Effectiveness of using sequenced model student books for integrated science lessons with themes of the human body adaptation system at temperature on student learning outcomes

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Abstract. Learning science should be developed as an integrative science between physics, biology, and chemistry. The real conditions in schools that science subjects are not yet integrated. One of the solutions that can be done is to apply integrated science book sequenced models. The theme used is the human body's adaptation system at temperature. The aim of the study was to determine the effect of integrated science books on sequenced models on student learning outcomes. The type of this research is Quasi experiment with the design of Randomize control-Group. The population of this study was all seventh-grade students at SMP 8 Padang in West Sumatra who were enrolled in school in 2017/2018. The data of this study were analyzed using descriptive, hypothesis testing, simple linear regression and correlation test. At the real level at 0.05 for both aspects. The results of the study found that the integrated science textbook sequenced model had a significant influence on learning outcomes in the knowledge aspect at a 95% confidence level.

1. Introduction
Science Learning (IPA) in junior high schools should be carried out with integrated learning between physics, biology, and chemistry subjects. As an integrative science, applicative oriented education, the development of a caring and responsible attitude towards the social and natural environment in substance, IPA can be used as a tool or tool to develop the domain of attitudes, knowledge and skills.

To integrate physics, chemistry and biology material is done by thematic approach and applicative oriented, development of thinking ability, learning ability, curiosity, caring attitude, and responsibility towards the natural environment. To carry out integrated science learning, a student book is needed for that [1].

There have been many attempts that have been made before to improve the quality of education, including through improving the curriculum, increasing teacher competency, and improving facilities and infrastructure. One of the ways to make it necessary is supporting facilities and infrastructure, namely integrated science textbooks that are in accordance with the characteristics of the learning to be carried out, but integrated science textbooks that are used are not fully integrated, where there is still a separation between biological, physical and chemical material overcome this problem has been developed integrated learning book, but the results have not been as expected. Student learning outcomes
are still low. This is because the handbooks of students still do not present science materials in an integrated manner so that students have difficulty in understanding the integration of material.

As is well known, one of the learning resources is a textbook. Textbooks are a set of materials that are arranged systematically, both written and unwritten so as to create an environment or atmosphere that allows students to learn. The function of textbooks is that students can learn without a teacher or friend, study anytime and anywhere, can learn according to their respective speeds. In addition the textbook serves as a guideline for students who will direct the activities of students, for students to function as guides that will direct in the learning process, and can also be used as an evaluation tool for achieving competency of students [2].

One effort to overcome the problem above is the use of Sequenced Model Integrated IPA Textbooks with the theme of the adaptation system of the human body at temperature. This textbook has been tested for its validity and practicality with a very good category. This article describes the influence of integrated science textbooks Sequenced Model with the theme of the human body's adaptation system to the temperature of student learning outcomes.

2. Methods
The type of research is quasi experiment. The research design used was Posttest Only Control Group Design. The sample of this study was students of SMP 8 Padang, West Sumatra, class VII. The study used experimental and control classes. The learning experimental class uses textbooks with the theme of a system of adaptation of the human body to temperature and a control class that uses textbooks commonly used in schools. While the dependent variable in this study is student learning outcomes which include cognitive assessment (knowledge). The control variables of this study were students’ initial abilities, number of lesson hours, subject matter, teacher teaching, and final test instruments.

2.1. Data Collection Technique
The technique of collecting data on knowledge competencies was taken in the form of a written test at the end of learning. The research instrument was adjusted to the research variables, data to be taken, and testers' statistics in the study. The instrument used in this study is knowledge competencies using multiple choice written tests that refer to indicators of competency achievement. This study uses two data variables, namely data relating to IPA textbooks integrated with the human body adaptation system at body temperature (variable X) and with regard to student competence (Y).

2.2. Data Analysis Techniques
Data analysis technical used is descriptive, requirements analysis test, simple linear regression analysis requirements, and product moment correlation tests. Simple requirements for linear regression analysis techniques to determine the relationship between problem-oriented teaching materials and the results of student posttest, then equation (1) is used.

\[ \hat{Y} = a + bX \]  

Where, X: the results of working on problem-oriented teaching materials, Y: student final test results, a: intercept, a constant number which means the average price of the variable Y when the variable X = 0, and b: regression direction coefficient which is a number that states the magnitude of the change in variable Y if X changes to one unit.

Product moment correlation test uses equation (2) to find out how closely the relationship between two variables.

\[ r_{xy} = \frac{n \Sigma x_i y_i - (\Sigma x_i)(\Sigma y_i)}{\sqrt{n \Sigma x_i^2 - (\Sigma x_i)^2}(n \Sigma y_i^2 - (\Sigma y_i)^2)} \]  

Correlation coefficient shows degree closeness of the relationship between variables X and Y. To test the correlation of the variable X with Y then do t test. In this study the t test was conducted to
find out the significance of the relationship between kompetensi knowledge of students with the value of assignments knowledge contained in science teaching books integrated theme of digestive health. then a significant test is carried out using equation (3).

\[ t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \]  

(3)

3. Results and Discussion

Posttest results are given, data distribution is obtained as shown in table 1.

| Interval value | Experimental | Control |
|----------------|--------------|---------|
|                | Σ   | %    | Σ   | %    |
| 60-75          | 7   | 21.875 | 19  | 59.375 |
| 76-95          | 25  | 78.125 | 13  | 40.625 |
| Sum            | 32  | 100   | 32  | 100   |

Table 1 indicates that the posttest value of the experimental class with a value of 60-75 is 7 students while in the control class is 19 students. Furthermore, the posttest value of the experimental class in the range 76-95 is as many as 25 students while in the control class there are 13 students. This shows the value in the experimental class is better than in the control class.

Based on student learning outcomes data, the calculation of the average score (\(X\)), standard balance (S), and Variance (S²) was calculated from the two sample classes. The values of descriptive statistic parameters can be seen in table 2.

| Classes       | N  | Min | Max  | \(\bar{X}\) | S  | S²  |
|---------------|----|-----|------|-------------|----|-----|
| Experimental  | 32 | 65  | 95   | 82.9        | 8.3| 69.1|
| Control       | 32 | 60  | 90   | 74.6        | 8.6| 74.1|

Table 2 it appears that the average value of students in the experimental class is higher than the control class. Where in the experimental class the average value of students is 82.969, while in the control class the average value of students is 74.6875. The standard deviation value of the experimental class is smaller than the control class, meaning that the competency of knowledge in the experimental class is more evenly compared to the control class. Furthermore, the variance value of the experimental class is smaller than the control class, meaning that the competency knowledge of the control class is more diverse than the experimental class.

Data analysis of differences in knowledge competencies. Testing the differences in knowledge competencies possessed by students can be done through a comparison of two averages. The two comparison comparison tests were carried out after the normality test and the second homogeneity test of the sample class were fulfilled.

The results of the normality test that has been carried out obtained the price of Lo and Lt at the real level (\(\alpha\)) of 0.05, it is known that data in the experimental class and data in the control class are normally distributed. The homogeneity test is carried out by comparing the value of \(F\) count with \(F\) table in the 31st numerator and the 31st mention. Based on the calculation results obtained \(Fc\)ount of 0.965914 while \(F\) table is 1.822 at the significant level of 0.05. This shows that \(Fh < F (0.05) (31:31)\) in other words both data have homogeneous variance.
Next to test the research hypothesis, the t-test is used. Calculation of hypothesis testing is presented in table 3.

**Table 3. Final test results for experimental and control classes**

| Classes     | n  | \( \bar{X} \) | \( S^2 \) | S  | \( t_b \) | \( t_t \) |
|-------------|----|---------------|---------|----|-----------|-----------|
| Experimental| 32 | 82.9          | 69.1    | 8.46| 3.91      | 2.00      |

Table 3 shows that \( t_{count} = 3.914 \) while \( t_{table} = 2.00 \) with the testing criteria accept \( H_0 \) if \( t_2 \leq t_b \) and tolah \( H_0 \) if it has a significant level of 0.05 and the degree of freedom \( d_k = (n_1 + n_2) -2 \). Based on the results of calculations using a significant level of 0.05 it was found that the price of \( t_{count} \) was in the rejection area of \( H_0 \). So that it can be concluded that the average final test in the experimental class is higher than the control class. So the working hypothesis \( H_i \) there is "the effect that means the application of the Integrated Science book with the theme of the human body’s adaptation system to the temperature of the learning outcomes of students" can be accepted at a significant level of 0.05.

Simple linear regression test serves to determine the extent to which the relationship between the independent variables and the dependent variable. Linear regression test was carried out after it was proven that there was an increase in the results of the experimental class posttest after being given treatment. Based on the scatter diagram, it is found that the relationship between the independent variable and the dependent variable is linear. Where the high value of the posttest of the experimental class students is followed by the high results of the work of the students the theme of the system is the adaptation of the human body to temperature. The simple linear regression model obtained for student learning outcomes in the competency of knowledge and the task value of knowledge of integrated science teaching materials the theme of the system of adaptation of the human body to temperature is as follows:

\[
\hat{Y} = -21.64 + 1.14X
\]

After the analysis, to make sense is obtained \( F_h \) value of 24.30. While the \( F_t \) value is 4.17. The significance test requirement is \( F_h > F_t \). so it can be seen that the regression coefficient means. For the linearity test obtained \( F_h \) of -0.99. While the \( F_t \) value is 2.40. The linearity test requirement is \( F_h < F_t \). the conclusion of the data is linear regression. Thus it can be interpreted that there is a meaningful relationship between the competency of knowledge and the tasks contained in the Integrated Science Student Book. The model is sequenced to the theme of the adaptation system of the human body at temperature.

From the results of the analysis obtained \( r \) value of 0.668. After referring to the table of interpretation of the correlation coefficient, it is known that the relationship between knowledge competencies and task values in the Integrated Science Student Book has a strong level of relationship. From the results of hypothesis testing, the value of \( th \) is 4.929 and \( tt \) is 2.042. These results indicate that the value of \( th \) is greater than the value of \( tt \). based on these data it can be stated that \( H_0 \) was rejected and \( H_i \) was accepted. Based on the results of hypothesis testing it can be stated that there is a meaningful relationship between the competency of students’ knowledge and the value of the assignments contained in the Integrated Science student book.

Based on the results of the data analysis, the determinant coefficient is 44.753%. This shows that the use of the Integrated Science Student Book sequenced model, the theme of the adaptation system of the human body at the temperature contributed to the knowledge competency of 44.753% and the remaining 55.297% was influenced by other factors.

On the aspect of knowledge, the results of hypothesis testing on knowledge competency indicate that the use of sequenced science materials in the sequenced model of the theme of the adaptation system of the human body at a temperature has a significant influence on the knowledge aspects of VII grade students of SMP 8 Padang. Because from the first to the last meeting the students showed high enthusiasm and motivation and there was a change in the attitude of the students in learning by using
science textbooks. Product Moment correlation test results can be expressed the relationship between aspects of knowledge with the values of knowledge tasks contained in Integrated Science Teaching Materials. The sequenced model of the system of adaptation to the human body at temperature has a strong level of relationship. Relevant to the research on the effectiveness of Integrated Science Teaching Materials on high-level thinking skills of junior high school students with the aim of testing the effectiveness of integrated science teaching materials for junior high schools, specifically the theme of household wastewater [3][4]. The results of the study are that there are differences in high-level thinking skills in junior high school students who use Integrated Science teaching materials with junior high school students who use separate science teaching material studies, and integrated IPA teaching is effective to improve students' high-level thinking skills. The effectiveness of learning depends a lot on the readiness and manner of learning carried out by the students themselves, both those carried out independently and in groups [5][6].

Based on the results of data analysis from the aspect of knowledge it can be stated that the use of Integrated IPA textbooks The sequenced model of the theme of the adaptation of the human body at temperature gives an effect which influences the learning outcomes of class VII students of SMP 8 Padang. This integrated science lesson textbook is suitable for use by teachers in schools to demonstrate Integrated Science learning so that it can improve student learning outcomes.

The purpose of using Integrated Science textbooks is the systemic theme of human body adaptation to temperature is a forum for students to achieve holistic and meaningful science learning goals. Holistic and meaningful learning processes are supported by good facilities. Supporting facilities can be in the form of: laboratory, lesson support book, internat. Integrated learning requires reading material or a large and varied source of information. These sources will support and enrich insight. Learning also requires adequate means so students can learn calmly [7]. If the facilities are not met, the application of integrated learning will be hampered [8].

4. Summary
Use of the integrated science learning textbook the sequenced model of the theme of the adaptation of the human body at temperature, the average value of the results of the posttest experimental class was 82.969, higher than the control class with an average score of Posttest obtained 74.6875. The t-test results obtained by learning outcomes have $t_{count} > t_{table}$, which means the difference in the ability of the experimental class students and the control class is significant at a significant level of 0.05. The results of the correlation aspect analysis of knowledge obtained a correlation coefficient of 0.6689 with a strong level of relationship category. This acquisition states that there is a significant influence in the use of the sequenced science book. The sequenced model of the human body adaptation system at a temperature of 44.753% and the remaining 55.274% is influenced by other factors.

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