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Learning Development of Structured Inquiry Learnning Model based on *Fish Bone* Strategies to Train Scitific Literacy for Fourth Grade

Iis lestari[1] Z.A Imam Supardi[2] Sifak Indana[3]
Postgraduate Program of Elementary Program
State University of Surabaya

Abstract:- This study aims to (1) produce a valid, practical, and effective structured inquiry learning model based on training in scientific literacy in fourth grade of elementary school, (2) describing the validity, practicality and effectiveness of learning model based on structured inquiry learning models to train scientific literacy in fourth grade on fifth theme of first sub theme in first learning material. This research is a development of learning devices based on *Dick and Carey* development model. Learning model based on structured inquiry learning models are validated by experts and the validity learning model can be used. Furthermore, it was tested on fourth grade students of Asemrowo II Surabaya Elementary School with One Group of Pretest and Postest. The results of trial practice showed (1) the learning devices developement are categorized as very valid. (2) Practical learning devices based on good lesson plan implementation which is categorized as very good learning devices and active student activities during learning is one of the category of good learning devices (3) Learning models are classified as very good strategies based on the results of literacy tests which showed 15 students have high *n gain* and 12 students are in *n-gain* category and the students response which is very good. It can be concluded that learning models based on structured inquiry learning models based on *fish bone strategies* are used to train science literacy for fourth grade on fifth theme of first sub theme in first learning material.

Keywords:- *Learning Devices, Structured Inquiry, Fish Bone, Science Literacy.*

I. INTRODUCTION

Literacy has been seen traditionally as the ability to read and write, in line with this meaning, the definition of literacy has shifted from a narrow understanding of language skills to a broader understanding of literacy in various fields of science. One field of science is scientific literacy. Therefore, scientific literacy skills become an important ability that must be mastered by students to be able to live and life in this 21st century (Yunus, 2017).

On 21st century, the mastery of science and technology is an important key to be the success of a nation. This is a benchmark for the nation progress in the area of global competition. Science education as a part of education is generally responsible and has an important role in producing and creating students who have the ability to think critically, logically, creatively, innovatively, and with global competition. Thus, actually scientific literacy is building a number of competencies that must be possessed by each student. The most important part of building scientific literacy is how the facts of science form certain skills in learning activities (Yunus, 2017).

In fact, scientific literacy in elementary schools is still not overlooked; this is because the teacher is also still do not understand what literacy is. In accordance with the results of the PISA 2015, literacy in Indonesia is still at a low level. Even though literacy is very important for students, because by understanding literacy students are able to improve learning outcomes especially in science. Literacy also spurs students to learn more about a science. Therefore a new strategy is needed to be able to improve the scientific literacy of students in elementary school by making appropriate learning devices.

Preparation of lesson planning for almost of teachers is still very limited. Evthough the creating of learning resources such as learning devices can improve the meaningfulness of learning in the classroom. If learning is considered meaningful for students, it will be easy to improve the learning outcomes and train students' scientific literacy. Professional teachers in improving the quality of education in schools, have the characteristics of understanding and being able to use various learning models. The use of various learning models can improve the quality of thinking and creativity of students. One indicator in the success of teachers in learning is that there is a better changing in attitude towards students after the learning process, so that in order to achieve these indicators, the teacher needs to plan a learning model which involves the active participation of students. The learning model that makes active students is a model of discovery or investigation (Suprijono, 201)

Inquiry-based science learning allows students to use science as a tool to find answers of some problems related to the real phenomena happened and the students compare with their minds, discuss and express them. The usefulness of scientific literacy here is to broaden the horizons of scientific knowledge so that it is increasingly tested (Hapgood & Palincsar, 2006). For achieving a good strategies, teacher need appropriate learning devices. In line with Vienna (2010), the strategy is all the actions of students and teachers in teaching and learning events.

One of strategies that can be used here is a strategy that is able to train scientific literacy for students. According to the elementary level of Literacy Movement Alloy Book, one of the strategies that can be used to train science literacy is the *fish bone* strategy. Fish bone strategy is suitable because it can link Indonesian and sciences learning which is exist in fifth Theme of first Sub-theme in first Learning material.

This is also accordance with other research from Cristiana (2018) which states that *fish bone* strategy can improve students' reading skills. *Fish bone* strategy is a strategy that contains images in the form of *fish bones* in each thorn's head and tail with information that contains important notes, titles and answers from 5WH question of who, where, when, what, why, and How so that this strategy is suitable for creating active students in learning (Edward, 2003).

II. METHOD

The type of this research is development research by modifying the Dick and Carey development model. The developed-devices are syllabus, lesson plan (RPP), Student Textbooks, and Student Worksheets (LKPD), and Science literacy tests of Dick and Carey Development Model. The development of learning with the Dick and Carey model consists of several steps, namely: curriculum analysis, learning analysis, identification of initial abilities, development of learning objectives, development of research instruments, development of learning strategies, development and selection of learning devices, validation and revision, design and application, and analysis. The trial practice was conducted on a limited class of 27 students. Referring to Sugiyono (2018), the design of this research trial will use the one group pretest and posttest; this design can be seen in the following picture:

Pretest	treatment	Postest
01	X	02

Fig 1

The data result of research analysis :

❖ *Validation Results Analysis*

Interval Score	Rating category	Information
$3{,}6 \leq P \leq 4{,}0$	Very valid	Can be used without revision
$2{,}6 \leq P \leq 3{,}5$	Valid	Can be used with the slight revision
$1{,}6 \leq P \leq 2{,}5$	Less valid	Can be used with many revisoins
$1{,}0 \leq P \leq 1{,}5$	Not valid	Can't be used

Table 1:- Validity criteria
(Ratumanan dan Lourens, 2006)

A. Analysis Of Readability Of Teaching Materials.

This analysis is calculated by using a formula, in this following::

$$P = \frac{\sum K}{\sum N} \times 100\%$$

Information :
P = readability percentages
∑K = number if sentences that can be completed
∑N = numb er of all sentences that must be completed

B. Lesson Plan Implementation Analysis

This assessment is carried out by two observers who gave a checklist (√) in the available columns with a range of scores 1-4. The results of observations of lesson plan implementation were analyzed by using qualitative descriptive analysis with the percentage of agreement formula. The instrument is categorized to be good (reliable) if the reliability value is> 0.75. Calculation of reliability of student activities is calculated using the Borich formula (Ibrahim, 2005) as follows:

$$R = \left[1 - \frac{A-B}{A+B}\right] \times 100\%$$

Information:
R = instument of reliability
A = frequency aspect of high values from two validator
B = frequency aspect of low values from two validator

C. Student Activity Analysis

Analysis of student activity is activity data which is seen during learning. The percentage of student activity is measured quantitatively by the following formula (Akbar, 2013):

$$\text{Percentage of activity} = \frac{TSe}{N} \times 100\%$$

Information:
Tse = number activities shown by the students
N = number of ll activities

D. Scientific Literacy Test Analysis

Individual student scores are scores obtained by students who divided by maximum scores then multiplied by 100. This analysis refers to the minimum completeness criteria (KKM) at school.

Increasing of scientific literacy was analyzed using the *gain score* between the value of the pretest and posttest *gain* using the Hake formula as follows (Savinainen and

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Scot in Rahmah, 2016):

$$g = \frac{Spost - Spre}{Smaks - Spre}$$

Information :
g (gain) = increasing of students skills process
Spre = pretest score
Spost = postest score
Smaks = maximum score

The criteria of gain score can be seen as follow :

No	Batasan	Kriteria
1	g ≥ 0,7	High Gain
2	0,7 ≥ 0,3	Medium Gain
3	g ≤ 0,3	Low Gain

Table 2:- Criteria of gain scores

III. RESULTS AND DISCUSSION

Assessment of BAS readability is done by giving questionnaires to students after structured inquiry-based learning. The results of BAS readability assessment are presented in Table 3.

No	Aspect of measurement	Respondent Persentage (%)	
1	The interesting materials/ materials in teaching learning for students.	Yes	No
		90	10
2	The interesting of displaying material for students	Yes	No
		100	0
3	The ease of undersatnding description or explanation in teaching materials.	Yes	No
		90	10
4	The ease of understanding illustrations or images in teaching materials of students.	Yes	No
		90	10
Students score percentages		92.5%	7.5%

Table 3:- the results of Assessment of Readability of Learning Materials for Students

In Table 3 provides information that students give a very strong response with a percentage of 92.5% answers yes to teaching materials given in this study. In addition to being given a questionnaire, after students read the teaching material, students are given reading pass accordance with teaching materials.

The activities of students are measured by using an activity observation sheet filled by observers. The results of observing student activities are presented in Table 4.

No	Students activity	Meeting						RT	A_S	I
		1		2		3				
		P1	P2	P1	P2	P1	P2			
1	Students listen to the teacher explanations.	14.0	13.0	11.0	10.0	5.0	4.0	9.5	67.9	G
2	Students read learning materials.	13.0	13.0	10.0	8.0	4.0	4.0	8.7	66.9	G
3	Students do some activities that creatte a conducive learning athmosphere.	13.0	11.0	13.0	13.0	15.0	15.0	13.3	88.7	VG
4	Students formulate a problem.	12.0	12.0	13.0	13.0	15.0	15.0	13.3	88.7	VG
5	Students create a hypothesis.	12.0	12.0	13.0	14.0	15.0	15.0	13.5	90.0	VG
6	Students determine data for examining the hypothesis.	11.0	12.0	13.0	14.0	15.0	15.0	13.3	88.7	VG
7	Students examined the hyphothesis.	12.0	13.0	14.0	13.0	16.0	16.0	14.0	87.5	VG
8	Students conclude the results	13.0	14.0	13.0	13.0	15.0	14.0	13.5	90.0	VG
Total		100	100	100	100	100	100	100	VG	
Students activities categories										

Table 4

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The result of students activities in the classroom

Based on the percentage of student activity in table 4 showed that most students who participated in the trial were limited so that the activities of students were categorized very good in the following learning. If you see a comparison of active and passive activities, active activities dominate more than 3: 1. It can be concluded that structured inquiry-based learning is learner-centered learning even with guidance and direction from the teacher.

Science literacy tests are given to students before the pretest and after the study using the structured inquiry model learning devices which is developed. The results of the pretest and posttest were used to determine the completeness of students' scientific literacy. The results of the scientific literacy test can be seen in table 5 below.

Students code	Pretest		Posttest		N-*gain*	I
	Score	I	Score	I		
S1	70	F	90	S	0.7	High
S2	50	F	90	S	0.8	High
S3	50	F	85	S	0.7	High
S4	50	F	80	S	0.6	Medium
S5	70	F	80	S	0.3	Medium
S6	40	F	85	S	0.8	High
S7	45	F	95	S	0.9	High i
S8	70	F	90	S	0.7	High
S9	40	F	80	S	0.7	High
S10	40	F	90	S	0.8	High
S11	65	F	80	S	0.4	Medium
S12	50	F	80	S	0.6	Medium
S13	60	F	85	S	0.6	Medium
S14	50	F	85	S	0.7	High
S15	50	F	90	S	0.8	High
S16	60	F	80	S	0.5	Medium
S17	60	F	80	S	0.5	Medium
S18	60	F	80	S	0.5	Medium
S19	40	F	85	S	0.8	High
S20	50	F	90	S	0.8	High
S21	50	F	70	F	0.4	Medium
S22	50	F	80	S	0.6	Medium
S23	40	F	85	S	0.8	High
S24	40	F	70	F	0.5	Medium
S25	80	S	100	S	1	High
S26	50	F	90	S	0.8	High
S27	50	F	80	S	0.6	Medium
number of students are failed		26	number of students are failed			2
Number of students are success		1	Number of students are success			25
procentage (%)		3,7%	procentage (%)			92,6%

Table 5:- Pretest dan Postest result

The Minimum Completion Criteria (KKM) is 76 for fourth grade in State elementary school of Asemworo II/63 Surabya. In Table 5 showed that the percentage of mastery learning at the pretest is 3.7%, it means that there are still many students who have not reached the specified KKM. After students have been given structured inquiry and posttest learning models, the percentage of completeness has increased by 92.6%, meaning that most students have been able to exceed the specified The Minimum Completion Criteria (KKM).

Questionnaire responses were given after the teacher finished the learning activities for three meetings. The results of the questionnaire responses of students to structured inquiry-based learning are presented in Table 6.

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No	Measurement aspects	Percentage of response (%)	
		Strong	weak
1	Teaching materials, learning atmosphere, teacher teaching methods and the steps of learning are interesting.	agree	disagree
		90	10
2	Teaching materials, learning atmosphere, teacher teaching methods and steps of learning are new.	agree	disagree
		90	10
3	Teaching materials, learning atmosphere, teacher teaching methods and stages directed in easy-to-understand learning	agree	disagree
		100	0
4	The way teachers implement structured inquiry based learning is easy to understand.	agree	disagree
		100	0
5	The literacy test questions that are made are quite easy to do	agree	disagree
		90	10
6	The test is quite easy.	agree	disagree
		80	20
7	Every question items is quuite new.	agree	disagree
		100	0
8	Structured Inquiry based learning makes learning more interesting	agree	disagree
		100	0
Students percentages		93.75%	6.25%

Table 6:- the response of students

Based on Table 6 it can be stated that learning devices and the application of structured inquiry-based learning received responses with a strong category of 93.75% of students. This is indicated by the percentage of responses from students.

IV. CONCLUSION

The validity of developement learning device can be seen from the results of the validity which carried out by the validator. The device is declared valid and feasible to be used in the activity if it has been revised and based on the advice and input of the validator. The practicality of the learning devices can be seen from; Implementation of lesson plan in the first meeting until third meeting which run very well. And the most dominant activity of learners in learning with structured inquiry models is analyzing and collecting data. The Obstacles found when the research can be overcome on the next meeting The effectiveness of the learning devices can be seen from the completeness of the learning outcomes of science literacy tests is 92.6%. Students also show a very strong response during learning process.

SUGGESTION

Based on the results of the research, it can be conluded that are several suggestions, namely: Management of time when needs more attention, Development and implementation of structured inquiry-based learning devices whihch need to be further developed and tested consistently.

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