students to design a problem-solving to test the hypothesis. This is shown through a practicum concerned about the issues in the environment. According to Piaget's constructivist theory focuses on the cognitive development of individuals who depend on the activity of students interacting with the environment by doing lab work [6]. Application of the principles of the constructivist theory by Piaget Worksheet for Laboratory Students are applied to all activities of practical activities. Meaningful learning theory of Ausubel Applications in Students Worksheet for Laboratory is also applied to the implementation phase, where

students apply concepts already held by carrying contextual lab.

As described in Table 4 each Students Worksheet for Laboratory has a different lab title. Practical on Students Worksheet for Laboratory 1 is The Effect of Household Chemical into the Environment. Students are required to observe the physical properties such as color fish gills, operculum number, as well as other physical properties and chemical properties of the solution pH of each solution before and after being treated with a drop of some sort household waste into solution

Practical on Students Worksheet for Laboratory 2 is Depurating Through Water Filtration. Students are required to perform filtering using 2 different types of material composition. Then students are asked to observe the color and smell of the solution before and after filtration.

Practical on Students Worksheet for Laboratory 2 is The Physical and Chemical Changes in Our Life. Students are required to make observations on the mass of wax, length of wick wick candles and color before and after burned by an interval of 3 minutes.

At this stage students are not only required to do the lab and observe objects, but students are also required to define research variables.

5. *Summation phase*

On Summation phase helping students to record results, Phase summation on Worksheet for Laboratory Students helping students to record results, analyze the results and compare the results with theory practice. It was shown several tables to record the results of lab work, the theoretical basis for each of the lab as well as questions and statements that help students to analyze the results so that it can be concluded

praktikumnya. Students also dimina make conclusions and compare with hypotheses.

6. *Exhibition phase*

Application of the principles of constructivist theory by Vygotsky is emphasis on the social nature of learning that students learn through interaction with peers who are better able to imitate, and observed [6]. Constructivist theory is applied to the activity of making presentations held in the exhibition phase. Students Stage exhibition at the Laboratory Worksheet for helping students to design a presentation on the results of lab and asks students to present their observation results in the group.

Based on the validation of the chemistry lecturer and physics teacher who teach chemical material is obtained in Table 4 that the Students Worksheet for Laboratory fulfill the feasibility presentation criteria with a percentage of 80.25%, and in the category of very good because it is in the interval 75% - 100%. These results indicate that the Students Worksheet for Laboratory with inquiry learning model orientation have been developed fulfill the feasibility presentation criteria of BSNP (2010) for Students Worksheet for Laboratory contains illustrations that match the subject matter, unsourced images, student-centered material and writing a bibliography according to a regulatory filing.

Based on the validation of linguists in Table 4 is obtained the Students Worksheet for Laboratory fulfill feasibility linguistic criteria with percentage of 80.00%, and in the category of very good because it is in the interval 75% -100%. These results indicate that the Students Worksheet for Laboratory with inquiry learning model orientation have been developed fulfill the feasibility linguistic criteria as in BSNP (2010) for Students Worksheet

for Laboratory use language appropriate to the level of development of student thinking, precision sentence structure, inter ketertautan chapters, sub-chapters, paragraphs, and sentences, consistent use of the term, and consistent use of symbols or emblems.

Based on the validation of graph in Table 4 is obtained the Students Worksheet for Laboratory fulfill feasibility graphic criteria with percentage of 91.29%, and in the category of very good because it is in the interval 75% -100%. These results indicate that the Students Worksheet for Laboratory with inquiry learning model orientation have been developed fulfill the feasibility graphic criteria as BSNP (2010) for the design, layout, typography and illustration Students Worksheet for Laboratory has met the criteria.

CONCLUSION

Based on the analysis of data, it can be concluded that the Students Worksheet Laboratory with inquiry learning model orientation to Matter Changes topic for SMP RSBI have been feasible for use as a learning material because it has reached the percentage of $\geq 51\%$ for all aspects described as follows:

1. Feasibility content criteria based on the validation lecturer in chemistry and physics teacher who teach chemical material for Students Worksheet for Laboratory with inquiry orientation of the Matter Changes topic is 83.33% (excellent) and compliance with the inquiry learning model is 80.56% (very good). Feasibility presentation criteria based on the results of the validation lecturer in chemistry and chemistry high school teacher to Students Worksheet for Laboratory with inquiry learning model

orientation of the Matter Changes topic is 80.25% (excellent).

2. Feasibility linguistic criteria based on the results of the validation language experts for Students Worksheet for Laboratory inquiry learning model orientation of the Matter Changes topic is 80.00% (excellent).
3. Feasibility graphic criteria based on the results of the validation media experts to Students Worksheet for Laboratory inquiry learning model orientation of the Matter Changes topic is 91.29% (excellent).

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