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FOREWORD

All Praises to Allah, Pancaran Vol. 6 No. 4 November 2017 has already been presented among readers. The topics of the implementation of several teaching and learning models are widely studied in the present journal, for example Kumon Learning Method, Design Contextual Teaching and Learning, Syntax Model, and Inquiry Learning Model as well as some other methods devoted to escalating learning activity and students achievement of research the subjects. Moreover, topic regarded to Local Wisdom of Padang Pariaman People in Managing of "Banned Fish" in Nagari Sikucur has been put into an educational research covered in the journal.

In addition, a work focusing on Analysis of Secondary School Students' Critical Thinking Skill in Learning Energy in Living System is also an appealing topic to read. It is expected that the works included in the present journal can encourage other researchers to make active contribution to the real life of education. To sum up, we hope readers find the present work useful.

Jember, November 2017 **Editor**

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STUDENT WORKSHEET SCIENCE BASED ON PROCESS IMAGE OF LIGHT CONCEPT FOR LEARNING IN JUNIOR HIGH SCHOOLS

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ABSTRACT

Student worksheet science based on process image is a printed material that presents a series of images of objects (objects, events, or phenomena), the images in the series between each other always appear to be relatively different in terms (state, position, shape, Combinations) which as a whole illustrate a coherent stage of events in a unified whole. A student worksheet is able to facilitate students in reviewing the material independently, so that materialized learning science of student centered learning. The purpose of this study is to examine the use of student worksheet based on the image of light concept process for practical and effective junior high school student learning. This research design uses one group pretest-posttest design. The result of the research shows that learning activity is increasing up to reach 83,18%, and respondent gives positive response with 'good' criterion. N-gain increased understanding of the concept of light by 0.628 on moderate criteria and supported with retention of 99.6%. The use of student worksheets based on the image of light concept process is practical and effective for improving students' understanding, as well as knowledge can be stored for longer in student memory.

INTRODUCTION

The essence of science learning is a process and a product. Science learning should be done through a scientific process to understand science products in the form of facts, concepts, principles, theories, and laws (Sund & Trowbridge 1973, Trowbridge & Bybee 1990, Foulds 1996, Yadav & Misra. More explicitly, Lawson (1995) reveals that teaching science should be as science working (teach science as science is done). Teachers are required to facilitate science learning through concrete activities such as trials, demonstrations, and practicums.

Science learning in junior high schools should encourage and facilitate students to construct their knowledge according to the philosophy of constructivism. Learning of teaching centered learning has long shifted to student centered learning (Hickey, et al., 2001: Cubukcu, 2012; Schreurs & Dumbraveanu, 2014). Students are expected to be more active and independent in understanding and applying knowledge (factual, conceptual, and procedural) through meaningful learning. Meaningful learning is an active process of building conceptual relationships between new knowledge and existing knowledge (Glynn & Muth, 1994). Teacher creativity as a learning facilitator is needed to select and prepare teaching materials that are appropriate to the students' development and needs so that meaningful learning process can take place optimally (Jeffrey & Craft, 2004).

The reality in the field, the process of learning science, especially on materials related to the concept of physics is still focused to infinitive instead preposition and problem solving. The allocation of learning time is more widely used to perform mathematical calculations than to understand the phenomena of science (physics) and natural laws with reason or logic. Science teachers as learning facilitators often encounter difficulties in facilitating students to understand the concept of science. Based on field studies, several factors are caused, among others; Differences in learning style and student background, available learning resources, complex material, and the number of students in one class. Various efforts have been made to improve learning, but not yet able to make student achievement maximal.

Based on observations in 14 junior high schools east of Jember Regency, the teacher learning process is still dominant and has not facilitated the students to learn

independently. The results of interviews and questionnaires in 30 junior high school science teachers at the eastern subject teacher conference in Jember District showed that teachers have not created their own teaching materials and are still using the student worksheet package purchased from commercial publishers. According to Prastowo (2013:18), it is possible that the material is not contextual, unattractive, monotonous, and not in accordance with the needs and characteristics of students. The interview also reveals the teacher's lack of awareness of the importance of developing teaching materials that meet their needs, tools, and benefits in learning.

Interviews with students revealed that students complained of not liking science lessons especially physics material because of the many counts and formulas. Students claim that they are more pleased with the material science (physics) that is often encountered in everyday life. Critical students always ask and want to get no answer by formula, but with rules and laws of nature are logical and practical. This fact, in accordance with Marks & Eilks (2009), says that many science lessons relate lessons learned with real-life phenomena, so that students are less interested in learning. Students want to learn that not only prioritizes the problem solving but the meaning of studying the processes that occur in science (physics).

Other factors that lead to science learning are less attractive to students because have of the limitations of science laboratory equipment that schools. Teachers find it difficult to develop innovative learning based on lab work or scientific inquiry. Results of field studies at 14 junior high schools in eastern Jember district revealed that 3 schools had no laboratory and 11 schools had laboratories, but the laboratories were not functioning optimally, because; (1) is used as a classroom, (2) there is no laboratory staff, (3) incomplete equipment, (4) lack of learning time, if the student has to go to the laboratory.

Based on the above facts, it is a necessary solution to overcome the problems in science learning. The use of instructional media gives hope for increased communication relationship in learning so that it can run smoothly with the maximum result (Taufiq et al., 2014). Learning media developed is student worksheet science-based image process. Student worksheet is a printed material used by teachers in conveying the topic of learning. The student worksheet itself contains the subject matter, work steps, questions or tasks to be completed by the students. Student

worksheet science is expected to facilitate students in studying science that is concrete or abstract according to the nature of science that is: objective, rational, empirical, accurate and coherent, valid and reliable, concrete and abstract and inductive that has generalization (Fensham, et al., 1994 Sutarto, 2003).

Piaget's constructive theory focuses on individual experiences to build perceptual, concrete, and abstract knowledge (Cahyo, 2013). Knowledge from the perspective of Piaget is the process of constructing knowledge throughout life through new knowledge and experience schemes. Every individual has a cognitive development according to his age level (Dahar, 2011). Piaget's theory underlies the theory of information processing by Gagne that is oriented towards students' ability to process information to build their knowledge (Santrock, 2013). Information processing refers to how to collect or receive stimuli from the environment, organize data, solve problems, find concepts using verbal and visual symbols (Aminah, 2014). According to the theory of dual coding information learning becomes more easily absorbed by students when using verbal and nonverbal media (text and images), (Najjar, 1995; Paivio, 2006). Prasetyo's (2012) findings indicate that students who study with diagrams/drawings have higher achievement than students who learn only using text.

Images can be developed as two dimens visual media to support learning (Arsyad, 2007; Tegeh, 2008). The word 'process' is interpreted as a series of relatively small (relatively small) incident phases of a relatively complex state of things (objects, events, or phenomena) (Anderson, 2012). Image of the process of science is a teaching material to help students in understanding a process incident (object, state, or phenomenon) of science. According to Taufiq et al. (2014, the presentation of student worksheet as a learning medium can be developed with innovation to attract and match the needs of students.The use of student worksheets through pencil and paper task can improve learning outcomes, think skills, and process skills on learning colligative nature Solution (Devi, 2008) The use of student worksheets through lesson study on invertebrate zoology learning can improve students' critical thinking skills (Haryanti, et al., 2013) Student worksheets in the form of CD containing materials, simulations and internet link presented by Alev (2010), is useful and effective in enhancing the understanding of physics concepts but has the obstacles in developing procedural and numeracy skills.Therefore, student worksheet science based on process image in this

study leads the student worksheet of science which presents a series of object images (objects, Or phenomenon), the images in the series between each other always seem to have a relative difference in terms (circumstances, position, form, and combinations) which as a whole illustrate a coherent stage of events in a unified whole. Student worksheet science based on process image can be interesting and in accordance with the needs of students, making it practical and effective in improving the thinking skills and student learning outcomes.

Student worksheet science based on process image contains a series of images of events that can be measured or recorded to further be analyzed as in actual practice. Student worksheets science based on process image helps students to understand concepts quickly because they show relationships, comparisons, relative numbers, developments, processes, classifications, and organizations in science. Student worksheet science based on process image can serve as a study material and analysis in learning science independently (individual or group). Student worksheet science based on process image is expected to facilitate students to more easily examine the material that must be mastered so as to manifest the learning of science centered on the students (student centered learning). The purpose of this study is to examine the use of student worksheet science based on the image of light concept process for practical and effective junior high school student learning.

METHOD

This research design uses one group pretest-posttest design (Sugiyono, 2011). Figure 1.

O_1	X	O_2

Information :

O_1 = pretest value before learning using student worksheet science based on process image of light concept.

O_2 = posttest value after learning using student worksheet science based on process image of light concept.

Student worksheet science based on process image of light concep is considered practical, if the learning implementation reaches at least 80% and get a minimum user response questionnaire assessment on "good enough" criteria. Effectively, if the minimum N-gain N-gain pretest-posttest meets the "moderate" criteria and the learning

completeness is classical reaches at least 85%. Analysis of student response questionnaire using the equation:

$$\text{Average score of student responses (D)} = \frac{\text{number of scores from users in each aspect}}{\text{maximum score of each aspect of assessment}}$$

With N-gain level achievement criteria:

Table 1. Criteria Score Student Worksheet Score Response Based Image Process

No	Interval Rerata	Kriteria
1.	4,20 < D	Very good
2.	3,40 < D ≤ 4,20	good
3.	2,60 < D ≤ 3,40	Pretty good
4.	1,80 < D ≤ 2,60	less good
5.	D ≤ 1,80	Not good

The N-gain analysis uses the equation:

$$\langle g \rangle = \frac{\text{actual gain}}{\text{maximum gain}} = \frac{\text{post test score} - \text{pre test score}}{\text{maximum score} - \text{pre test score}}$$

(Hake, 2007)

With N-gain level achievement criteria:

Table 2 N-gain Performance Level Criteria

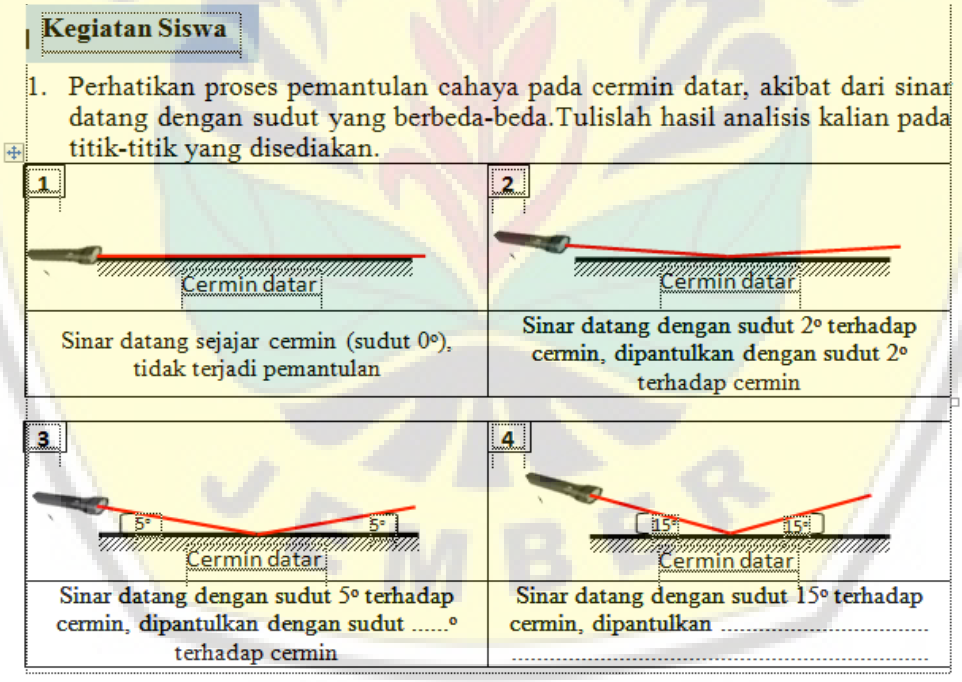
No	N-Gain Average Interval	Criteria
1.	$0{,}70 \leq \langle g \rangle \leq 1{,}00$	High
2.	$0{,}30 \leq \langle g \rangle < 0{,}70$	Medium
3.	$0{,}00 \leq \langle g \rangle < 0{,}30$	Low

RESULTS AND DISCUSSION

Student Worksheet Science Based On Process Image Of Light Concept

Student worksheet science based on process image is a two-dimensional print material that presents a series of images of objects (objects, events, or phenomena), the images in the sequence between each other always seem to have relative differences in things (state, position, As well as its combinations) which as a whole describe a coherent stage of events in a unified whole. Student worksheet science based on process image can be interesting and in accordance with the needs of students, so that practical and effective in improving the thinking skills and student learning outcomes.

Student worksheet science based on the process of light concept consists of title, activity manual, learning objectives, student activities, competence test, and conclusion. Student activity display on student worksheet science based on process image of light concept submerse of light reflection law can be seen in Figure 1.



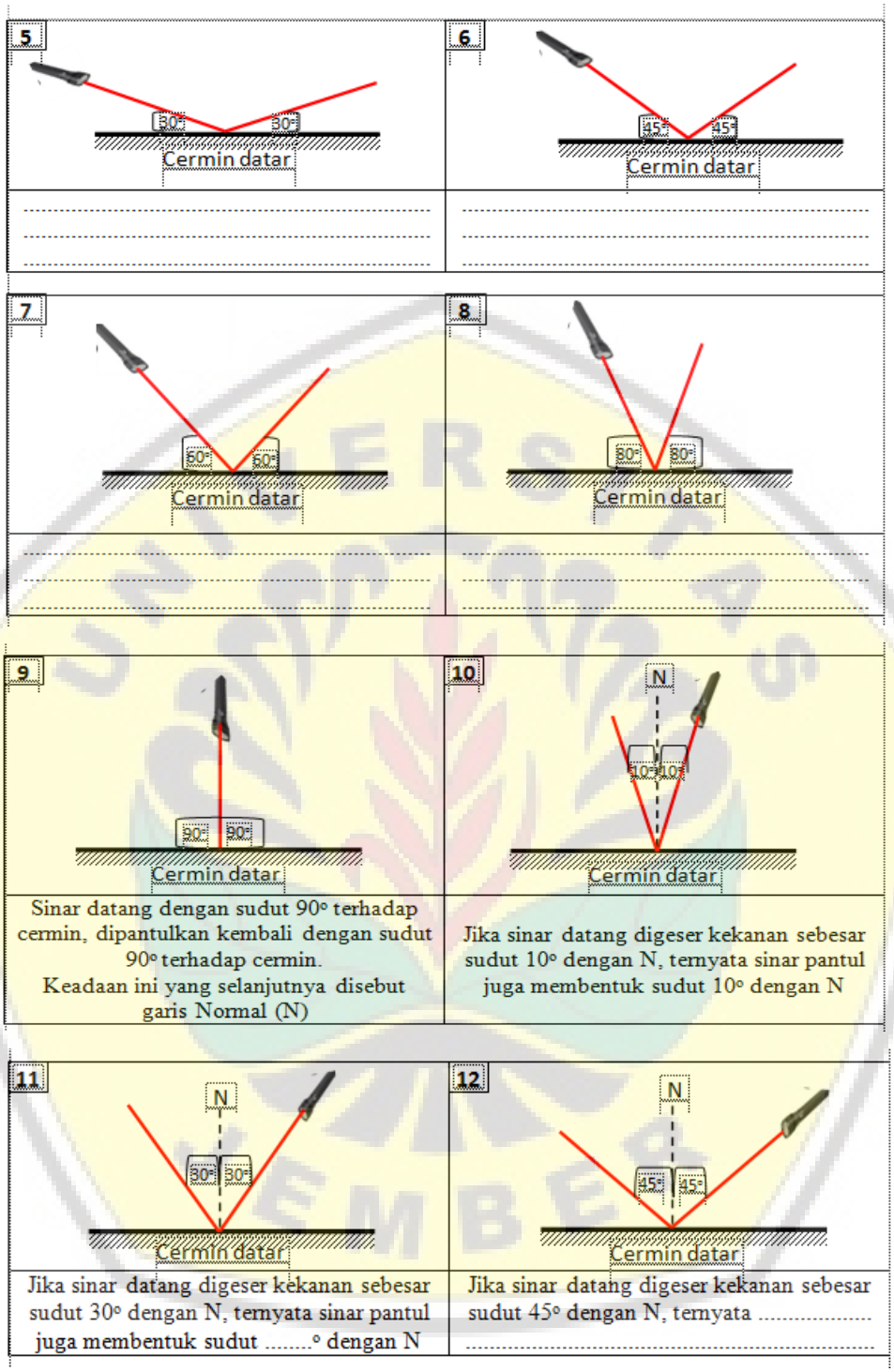


Figure 2. Image Concept Process of Light Reflection Law

Based on Figure 2., it can be made table 3. and table 4.

Table 3. Large angle of incidence and reflection angle with mirror

No Image	Large angle between the incident beam and the plane	Large angle between the reflected ray and the plane
1	0^o	0^o
2	2^o	.....
3	.....	.....
4	.....	.....
5	.....	.....
6	.....	.....
7	.....	.....
8	.....	.....
9	90^o	90^o

Based Figure 2. no picture 1, the incident light is not reflected because the light comes parallel to the mirror. Figures 2 to 8 show that the angle between the incident beam and the mirror is always the same as the angle between the reflected ray and the mirror, and at no. 9, it is seen that the angle coming perpendicular to the mirror 900 is reflected perpendicularly back to the mirror 900). This is hereinafter referred to as normal line (N) which is described with dashed line. It also appears that the coming rays, reflected rays, and normal lines (N) lie at one point on a flat mirror. The flat mirror is hereafter called the flat.

Figure 2. no. 10, 11, and 12 rays come in sliding right know the normal line (N), then the following table 4 can be made;

Table 4. Large angle of incidence and reflection angle with normal line (N)

No Image	The angle between the incoming beam and the normal line (i)	The angle between the reflected beam and the normal line (r)
10	.....	.....
11	.....	.....
12	.....	.....

Figure 2. no 10, 11, 12 images show that the angle between the incoming beam and the normal line is always equal to the angle between the reflected and normal lines. The angle between the incoming ray and the normal line is hereinafter called the incident angle (i) and the angle between the reflected ray and the normal line hereinafter referred to as the reflecting angle (r). Thus it is found that the magnitude of the incident angle (i) is equal to the magnitude of the reflected angle (r).

Based on the above explanation, it can be written that;

1. The coming rays, reflected rays, and normal lines (N) always lie on the same point on the plane.
2. The magnitude of the incident angle (i) is equal to the magnitude of the reflected angle (r).

These two points are called Snellius Law of Light Reflection.

Learning With Student Worksheet Science Based On Process Image Of Light Concept

Learning begins with a pretest to determine students' early skills. Furthermore, learning is done by using a science worksheet based on the image process of light concept. At the beginning of the meeting, the subject teacher gave an explanation of the learning activities to be performed and the use of student worksheet science based on the image of light concept process. Learning activities at the first meeting discussed student worksheet-1 (SWS-1) "Law of Light Reflection and Flat Mirror". Learning is opened by greeting and checking the students' presence. In the preliminary stages, the teacher initiates the learning by motivating the students through the questions that match the material. Students look awkward in answering questions given by the teacher. The teacher asks about the sound wave material that has been studied at the previous meeting, the students answer the question fluently, among them is the student can answer the sound wave qualities correctly and there are students who can mention the sound reflection law correctly.

The core stage of the teacher explains the concept of light properties by lecture and question and answer methods. Students listen and pay attention to teacher explanations, students answer questions and ask questions about the nature of light. The teacher grouped the students into eight groups with members of each group of 4-5

students. The teacher distributes SWS-1 to each student to be discussed in the group. Students receive student science worksheets, read instructions, objectives and group discussions to complete student activities and competency tests. Groups that do not understand the contents of student worksheet science ask the teacher for an explanation. After the group discussion time is over, the teacher appoints a group to present the outcome of the discussion in front of the class and the other group responds, refutes, or asks. During this class discussion the teacher served as a facilitator, moderator, and provided a stimulus in order to smooth the class discussion. At the end of the class discussion, the teacher guides the students to summarize the results of the discussion and refine their work if there is still a mistake.

The closing stages of teachers provide reinforcement of the concept of light properties, light reflection laws, and flat mirrors that have been worked on and discussed. Students listen to teacher reinforcement and record things that are important. Learning ends with assigning tasks to students to learn advanced materials about concave mirrors and convex mirrors. After the teacher closes the lesson with a greeting, the researcher asks the students and teachers to fill out the product user response questionnaire. The researcher also interviewed 3 students about the newly implemented lessons.

The second meeting of the students has been seen getting used to learning using SWS-2 "Mirrored Mirror and Concave Mirror". Students are more active in asking questions, group discussions, and class discussions. Students are no longer awkward expressing their opinions. This is seen during class discussions, many students point their fingers, students ask each other and respond to questions in the discussion. Based on the observations made during the learning process, student activeness began to increase, but the discipline of students in doing the learning stages is not controlled because of the time of excessive class discussion. This becomes a part that should be evaluated for improvement in future meeting lessons. After the end of the study, the researcher distributed a user product response questionnaire. The researcher also interviewed 3 students about the newly implemented lessons.

The third and fourth meetings for the SWS-3 "Lighting Refraction" and SWS-4 "Concave Lenses and Lens of the Suns" in general the learning enlargement is increasing, but the weakness lies in improper learning time. Based on the results of

learning reflection, it is necessary to have good planning when the students do group discussions and class discussions, and the need for discipline in completing the activities that exist in the student worksheet science based on the image of light concept process. Lack of learning time is also a positive value, meaning that the motivation/enthusiasm of students in completing the task and get good results. Posttest is executed after learning using student science worksheet based on process image of light concept for 4 meetings end. After an interval of three weeks, the researcher along with the teacher conducted a retest to find out student retention.

Learning With Student Worksheet Science Based On Process Image Of Light Concept Practical and Effective

Based on the result of the research, it is found that the student worksheet of science based on process of image of light concept developed is practical and effective. The practicality of the student worksheet of science is known from the percentage of learning activity which has increased with the average of 83.18% according to Table 5. Based on the user response questionnaire it is found that students and teachers respond positively to the student worksheet of science based on process image of light concept. This positive response questionnaire is seen in the students' assessment with good average criteria, as Table 6. The mean score of student's response questionnaire on the use of student worksheet science based on the process of image of light concept also shows improvement, as shown in Figure 3. The results of the observation indicate that students Look enthusiastic in doing learning activities and group discussions. Active students ask friends in groups or between groups. The results of this study support the statement Andriyani (2013) that the material works (student worksheets) are arranged neatly and interesting can motivate students to do learning activities well. Student worksheet science based on the image of light concept process is also suitable for cooperative learning in accordance with Slavin (2008).

Table 5. Implementation of Learning Student Worksheet Science based on the process of image of light concept

No	Aspects of Learning	Learning Implementation				Average
		SW S1	SW S 2	SW S 3	SW S 4	
1.	Students are interested to start the lesson and immediately take the student worksheet of science-based images of the light material process that teachers share.	5	5	4	5	4,75
2.	Students read seriously the instruction manual on the student worksheet of science-based image light material process and ask if there is anything that has not been understood.	5	5	5	5	5,00
3.	Students read seriously the learning objectives of the student worksheet of Science	5	5	5	5	5,00
4.	Students look serious to finish student worksheet of the science-based drawing process of light material which is distributed by way of discussion with group member.	4	4	4	5	4,25
5.	Less than three groups asked the teacher in completing the student worksheet of science-based image light material processes during the lesson.	3	3	4	4	3,50
6.	Discussion group can complete student worksheet science-based drawings material process light on time	3	4	4	4	3,75
7.	There are three or more groups who volunteered to present the results of their group discussions.	3	4	3	4	3,50
8.	Students are seen actively discussing the	4	4	4	4	4,00

	class					
9.	The teacher acts as a facilitator and a motivator	4	4	4	5	4,25
10.	Learning ends with a happy feeling by all students	4	4	4	4	4,00
11.	Learning time as planned	3	4	4	4	3,75
	amount	43	46	45	49	45,75
	Percent Performance	78,18	83,64	81,82	89,09	83,18

Table 6. Results of Recapitulation of Student Response Questionnaire

Kriteria Respon	SWS-1	SWS-2	SWS-3	SWS-4
Very good	4	5	5	6
good	24	24	25	25
Pretty good	6	5	4	3
less good	-	-	-	-
Not good	-	-	-	-

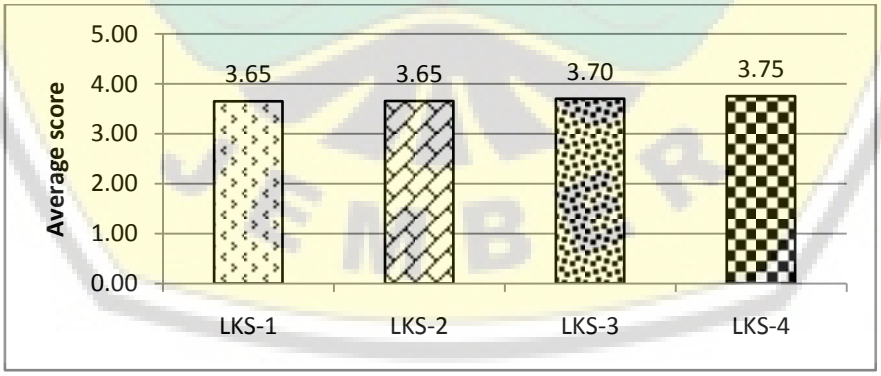


Figure 3. Mean Score of Student Response Score

Student worksheet science based on the process of light concept effective to improve understanding of the concept of light based on increasing pretest-posttest value, and analyzed through normalized gain. N-gain in this study was obtained at 0.628 in medium criteria. The pretest average of 38.29 has increased to 77.26 (posttest average)

as shown in Table 7. This is supported by learning completeness by 85.3% classically. The effectiveness of student worksheet science based on the image process of light concept is also supported by the retest result which is implemented after three weeks after posttest. The average retention rate of 99.6% is in excellent criteria. The results of this study revealed that student worksheet science based on the image of light concept process is an effective instruction used to stimulate student memory in accordance with Allan, et al. (2001) and Santrock (2013). Learning using student science worksheets based on the image of light concept process effectively improves students 'understanding and students' knowledge is stored longer in long term memory.

Table 7. Recapitulation of Pretest, Posttest, and Retest Value

No.	Uraian	*Pretest*	*Posttest*	*Retest*
1.	Average	38,97	77,26	76,97
2.	The highest score	57	90	88
3.	The lowest value	26	53	64
4.	Number of Students with a value of ≥	0	29	27
5.	KKM	34	5	7
6.	Number of Students with <KKM	0	85,3	79,4
	Ketuntasan Exhaustiveness Classical (%)			

CONCLUSION

Student worksheet science based on the process of light concep is considered practical and effective for junior high school students' learning. Student worksheet science based on process image of light concep is considered practical based on the average of learning activity of 83.18% and get positive response from users of the product. Student worksheet science based on the image of light concep process is effective based on the average increase of pretest-posttest value with N-gain of 0.628 (medium criterion) and students' learning completeness 85.3%. Effectiveness is supported by student retention of 99.6% with very good criteria.

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