

## THE DEVELOPMENT OF STUDENT WORKSHEET BASED ON GUIDED INQUIRY FOR TRANSPORT MEMBRANE TOPIC TO TRAIN INTEGRATED SCIENCE PROCESS SKILLS

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### **Abstract**

*This research was aimed to produce a valid, practice, and effective student worksheet based on guided inquiry for transport membrane topic to train integrated science process skill. The development was referred to 4D (define, design, develop, and disseminate) method without disseminate. The developed student worksheet was implemented to twenty 11th grade students of Senior High School Muhammadiyah 1 Taman. The observed method were validity method, observation of student worksheet implementation, test method, and questionnaire method. Data was analyzed with qualitative and quantitative descriptive. The result of this research showed that the developed student worksheet was proved completely valid with validation score 3.87. The student worksheet practicality determined from the student worksheet implementation that gained the average of practicality score 87.67% with very practice category. The developed student worksheet was stated completely effective which determined from the achievement result of science process skill and student positive response. The achievement result of science process skill gained score 80.6% with an N-gain 0.60. Besides, the student positive response had score percentage 96%. Based on the result, it can be concluded that the student worksheet were valid, practice, effective and worthy to be used in the learning process.*

**Keywords:** Student worksheet, guided inquiry, integrated science process skill, transport membrane

### **INTRODUCTION**

The process of discovering concepts in learning is carried out with scientific experiment activities. Concepts are products that are produced by good scientific activities. To conduct good scientific activities so as to be able to come up with a concept, students need to have a good scientific attitude. Scientific attitudes can be formed along with the development of science process skills in students (Sridevi, 2008).

Science process skills are actions taken by students in scientific research to gain knowledge independently with permanent results. Science process skills are important to be mastered by students because students who master science process skills can understand a science well so that it can improve their standards and quality of life. Science is a process in which the process will not take place without adequate science process skills. Besides, students who master the science process skills have resilience in dealing with problems in daily life through good problem solving. These skills can be trained through well-designed scientific activities (Derilo, 2019).

There are two types of science process skills, basic science process skills and integrated science process skills. The science process skills used in this research are integrated science process skills. Integrated science

process skills include skills to formulate problems, formulate hypotheses, identify variables, design experiments, conduct experiments, obtain and present data, analyze data, and conclude (Dimiyati and Mudjiono, 2013).

Based on the results of preliminary research with students of class XI IPA 1 at Muhammadiyah 1 Taman Senior High School, only 30% of students mastered integrated science process skills. This is indicated by the inability of students in making problem formulations, making hypotheses, writing experimental variables, making experimental designs, presenting data, analyzing data, and making conclusions. The highest result of integrated science process skills assessment is data analysis skills, which is 15% of students are able to make data analysis correctly. As for the integrated science process skills, in addition to analyzing data, less than 10% of students master it well.

Science process skills can be applied in learning through research-based activities. One of the research based learning model is guided inquiry. This is in line with the statement of Derilo (2019), where from the results of his research the teacher is recommended to practice the science process skills through the inquiry model. Inquiry learning model is a learning model that can train science process skills because in this learning

students are asked to solve a problem or find an answer to that problem (Vlassi and Karaliota, 2013).

The inquiry model that used in this research is guided inquiry because students are not accustomed to learning in free inquiry. So in this model, the teacher must be guiding students in conducting learning activities. Guidance by the teacher can be in the form of questions to lead the discussion directly or writing in the student learning activity guide. There are six steps syntax of guided inquiry learning model according to Arend (2012) namely, focusing attention and explaining the inquiry process, presenting problems, formulating hypotheses, collecting data, concluding, and reflection.

Guided inquiry learning activities can be supported by scientific research-oriented student worksheet. This student worksheet will help students especially for who are not accustomed to using their process skills independently. This guided inquiry-oriented activity will provide written guidance through instructions on student worksheet as well as verbal guidance from the teacher to students.

Transport membrane topic in the 2013 curriculum is contained in Basic Competence 3.2 and 4.2. Basic Competence 3.2 namely analyzing various bioprocesses in cells which include transport membrane mechanisms, reproduction, and protein synthesis. Basic Competence 4.2 is making a model about bioprocesses that occur in cells based on literature studies and experiments. The Basic Competence requires students to be able to understand the bioprocesses of cell through experiments. This cannot be achieved without going through scientific experiment-based activities. The use of transport membrane topic is also supported by the results of the 2019 national exams. There are only 36.67% of students can correctly answer the indicators of interpreting the molecular movement process based on experiments. In addition, the results of preliminary research on students of class XI IPA 1 at SMA Muhammadiyah 1 Taman, as much as 60.6% of students had difficulty understanding and distinguishing the concepts of diffusion, osmosis, and active transport. This shows that the mastery of transport membrane concepts in students is still low. Students need experiment-based learning that can facilitate inculcation of long-term concepts.

Based on the problems that have been described, the purpose of the study is to produce a valid, practical, and effective student worksheet based on guided inquiry based for transport membrane topic to train integrated science process skills.

## METHOD

The study was conducted using a 4-D development model (define, design, and develop) without the disseminate phase. The define phase included curriculum analysis, student analysis, concept analysis, and task analysis. The design phase included the design phase of student worksheet according to the guided inquiry steps.

The design phase produced the final manuscript. The research design used one group pretest-posttest design.

The define phase was carried out in October 2019 at Universitas Negeri Surabaya. The preliminary research was carried out in October 2019 at Muhammadiyah 1 Taman High School. While the design and the develop phase was carried out in October - December 2019 in the Biology Department, Faculty of Mathematics and Natural Science, State University of Surabaya. Student worksheet was validated by three validators in December 2019 - January 2020. Student worksheet was then trialed in January 2020 at Muhammadiyah 1 High School in Taman.

This research was tested on 20 students of class XI IPA of Muhammadiyah 1 Taman Senior High School. The data was collected by validation methods, observation methods, test methods and questionnaire methods. The instruments which used in this research were validation sheets, student worksheet implementation observation sheets, pretest-posttest question sheets, and student response sheets. Data analysis was performed descriptively qualitative.

The aspects assessed in student worksheet validation were aspects of presentation on technical requirements, content aspects on didactic requirements, linguistic aspects on construction requirements, aspects of achievement of integrated science process skills, and aspects of guided inquiry steps. Student worksheet was validated by education expert lecturer, material expert lecturer, and high school biology teacher. Validation values from the three validators were averaged on each aspect then the average of all aspects was calculated. Student worksheet is categorized valid if it reaches a score 2.51 - 4.00 (Riduwan, 2013).

The validated student worksheet was tested on students and assessed using student worksheet implementation sheet to determine the practicality of it. Student worksheet is practical if student worksheet implementation score is 61 - 100. Students were given a pretest-posttest and student response sheet to find out the effectiveness of student worksheet in practicing integrated science process skills. Student worksheet is said to be effective if the N-gain 0.30 - 1.00 and the response score 75 - 100.

## RESULTS AND DISCUSSION

This study produced guided inquiry student worksheet based on transport membrane topic to practice integrated science process skills. The student worksheet consisted of three worksheets namely student worksheet 1 with the topic "Effect of Temperature on Diffusion", student worksheet 2 with the topic "Osmosis", and student worksheet 3 with the topic "active transport". Each of them had a component that complied with student worksheet construction requirements, a component that showed the guided inquiry syntax, and an integrated science process skills indicator component.

The description of the components as a profile of the student worksheet can be seen in Table 1.

**Table 1.** The Component of Guided Inquiry Student Worksheet

No.	Components	Description
<b>A. General components</b>		
1.	Topic	Provided information related to learning topics that would be studied through student worksheet
2.	Time allocation	Provided information about the time was needed to work on student worksheet
3.	The learning objectives	Provided information about learning objectives that must be achieved through student worksheet.
4.	Student worksheet guidance	Explained the related instructions for used student worksheet
<b>B. Guided Inquiry Steps</b>		
1.	Focused the attention and explained about guided inquiry	Contained the objectives and ways of learning used guided inquiry
2.	Provided problem	Presented sources of information and images in accordance with the learning topic
3.	Formulated hypotheses	Directed student in formulated problems and hypotheses
4.	Collected data	Directed students in collected, presented, and analyzed data.
5.	Made conclusion	Directed students in made conclusion
6.	Reflection	Directed students to reflect on the guided inquiry learning that has been done.
<b>C. Integrated Science Process Skills Indicators</b>		
1.	Formulated problem	Directed students to formulate the problem
2.	Formulated hypotheses	Directed students to made hypotheses
3.	Identified variabels	Directed students to identified manipulation, response, and control variables.
4.	Arranged plan and conducted experiment	Directed students to create a flow diagram
5.	Presented data	Directed students to present the data obtained in the form of results tables.
6.	Analyzed data	Directed students to analyze data with the help of several questions related to the activities carried out.
7.	Concluded	Directed students to make conclusions that answer the problem formulation.

### Validity of Student Worksheet

The student worksheet was then assessed by three validators. The results of the assessment of the validity are presented in Table 2.

**Table 2.** Validation Results of Guided Inquiry Student Worksheet

No.	Criteria	Mean	Category
1.	Technical requirements (presentation aspects)	3,85	Completely valid
2.	Didactic requirements (content aspects)	3,77	Completely valid
3.	Construction requirements (linguistic aspects)	3,83	Completely valid
4.	Aspects of guided inquiry steps.	3,89	Completely valid
5.	Aspects of achievement of integrated science process skills	4	Completely valid
<b>Student worksheet validation average score</b>		3,87	Completely valid

The average of guided inquiry student worksheet validation scores showed that the validation of student worksheet reached 3.87 with a completely valid category. There were five aspects assessed from the student

worksheet, namely the aspects of presentation, content, linguistics, guided inquiry steps, and the integrated scientific process through guided inquiry. According to Widjajanti (2008), student worksheet can be stated as good if it has fulfilled the presentation aspects in

technical requirements, content aspects in didactic requirements, and linguistic aspects in construction requirements.

The first student worksheet assessment was the aspect of presentation in technical terms. The presentation aspect had seven evaluation components, namely the appearance of the cover, the accuracy of the use of letters, the accuracy of the title and topic of the activity, the appropriateness of time allocation, the accuracy of the learning objectives, the clarity of instructions for use, and the accuracy of the tools and materials. In the aspect of presentation, the student worksheet has obtained an average validation score of 3.85 with a completely valid category. This showed that the student worksheet was interesting to be used in learning in accordance with the technical requirements in making student worksheet. According to Mazidah et al. (2019), to fulfill the good technical requirements of student worksheet, it is necessary to pay attention to the combination of writing, pictures, and colors that must be attractive in order to foster student interest in learning.

The second assessment of validity was carried out on didactic requirements which included aspects of the contents of the student worksheet. There were three components of the assessed aspects of content, namely the appropriateness of activities, questions, and direction, the appropriateness of the material with the level of thinking of students, and the accuracy of the concept of material. Validation of the content aspects of the student worksheet obtained an average score of validation of 3.77 with a completely valid category. The accuracy component of the activities, questions, and direction as well as the accuracy of the material concept get an average score of 4. This showed that the student worksheet had fulfilled the student worksheet preparation requirements in terms of content. It could led students to find concepts and there was compatibility of the material with the learning objectives. According to Widjajanti (2008), the aspect contained in the didactic requirements was the suitability of the material with the learning objectives so that the contents of student worksheet could motivate students to be able to solve existing problems.

The component of the material suitability with the students level of thinking on the content aspect got a low score. This was because the transport membrane topic had many terms that could make students confused if they did not understood well each term before working on student worksheet. For students whose level of thinking ability on transport membrane topic were still low will have had difficulties due to the many terms that

each definition must be understood. According to Nugraha et al. (2017), there was a correlation between high-level thinking ability with science process skills where students who had high-level thinking ability will have had high science process skills and just the opposite.

The third assessment of validity was carried out on construction requirements which include linguistic aspects of the student worksheet. There were two aspects of language that were used, namely the use of language and sentence structure. In the linguistic aspect, the validity score obtained 3.83 with a completely valid category. The component of language used in the linguistic aspect got a perfect score of 4. This showed that the used of the language had been in accordance with enhanced spelling (EYD), the term used had been in accordance with the level of thinking of students and did not caused multiple meanings. While the sentence structure component got an average validation score of 3.67. This was because the sentence structure used was not simple, some sentences were too long and a little difficult to understand. According to Widjajanti (2008), student worksheet is said to be good if it is easy to understand, uses a discussion that is appropriate to the level of thinking of students, uses short, clear, simple sentences and does not cause multiple meanings.

Evaluation of the four validities was carried out in the guided inquiry step aspect. The guided inquiry step aspect had six assessment components which were the steps of the guided inquiry model. These components included focusing on and explained the inquiry process, presented problems, presented hypotheses, collected data, made conclusion, and reflected. The aspects of the guided inquiry step obtained an average score of validation of 3.89 with a completely valid category. Components focused attention and explained the inquiry process, formulated hypotheses, collected data, and made conclusion got an average score of perfect validation that was 4. This showed that the steps used were appropriated and described guided inquiry. The component presented the problems and reflection of each obtained an average validation score of 3.67. In the component of presented problems, the readings and images presented could focus students on the topic of activity but were not directed students to formulate problems and to formulate hypotheses. This was because the readings and sample images presented were general information that was abstract. Statements and questions that directed students to make the formulation of the problem were very short so that some students will have found it difficult to connect the information and pictures with statements or questions that led to the activities to be carried out.

While in the reflection activity there was a lack of non-uniform writing procedures.

The fifth assessment of validity was carried out on the aspects of integrated science process skills. The aspects of integrated science process skills had nine assessment components, which included formulated problems, formulated hypotheses, identified variables, designed experiments, conducted experiments, collected data, and concluded. In the aspect of integrated science process skills, the student worksheet obtained an average

score of perfect validation that was 4. This showed that student worksheet fulfilled the aspects of practicing integrated science process skills through guided inquiry.

#### Guided Inquiry Student Worksheet Practicality

The guided inquiry student worksheet was then trialled to 20 high school grade XI students to observe its implementation in learning activities. The results of observations of the implementation of guided inquiry student worksheet based on learning are presented in Table 3.

**Table 3.** Implementation Observation Results of Guided Inquiry Worksheet

No.	Activity on student worksheet	Mean (%)
1.	Read the experiment topic	92
2.	Read the time allocation	90
3.	Read the using guidance	90
4.	Read the objectives and guided inquiry activities guidance	87
5.	Read the literature and observed the images	93
6.	Formulated problem	87
7.	Formulated hypotheses	88
8.	Identified experiment variables	92
9.	Read the table of tools and materials	78
10.	Understood the experimental design	80
11.	Arranged the experiment step	88
12.	Prepared the tools and materials	83
13.	Conducted the experiment	95
14.	Written the experiment results in a table form	87
15.	Conducted discussion	88
16.	Concluded	88
17.	Conducted reflection	82
<b>Average:</b>		<b>87,67%</b>
<b>Category:</b>		<b>Very practical</b>

The observation results of the implementation of student worksheet based on guided inquiry by the four observers showed that the average percentage of student worksheet implementation as a whole was 87.67% with a very practical category. This showed that learning used the guided inquiry model made students more active at work. These results were supported by statements by Khusna et al. (2019) namely guided inquiry learning is learning oriented to the learning process and the activeness of students so that students are actively involved in gaining learning experiences.

The highest implementation score was conducted an experiment with a percentage score of 95%. In this activity, overall the enthusiasm of the students was very high because the students got new experiences. This was in line with the statement of Khusna et al. (2019) that

guided inquiry learning involves students actively and helps students to be directly involved. While the activity with the lowest percentage of practicality was the activity of understood the experimental design with the percentage of 80%. The activity of understanding the experimental design got a low percentage because not all students understood the purpose of the activity. This could be overcome by invited students to read and to understand the design of the experiment classically.

The guided inquiry learning model required quite a long time in its implementation, especially if students and teachers were not accustomed to learning to use guided inquiry. Therefore, effective teacher guidance was needed in directed students to focus on learning. This was in line with Arianti's statement (2018), that for the first time of using inquiry learning must be done with more guidance and it decreases with increasing intensity



of learning using guided inquiry. However, the learning outcomes obtained will be proportional to the length of time required because students have more time in dealing directly with the learning process (Wati et al., 2015; Pradianti et al., 2015). In addition, time efficiency can be done by carrying out activities to read topics, allocation of time, learning objectives, instructions for using LKPD, focusing attention and explaining guided inquiry, and presenting problems classically (Ijtimaiyah, 2016).

**Guided Inquiry Student Worksheet Effectiveness**

The integrated science process skills were viewed from the results of the pretest and posttest completeness. Pretest questions were given before learning used student worksheet and posttest questions were tested after learning used student worksheet. Data on the completeness of the integrated science process skills are presented in Table 4.

**Table 4.** Integrated Science Process Skills Assignment Results

No.	Name	Pretest		Posttest		N-gain	Category
		A	B	A	B		
1.	ABA	42	I	65	I	0,68	Medium
2.	AB	47	I	85	C	0,71	High
3.	AUH	51	I	76	C	0,51	Medium
4.	DAR	49	I	88	C	0,76	High
5.	ENR	50	I	79	C	0,58	Medium
6.	FA	68	I	93	C	0,78	High
7.	FY	67	I	81	C	0,42	Medium
8.	HSF	46	I	85	C	0,72	High
9.	IAPMC	53	I	83	C	0,65	Medium
10.	JQR	53	I	85	C	0,68	Medium
11.	MD	49	I	75	C	0,51	Medium
12.	MHA	51	I	79	C	0,57	Medium
13.	MNS	39	I	82	C	0,70	High
14.	MRC	53	I	79	C	0,56	Medium
15.	NZF	43	I	85	C	0,73	High
16.	RA	47	I	67	I	0,37	Medium
17.	RAF	60	I	75	C	0,38	Medium
18.	RI	46	I	81	C	0,64	Medium
19.	SPR	53	I	74	I	0,44	Medium
20.	SK	46	I	75	C	0,54	Medium
<b>Mean</b>		<b>50,65</b>	<b>I</b>	<b>79,6</b>	<b>C</b>	<b>0,60</b>	<b>Medium</b>
<b>Completeness percentage(%)</b>		<b>0%</b>		<b>85%</b>			

**Statement:**

A: Score B: Category C: Complete I: Incomplete

On pretest all students were not finished. This was because students were not yet accustomed to used integrated science process skills well and not understood how integrated science process skills actually were. This statement was in line with the statement of Fahrudin et al. (2014) that the application of integrated science process skills is common, it's just that students do not yet understand that what is done is science process skills.

After doing posttest, it was found 85% of students were complete and 3 students were incomplete. Inadequacy of 3 students at posttest because students were not accustomed to learning to find concepts independently on material that was considered

complicated. As stated by Arends (2012) and Khusna et al. (2019), that in guided inquiry learning, students are expected to be able to obtain new knowledge independently of their potential, but they are still associated with inquiry learning itself. Inadequacy of students could also be caused by students' low achievement backgrounds so they were unable to think at a high level in inquiry learning. In addition, according to Dorin (2009) students will experience difficulties if left behind and do not participate actively in inquiry-based learning. Therefore, guidance from teachers was needed to guide students in achieving learning objectives so that students could understand the direction of learning well

(Gultom and Sinurya, 2016). According to Fahrudin et al. (2014), broadly, the incomplete 3 students due to three main factors. The first factor was because the guidance provided by researchers is not comprehensive. The second factor is the time required to study science process skills for a long time because science process skills have a tiered level of thinking. The third factor is the posttest questions that are not in accordance with the development of the level cognitive thinking of students. The question want students to be able to abstract a scientific research process as outlined in the form of questions. In this study, the main factor that caused 3 students to not complete the posttest was the third factor, namely the posttest problem that was not in accordance with the students' thinking abilities. This was supported by the background of the achievements of 3 students who were incomplete, where the students have a low achievement background and have not been able to think at a high level so that students felt difficulties.

The increase integrated science process skills of each student were analyzed using the N-gain test. The N-gain test results obtained were an average N-gain score of 0.60 in the medium category. Overall, students' science process skills have increased differently and have not been maximized because only 6 students got high N-gain scores. The difference in the improvement of students' science process skills indicates several things, namely: 1) provided researchers' stimulus to students to focus on uneven and unoptimum, 2) the difference ability of students to absorb information, but researchers were not fully aware of the different conditions of students thinking in learning so that researchers paid less attention to students who had low information absorption (Fahrudin et al., 2014).

Pretest and posttest results were also used to see the achievement of cognitive learning outcomes and indicators of integrated science process skills. The results of these achievements are presented in Figure 1.

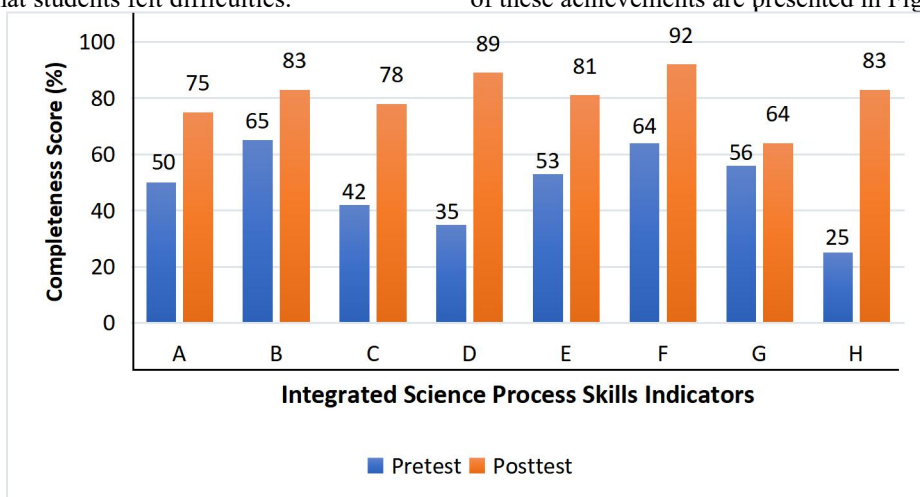


Figure 1. Completeness of Integrated Science Process Skills Indicators

**Statement:**

- A: Made comparison among difussion, osmosis, and transpot active
- B: Formulated problem
- C: Formulated hypotheses
- D: Identified experimental variabel
- E: Designed and conducted experiment
- F: Presented data
- G: Analyzed data
- H: Concluded

Picture 1. Showed an increase percentage of cognitive learning outcomes and achievement of each indicator between pretest and posttest. Achievement results from each indicator of integrated science process skills in the pretest got an average of 48.7% completeness with incomplete categories. Whereas posttest got 80.6% completeness with complete category. Overall there was an increase in completeness from pretest to posttest. However, the indicator analyzed data for the posttest obtained a completeness value of 64%

with an incomplete category. This showed that students had not mastered the skills to analyzed data properly because of the lack of initial knowledge or concepts. This was in line with the statement of Diwaluthfi (2017), if the initial concept possessed by students is limited, it will cause students to get low scores.

Student worksheet was also evaluated from the students' responses. The results obtained from the student questionnaire responses. Data on the results of student questionnaire responses are presented in Table 5.

**Table 5.** Student Questionnaire Responses Results

No.	Assessed Aspec
1.	Student worksheet was interesting and appropriated wi
2.	Facilitated to understand transport membrane topic
3.	Easy to understand the language
4.	Unambiguous sentences
5.	Trained to make problem formulation
6.	Trained to make hypotheses
7.	Trained to identify the experimental variabels
8.	Trained to design and to conduct experiment
9.	Trained to present experiment results in table form
10.	Trained to analyze data
11.	Trained to conclude the experiment results
12.	Facilitated to active on learning
13.	Stimulated the curiosity
14.	Facilitated to hone cooperation skills
15.	Facilitated to hone scientific attitude (honest, dicipline.
16.	Facilitated to gain new knowledge in a fun way.

The student worksheet had an average response score of 96% with a very effective category. This showed that students were happy with learning used the student worksheet. This was because learning with the student worksheet became more fun, easy, attracted the attention of students, gave satisfaction, it could train integrated science process skills, and made students more disciplined and thorough in conducted activities. This was supported by the statement of Sukma et al. (2016), that the guided inquiry learning model is one of the learning models that is fun and motivates students to be active in learning. In addition, guided inquiry learning models provide more experience for students in learning so that students try to answer questions that arise at the beginning of learning through simple experiments (Fahrudin et al., 2014).

Negative responses from students by 4%. Aspects that received negative responses were ease of understood transport membrane topic used guided inquiry models, used of sentences in student worksheet, activities of identified variables, designed and conducted experiments, honed cooperative skills, honed scientific attitudes, and gained new knowledge in a fun way.

Aspects of understood the topic got a negative response of 5% where it showed that 5% of students had not been able to understand well the material taught used

guided inquiry student worksheet. There were two factors, namely lack of guidance and student low ability to absorb information. The use of sentences in student worksheet got 20% negative responses because many terms were used so it was prone to cause multiple meanings. While in the aspect of practiced the skills of identified variables, it got a negative response of 10%. This was caused by students who felt they had not been helped to identify control variables as evidenced by the incompleteness of students in answered the activity of analyzed control variables in student worksheet.

Activities identified variables and honed the ability to work with groups got a 10% negative response. This showed that the student worksheet had not fully facilitated students to be able to identify variables. It because there were any students who found it difficult even though the value of completeness of the test and the student worksheet value on the activity of identified the variables were good. The student worksheet was considered not able to direct students to work well as evidenced by the completeness of indicators compiled a hypotheses that was only 78%. It showed that students had not been able to work well together in solved every problem in student worksheet. While in the aspects of designed experiment and conducted experiment, honed scientific attitude, and gained knowledge in a fun way each got a negative response of 5%. Learners assumed that student worksheet had not been able to help trained design skills and conducted experiments optimally. This was evidenced by the decrease in achievement of the posttest score on the indicator designed the experiment compared to the score at student worksheet which was 81% at posttest and the student worksheet score of 88.

Learners also assumed that the learning model used was not enough to practice scientific attitude. This was supported by observers' observations when learning where students had not been able to work in a disciplined manner using the guided inquiry model. In addition, according to student worksheet, it had not made it easier to obtain knowledge in a fun way. For students who were not familiar with inquiry learning and thinking at a high level will feel pressured and quickly bored in the learning process used this student worksheet. Students with the ability to absorb information and low intelligence levels will tend to be left behind by other friends in solved problems so they felt difficulties. This was consistent with Daryanto's statement (2016) that students with high intelligence levels will more quickly solve problems than students who have low intelligence levels. Thus, to overcome the various problems faced by students in learning, it took the role of the teacher to



guide intensively and made habituation to students to learn used the inquiry model and the similar model as it.

## CONCLUSION

Student worksheet based on guided inquiry on membrane transport topic to train the integrated science process skills was declared feasible based on the validity, practicality, and effectiveness of LKPD. LKPD is declared valid with a validity level of 3.87. LKPD declared practical with a practical level of 87.67%. LKPD was declared effective for use in learning based on completeness of the integrated science process skills test by 85% with an N-gain of 0.60, an increase in cognitive learning outcomes and the achievement of integrated science process skills indicators by 31.9% with completeness of 80.6%, and students' positive responses to LKPD by 96%.

## SUGGESTION

The guided inquiry learning model can be used on other topic that has the character of found concepts through many manipulation experiment variables. It should be noted that the time allocation used to be suitable for completing learning using guided inquiry student worksheet. Indicators of integrated science process skills that need to be improved are the skills of analyzing data by giving more varied questions to guide students to be able to analyze well and in detail, ensure students have preliminary knowledge that supports, and make it a habit to learn to use guided inquiry to practice skills science process.

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