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COMPARATIVE STUDY OF INQUIRY LEARNING AND PROBLEM-BASED LEARNING ON THE ACHIEVEMENT OF SCIENCE PROCESS SKILLS AND PROBLEM SOLVING ABILITIES

Dwi Hesty Kristyaningrum, Akhmad Rifa'i
[1] Program Pascasarjana, Universitas Negeri Yogyakarta
Email : dwihestyristyaningrum@gmail.com

Abstrak

Penelitian ini merupakan penelitian eksperimen semu yang menggunakan desain Matching Pretest-Postest Control Group Design. Populasi penelitian ini adalah seluruh peserta didik kelas VII SMP N 15 Yogyakarta yang terdiri dari 10 kelas. Teknik pengambilan sampel yang digunakan pada penelitian ini adalah cluster rundom sampling, sehingga didapatkan 3 kelas sebagai sampel penelitian, yaitu kelas 7A sebagai kelas kontrol, kelas 7B sebagai kelas eksperimeen dengan menggunakan pembelajaran berdasarkan masalah, dan kelas 7C sebagai kelas eksperimen dengan pembelajaran dengan menggunakan pembelajaran inkuiri. Teknik Pengumpulan data yang digunakan adalah teknik tes dan nontes. Teknik tes digunakan untuk mengetahui pencapaian keterampilan proses dan kemampuan pemecahan masalah peserta didik, sedangkan teknik nontes digunakan untuk mengetahui pencapaian keterampilan proses peserta didik. Teknik analisa data yang digunakan adalah uji multivarat yang dilanjutkan dengan uji univariat menggunakan uji t-pihak kanan dengan taraf signifikansi 0,05.
Hasil penelitian ini menunjukkan bahwa terdapat perbedaan antara pembelajaran dengan inkuiri dan pembelajaran berdasarkan masalah pada aspek keterampilan proses dan aspek kemampuan pemecahan masalah peserta didik, tidak terdapat perbedaan antara pembelajaran dengan inkuiri dan pembelajaran berdasarkan masalah pada aspek keterampilan proses, terdapat perbedaan antara pembelajaran dengan inkuiri dan pembelajaran berdasarkan masalah pada aspek pemecahan masalah, pencapaian keterampilan proses peserta didik yang menggunakan pembelajaran inkuiri kurang dari atau sama dengan peserta didik yang belajar denganpembelajaran berdasarkan masalah, pencapaian pemecahan masalah peserta didik yang menggunakan pembelajaran berdasarkan masalah lebih baik dari peserta didik yang belajar dengan pembelajaran inkuiri.

Kata Kunci : Pembelajaran Inkuiri, Pembelajaran Berdasarkan Masalah, Keterampilan Proses sains, Kemampuan Pemecahan Masalah

Abstract

This study is a quasi-experimental study using the Matching Pretest-Postest Control Group Design. The population of this study was all students of class VII of SMP N 15 Yogyakarta consisting of 10 classes. The sampling technique used in this study was cluster rundom sampling, so that 3 classes were obtained as research samples, namely class 7A as the control class, class 7B as the experimental class using problem-based learning, and class 7C as the experimental class with learning using inquiry learning. The data collection techniques used were test and non-test techniques. The test technique was used to determine the achievement of process skills and problem-solving abilities of students, while the non-test technique was used to determine the

achievement of process skills of students. The data analysis technique used was a multivariate test followed by a univariate test using the right-tailed t-test with a significance level of 0.05. The results of this study indicate that there are differences between inquiry-based learning and problem-based learning in terms of process skills and problem-solving ability aspects of students, there are no differences between inquiry-based learning and problem-based learning in terms of process skills, there are differences between inquiry-based learning and problem-based learning in terms of problem-solving aspects, the achievement of process skills of students who use inquiry learning is less than or equal to students who learn with problem-based learning, the achievement of problem-solving of students who use problem-based learning is better than students who learn with inquiry learning.

Keywords: Inquiry Learning, Problem Based Learning, Science Process Skills, Problem Solving Ability

Keywords: Parental Participation, Discipline Attitude

Introduction

The 21st century is identical with the development of Science and Technology (IPTEK) which is very fast so that it has an impact on human life. The results of the open discussion of the professors' council of the Indonesian Education University (UPI) (2013), to face the challenges of the 21st century, education is needed that guarantees the occurrence of a learning process that leads to the empowerment of every Indonesian person to open and use the talents they have as widely as possible, which makes them meaningful people in the 21st century. To welcome the challenges of globalization marked by the Asean Free Labor Area (AFLA) and the Asean Free Trade Area (AFTA) which will soon be implemented in 2015, it is necessary to prepare Human Resources (HR) who are able to compete both cognitively and in soft skills. In facing this, a learning method is needed that can prepare students to be literate in science and technology, able to think logically, critically, creatively, and be able to argue correctly (Puskur, 2007: 5).

The implementation of the current learning process is far from the process standards in the 2013 curriculum, namely that there are still many learning activities that are oriented towards tests/exams so that students learn science only as a product, as is also the case at SMP N 15 Yogyakarta. This is not quite right because the nature of science includes attitudes, processes, products, and applications. The results of interviews with science teachers indicate that science learning with the 2013 curriculum concept has begun to be implemented. However, its implementation is less than optimal because time is quite limited and students still have to get used to the learning process that is new to them. Different from the usual way of learning science by memorizing concepts, laws, and theories. As a result, students' problem-solving abilities are not yet known.

One of the themes for the seventh grade science lesson is the Interaction of Living Things and Their Environment. According to the Ministry of National Education (2013), this material has Core Competencies: Understanding knowledge (factual, conceptual, and procedural) based on curiosity about science, technology, art, culture related to visible phenomena and events. Basic Competencies in this material are describing the interaction between living things and their environment, describing pollution and its impacts, describing the causes of global warming and its impacts on the ecosystem. Based on core competencies and basic competencies, this material has material characteristics that raise many broad and potential problems to be studied further through an investigation. This material also requires students to investigate related phenomena. Students are required to be active in learning that can develop science process skills and problem-solving skills. In addition, this material is "close" to students' daily lives so that students are expected to be able to apply problem-solving skills and science process skills that they gain through direct learning in everyday life, especially those related to the theme of Interaction of Living Things and Their Environment.

The use of inquiry learning and problem-based learning is assumed to help students develop a deep mastery of science and scientific investigation. Both of these learning methods are still relatively new to teachers, so many teachers have not yet implemented them. Some teachers who are familiar with them have not been able to use them optimally because they are constrained by time constraints when associated with the large amount of material that must be taught to students.

Active involvement of students in learning to find their own answers will train students to use their problem-solving skills. This process also provides meaningful experiences for students so that the knowledge gained is expected to last a long time. The process of finding answers and solving problems using scientific methods in both of these learning methods will train students to use their science process skills so that students' science process skills can be improved. With the use of both varied learning methods, it is hoped that it will be possible to determine the differences in the achievement of science process skills and students' mastery of concepts using inquiry learning and problem-based learning.

Methods

This type of research is quasi-experimental research. The experimental design of this research uses a modification of the Matching Pretest-Postest Control Group Design. This research was conducted at SMP Negeri 15 Yogyakarta Jl Tegal Lempuyangan no 61 Yogyakarta, class VII, odd semester, academic year 2013/2014. This research was conducted in April 2014, the implementation time in the research design can be seen in Table 4 which was conducted in the odd semester of the academic year 2013/2014. The

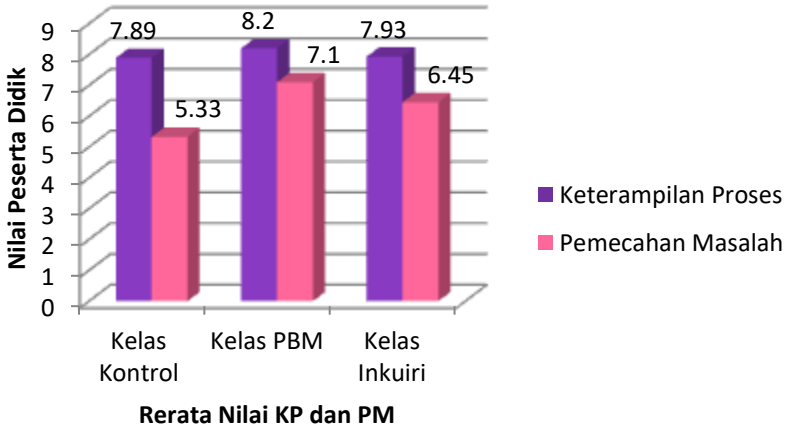
population used in this study were all students of class VII of SMP Negeri 15 Yogyakarta in the academic year 2013/2014 consisting of 6 classes. The sampling technique used in this study was by drawing lots. The drawing resulted in class 7A as the control class with 34 students, class 7B as a class with problem-based learning with 36 students, and class 7C as a class with problem-based learning with 34 students. The total number of samples in this study was 104 students. Hypothesis testing in this study used Manova and right-sided t-test. Data analysis was performed using SPSS 16 for Windows software.

Result and Discussion

Learning in this study was carried out for 4 meetings each. From the results of the implementation of learning in the problem-based learning class for 3 meetings, it can be implemented with 100% implementation, while in the fourth meeting it was only implemented 93%. This is because in the last meeting students were no longer given assignments. In inquiry learning, there was one meeting that was only implemented 86%. This was due to the transfer of classes with insufficient number of seats for the number of students, making the atmosphere not conducive and there were 2 learning steps at the end that were not implemented. Meanwhile, from the response to the implementation of learning, students who used problem-based learning gave a better response than students who used inquiry learning.

This study aims to determine whether there are differences and compare which is better between inquiry-based learning and problem-based learning in terms of process skills and problem solving. In addition, it also tests the strength of the relationship between process skills and problem solving. The results of the hypothesis testing are as follows :

1. There are differences in the achievement of process skills and problem-solving abilities of students with PBM and PI.
   The results of the study and the results of the hypothesis test with MANOVA using SPSS 16 for Windows software showed that there were significant differences in the aspects of process skills and problem-solving abilities of students with problem-based learning and inquiry learning. The average posttest score for the process skills aspect of the class with problem-based learning was 8.20 and the inquiry learning class was 7.93. While for problem solving in the class with problem-based learning was 7.10 and the class with inquiry learning was 6.45. In the control class, the process skills score was 7.89 and problem solving was 5.33.



Average value of process skills and problem solving

the average process skills of students from both experimental classes are almost the same but still different with a difference of 0.27, as well as the control class which is only slightly different. If we compare the three classes, the control class has the lowest average process skills. The problem-solving ability of students with problem-based learning is higher with a difference of 0.65 from the class with inquiry learning. This is also in accordance with the results of a review by Orguz-Uver (2011: 307) which resulted in the conclusion that "the two methods which seem to be very similar and frequently confused with each other are different in many aspects" namely two methods (inquiry learning and problem-based learning) which seem similar and often confuse each other are actually different in many aspects.

2. There is no difference between inquiry-based learning and PBM in students' achievement of science process skills.

Science process skills are defined as skills applied to many sciences that reflect the behavior of scientists. These skills provide facilities for learning physical science, ensure active participation of students, develop a sense of responsibility in learning, improve permanent learning, and students also obtain ways and methods of research that ensure they think and behave like scientists. So it is important to apply in science learning

From the results of the hypothesis test of each variable, it was found that there was no difference between learning with inquiry and problem-based learning in achieving process skills. When viewed from the average posttest score, there was a difference but the difference was small. The average posttest score from problem-based learning had a difference of 0.27 greater than inquiry learning and 0.31 greater than the control class, as presented in Figure 4 above. When compared with the pretest, it can be seen that there was a decrease in the value of students' process skills, while in the experimental class there was an increase. This is thought to be due to the selection of teaching methods in the control class that were less appropriate for developing

students' process skills, so that students who initially had students' process skills became untrained.

3. There are differences between inquiry-based learning and PBM in students' problem-solving abilities.

From the results of the average posttest score of problem solving, it shows that the problem-based learning class has the highest average score of 7.1, then the class with inquiry learning of 6.45 and finally the control class of 5.33. The average posttest score in the experimental class shows a significant difference. The class with problem-based learning is higher with a difference of 0.65 with the inquiry learning class.

The results of data analysis with manova show that Ho is rejected or there is a difference between problem-based learning and inquiry learning in the aspect of problem solving.

The problem-solving variable is one of the high order thinking skills just like critical thinking skills. So the results of this study are in accordance with the results of research from Sohibi and Siswanto (2012: 142) which revealed that (a) the problem-based learning model has a better influence than the guided inquiry and expository learning models on students' critical thinking skills at SMA Negeri 1 Comal, Pemalang Regency 2012/2013, (b) the problem-based learning model has a better influence than guided inquiry and expository learning on students' creative thinking skills at SMA Negeri Comal, Pemalang Regency 2012/2013.

The stages of activity in problem-based learning have six phases, namely problem orientation, organizing researchers, independent and group investigations, artifact development, artifact presentation, analyzing and evaluating. Starting from the first phase, students are given orientation to real problems that they often find in everyday life such as ecosystem imbalance, pollution, and global warming. Furthermore, students are asked to find problems in the articles and videos presented. In the second phase, students are directed to work in groups and given directions on the tasks they must complete while working in groups. In the third phase, students in groups analyze problems critically from various perspectives and collect supporting data to solve problems. Problem solving is arranged in the form of artifacts in the fourth phase which will then be presented in the fifth phase and evaluated in the sixth phase.

The advantages of problem-based learning over inquiry learning in achieving students' problem-solving abilities are in the problem-based learning steps, with problem-solving stages that include understanding the problem, planning problem solving, implementing the plan, evaluating the results. The problem-understanding stage is integrated in the problem orientation phase, the problem planning stage is integrated with the independent and group investigation phase and artifact development, the plan implementation stage is integrated with the artifact presentation phase, and the result evaluation stage is integrated with the analyzing and evaluating

phase. In addition, the essence of problem-based learning is learning from real problems as defined by Arends (2008: 41) that problem-based learning has the essence of presenting various authentic and meaningful problematic situations to students, which can function as a stepping stone for investigation and inquiry. Problem solving in problem-based learning has become a goal that must be achieved, so that students are required and trained to use their problem-solving abilities continuously which can improve students' problem-solving abilities.

The difference in the achievement of posttest problem-solving ability of students who learn with problem-based learning and inquiry learning is then further tested with the right-sided t-test to find out whether students who learn with problem-based learning are better than students who learn with inquiry learning. The test results with the help of SPSS 16 software provide information that the problem solving of students who use problem-based learning is better than inquiry learning. Judging from the posttest scores of each dimension of problem-solving ability, there are differences in all posttest achievement scores of each dimension of problem solving. In problem-based learning, it is better in the dimensions of planning problem solving, implementing plans, and evaluating solutions. In inquiry learning excels in the dimension of understanding problems.

Conclusion

Based on the results of the research and discussion that has been done, it can be concluded that There is a difference between inquiry-based learning and problem-based learning in achieving process skills and problem-solving abilities of students. There is no difference between inquiry-based learning and problem-based learning in achieving science process skills of students. There is a difference between inquiry-based learning and problem-based learning in students' problem-solving abilities, namely the achievement of problem solving of students who learn with inquiry learning is better than students who learn with problem-based learning. There is a unidirectional correlation between process skills and problem-solving variables but its strength is very weak.

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