

Application Of Model Problem Based Learning (PBL) With Creative Problem Solving (CPS) In Arithmetic Sequence And Series

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Abstract

Learning model of Problem Based Learning (PBL) having problem as main focus. Problem solving in PBL can hone students' creativity in finding alternative settlement. In learning, a method can hone students' creativity in finding alternative of settlement is Creative Problem Solving (CPS). The combination of the model of Problem Based Learning (PBL) by the method of Creative Problem Solving (CPS) makes a study that focuses on a problem and led to various alternative settlement as a form of student creativity. This study includes a descriptive study. The data obtained in the form of learning management, student activities, student learning outcomes and student responses to the model of Problem Based Learning (PBL) by the method of Creative Problem Solving (CPS). These subjects include teacher educators and science students of class X SMA Negeri 2 Mojokerto semester academic year 2013/1014. Of the 34 students who take learning, four students were randomly selected as subjects of student activity observation. The results showed: (1) learning management can be categorized as very good overall; (2) the activity of the students during the learning can be categorized effectively; (3) mastery learning outcomes of students in aspects of knowledge by 85.29%, on the skills aspect of 83.35%, and 88.24% in the aspect of attitude; and (4) the response of students towards learning Problem Based Learning (PBL) by the method of Creative Problem Solving (CPS) is included in good category.

Keywords: Problem Based Learning, Creative Problem Solving

Introduction

Seraffino & Cicchelli (Eggen & Kauchak in, 2012) explains that the problem-based learning is a teaching model that uses a set of issues as a focus for developing problem solving skills, materials and self-regulation. Problem-based learning focuses on solving the problem that aims to develop skills. Another opinion expressed by Arends (in Warsono and Hariyanto, 2012) problem-based learning is a learning model based on constructivism and accommodate student engagement in learning, and engage in problem solving is contextual. This understanding shows that the issue presented in the problem-based learning is a contextual issue. From some of the above model of learning problem-based learning and understanding expressed by Seraffino and Cicchelli and Arends, it can be concluded that the problem-based learning model (Model Problem Based Learning) is a conceptual framework that describes the details of the process and the creation of learning environments that use contextual problems as focus on developing problem-solving skills.

Characteristics of problem-based learning according to Rusman (2012: 232-234) is

1. The problem is the starting point in the study
2. Issues raised are problems that exist in the real world unstructured
3. The problem requires multiple perspectives (multiple perspective)
4. Problems, challenging the knowledge possessed by students, attitudes and competencies that then requires the identification of learning needs and new areas of learning
5. Learning self-direction becomes the main

6. The use of diverse sources of consumer knowledge, and resources evaluation is a process that is effective in PBL (problem based learning)
7. Learning is collaborative, communication, and cooperative
8. Development of the inquiry and problem solving skills are as important as mastery of content knowledge to find solutions of a problem
9. Transparency in the PBL process includes the synthesis and integration of a learning process
10. PBL involves the evaluation and review of student experiences and learning

The following is a table syntax problem based learning model (Arends, 2008: 58)

Stage	Teacher Activity
1. Provide orientation about the problem to discuss the purpose of the lesson the student	Teachers, describes a variety of important logistical needs, and motivate students to engage in activities to overcome the problem
2. Organize students to examine	Teachers help students to define and organize learning tasks related to the problem.
3. Helping independent investigation and the group	Teachers help students to get the right information, carry out experiments, and seek explanation and solutions
4. Developing and presenting works or statements	Teachers helps students plan and prepare appropriate works, such as reports, video recordings, and the models and help them to pass it on to someone else
5. Analyze and evaluate the process of overcoming the problem	Teachers help students to reflect on the investigation and the processes they use

Creative problem solving, consists of three words that is creative, problem and solving. The third meaning of this word, according to Mitchell & Kowalik (1999) is an idea that is creative has an element of newness or uniqueness, at least to the one who creates the solution, and has value and relevancy, the problem is any situation that presents a challenge, an opportunity, or is a concern, solving is devising ways to answer, to meet, or to resolve the problem. In this definition, the definition of protagonist is a new idea or unique, or valuable and relevant solutions, the problem is a situation that presents a challenge, opportunity or concerns and solving is to design a way to answer or to solve problems.

Byron (2006: 3) describes creativity that creativity is the thinking associated with ideas, imagination, inspiration and ingenuity which means that creativity is associated with the idea of thought, imagination, intuition and intellect. Intuition is the ability to understand something without reasoning, while imagination is the power or process of producing mental images and ideas. Creativity is the thinking that is related to the ability, strength, or in the process of understanding something and generate mental images and ideas with or without reasoning.

Creative namely the ability: (a) to create a new combination, based on data, information, or an existing element, (b) based on data or information are available, find many possible solutions to a problem, where the emphasis is on quality, efficiency and diversity answers (c) reflecting fluency, flexibility and originality in thinking and the ability to elaborate an idea (Utami Munandar in Sukmadinata, 2005: 104). In line

expressed Munandar Utami, Sukmadinata (2005: 107) draw conclusions about the definition of a creative person's ability to discover and create new things. So according to researchers is a creative problem solving is designed to approach the problem in a way that is imaginative and result in effective action.

Ratner (1995) suggested some key tricks in the creative problem solving that problem identification, welcome new ideas, explore alternatives as mind maps and matrices, think dimensionally the measure ideas on the line, understand clearly, group brainstorming, people understand, review your goals, try "blinking" your mind in a few minutes, reviews these tools use in any order, take action.

Identify the problem in this case is to understand what information is presented in the problem, and asked what the problem was. Exploring alternative is the search for alternative solutions that can help solve problems such as creating a mind map and matrix. Mind dimension in question is thinking through a variety of viewpoints. The problem faced should be viewed from different angles, in order to produce a variety of information from many viewpoints. If the problem is viewed from a single viewpoint, then the solution of the problem will be single anyway, otherwise if the problem is viewed from multiple points of view so many solutions to problems that are found. Understand clearly have an intention to understand the problems clearly, concerning information related to the problem. To understand the information related to the problems, required sufficient knowledge in order to avoid false assumptions. Group brainstorming creativity meaning is not only derived from the thinking of the people, but the mind set of some person or group. Group brainstorming requires an understanding of other people or called Emotional Quotient (EQ). Emotional intelligence to make students aware of the conditions experienced by other people, so that students can customize the language used to communicate. Reviewing the destination is also required in taking the steps to be taken. If the idea had not yet appeared, it is necessary to empty the mind for a moment. Emptying the mind in the sense of making the mind feel Relax and clear. The use of tools or media serves as a means to realize a simple idea or the visualization of the problem.

Steps (Zaenab, 2013) activities in the CPS method is as follows.

1. Clarification of the problem

Including briefing the students about the problems posed for students to understand about the expected completion

2. Disclosure issues

Students are free to express ideas on a wide variety of problem-solving strategies

3. Evaluation and selection

Each group discusses the opinions or strategies suitable for problem solving

4. Implementation

Students determine the strategies that can be taken to resolve the problem

Method

This research is a descriptive study. This study was conducted from March to April 2014 on the subject of this study were 34 students of class X IPA 3 SMAN 2 Mojokerto. A teacher who acts as an observer, and an associate researcher S1 graduate mathematics education courses that act as observers activities of students when learning takes place. 3 science students of class X is divided into 8 groups studied, with members of each of 4 students. Based on observations with one of the teachers at SMAN 2 Mojokerto, there is no superior class, and the students' abilities in one class is heterogeneous.

This study design uses a one-shot case study, directed the research done to gather data, take the meaning and gain an understanding of a case (Sukmadinata, 2010: 64). The procedure of this study is divided into four stages, namely preparation, execution, data analysis and report generation.

Learning tool in this study is the RPP (Lesson Plan) and LAS (Student Activity Sheet). Research instrument in this study is the validation sheet learning, learning management observation sheet, observation of student activity sheets, student achievement test, attitude assessment observation sheet, observation skills assessment sheet and questionnaire responses of students.

Analysis of the validity of the learning by doing recapitulation, determine the average for each criterion, determining the average each aspect, determining the average total then determines the validity of validity by matching the category average total with the validity criteria were adapted from khabibah (2006) is

$3, 25 \leq RTV \leq 4$: very valid

$2, 5 \leq RTV < 3, 25$: valid

$1, 75 \leq RTV < 2, 5$: less valid

$1 \leq RTV < 1, 75$: invalid

The device is said to meet the criteria of validity if validity category is valid or very valid.

Learning management data analysis by calculating the average of each category of the number of meetings held. Assessment of each criterion by using the 1-4 range, with a value of 1 or less completely, 2-sufficient, 3-good, 4-very good. Data management of learning by teachers analyzed using formulas and criteria adapted from Masriyah(2006),namely:

Limitation value criteria:

value $< 1,50$: very less

$1,50 \leq \text{value} < 2,50$: less

$2,50 \leq \text{value} < 3,50$: good

value $\geq 3,50$: very good

Analysis of the data during the learning activities of students is done by calculating the frequency of observations of each activity students each meeting, calculate the percentage of the frequency of student activity during the discussion as well as to calculate the average percentage of students when discussing the frequency of activity for all meetings. Student activity is said to be effective if the amount of the average percentage of the whole meeting for all student activities, in addition to behaving irrelevant $\geq 75\%$. Student activity is said to be effective if the amount of the average percentage of the whole meeting for all student activities, in addition to behaving irrelevant $< 75\%$.

Student learning outcomes are determined by three aspects, namely the aspects of knowledge, skills and attitudes. Aspect of knowledge is determined by the achievement test, the skills aspect is determined by observation skills assessment sheet. Aspects of attitude is determined by observation sheets attitude assessment.

Achievement test data analysis to convert the student's grades from the scale of 100 to 4 scale, determine the predicate start A through D. The student is said to pass the study of aspects of the knowledge obtained if the value of ≥ 2.66 and vice versa is not complete if the student declared value obtained < 2.66 .

Analysis of the data by converting the skill assessment skill level each meeting be 1-3 scale value, converting each value into a scale 1-4 meeting, finding the average value of all the meetings and determine the predicate. Students are said to be thoroughly studied from the aspect of skill if the value obtained ≥ 2.66 and vice versa is not complete if the student declared value obtained < 2.66 .

Data analysis, the assessment criteria ie by converting the value of attitude becomes 1-3, the average seek setiao meeting, convert average each meeting into 1-4 scale, finding the average of all meetings, determine criteria
 Value $\leq 3.66 \leq 4$, the value of competency attitudes “very good “
 $2.66 \leq \text{value} < 3.66$, the value of competency attitudes “good “
 $1.66 \leq \text{value} < 2.66$, the value of competence attitude “enough”
 $1.00 \leq \text{value} < 1.66$, the value of competency attitudes “less”

Students are said to be complete if it got a score of at least equal to the score of a school KKM implementation of research which refers to Appendix 4 Permendikbud No. 81A in 2013 mentioned that for the aspects of knowledge and skills, said to be complete if the student meets the minimum completeness criteria of 2.66 (on a scale of 1-4). As for the aspect of attitude, said students meet minimum achievement if the student attitude measures included in both categories. Mastery learning is achieved if the percentage of students in the classical mastery learning is $\geq 75\%$. Learning models of PBL with CPS method was successful of aspects of learning if the student has thoroughly studied individually and classical. If not, then the learning model of PBL with the CPS method has not been successful on the aspects of student learning outcomes.

Result and Discussion

Validation activities carried out on March 28, 2014 This activity is done by providing the tools, instruments and sheet validation study to the validator. Advice from the validator is used as the basis of an improvement or revision tools and instruments of learning. Instruments and devices that are validated Lesson Plan (RPP), Student Activity Sheet (LAS) and Test Results Learning. Validator which validate learning device used in this study are as follows.

Number	Validator Name	Profession
1.	Shofan Fiangga, M. Sc	Mathematics lecturer, State University of Surabaya
2.	Nurul Huda, S. Pd	Mathematics teacher, SMA 2 Mojokerto

Based on the results of the validation and by matching the average total RPP validity criteria specified then the Lesson Plan (RPP) Problem Based Learning (PBL) by the method of Creative Problem Solving (CPS) is included in the category of very valid. The validator states that the RPP is made to be used with minor revisions.

Based on the validation and by matching the average total with the validity criteria specified learning the test results of Learning Problem Based Learning (PBL) by the method of Creative Problem Solving (CPS) is included in the category with an average valid validity of 3,22. The validator LAS developed states that can be used with minor revisions.

Based on the results of the validation and by matching the average total with the validity criteria specified learning the Student Activity Sheet (LAS) learning model based Problem Based Learning (PBL) by the method of Creative Problem Solving (CPS) is included in the category with an average valid validity at 3.11. The first

validator states that LAS is made to be used with large revisions. While the second validator states that LAS is made to be used with minor revisions.

Based on observations revealed that the average value of learning management is 3.61. At the first meeting at 3.68 and include criteria very well. In the second meeting, including the learning management criteria very well with an average value of 3.53 learning management. According to result of research it can be concluded that the management of the learning is done with a model of Problem Based Learning (PBL) method Creative Problem Solving (CPS) on the material arithmetic sequence and series, including the criteria very well, with an average value of 3.61.

In general, the management of learning undertaken by teachers include the criteria very well. The values obtained in the teachers' criteria is 3 or 4, however, there are two criteria that have a value of 1 which is the criteria for checking the readiness of students and reflect or make a summary. In the first and second meeting there were 19 criteria for assessment of learning management. At the first meeting of the 19 criteria for teachers to get the value of 4 on 13 criteria and grades 3 to 6 criteria. At the second meeting of the 19 criteria for teachers to get the value of 4 on 14 criteria, the value of 3 on 3 criteria and the value of 1 on 2 criteria.

At the time of the first meeting, a process done after the discussion with a group of students gathered each. When the process of the discussion the teacher (researcher) around the class to give direction on the process of the student problem solving in groups. Various questions were asked of students and diverse alternative solution would also appear to resolve the problem. When a group presentation to the class, seven students expressed an alternative solution.

Second meeting performed after the first meeting. At this meeting, the teacher does not check for the presence of students, not asked about the students and do not remind students to prepare for completeness learn. Thus, the criteria for checking the readiness of students for teachers to get points 1 on the management of learning. Students are still conditioned to remain in the group. Teachers submit the problems at the LAS 2 after the teacher gives apperception, motivation and learning objectives. The teacher then distributes instructional media such as plastic cups (cup of tea). As with the first meeting, when the teacher asked students around a variety of questions and a variety of alternative solution would also appear to resolve the problem. There are four alternative solutions that students raised during the presentation.

Student activities in accordance with indicators that show the application of the PBL with the CPS method is (1) demonstrate an understanding of the problem, (2) organizing the data and choose the relevant information in problem solving, (3) presents a mathematical problem in a variety of forms, (4) choose the approach and methods of solving the problem appropriately, (5) develop problem-solving strategies, (6) create and interpret mathematical models of a problem, (7) resolve non-routine problems, while inappropriate behavior on (8) behaves the not relevant in teaching and learning activities, such as chatting, doing something outside of the learning topic, walking and daydreaming.

At the time of learning the first meeting to be held with both the observation of a group of students consisting of four randomly selected students. This observation made by a friend Unesa S1 graduate mathematics education at each meeting. This observation begins when students discuss in groups to summarize the results of the discussion. Time to observe student activity at the first meeting is 40 minutes. While the time to observe the activities of students in the second meeting is 55 minutes.

Based on research data and by matching the average percentage of the whole meeting for all student activity in addition to behave irrelevant and match with the effectiveness criteria specified in method, the activity of the students during the learning process based model of Problem Based Learning (PBL) by the method of Creative Problem solving (CPS) is included in the effective category with an average of 87.85%.

At the first meeting, observation of student activity lasted for 40 minutes. These observations done during the group discussions held. Each student activity criteria appear with different frequencies. Student activity is the most dominant category (5) which was to develop problem-solving strategies. The most dominant activity of the student because of the issues presented requires students to think kreatif in solving these problems. In general, each group was not satisfied with the solution just so that they continue to try to find another alternative solution that is easy to implement. So that category (5), developing problem-solving strategies got a percentage of 30%.

At the second meeting, observation of student activity carried out for 55 minutes. At the time of the discussion, each student activity criteria appear with different frequencies. As in the first meeting, the student activity is the most dominant category (5). Each group effort to find alternative solutions to problems seen begins with a picture illustrating a special pattern to interpret a sequence of numbers. Spark students' creativity in the idea appears in search solutions of this problem. So the activity develop problem-solving strategies got a percentage of 35.72%.

Time observation of student activity at the first meeting and the second row is 40 minutes and 55 minutes. The difference is based on the observation time duration of the discussion. After the first meeting, a second meeting be continued so that the closing on the first meeting and the second meeting up activity is reduced. With increasing time discussion also increased the percentage of student activity categories. Categories activity increased the percentage of students who are 5, 6, and 8 Category 5 develop problem-solving strategies percentage 35.72%, category 6 make and interpret mathematical models of a problem and 8 behave irrelevant in learning activities percentage 14.29% . Increased activity of developing problem solving strategies generated more strategies that increase the activity of interpreting the mathematical model as well. Increased discussion time was also the trigger for increased student behavior irrelevant. Boredom is possible because of the length of time a discussion arises. So that students do not conduct relevant in teaching and learning activities.

Based on the description above, it is known that the dominant students activities at all meetings, developing problem-solving strategies and increased with increasing time discussions were also three student activities that develop problem-solving strategies, and interpret mathematical models behave irrelevant. Based on data from the average percentage of the whole meeting for all student activities besides behave irrelevant and match with the effectiveness criteria specified in method of the student activity during the learning process based model of Problem Based Learning (PBL) by the method of Creative Problem Solving (CPS) including effective in the category with an average of 87.85%.

Student learning outcomes include three aspects, namely knowledge, skills and attitudes. On the aspects of knowledge is done by giving a written test. On the aspects of the skills and attitudes with observations during the learning process takes place.

Based on data from test scores and student learning outcomes completeness criteria in method which states that a student is said to be complete if the student scores

≥ 2.66 . So there are 29 students who meet the minimum completeness criteria and there are 5 students who do not meet the minimum completeness.

In addition to the minimum completeness of each student, also measured classical completeness. Under method states that mastery learning classical achieved if $\geq 75\%$ of students achieving minimum completeness criteria. Based on the results of the test are known students achieve mastery at a minimum of 85.29%, thus the completeness of classical learning aspect of knowledge is achieved.

Student achievement test conducted at the third meeting and worked individually. In a mastery test this knowledge, there are three issues that must be resolved students. Problems 1 and 2 completed using the existing formula. 3 Problems solved in four different ways by students. Student creativity in solving the problems appeared on problem solving 3.

Based on data from skills assessment and completeness criteria in method which states that a student is said to be complete if the student scores ≥ 2.66 . So there are 27 students who meet the minimum completeness, 6 students who do not meet the minimum completeness criteria and the students are not learning.

In addition to the minimum completeness for each student was measured also classical completeness. Under method states that mastery learning classical achieved if $\geq 75\%$ of students achieving minimum completeness criteria. Based on the assessment *keerampilan* known students who achieve a minimum of 82.35% of completeness thus completeness of classical learning skills aspect is reached.

In the aspect of skill, there are 6 students who do not meet the minimum completeness criteria. This is because when the learning takes place, some students have difficulty in finding alternative solutions to problems. Some students said that the LAS is usually given contains steps to find a solution. Learning that they used to receive the findings guided. That is, learning is done by their new perceived teacher. LAS given loading of the problems that must be solved without any steps in finding solutions.

Based on the data, the assessment results and minimum criteria in method which states that a student is said to be complete if the attitude of the student profile at least be in the good category (B). So there are 30 students or 88.24% of students who meet the minimum criteria, 3 students did not meet the minimum completeness criteria and the students are not learning.

Based on the results of the assessment and Annex IV to Regulation Ministry of Education and Culture No. 81A as described in method, then in class X IPA 3 SMAN 2 Mojokerto there are three students who still need to get active coaching attitude, cooperation and tolerance.

In the aspect of attitude, there are 30 students who meet the minimum criteria, 3 students did not meet the minimum criteria and the students are not learning. When learning takes place, students argue the procedure is set in advance by the teacher partners. Procedures for students argued that (1) a show of hands, after being allowed teachers / moderators (2) student greetings, names, numbers and utter their opinions absent, "Good morning / afternoon, my name is R, the number 23, I want to ask / give suggestion about ... ". In this way, students are orderly in thought. Only a few students were sitting in the back row are often not mempehatikan explanations teacher or friend that presentation. The observation of the attitude assessment shows 3 students did not meet the minimum criteria, so it is necessary to guide the active attitude, cooperation mainly tolerant attitude.

In the first and second statements about student interest in teaching the teachers and their happy feelings during the lesson gets a percentage of 67.63% and 64.71% fall into either category. That is, there is a sense of interest and pleasure in students' learning undertaken by teachers. Students interested and excited in participating in learning because learning is done and new for those teachers who teach any different from the usual.

Lowest percentage appears on the fourth statement which contains the student's motivation during the lesson. In this statement gets a percentage of 58.82% and of 34 students, 7 students are not motivated to learn. In the implementation of this learning, the teacher had tried to arouse the interest of students by providing a learning medium drinks and when students discuss in their groups through the classroom teacher to provide direction and bridge if there is disagreement in the quest for alternative solutions.

The fifth highest percentage in the statement that contains the LAS role in learning and very well in criteria with a percentage of 77.45%. That is, LAS is given to students to help the students in learning. LAS provided contains indicators, material, workmanship and issue instructions. LAS Problems in the problems related to everyday life and are given a problem description without illustrations about. Teachers freeing students to be creative in solving the problem. Given the problems including open ended way. The results of student work in progress LAS 1 is seven different ways and at LAS 2 is four different ways. It can be concluded that the LAS that helps students in learning and honing the students' creativity LAS containing issues relating to the real world and can be resolved with open ended way. Open ended question is how to open the way, that students are free to choose the way that they use in solving problems.

Conclusion

The ability of the teacher to manage learning using problem based learning model with Creative Problem Solving method in materials arithmetic sequence and series 3 class X SMA IPA 2 Mojokerto is very good. Students during the learning activity using the model of Problem Based Learning by Creative Problem Solving method in materials arithmetic sequence and series 3 class X SMA IPA 2 Mojokerto is effective. Student learning outcomes after learning using problem based learning model with Creative Problem Solving method in materials arithmetic sequence and series 3 class X SMA IPA 2 Mojokerto is completeness in the knowledge aspect of 85.29%, the skill aspect of 83.35% and 88.24% in the attitude aspect. Student's response after learning using problem based learning model with Creative Problem Solving method in materials arithmetic sequence and series 3 class X SMA IPA 2 Mojokerto included in both categories.

Suggestion

Because the results of this study learning management dilakaukan categorized very good teacher and lesson plans based on the results of the validation are categorized very valid then learning with problem-based learning models with good problem solving creative methods to be applied

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