Effectiveness of integrated science textbook theme earthquake using connected model SSCS problem solving

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Abstract. Integrated science learning is a concept that can be thought of as a learning approach that connects concepts in science to provide a more meaningful learning experience to students. All these scientific concepts can be linked to textbooks. Textbooks are the main source of learning that learners should use. This study aims to describe the improvement of the competence of learners after using the earthquake disaster of Junior high school integrated (SMP) earthquake with the type of connected problem solving problem SSCS. The method used is pre-test, post-test design, n gain and effect size with one group using class as research subject. In the competence of pre-test knowledge is given before the treatment to measure the problem of students' initial understanding, while the post-test is given to measure the final understanding of the students as for the competence of responsiveness and skill seen classical mastery. The subject of this research is the students of class VII of SMP Negeri 4 Padang. The results show that there is a very effective use to improve student responsiveness and skills. On score n gain shows student's knowledge competence categorized increase significantly and high and effect size is in category with great influence.

1. Introduction
The Indonesia region and surrounding areas have very complicated plate convergences consisting of subduction, collision, back arc thrusting and back arc. As a result of the complexity of the region is considered one of the most tectonically active areas in the world. in Indonesia about 460 earthquakes of magnitudes than 4.0 have happened every year [1]. Especially Padang city in province West Sumatra have frequent earthquakes with enormous powers that more causalities. Several powerful earthquakes have struck Padang during recent years, one of the largest of which was on September 30, 2009 and caused more than 1000 casualties [2]. An earthquake is a movement from within the earth where vibrations or shocks occur on the surface of the earth due to the sudden release of energy from within that creates seismic waves. Earthquakes are commonly caused by the movement of the Earth's crust [3].

Responsiveness is very important in the earthquake disaster is a must because earthquakes are natural events that are not predictable bias. Disaster response is an attitude that is aimed at preventing, dealing with and overcoming disaster [4]. Earthquake disasters can be explained in the science lesson. The science material is a very closely related lesson to the universe, both living and inanimate objects, and systematically searching nature for the mastery of scientific knowledge, facts, concepts, principles and processes. The nature of science is the science that studies the phenomena through a series of processes known as scientific processes built on scientific attitudes and the results are manifested as
scientific products composed of the three most important components of universally applicable concepts, principles and theories [5]. Viewed from the physical IPA is a science whose object of study is nature with all its contents that is human, animal, and plants including earth [6].

The 2013 curriculum has the concept of maturity of learners in accordance with its psychological development and gets pedagogical treatment in accordance with the context of the environment and its era. Earthquakes are an environmental context that is often felt by learners living in the area of West Sumatra. Knowledge about disaster mitigation can be provided to learners in schools because schools have the potential for the ability to manage disaster risk in their environment. [7].

The integrated IPA contains the physics, biology, and chemistry materials incorporated in a single unit without any separator of each material. The realization of integrated science learning in accordance with the demands of the 2013 curriculum, then the earthquake will be the theme in textbooks and integrated model that will be used is integrated model type connected. The connected model is a model that organizes or integrates a concept, skill, or capability developed within a subject or sub-topic that is linked to concepts and skills in one field of study [5]. The connected model is a model that can unify the particular subject matter so that it becomes wholeness in shaping the ability and organizing the learning items in an integrated manner [6]. So this model can be used for children of SMP / MTs because it is appropriate with the level of understanding of the child in connecting concepts with other concepts, topics with other topics and skills with one another skill.

Problems in the learning process of science always requires participants didik to connect the existing concepts. So the learning model that is suitable to apply in problem solving process is the learning model of SSCS problem solving. this SSCS model is requiring more conceptual understanding and higher level thinking when in the learning process. The SSCS problem solving (1) search stage includes the initial investigation, (2) the solve, the learners design the design to be used in the investigation, (3) create, the last stage in the learning model (4) Share, stage (5) This share divides or provides results and evaluations of the investigations it conducts. [8].

The curriculum and textbooks have a very close relationship. Proven if the curriculum changes then the text book must also adjust to it. Textbooks are one of the teaching materials which in its development should refer to the curriculum applicable when the book is prepared [6]. Lesson textbooks can be a major learning resource for achieving core competencies and core competencies and are declared appropriate by the Ministry of Education and Culture for use in educational units. Books used by learners must meet the needs and demands that exist. So that textbook is a mandatory component that must exist in learning. The preparation of textbooks with the 2013 curriculum must be in accordance with predetermined rules or principles. Textbook creation should pay attention to the suitability of the book with SKL, KI and KD, adequacy and depth of material, scientific approach, authentic assessment [9].

The textbook used should be in accordance with the needs of learners so that the realization of an effective textbook. Effectiveness is a measure that gives an idea of how far a target can be achieved. This understanding of effectiveness is more oriented to output while the problem of using inputs is less of a major concern [10]. If efficiency is associated with effectiveness, even if there is an increase in effectiveness it is not necessarily that efficiency increases. So, the purpose of this study determines the effectiveness of integrated science textbook theme earthquake using connected model SSCS problem solving applied to learners’ learning outcomes consisting of responsiveness, knowledge, and skills.

2. Method
This research is a quasi-experimental design study using one group pre-test and post-test design. Seeing the extent of early ability of learners before using the text book then given the pre-test. After learners learn to use textbooks then do post-test to see the final competence of learners the extent to which they understand learning. Subjects in this study were students class VII 3 SMPN 4 Padang Year Teaching 2018/2019. The data to be taken is the responsiveness attitude data by using questionnaire, the competence of pre-test and post-test knowledge and skill competence with skill rubric according to SSCS problem solving model.
2.1 Competence Analysis of Disaster Response and Skill Competency

Competence Analysis of responsiveness and skills of students using the equation as follows:

\[
P = \frac{\text{skor yang diperoleh}}{\text{skor maksimum}} \times 100
\]

(1)

| Interval % | Category        |
|------------|-----------------|
| 0 < p \leq 20 | Ineffective    |
| 21 < p \leq 40 | Less Effective |
| 41 < p \leq 60 | Effective Enough |
| 61 < p \leq 80 | Effective      |
| 81 < p \leq 100 | Very Effective |

2.2 Competence Of Learners Knowledge Analysis

The effectiveness of textbooks on knowledge competence is done by pre-test and post-test members in the tested class. Data analysis aims to test whether the tested hypothesis is accepted and rejected. Hypothesis test is paired t test. Before executing the hypothesis test then first tested normality. Analysis of the effectiveness of knowledge competence is obtained through the following stages.

a. Scoring of the students' answers to the questionnaire to obtain a pre-test score and post-test.

b. Calculates the increase in knowledge that occurs before and after the learning with the gain formula. Furthermore, the acquisition of N-Gan normalization is calcified into three categories, namely below. Categories of Normalized Gain Categories in Table 2 below.

c. Next to see Effect Size then tested the normality of knowledge competence data.

d. After doing the normality test then continued with the homogeneity test data. Homogeneity test aims to see the data in both samples having homogeneous variance or not. Testing homogeneity used F test.

e. Followed by the two-point equality test, hypothesis testing is a procedure that will produce a decision, ie the decision not to reject or reject the hypothesis. With the test statistic formulated that is, the data has been distributed normally then used t test.

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g. If the result shows that there is a difference of effectiveness of improvement of attitude attitude of pretest and posttest of disaster will be searched the difference size (effect size). The category of effect size according to the effect can be seen below.

| Nilai <g> | Criteria   |
|-----------|------------|
| g \geq 0,7 | High       |
| 0,7 > g \geq 0,3 | Medium |
| < 0,3      | Low        |
Table 3. Criteria Category Effect Size

| d value | Category   |
|---------|------------|
| 0.8 ≤ d ≤ 2.0 | Great influence |
| 0.5 ≤ d ≤ 0.8 | Medium influence |
| 0.2 ≤ d ≤ 0.5 | Low influence |

3. Results and Discussion

3.1 Disaster Response Attitude
The results of the analysis indicate that every attitude of learners attitude has increased. The Disaster Response Attitude of integrated science textbook theme earthquake using connected model SSCS problem solving for the better in the learning process. This indicates that textbook development can improve the responsiveness of learners. The graph showing the increase in responsiveness of each meeting is shown in Figure 1.

![Figure 1. Disaster response attitude of students](image)

Based on Figure 1, it is seen that learners have improved responsiveness in each meeting which has an average of 81.07. This shows the textbook of integrated science textbook theme earthquake using connected model SSCS problem solving to improve disaster response attitude is categorized as very effective.

3.2 Competence Of Learners Knowledge
Data on post-test results based on inductor-indicator of learning materials. Post-test result data is taken after the learner has finished studying one KD material in which the post-test question consists of 5 essay questions. The conclusion of the research results obtained after doing statistical test of N-gain and effect size. The results obtained with the N-gain statistical test is 0.71 is in the high category. The improvement of students' knowledge competence with integrated Natural Science (IPA) textbook of Junior High School (SMP) is applied to the model-based character where the score gain score is 0.73, indicating that the students' knowledge competency is increased significantly and high [11]. It can be concluded that the knowledge that happened before and after using this IPA textbook has increased
high. After performing statistical test of N-gain then proceed with effect size test statistic. Before getting the value of the effect size then tested the normality and hypothesis test.

3.2.1. Normality Test

Test the normality of the sample class to see whether the results of the pretest and postes grades of the sample class come from normally distributed populations. The result of normality test of sample class can be seen in Table 4. Based on Table 4 it can be seen that Lo <Lt for both pretest and posttest samples means the data of both data come from normally distributed populations.

| Table 4. Test Result of Normality Of Pre-test And Post-test Value Competence of Learners Knowledge | N | α | Lo | Lt | Criteria |
|-----------------------------------------------------------------------------------------------|---|---|----|----|----------|
| Pretest                                                                                      | 27 | 0,05 | 0,0052 | 0,161 | Normal   |
| Postes                                                                                      |   | 0,05 | -0,032 | 0,161 | Normal   |

3.2.2. Hypothesis Testing

After the test of normality and homogeneity then tested the similarity of two averages. From the normality and homogeneity test it was found that the two sample classes came from normally distributed populations and had homogeneous variance. Therefore, in the two equality test equations the t test is used. The results can be summarized in Table 5.

| Table 5. Equalization Test Results Two-Point Pre-test And Post-test Values Competence Of Learners Knowledge | N  | x  | s   | t_calculate | t_table |
|------------------------------------------------------------------------------------------------------------|----|----|-----|-------------|--------|
| Pretest                                                                                                    | 27 | 55,2 | 19.24 | 6.8         | 1.68   |
| Postes                                                                                                     |   | 88,15 | 8.89  |             |        |

Based on the calculation results obtained \(t_{\text{calculate}} = 6.8\), while the \(t_{\text{table}}\) value at the real level of 0.05 obtained \(t(0.05;27)\) of 1.68. Test criteria accept \(H_a\) if \(t_{\text{calculate}} > t_{\text{table}}\). Because \(t_{\text{calculate}}\) is within \(H_a\)’s acceptance area, \(H_a\) is accepted. Means that both pre-test and post-test data of difference mean that there is a tendency to increase knowledge competence of integrated science textbook theme earthquake using connected model SSCS problem solving.

3.2.3. Effect Size

After seeing the difference of pre-test and post-test average by testing hypothesis then continued with statistic effect size test. Effect Size serves to see the size of the influence of IPA textbooks on the knowledge of learners. The results of the statistical test can be seen in Table 6.

| Table 6. Data From The Effect Size Statistics Test Result | Cohen’s (D) | S | Score  | Category       |
|---------------------------------------------------------|-------------|---|--------|----------------|
|                                                         | 27.96       | 14.99 | 1.86   | Great influence|

From Table 6 above obtained the result that the value of the influence of textbook books IPA to the competence of learners knowledge is 1.86 is in the category of great influence.
3.3. Skills Competencies
The assessment parameters of the skills are carried out with the instruments of practice assessment already in the learners' worksheets according to the SSCS problem solving model. Skills assessment of learners is done at each meeting. This assessment is done to see how far learners' skills can improve.

The results of the analysis show that each skill meeting of students has increased. Skills of students in using textbooks of integrated science textbook theme earthquake using connected model SSCS problem solving for the better in the learning process. This suggests that textbooks can improve the competence of learners' skills. The graph showing the improvement in response attitudes of each meeting is shown in Figure 2.

Based on Figure 2 It can be seen that the learner has increased skills competence in each meeting which has an average of 82.76. This shows the textbook of integrated science textbook theme earthquake using connected model SSCS problem solving to improve disaster skill competency is categorized as very effective.

4. Conclusion
The effectiveness of integrated science textbook theme earthquake using connected model SSCS problem solving based on students' learning outcomes consisting of disaster response attitude, 81.07 is very effective. In knowledge competence that is N-gain is 0.71 is in high category. It can be concluded that the knowledge that occurred before and after using this IPA textbook has increased high and the effect size that the value of the influence of textbook IPA to the competence of learners knowledge is 1.86 is in the category of great influence, and skills 82.76 categorized as very effective.

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