IMPROVING COGNITIVE AND PEDAGOGICAL OF UNDERGRADUATE SCIENCE EDUCATION STUDENTS IN INTEGRATED SCIENCE COURSE THROUGH SIMULATION METHOD

B. Setiawan*

Science Education Department, State University of Surabaya, Indonesia

ABSTRACT

The purpose of this research is then subdivided in to two spesific goal as follows to describe the cognitive competence of students or junior high science teacher candidates reflected in the activities of pretest and posttest on Integrated Science course. Research design using pre-experimental research design to study design one group pretest-posttest design. The conclusions obtained in this study were 1) Observation of simulation activities or pedagogical students each, student obtained score of 1.9 to 2.5 was categorized good.

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INTRODUCTION

Nature of science includes four main elements, namely attitudes, processes, products, and applications. The fourth element is an integral feature of the actual science that can not be separated from one another in term of Natural Sciences (IPA), in accordance with efforts to understand the various natural phenomena systematically. Therefore, the purpose of learning science is not merely collecting knowledge are a must instead achieving various process skills, and fostering scientific attitude. Learning science should also be able to foster creativity (creativity) and give attention to applied science in everyday life (application).

Scientific attitude with regard to curiosity about objects, natural phenomena, living beings, as well as the causal relations give rise to new problems that can be solved through the proper procedure. Scientific processes related to troubleshooting procedures using the scientific method include formulating hypotheses, designing and carrying out the investigation, and analyzing and collecting data, and drawing conclusions. Since product considers knowledge as factual knowledge, procedural, and conceptual knowladge covering principles, laws, and theories. The application relates to the application of the scientific method and science products in everyday life. Creativity in touch with new ideas or ways are unusual in describing and utilizing products science as well problem-solving activities. Hence, learning science should include five fundamentals as explained above.

However, if the observed trend in today's science teaching only science-oriented products, than is indicated by the number of students who study science by way of memorizing concepts, principles, laws, and theories. This situation is exacerbated by learning oriented to test or exam. As a result the dimensions of attitudes, processes, applications, and creativity are explored optimally.

The development in the 21st century is indicate by the use of advanced technologycal in-

*Correspondence Address:
Jl. Ketintang, Surabaya, Jawa Timur 60231
E-mail: beni.dzaky@gmail.com

formation and communication in the entire field. In such, this make changes in qualification and competencies of labour needed for future. According to partnership for 21st century skill, students are determined to be capable of doing critical thingking, problem solving, communicating, and collaborating.

Based on the observation by the researchers doing the implementation integrated science in school science courses, the application of integrated science teaching in the subject of innovative teaching, research observations during a facilitator in USAID priority activities and of course the result of several meetings on the subject of integrated science itself is student difficulties in combining some of the material in the basic competencies using a type of integration and implement integrated learning in teaching and learning activities at the time of the simulation. Before carrying out the simulation course students must create an integrated learning tools including ajarnya material.

Pedagogical capabilities can increase through microteaching / simulation and improve cognitive ability to master the material in Integrated Science with an integrated understanding of the training. In line with the such search Sukaesih, according to Barak and Shakhman (2008), "teachers are frequently puzzled or uncertain about the entire issue of fostering higher order thinking in school. Introducing elements of constructivist pedagogy combined with the specific steps aimed at fostering higher order thinking into the science class is required to make the development of higher order thinking a regular ingredient in science teaching within the current schooling"

Learning can be implemented on an ongoing basis to provide high-level thinking skills in the study of science and pedagogical abilities combined with a high level of learning objectives can develop high-level thinking skills in science teaching.

In accordance with the opinion and previous studies over the cognitive and pedagogical abilities of students could be increased by the students practicing Integrated science learning through simulation.

Based on the above issues, the formulation of the problem focus on "How do cognitive and pedagogical ability possesed by of science education undergraduate program in Education as a prospective teacher in Integrated Science course?".

The purpose of this research is preparing. The general purpose is then subdivided in to two spesific goal as follows: 1) Describe the cognitive competence of students or junior high science teacher candidates reflected in the activities of pretest and posttest on Integrated Science course; 2) Describe the pedagogical competence of students / junior high science teacher candidates reflected from feasibility RPP developed in Integrated Science course.

The benefit of this study is preparing candidates of junior high school science teacher. This research benefits students in term of two areas; as training activities, it improves the way good science teaching and learning implies in accordance with devices have been made and it improves cognitive competence of students / junior high science teacher candidates. Simulation can be used as an alternative method to improve pedagogical and professional students as prospective teachers.

METHOD

The type of this research is experimental with pre-experimental research design to implement an integrated science teaching through learning activities that cognitive and pedagogical mastery of the science students can be increased.

For cognitive abilities or understanding of the material on the Integrated Science research design using pre-experimental research design to study design one group pretest-posttest design.

The test before tratment, after treatment and in between. Thus the results of treatment could be determined more accurately, because it could be compared with the situation before and after treatment. In this design there was only one class used for research. Analysis of these activities was done in the form of between the results of the pretest and posttest.

Based on the research research questions, it can be identified the research variables as follows the student's cognitive ability and pedagogical student ability. The research available were observed and described in this study including: 1) Cognitive ability of students is the ability to master the knowledge of the material Integrated Science; 2) Pedagogical abilities of studentsthe ability to teach a prospective teachers in teaching integrated science; 3) Student results are obtainedly scoring the students who demonstrate the value of integrated science courses. To know the results of student learning achievement test was used.

Students conducted research subjects in Science Education Undergraduate Program S1 of Surabaya State University class of 2011 on Integrated Science course as many as 40 students.

Locations of research conducted in the S-1 Study Program Science Education State University of Surabaya.

Instrument used in thus study include: 1) Observation sheet; observation sheet in this study teacher performance assessment instrument (IPKG) 2 on learning assessment conducted by the teacher in the classroom with modified curriculum in 2013; 2) Test Sheet; Tests sheets used in this study is cognitive ability tests on materials science and the concept of the type of integration in Integrated Science course. Data collection techniques were performed using the following technique; 3) Giving observation sheet; Observation sheet is used to give a score on the activities carried out by students in teaching Integrated Science in simulation activities; and 4) Giving Test Results Learning; Achievement test is based on the learning objectives to be achieved. Tests are carried out after learning activities with the aim to determine the effect of learning that has been followed. During work,without cheating students result are do the test individually and honestly and not cooperate.

The data was analyzed: the student activity during the learning process in the simulation, mastery of learning objectives achieved during the learning process took place towards the understanding of Integrated Sciences and some of the obstacles encountered during the learning activities.

Data obtained by the modified sheet IPKG 2 was analyzed by using descriptive, ie the calculation of scores obtained for each activity observed by the observer. The assessment criteria of simulations carried out by the students are the acquisition of the average value of each phase of the two observers.

Assessmentat the time of the simulation use the criteria and then was sought the average value from the two observers and was converted with learning feasibility criteria as follows.

Table 1. Criteria Average Rating Simulation

Score average	Criteria
0.00 to 1.49	Less
1.50 to 2.49	Enough
2.50 to 3.49	Good
3.50 to 4.00	Very good

(Zohar and Schwartzer, 2005)

Simulation/learning activities is said to be effective if the pedagogical abilities of students has reached at least the category of good or fair.

Test of student understanding of concepts are scored with the following criteria: A value is> 80, the value of B is 66-79, the value of C is 56-65, the value of D is 46-55, and the value of E is 36-45.

RESULTS AND DISCUSSION

Pedagogical understanding of students obtained from the simulation in student activities undertaken individually. The results of the simulation students as many as 40 students can be seen in Figure 1.

In the simulation activities recorded using instruments IPKG 2 modified with curriculum in 2013 showed that students could expand and enhance the pedagogical capabilities such as the ability of mastering concepts, skills, critical thinking skills and making a conclusion / decision reflected in the activities of 5M in 2013 curriculum.

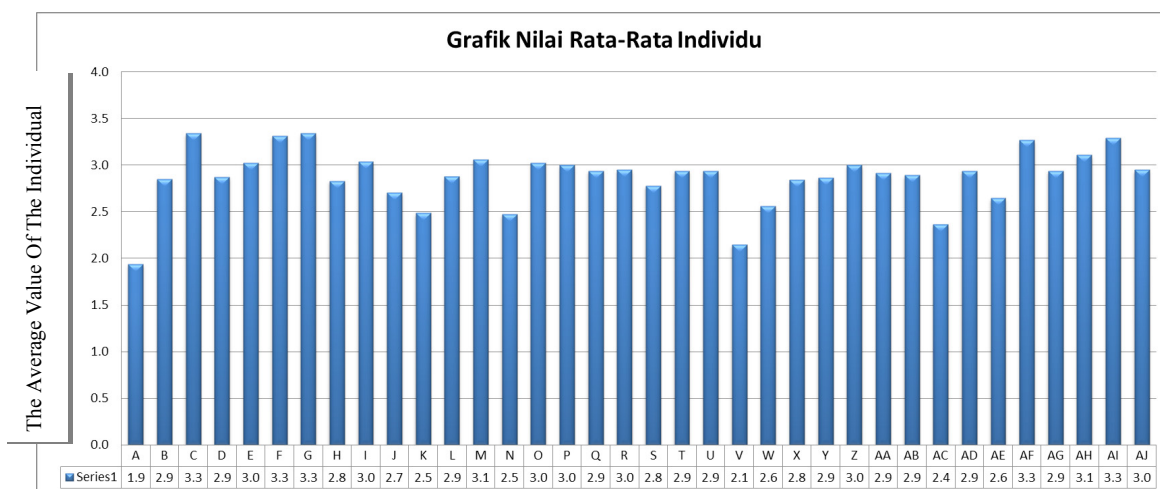Based on the chart above, the lowest score to get is 1.9 to 2.5. this is verified as "enough"

Figure 1. Individual Average Score Graph

for category got by student A and V, while the highest scores of 3.0 to 3.5 which can be categorized as "good" to excellent. The lowest score appears, lack of pedagogical student ability and it implies that they are still lack an understanding of integrated science teaching in addition to the difficulties in integrating the material. Thus the need for continuing teaching practice, is a must and it is supported by several previous studies such as Boesdorfer and Lorsbach (2014) and also Nilsson (2014) that the professional abilities of teachers / prospective science teachers can develop further throughPCK development and classroom practice.This is in line with the research down at which improved their teaching through skill in microteaching.

Average score of all students obtained at 2.9 good categorized so that the simulation / learning activities is said to be effective if the pedagogical abilities of students has reached at least the category of good or fair.

From the results of some research supported by previous research in designing and implementing the science teaching prospective teachers should pay attention to the following matters: 1) considering the students' prior knowledge, 2) viewing learning as a process of transformation that led to the conception of conceptual change in students, 3) engaging students in science activities through trial because of conceptual changes made in hands-on activities and mind-on, 4) paying attention to the social interaction of students in the group discussions.

The value of this pretest is because students already have integrated science materials on subjects previously, school of science courses so that students have started to have a relatively strong base of knowladge. The lowest posttest value was obtained at 65 and the value of the highest posttest obtained as 91. The average score of the N-Gain results show that there is an increase in cognitive aspect in term of knowledge with an average score of 0.52 or middle category, as appeared in the research done by Hake (1998). While the value of students varies from the value of C to the value of A and reinforced by other studies Suharini (2009), with research on the study of pedagogical and prefessional for Geography teachers in senior high school Pati district showed that the Geography teacher pedagogical competence of 0.68 is included in both categories.

There N-Gain shows that there are several student possesed low score. This is because of difference between pretest and posttest values the gap is not too far because the students had never been able to understand and integrated science on a similar course namely science school.

CONCLUSION

The conclusions obtained in this study were 1) Observation of simulation activities or pedagogical students each, student obtained score of 1.9 to 2.5 was categorized good. For the highest score in the score of 3.0 to 3.5 which can be categorized had as good, it was obtained by the students that already understood the material of integrated science but still little difficulty in teaching integrated science. 2) low pretest value obtained in figure 31, while the highest value obtained for 72 and the lowest value obtained for 65 posttest and posttest highest value obtained a value of 91 with an average value of N-Gain 0,52 which are categorized and student cognitive value varies between C to A.

Some suggestions in this study were: 1) to provide a comprehensive understanding of the integrated understanding of science, 2) the allocation of time, considering each student individually simulate that it took a long time, 3) modeling by faculty conducted continuously.

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