

The Analysis of Instructional Process through Scientific Approach on Science Subject Matter and Its Effects toward Learning Achievement

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Abstract

This study aim to describe the implementation of a scientific approach in the learning process and know the differences learning outcomes of science in terms of the levels scientific learning process in grade V at SD Negeri 1 Semarang Tengah. This study was descriptive and inferential, the study population was a learning process in grade V SD Negeri 1 Semarang Tengah. Samples were taken by eksidental sampling because researchers use science learning process ongoing research in class V SD Negeri 1 Semarang Tengah is Theme 9 "Environment Our Friends". Data collection methods used were observation, test, and kuesioner. Data collected using an objective test instruments, questionnaires and guidelines for observation and then analyzed using descriptive statistical analysis and inferential statistics (t-test). The study found that the levels scientific learning process science of classr VB obtain an average score of 62 which included a high category and class VC obtain an average score of 47 which included medium category. There are differences in outcomes between students learn science class VB and VC classes. ($T = 10.379$ and $p = 0.000$). Because the p-value less than $\alpha = 0.05$, which means that H_0 is rejected can thus be interpreted that there are significant differences between students' learning outcomes science VB and VC classes are taught using a scientific approach. Of the average score obtained, VB class gained an average score of 151.62 which is at a very high category. While the average score obtained VC class is 126.72 which is at a high category.

Keywords: scientific approach, learning outcomes Science

Introduction

Science is the human attempt to acquire knowledge systematically to understand the universe through the right observation and procedure so that a right conclusion could be made about the universe. Science is a knowledge and experience of human which is dynamic and always developing (Trianto, 2010).

Science education would give space for students to learn about their selves, the nature around them, and further development in implementing it in their daily life. The process of science education emphasize in giving direct experience to develop their competence so that they could explore and understand their surrounding nature naturally. Because of that, Science education is one of the tools to achieve education purpose. Because Science is closely related to the way how to know nature systematically, so Science not only about mastering a mass of knowledge in form of facts, concepts, and principles but also the process to find it.

In the implementation of Science education in elementary school, it is needed to be done in the basic and real form. Besides that, in this level student learn to relate new concepts with the old concepts. Based on this experience, students form new concepts about number, space, time, body function, gender, moral, and so on. For elementary school students, teacher explanation about the material would be easier to be understood if the students did it individually.

Basic Science education could give significant contribution to all of the learning process which happened to students. In the elementary school, Science education needs to open a chance to invoke the curiosity of the students scientifically. This is because elementary school students basically, in their daily life always facing with nature which is the

object of science education. This could help them develop their ability of asking question, basic thinking, or critical thinking of students. As the implication, in the education process in school, learning process need to be done interactively, inspirationally, fun, challenging, and motivating for the student in their learning, so that students could study well and could master the knowledge maximally in tune with the competency which came from the curriculum.

From the statements above, the quality of education is very important especially in an elementary school. It could be seen from the result of study of the students. Result of study is a result which someone or students get after participating in a learning process on a period of time. Result of study is very important for the learning process in school, because from the result of study of the students, it would show the quality of the learning process whether it's already run well or not. Next, good or bad result of the study which student got would affect the education quality of a country.

But In the actual implementation, Science education in elementary school still focus on product with the activity is dominated by teacher. The involvement of students in the learning process was still limited to acquiring material through the lecturing method. In the learning process, students were passive and waiting for information, note, or question from the teacher. Science education generally was still acknowledged as a hard subject from some students. There were a lot of students who got low score or couldn't achieve the expected condition.

Besides of that, based on the result of survey from The Program for International Student Assessment (PISA) in 2012, they reported that in Science, Indonesian students was in the 64th place from 65 countries with an average score 382 which was below Malaysia which had an average score of 420, Thailand with average score of 444, and Singapore with an average score of 551. The first place was occupied by students from Shanghai China with an average score 580 (Gading, 2014:2). Report of that survey, besides showing that the quality of education in Indonesia was still low especially in Science subject, it also showed that education process still did not run properly.

In improving the result of students study, especially the result of science, government did improvement of the curriculum. After the Kurikulum tingkat satuan pendidikan (KTSP), government then improved it again with 2013 curriculum. 2013 curriculum emphasized more on competence with the competence of attitude, skill, and knowledge as the base. 2013 curriculum demand the teacher ability to be knowledgeable and passionate to seek for more knowledge because the students nowadays was easier to find information freely through the development of technology and information. On the other hand, student was more demanded to have responsibilities to their environment, interpersonal skill, personal skill or critical thinking skill.

In the 2013 curriculum, learning process is using the scientific approach. Learning process using scientific approach is a learning process which is designed so that students is active in constructing concept, law, or principle through observation, formulating problems, presenting or formulating hypothesis, gathering data, and using a lot of technique of analyzing data, making conclusion, and communicating concept, or principle that had been found (Kurniasih and Sani, 2014).

Using scientific approach could improve the scientific thinking ability of students. Scientific approach could be said to be learning process which guide students to solve problems through good planning, throughout of gathering data, careful analyzing activity to produce a conclusion. Scientific approach learning process was a learning process that demanded student to think systematically and critically in an effort to solve problem which the answer was hard to see. Based on those statements, this approach would involve students in a complex problem solving activity through brainstorming, creative thinking, doing research activity, and making concept of a knowledge. Scientific approach had a close

relation with Science education because scientific approach process really affect the students activity especially in the aspect of observation, questioning, reasoning, trying something, making conclusion, and communicating. Because of that, scientific approach affect the improvement of the student study result.

Some past research result about the learning process with the scientific approach or other approach which was not so different with the scientific approach and the relation with result of student study were done by Putrawan (2014) which stated that with scientific approach and the help of Geogebra had showed that the math learning media which was developed was valid and could improve the student study activity. Marjan (2014) stated that learning process with the scientific approach was better than direct approach in improving the study result and skill of Science subject.

Based on the theory and finding of past research, it could be concluded that conceptually the implementation of scientific approach in the learning process could improve the learning process quality, because in the learning process with the scientific approach, students constructed concept, law, or principle through observation, formulating problems, presenting or formulating hypothesis, collecting data with many techniques, analyzing data, making conclusion, and communicating concept, law, or principle which had been found. And at the end, it would improve the study result of the students and quality of education in general.

All of the above was still in the form of opinion or theoretical, it still needs to be proven in the empirical sense. Based on the interview with the teacher of fifth grade in elementary school at SD Negeri 1 Semarang Tengah, teacher stated that they still had problems in the implementation of 2013 curriculum especially in the learning process and writing the student report.

To know the learning process of using the scientific approach in SD Negeri 1 Semarang Tengah, a research about "*Analisis Proses Pembelajaran dengan Pendekatan Saintifik pada Pembelajaran IPA dan Dampaknya Terhadap Hasil Belajar Siswa Kelas V SD Negeri 1 Semarang Tengah Tahun Pelajaran 2014/2015*" was done. This research had purpose of making conclusion about the effect of the scientific approach for the student study result especially in the science class of the fifth grade.

Research Methods

Looking from the type of data, research approach that was used in this research was descriptive and inferential. The design was basically a description of things related with how the research was done. To answer the first problem, it was done by descriptive research. On the other hand, to answer the second question, it was done by doing inferential research. Descriptive research could be said to be a research which tried to describe a phenomena/accident systematically as it was. Descriptive research was done to get information about the current condition. In the descriptive analysis, there was no control group like in the experimental study because the purpose of the study was to describe it as it was, relating it with variables or condition in certain situation (Dantes, 2012:51). On the other hand, inferential analysis was a statistic which was used to get conclusion based on the acquired data from the sample which then generalized for the population. As that explanation, inferential analysis was an analysis that study about how to get conclusion based on the data from sample which was generalized for the population (Jample, 2005). Choosing this research design was based on the statement of problem which point toward thinking process of "how is the implementation of scientific approach for the fifth grade of SD Negeri 1 Semarang Tengah and whether there is difference in the result of Science study in the learning process from scientific point of view. This research observed the Science learning process with the scientific approach in the fifth grade of SD Negeri 1 Semarang Tengah.

The place to do this research was SD Negeri 1 Semarang Tengah. The population of this research used object population which was the learning process of science subject of the fifth grade in SD Negeri 1 Semarang Tengah. The research sample was chosen using accidental sampling because the researcher was using science subject learning process which was happening in the fifth grade of SD Negeri 1 Semarang Tengah which was Material 9 “*Lingkungan Sahabat Kita*” The research variable is phenomenon or object which was observed which would be researched (Dantes, 2012). This research involved independent and dependent variable. Independent variable is one or two more variables which were studied the effect to the dependent variable (Agung, 2014). The independent variable in this research was learning with the scientific approach. The dependent variable is the variable that depends on the existence or emergence of independent variables (Agung, 2014). As for the dependent variable in this study was the result of student learning in science subjects.

Data collection techniques used in this research was observation, tests and questionnaires. The data collection techniques were done naturally without giving special treatment beforehand. Observations were carried out to obtain a real picture of an event or events to answer research questions. Observation method was used to collect data on the levels of scientific process of learning science by the scientific approach and learning result in the aspect of skills (Core Competence 4). The test was one way to hold an assessment in the form of a task or series of tasks that must be done by a student or group of students so to produce score about the behavior or performance of the students, which can be compared with the score achieved by other students or with the standard score (Nurkancana, 1990). The test method was used to collect data on learning result of science subject on the aspects of knowledge (Core Competence 3). The questionnaire was written questions which need to be answered by the respondent in written form. In this study, a questionnaire instrument was used to collect data on learning result of Science subject in the aspect of spiritual attitude (Core Competence 1) and aspects of social attitudes (Core Competency 2).

In this study, two techniques of analysis would be used, statistical analysis descriptive and inferential analysis. In this study, the data which was obtained was described in accordance with their respective variables of scientific levels of the learning process with the scientific approach and science learning result. To determine the high and low levels of scientific learning process, it was determined based on the criteria of the normal curve which was presented in Table 1, whereas to determine the level of learning result of science students, it used convertible five-point scale according to (koyan, 2012). Method of inferential analysis was used to test the hypothesis was using t-test by (Guilford.JPFrunchter.B, 1973). Prior to hypothesis test the prerequisite test were need to be done: (1) test for normality and homogeneity test.

Tabel 1. Criteria of score interval and category for the level of scientific approach

Normal Curve	Score Interval	Category
$>M_i + 1SD_i$	> 60	High
$M_i - 1SD_i$ s.d. $M_i + 1SD_i$	30 s.d 60	Average
$< M_i - 1SD_i$	<30	Low

(Modified from Gading, 2014)

Finding and Discussion

Finding

Learning process in the gathered data using the observation sheet. Guidelines for observation was conducted over 6 times that consisted of five aspects, where the highest score for every aspect was 3 and the smallest score for every aspect was 0. If converted into a category it would consist of three categories. The results of observation guidelines would be

divided which were score that was relatively high, medium, and low scientific level.

Descriptive analysis result was intended to find the scientific level of the science learning process of SDN 1 Semarang Tengah. Referring to the criteria determining scientific level, science learning process was presented in Table 1. Descriptive analysis result of the scientific levels of science learning process in this study was presented in Table 2 below.

Table 2. The result of descriptive analysis about the scientific level of the science learning process

No.	Class	(Mean)	Category
1	VB	62	High
2	VC	47	Average

Description of learning result of Science described score which was obtained by students who used scientific approach. Data which were analyzed for the science results were obtained from data on the result of aspects of spiritual attitudes (Core Competence 1), social attitudes (Core Competency 2), knowledge (Core Competency 3), and skills (Core Competence 4). Calculation of data was done using a support program which was Microsoft Excel 2007 for Windows. From the calculation for Science study results could be seen in Table 3 below.

Table 3. Descriptive analysis result of science subject

Descriptive analysis	Results	
	Class VB	Class VC
Mean	151.62	126.71
Median	154	124.00
Mode	156	121
Varian	86.09	136.21
Standar	9.28	11.67
Maxim	170	147
Minim	132	95
Range	38	52
N	39	38

Data from Science study result of VB class can be presented in the form of polygons as in Figure 1.

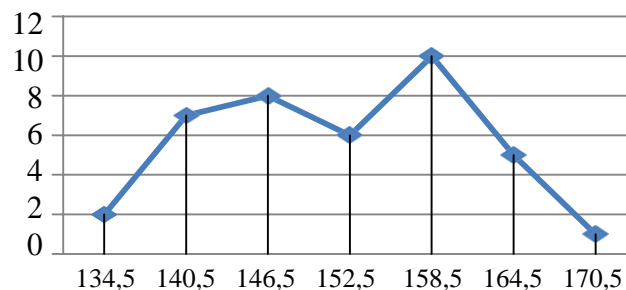


Figure 1. Graph of polygon data for science learning result of VB class

Based on the polygon of figure 1 it could be seen that the mode is greater than the median and the median is greater than the mean ($M_o > M_d > M$). So the graph 1 included a

negative curve which means most scores tend to be higher. To determine the level of learning result of science in students, the average score of students' learning result in Science were converted using the average ideal criteria (Xi) and the standard deviation of the ideal (SDI). From the calculation of Xi and SDI conversion of the obtained results as shown in Table 4

Table 4. Result of science study conversion on science score

Score Interval	Category
142.5 X 180	Very high
$117.5 \leq X < 142.5$	High
$92.5 \leq X < 117.5$	Normal
$67.5 \leq X < 92.5$	Low
$30 \leq X < 67.5$	Very low

(Modified from Koyan, 2012)

Based on the conversion results in Table 4 it showed that the average score of students' learning result in Science in VB class with $M = 151.62$ was classified as very high criteria. Science learning result of VC class could be presented in the form of polygons as shown in Figure 2.

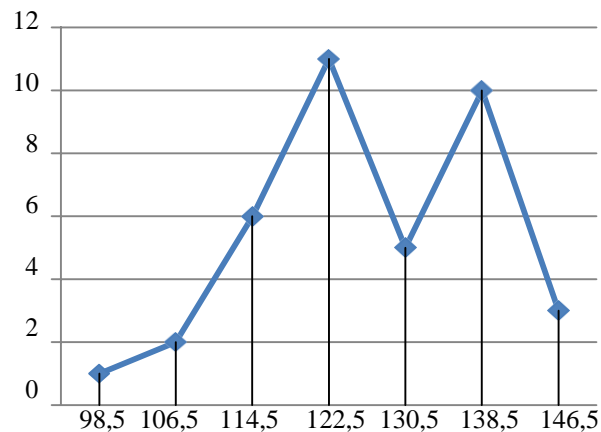


Figure 2. Graph of polygon data of science learning result of VC class.

Based on the above polygons, It was known that the mean was greater than the median and the median was greater than the mode ($M > Md > Mo$). Thus, the curve above was positive squint curve which means most scores tend to be lower. To determine the level of variables of students science study result, the average score of students Science subject were converted using the average ideal criteria (Xi) and the ideal standard deviation (SDI). From the calculation of Xi and SDI, The result of study result conversion was shown in Table 4. Based on the conversion results in Table 4 it showed that the average score of students' Science subject of VC class with $M = 126.71$ was categorized as a relatively high criteria.

Prerequisites Analysis

Technique that was used for data analysis in this research was inferential statistics to test hypotheses of the study. Prior to testing the hypotheses, first, it was needed to do the prerequisite analysis of the data of the research results data. Prerequisites testing for

distribution of data of research result included normality test and homogeneity test. The technique used to test for normality of data was the technique of Kolmogorov-Smirnov using SPSS 16.0 for Windows. To define the data to be in normal distribution, criteria of significance could be used, which was greater than 0.05 (Candiasa, 2011). The results of the analysis of Science learning result of normality could be seen in Table 5.

Table 5. Test of normality of the result of science study

Tests of Normality				
	Kelas	Kolmogorov-Smirnov ^a		Sig.
		Statistic	Df	
Learning Results Science	VB	.114	39	.200*
	VC	.135	38	.078

Based on Table 5 it showed the analysis of Kolmogorov-Smirnov statistic. On the table it can be seen Sig. or score of normality significance for class VB was $p = 0.200$ and for class VC was $p = 0.78$. The significance of both classes exceed $\alpha = 0.05$ and was therefore could be concluded that the data from the result of study of VB and VC class were in normal distribution.

Homogeneity test was also performed with SPSS 16.0 for Windows, with Lavene Statistic techniques. The results of the analysis of the homogeneity of the student study result in Science could be seen in Table 6.

Table 6. Analysis of variance test of homogeneity of science study result

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Learning Result	Based on Mean	2.375	1	75	.128
	Based on Median	1.691	1	75	.197
	Based on Median and with adjusted df	1.691	1	70.763	.198
	Based on trimmed mean	2.418	1	75	.124

Based on Table 6 it could be seen that the result of Science subject of students in VB and VC classes indicated the numbers of significance of Levene Statistic was larger than $\alpha = 0.05$. Thus we could conclude that result of the learning process of VB and VC class were homogeneous. This means that the groups which were analyzed in t-test were homogen.

Inferential Analysis

Inferential analysis in this study was done to test the hypothesis of the differences in Science learning result in terms of scientific levels in the learning process in fifth grade in SDN 1 Semarang Tengah. Hypothesis testing was done by using t-test. The results of the analysis with the help of SPSS 16 program was as presented in Table 7.

Tabel 7. Result of t-test to test hypothesis

Independent Samples Test						
Levene's Test for Equality of Variances		t-test for Equality of Means				
		F	Sig.	t	df	Sig. (2 tailed)
Learning Result Science	Equal variances assumed	2.375	.128	10.379	75	.000
	Equal variances not assumed			10.348	70.550	.000

Based on Table 7 It showed the difference of student learning result in Science in terms of scientific level of the learning process, with value of $t = 10.379$ ($P = 0.000$). Thus it can be interpreted that there were significant differences between student learning result in Science in VB and VC class by using a scientific approach in terms of scientific levels of the learning process.

Discussion

Based on the results of the study, it had been found that scientific levels of the science learning process in VB class was classified as high and in class VC was classified as medium. It was based on the class VB learning process which had taken place in the expected scientific level; this means that all indicators of scientific learning had been running well.

While the learning process in the class VC was still lacking in the aspect of questioning, reasoning, and concluding and in the aspect of observing and communicating were running well. It was because the lack of student motivation. Therefore, it was needed for improvements in all indicators of scientific learning, especially in the aspect of questioning, reasoning, and concluding.

The results were consistent with the theories used that said scientific levels of learning process could improve student learning result so because of that student learning result became more optimal. Theoretically the opinion of (Kurniasih and Sani, 2014) that said scientific approach in study influenced student learning result since it involved skills such as, classifying, measuring, predicting, explaining, and concluding. Also according to (Abidin, 2014) The scientific approach had major components which were: (1) observing, (2) asking, (3) collecting information, (4) associating, (5) communicating. These components in the process prioritized the role of students in learning, meaning that in the learning process students were given the opportunity to construct their own knowledge through the creation of ideas in their mind while teachers are just as mediation for students to help constructing the students' ideas. The scientific approach learning activities linked between concepts that students learned to real life, so it would provide considerable opportunities in the process of learning science which became more meaningful and students would construct their own knowledge through active learning based on prior knowledge that the students had. Therefore, the higher the scientific level of students, the higher the students' learning results.

The results of this study also was supported by the results of previous research which were conducted by several researchers, among others it was conducted by Marjan (2014) which stated that learning with the scientific approach was better than the direct learning model in improving Science learning result and science processing skills. Meanwhile, Putrawan (2014) stated that learning with scientific approach with the help of GeoGebra showed mathematical learning model which was developed was valid and could enhance students' learning activities. Another study, also conducted by Budiarsana (2013) on a fourth grade student stated that there were significant differences which indicated that the learning

model of Pendekatan Keterampilan Proses (PKP) assisted with the help of media Audio Visual gave positive effect on students' learning result in Science compared with conventional learning models.

Conclusion

Based on the results of research and discussion, it can be concluded as follows. Based on the observation of the learning process with the scientific approach in the science learning process in VB class got an average score of 62 and could be categorized as very high, and the highest score obtained in the aspect of observing, questioning, and communicating. While the observation of the learning process using scientific approach in science learning process in class VC got 47 and could be considered as normal or medium.

Based on hypothesis testing, the known value of $t = 9,315$ and the value of t_{cv} with significance level of $5\% = 1.980$. The results of these calculations showed that t_{obs} was greater than the value of t_{cv} ($t_{obs} > t_{cv}$) so it could be concluded that the research results were significant. This means that there were differences in learning result of science based on the scientific levels of the learning process between VB and VC students. Qualifications of the Science learning result for VB students was considered very high while Science learning result for VC students was considered high. Comparison of the results for the calculation of the average result of the science learning process was 151.62 for VB which was greater than the average of VC class which was 126.71.

Suggestions which could be delivered based on the research that had been done were as follows. (1) For the schools, especially elementary school (SD), they should be able to make a scientific approach as one of learning model that could be suggested to other teachers to be applied. (2) Teachers should apply scientific learning approach to improve student learning result. (3) For the students of Elementary School (SD), they should always be actively involved in the learning process so as to improve learning result and acquire new knowledge through experience of self-discovery. (4) The research was conducted at SDN 1 Semarapura Central in Class V. To further improve the accuracy of the results of this study, to those who are interested need to make similar studies involving more samples, wider region and variety of class level.

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