

A Basic Skills Process on the Natural Science Learning Outcomes Viewed from the Ability to Communicate

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Abstract—There are two kinds of process skills, i.e. basic skills and integrated skills. Basic skills are commonly used as a lesson model in junior high school in Indonesia. Basic skills consist of observe, clarify, communicate, measure, predict, and conclude. Basic skill arranges science and technology during lesson. These skills re-built students' intelligences in order. Combining steps of basic skills might help students in developing knowledge and giving opportunity to do a simple natural science research. Moreover, this could improve their learning outcomes and communication.

Keywords—*basic skills, natural science, communicate*

I. INTRODUCTION

Many works points out that natural science learning not only conveys information (facts) and material understanding, but also pays attention to the development of other capabilities namely the ability to use tools and solve problems, even to the development of attitudes, appreciation, and students' interests [1]. The natural science learning emphasizes the students' total involvement to take an active role in the learning processes [2]. The process skills in natural science are crucial for students to foster intelligence, skills, expected attitudes and values [3].

The process skills approach seeks to accentuate students' development, underlying abilities and skills in everyday life particularly in facing a wide range of changes in social life [4]. In learning, teachers should guide learners to discover their own concepts through their own creativity, construct knowledge into their minds by emphasizing the processes rather than the outcomes [5]. The process skills in the junior high school levels are widely applied, i.e., basic process skills to observe, clarify, communicate, measure, predict, and conclude [6].

Communication plays a significant role in learning activities with regard to process skills. Communication is a process of involving two or more people, in which the exchange of information in order to achieve a certain goal [7] is worth considering. The process of communication will determine the success or failure of learning and teaching. To achieve goals is a communication success.

The learning process in schools commonly results in learning outcomes. Learning outcomes are a combination of two words called learning and outcomes [8]. The outcome is

the acquisition or something obtained from hardworking or efforts, while learning is a process of behavioral change resulting from the teacher's influence. Learning outcomes are the achievement of educational goals in learners who follow the learning processes [9].

The result of observation in the school shows that (1) the students are less enthusiastic to learn, (2) the learning is teacher-centered so that the students become less active, (3) the students do not actively ask and answer the teacher's questions, (4) students find it difficult to express opinions when discussing, (5) Students only listen to the teacher's explanation and record what is requested by the teacher so that the students' ability to communicate becomes less developed, and (7) the natural science students' learning outcomes are still below a low passing grade of 75 established by the school, as stated in the following Table I.

TABLE I. AVERAGE SCORES OF NATURAL SCIENCE FINAL TEST IN THE EVEN SEMESTER OF THE 2016/2017 ACADEMIC YEAR

Class	Number of Students	Average Scores
VIII A	34	73
VIII B	34	72
VIII C	34	68
VIII D	34	65

Table I above shows methods and natural science students' learning outcomes. Less effective learning methods can make students active in communicating, but at the same time their learning outcomes fail to reach specified learning targets. With such conditions, it is necessary to improve the learning strategies that will be applied. Learning a natural science is a process to focus on the direct experience through the use of process skills as one of the efforts to improve natural science learning outcomes. As a variable, communication skills need to be presented as a controller approach toward the process skills used.

On this occasion, we are interested in describing (a) natural science students' learning outcomes in SMP Negeri 11, Yogyakarta in the 2016/2017 academic year; (b) a difference between the natural science learning outcomes using a process skills approach and an expository approach in terms of the communication ability, and (c) an influence of

the process skills approach on the natural science students' learning outcomes.

The rest of this paper is organized as follow: Section II describes proposed research method. Section III presents the obtained results and following by discussion in section IV. Finally, Section V concludes this work.

II. PROPOSED METHOD

This is a quasi-experiment or a quasi-research conducted in SMP Negeri 11, Yogyakarta in even semester of the 2016/2017 academic year. This study used three variables, namely (1) independent variable in the form of a process skills approach, (2) dependent variable as the outcomes of natural science learning, and (3) covariate variable (control) pertaining to the communication ability. The design of this research deals with the influence of natural science students' learning outcomes using a process skills approach and an expository approach by controlling communication skills.

The total population of this study is 136 students of class VIII in SMP Negeri 11, Yogyakarta consisting of four classes. The research sample was taken randomly by drawing and involving the class VIII A (as the experimental class) and class VIII B (as the control class). The data collection techniques include (1) a test technique to collect data of natural science students' learning outcomes, (2) a questionnaire technique to collect the data of students' communication ability, and (3) a documentation technique to collect the midterm tests data of natural science subjects, students' list of attendance, and photographs taken at the time of the study. The questionnaire validity and questionnaire were tested by using the Product Moment formula, test instrument reliability of KR-20 formula that obtained $r_{tt} = 0.876$ along with reliable criteria, and reliability of questionnaire instrument tested with that Alpha Cronbach formula that obtained $r_{tt} = 0.848$ along with some reliable criteria.

The descriptive analysis was used to determine the trend of learning outcomes and communication skills through the criteria of five normal curve scales [10]. The test of hypothesis was undertaken by using Covariance Analysis (Anacova) with the help of the Series Program Statistics (SPS) software. The test requirements analysis includes the distribution of normality test using the Chi-Square, test of variant homogeneity and linearity test relationship with the F test.

III. RESULTS

The description of natural science students' learning outcomes using the process skills approach and the expository approach is presented in Table II. By considering the ideal and standard deviation, criteria of natural science students' learning outcomes can be obtained, as shown in Table III.

TABLE II. DATA OF NATURAL SCIENCE LEARNING OUTCOMES

Information	Learning Approach	
	Process Skills Approach	Expository Approach
Highest Score	34	33
Lowest Score	17	16
Average Score	29.21	23.88
Standard Deviation	3.72	4.85

TABLE III. CRITERIA OF NATURAL SCIENCE LEARNING OUTCOMES

Natural Science Students' Scores	Criteria
$26.27 \leq \bar{X} \leq 35.00$	Highest
$20.42 \leq \bar{X} < 26.27$	High
$14.58 \leq \bar{X} < 20.42$	Average
$8.73 \leq \bar{X} < 14.58$	Low
$0.00 \leq \bar{X} < 8.73$	Lowest

The description of students' communication ability using a process skills approach and an expository approach is presented in Table IV. Meanwhile, Table V presents the tendency criteria of students' communication skills.

TABLE IV. STUDENTS' COMMUNICATION ABILITY

Information	Learning Approach	
	Process Skills Approach	Expository Approach
Highest Score	98	88
Lowest Score	69	55
Average Score	78.68	71.76
Standard Deviation	7.07	7.68

TABLE V. CRITERIA OF STUDENTS' COMMUNICATION ABILITY

Scores of Students' Communication Ability	Criteria
$87.75 \leq \bar{X} \leq 108.00$	Highest
$74.25 \leq \bar{X} < 87.75$	High
$60.75 \leq \bar{X} < 74.25$	Average
$47.25 \leq \bar{X} < 60.75$	Low
$27.00 \leq \bar{X} < 47.25$	Lowest

The prerequisite analysis test is the distribution of normality test, variance homogeneity test and linearity test relationship, as obtained in Table VI, Table VII and Table VIII below. Table VI shows that the probability (p) of each variable is greater than 0.05 and it means that all data have been normally distributed. Table VII indicates that the probability value (p) of each variable is greater than 0.05 and it means that the sample of the population is homogeneous. Table VIII shows that the probability value (p) is 0.306 at a significant level of 5% so that $p \geq 0.05$ and the data obtained is linear. From these data, the research results can be continued with the hypothesis testing stage.

TABLE VI. THE DISTRIBUTION OF NORMALITY TEST OUTCOMES

Variables	χ^2	P	Information
Process Skills Approach	6.638	0.249	Normal
Students' Communication Ability	6.136	0.726	Normal
Expository Approach	9.107	0.427	Normal
Students' Communication Ability	5.959	0.744	Normal

TABLE VII. VARIAN HOMOGENEITY TEST OUTCOMES

Variable	F-	P	Information
	Count		
The Process skills approach viewed from students' communication ability	1.695	0.067	Homogeneity
The expository process viewed from students' communication ability	1.178	0.320	Homogeneous

TABLE VIII. THE CORRELATION OF LINEARITY TEST OUTCOMES

Variable	F- count	P	Informa tion
Process Skills Approach and Expository Approach Process Skills Approach and Expository Approach Viewed from Students' Communication Ability	1.0 69	0.3 06	Linear

IV. DISCUSSION

Through the criteria in Table III, the average score of natural science students' learning outcomes using the process skills approach is very high, while the natural science students' learning outcomes using the expository approach are categorized as high. In the process skills approach, students can develop scientific attitude and curiosity that grow internally but naturally. Students directly get involved in using real objects to facilitate an understanding of the subject in that the learning outcomes are obtained well. While in terms of an expository approach, the teacher gives some materials and the students listen carefully, record or summarize the materials, and the rest of students is required to memorize facts or concepts. In this sense, students cannot develop their skills so that the results of their tests are lower than expected.

Data in Table VI and Table VII show that the mean score of students' communication ability and natural science learning using the process skills approach is high, while the natural science learning using an expository approach is in a medium category. As these data evidence, students' communication ability using a process skills approach is higher than that of using the expository approach.

The result of communication ability shows that the class that was taught using a process skills approach got the mean of 78.68 categorized as high. In the natural science learning using the process skills approach, students actively discuss, ask and answer questions so that the ability to communicate can be improved. The ability to communicate with students who were taught using the expository approach shows an average score of 71.76 (in the medium category). This is because the learning activities and the expository approach merely go one way without any reciprocity between the teacher and students. Students cannot participate actively or directly in learning activities so that their communication ability is lower than expected.

The results of Anacova test show the probability value (p) of 0.000. whereas $p \leq 0.01$ so that the hypothesis is accepted (see Table IX).

TABLE IX. ANACOVA TEST RESULTS

Groups	JK	df	RK	F- count	P	Informa tion
Process Skills Approach and Expository Approach Viewed from the Students' Communication Ability	393.8 08	1	393. 808	20. 75 9	0. 0 0	Very Signifi cant

Thus, there is a very significant difference between the learning outcomes of natural science students whose learning uses a process skills approach and learning outcomes of science students whose learning uses an expository approach in terms of the communication ability.

This can happen because learning in a contextual process skills approach can develop a fundamental capability that, in principle, has already existed within students. In solving the problem of science, students can develop 6 skills, namely observing, classifying, predicting, measuring, summing up, and communicating skills. In this learning, students look active during the learning processes. Such learning can improve the learning outcomes of science students and the ability to communicate. Thus, elements of process skills, knowledge, values and attitudes that occur in learning activities interact and influence each other. While at the learning, the process using an expository approach is more teacher-centered (a teacher-centered approach). The material is delivered through a lecture method in which teachers dominate the activities by controlling the flow of learning. Students tend to be required to memorize facts or concepts they conceive. This makes students unable to develop the skills they have. Thus, students' ability to communicate is relatively low resulting in unsatisfactory natural science learning outcomes.

The natural science learning outcomes using a process skills approach have a higher mean score than that of the natural science learning outcomes using an expository approach. There is a positive and highly significant difference between the two approaches. Therefore, the process skills approach has a positive and significant impact on the natural science learning outcomes in terms of the communication ability.

The research result is like Septia's research [11] which concludes that there is a very significant difference between the result of natural science learning of grade VIII students of MTs Negeri Sleman, where learning uses both a process skills approach and an expository approach. The mean scores and grades of natural science students' learning outcomes that use the process skills approach are higher than those using the expository approach. The results of Rahmandani's research [12] also show the relevant meaning, that is, the process skill approach has increased the mathematics students' learning outcomes of SMA Negeri 1 Sigi.

Some of the skills that exist in learning using a process skills approach are applicable in schools, namely; (1) Observation, this activity provides an opportunity for the students to collect relevant information about simple experiments on vibration and wave, (2) Interpretation of observation results, activities undertaken are likely to elicit information through observation, (3) Forecasting, in terms of activities undertaken on this stage, students are asked to predict something that will happen based on the previous information, (4) Assessment is to examine the results of forecasting to ensure the truth of the forecast. (5) Generalization of the findings, in this activity, the students are asked to conclude observations related to the vibration and wave materials, (6) Application, in this activity, the students do the exercise questions related to the material that has been studied. In this activity, the students are given the

opportunity to directly apply their learning outcomes by doing the exercises, (7) Communication, in this activity, the teachers and students conclude materials in the learning activities.

A basic process skills approach consisting of observing, classifying, communicating, measuring, predicting and concluding is a foundation for training in more complex integrated process skills. Process skills need to be trained and developed in the natural science learning. This is because process skills can help students learn to develop minds and give students the opportunity to make discoveries. If a student succeeds in doing something, it will give him or her satisfaction. In addition, it can improve memory and help students learn about natural science concepts.

Having a wide range of advantages, a process skills approach can stimulate curiosity and develop students' scientific attitudes. Students will be active in learning and experiencing their own conceptualizing processes. Students' understanding is more stable and long lasting. Students directly involve in real objects to facilitate their understanding of the subject. Applying this process skills approach can train students to think more critically, to ask questions and engage more actively in learning, encourage them to discover new concepts, and provide opportunities for students to learn to use scientific methods,

V. CONCLUSION

The descriptive research results show that the tendency of students' natural science learning outcomes of class VIII in SMP Negeri 11, Yogyakarta in the 2016/2017 academic year where learning uses the process skills approach obtains average natural science learning outcomes of 29.21 categorized as the highest score and an expository approach obtains average natural science learning outcomes of 23.88 categorized as a high score. The tendency of communication ability of students whose learning uses a process skills approach obtains a mean of 78.68 categorized as a high score and an expository approach obtains a mean 71.76 categorized as a medium score.

Anacova test results obtain that the F -count = 20.579 with $p = 0.000$ because $p \leq 0.01$, and then the hypothesis is accepted, and it is very significant. Comparatively there is a positive and very significant difference between students' natural science learning outcomes of class VIII in SMP Negeri 11, Yogyakarta in the 2016/2017 academic year using a process skills approach and an expository approach in terms of the ability to communicate. The average of natural science students' learning outcomes and the ability to communicate using a process skills approach is higher than those of using the expository approach. There is a positive and very significant effect of a process skills approach on natural science students' learning outcomes of class VIII in SMP Negeri 11, Yogyakarta in the 2016/2017 academic year viewed from the ability to communicate.

ACKNOWLEDGEMENT

We would like to thank Drs. Sukirno, S.H. as the Principal, Komarudin, S.Pd. as a Class VIII Science Teacher, and all students of Class VIII in SMP Negeri 11, Yogyakarta

who are willing to provide opportunities for us to conduct this research. On this occasion, we suggest that a continuous research seeks to outline the effectiveness of a process skills approach on the students' learning outcomes in terms of the ability to communicate and determine the interaction of students' communication skills in each category of learning outcomes.

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