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Development Learning Instructional based on Science, Environment, Technology, and Society (Sets) Approach on a "Plant Growth" Chapter for Scientific Literacy on Elementary Schools

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Abstract:- The aim of this study was (1) produced the learning instructionals based on SETS for Scientific Literacy on Grade III Elementary Schools, (2) described the validity, practicality, and effectiveness of this learning instructionals for Science Literacy Drilling on a "Plant Growth" chapter.This research was a study on the development of the learning instructional refers to the Dick and Carey development model. The developed learning instructionals then validated by experts. The validation results showed that this learning instructional was valid and ready to use. Furthermore, it was tested on third-grade students of SDN Kandangan I / 121 Surabaya with One Group Pretest-Postest Design.The research results showed (1) the developed learning instructionals were categorized as remarkably valid, (2) the developed learning instructional was practical, on the implementation of lesson plan considered as an excellent category and the student activities were relevant to the lesson plan (3) the developed learning instructionals was effective; as revealed by the test results of the students on the scientific literacy, showing all the students were passed with a high N-gain category, and also excellent feedback given by the students. It can be concluded that learning instructionals based on SETS was feasible to drill the students on scientific literacy; thereby can improve the students' scientific literacy.

Keywords:- *Learning Instructional, SETS, Science Literacy.*

I. INTRODUCTION

Science literacy is the ability to engage with issues related to science and with scientific ideas (OECD, 2016). One of the aims of teaching literacy is to help students develop the ability to think deeply about what they have read and to help students express themselves in various ways.

The results of the 2015 PISA study state that Indonesian scientific literacy ranks 62 out of 70 countries (OECD, 2016). The results of the pretest on 20 students regarding scientific literacy skills at the elementary school level stated that the 20 students scored below the Minimum Criteria of Mastery Learning (KKM).

Ackay and Yager (2010) say that SETS is considered important for achieving basic scientific literacy. Science literacy has a variety of objectives similar to SETS, making the SETS approach an appropriate means of achieving scientific literacy goals (Lau, 2013). The basic objective of SETS is to create a society that is literate in science and technology and can make decisions and dare to take risks for what has been done (Aikenhed, 1992).

The learning objectives using the SETS model according to Poedjiadi (2010) are the students have scientific and technological literacy, have the ability to solve problems using science concepts derived from education, recognize the technology products around them and their impact, and are able to make decisions based on the values and culture of society. The development of learning instructional using the SETS approach and model will appear in the learning step in the lesson plan. The learning instructional is tools for implemented learning activities that allow teachers and students to do learning (Zuhdan, 2015).

The material for plant growth is appropriate when taught by learning that connects between science with its application in life, one of which is by using the SETS approach.The material contains the context of science, process, and product. Whereas SETS is learning that connects science with environment, technology, and society.

The application of SETS learning in plant growth material will make it easier to practice scientific literacy to elementary students. SETS has 5 syntax in it that can accommodate students in improving their scientific literacy. Because in SETS, students are trained to understand the concept of science and its application in life about how to behave towards technological developments towards the environment and society.

Research results related to the SETS approach have been implemented by several researchers. Nugraha (2018) has developed a learning device based on the SETS approach to biotechnology material in class VIII SMP and the results show that the learning device is valid, practical, and effective for training students' scientific literacy. Azizahwati, Sudrajat and Puteri (2011) have developed

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learning using the SETS approach to the subject matter of optical devices in Class V elementary school students and the results that the SETS approach can improve students' absorption and psychomotor skills in science.

Based on the description above, the researcher wants to conduct a study "Development Learning Instructional Based on Science, Environment, Technology, and Society (SETS) Approach on A "Plant Growth" Chapter for Scientific Literacy on Elementary Schools ".

II. METHODS

This research includes the type of development research using the Dick and Carey model. This study develops Learning instructional with the SETS Approach to train the Science Literacy of Class III Elementary Students in the Material of Plant Growth.

The study was conducted in class IIIB of the 2018/2019 academic year, which was from January 2019 to April 2019. The research subjects were class IIIB students at Kandangan I / 121 Elementary School Surabaya in 2018/2019 academic year, amounting to 40 students consisting of 23 male students and 17 female students.

The experimental of learning instructionals developed using the One Group Pretest-Posttest Design. The pre-experimental design used one group to be given a pretest and given posttest after being treated. The research design by Fraenkel, Wallen, and Hyun (2012) is described as follows:

Pretest	Treatment	Posttest
O_1	X	O_2

Keterangan

O_1 : Pretest experimental for knowing score literacy science before do treatment

X : Giving treatment using SETS based learning instructional

O_2 : Posttest experimental to determine the student's scientific literacy score after being given treatment

Data analysis techniques are implemented for processing data that has been obtained, so that learning instructionals used in the learning process can be known validity, practicality, and effectiveness. The results of the research data analyzed consisted of device validity, scientific literacy tests, student response questionnaires, student activity sheets, and obstacles that arise during the learning process.

Data on research results to be analyzed include:

A. Analysis of Learning Instructional Validation Results

Validation of learning instructional consists of Syllabus, Lesson Plan (RPP), Workbooks (LKS), and scientific literacy tests. The results of the validation of the learning device were then analyzed descriptively quantitatively, namely by calculating the average score of the assessment from the validator. The average score obtained is converted using the following conditions:

Interval Score Validation	Category Ratings	Information
$3{,}6 \leq SV < 4$	Very Valid	Can be used without revision
$2{,}6 \leq SV < 3{,}5$	Valid	Can be used with a little revision
$1{,}6 \leq SV < 2{,}5$	Less Valid	Can be used with many revisions
$0{,}6 \leq SV < 1{,}5$	Invalid	Not yet usable, it still requires consultation

Table 1:- Criteria for categorizing the validity of learning instructional

Description: SV = validation score (Ratumanan & Laurens, 2011)

B. Analysis of the Implementation of Learning Implementing Plans

The analysis of the lesson plan implementation was analyzed as descriptively quantitatively by calculating the results of observations (observed by the observer), then the percentage of the implementation of the teaching and learning stages in the lesson plan has been implemented by the teacher during the learning process. In general, the calculation of the percentage of implementation of lesson plan (P) is as follows:

$$P = \frac{\textit{the number of settlement lesson plans that were successfully implemented}}{\textit{the total stages of the lesson plan}} \times 100\%$$

The percentage of phase implementation using criteria is in Table 2

Interval	Category
$0\% \leq P \leq 25\%$	Not done
$25\% \leq P \leq 50\%$	It's done poorly
$50\% \leq P \leq 75\%$	Well done
$75\% \leq P \leq 100\%$	It's done very well

Table 2:- The percentage of implementation (Riduwan, 2012)

C. Student Activity Analysis

Analysis of student activity is activity data seen during learning. The percentage of student activity is measured quantitatively by the following formula (Akbar, 2012):

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Activity Percentage = $\frac{TSe}{N} \times 100\%$

Information :
Tse = Number of activities are shown by students
N = Number of all activities

D. Analysis of Science Literacy Tests

Determine the improvement of students' scientific literacy by calculating *Normalized Gain* (%) by using the *gain score* (improvement score) on the entire scientific literacy of students. The amount of increase or gain can use formulas (Hake, 1999).

$$g = \frac{(S_{post})-(S_{pre})}{Skor\ \max - (S_{pre})}$$

Information :
G (gain) = increasing the level of scientific literacy
S_{pre} = pretest score (initial literacy level)
S_{post} = posttest score (final literacy level)

Clarification of gain as follows:

g-heigh = (g) > 0,7
g-medium = 0,7 ≥ (g) ≤ 0,3
g-low = (g) < 0,3

III. RESULTS

The level implementation of the lesson plan in the experimental is categorized very well with an average mode score of lesson plan implementation of 3.7. The magnitude of the reliability coefficient of the instrument for observing lesson plans is 94.6%.

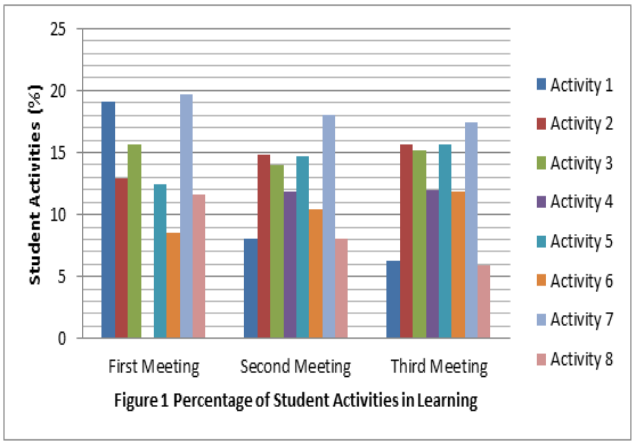

Figure 1 Percentage of Student Activities in Learning

Information :
1. Activity 1: Listen and pay attention when the teacher explains (passively)
2. Activity 2: Reading teaching materials (active)
3. Activity 3: Work on tasks contained in student teaching materials and workbook (active)
4. Activity 4: Perform an Experiment (active)
5. Activity 5: Cooperate between groups (active)
6. Activity 6: Communicate the results of group work (active)
7. Activity 7: Asking questions, expressing opinions (active)
8. Activity 8: Inappropriate behavior or less relevant (passive)

Based on Figure 1, it can be seen that the percentage of student activity dominated more than teacher activity. This difference frequency can be known by comparing activities to paid attention to teachers who provided information and behavioral activities that were not relevant to student activities that show activity. This shows that students played an active role in learning.

Students are considered complete in scientific literacy tests when obtaining a minimum value equal to KKM is 78. The pretest and posttest results show the completeness of the individuals obtained during the experimental can be seen in Table 2 below.

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No.	Students Name	Pretest		Postest		N-gainscore	Category
		Score	Category	Score	Category		
1	Student 1	35	Incomplete	80	Complete	0.75	High
2	Student 2	43	Incomplete	85	Complete	0.81	High
3	Student 3	33	Incomplete	79	Complete	0.74	High
4	Student 4	46	Incomplete	82	Complete	0.73	High
5	Student 5	37	Incomplete	85	Complete	0.83	High
6	Student 6	42	Incomplete	90	Complete	0.91	High
7	Student 7	43	Incomplete	80	Complete	0.71	High
8	Student 8	38	Incomplete	83	Complete	0.79	High
9	Student 9	52	Incomplete	95	Complete	1.00	High
10	Student10	46	Incomplete	85	Complete	0.80	High
11	Student11	35	Incomplete	80	Complete	0.75	High
12	Student12	45	Incomplete	92	Complete	0.94	High
13	Student13	43	Incomplete	94	Complete	0.98	High
14	Student14	35	Incomplete	80	Complete	0.75	High
15	Student15	28	Incomplete	79	Complete	0.76	High
16	Student16	20	Incomplete	80	Complete	0.80	High
17	Student17	36	Incomplete	86	Complete	0.85	High
18	Student18	30	Incomplete	78	Complete	0.74	High
19	Student19	43	Incomplete	84	Complete	0.79	High
20	Student20	37	Incomplete	82	Complete	0.78	High

Table 2:- Student Science Literacy Test Score

Based on Table 2, information is obtained that the average value of scientific literacy achieved by students after the pretest is 38.35, while based on the posttest value there is an increase in the average score of students' scientific literacy is 83.95. From these results indicate that, after the application of learning instructional based on the SETS approach in the learning process can increase scores.

IV. DISCUSSION

The practicality of the learning instructional is viewed from the implementation of the lesson plan in the learning process. The implementation of the instructional was observed by two observers for 3 times of meeting as the implementation of First Lesson Plan, Second Lesson Plan, and Third Lesson Plan. All stages of the activities contained in the lesson plan were implemented in a limited experimental with an average implementation score of 88% is done very well category. The instrument of implementation of the lesson plan has an average *Percentage of Agreement* reaching 94.6%.

The aspects of student activity observed in the learning process were listening and paying attention to the teacher when explaining, reading instructional materials, working on tasks contained in teaching materials and workbooks, conducting experiments, collaborating between groups, communicating the results of group work, asking questions and expressing opinions, and student behavior that was irrelevant or incompatible with learning.

Based on Figure 4.1 it can be seen that student activity in the learning process was very active, in terms of the acquisition of percentages in activities that indicated that the activity requires students to be more active during the learning process.

The scientific literacy test was conducted twice, namely the pretest and posttest. Pretest scores are used to determine the level of scientific literacy of students before learning to apply learning devices based on the SETS approach to plant growth material. From the results of the pretest , the average score of students' scientific literacy was 38.35. The value of posttest scientific literacy was obtained by students after attending the SETS approach based on three meetings. From the posttest results obtained

the average score of scientific literacy of students is 83.95 with the level of scientific literacy.

Increased scientific literacy skills can be seen from N-gain science literacy test scores ranging from 0.7-1. The increase is indicated by the results of the analysis using N-gain. N-gain results of student scientific literacy tests in the high category are indicated by an increase in scores at the pretest and posttest. This shows that the application of learning instructional based on the SETS approach can train students' scientific literacy in plant growth material.

V. CONCLUSION

Based on the research results it can be concluded that learning devices based on the Science, Environment, Technology and Society (SETS) approach developed are feasible to enhance scientific literacy.

SUGGESTION

Referring to the research process of developing learning instructional based on the SETS approach, then for further research it is necessary to improve the research steps, including the following:

1. If practice scientific literacy, students can use SETS-based learning tools.
2. This research was conducted in a small scale experiment. It should be tested on a larger scale in order to get more relevant results.

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