International Journal of Scientific Research and Management (IJSRM)
||Volume||5||Issue||08||Pages||6789-6793||2017||
Website: www.ijsrm.in ISSN (e): 2321-3418
Index Copernicus value (2015): 57.47 DOI: 10.18535/ijsrm/v5i8.28

How to Improve Students' Creative Thinking Skills In Learning Prism Nets Through Problem-Based Learning?

Hessy Susanti[1], Hobri[1], Susanto[1]

[1]Mathematics Education Department, University of Jember,
Jember, Indonesia

Abstract:
Creative thinking is one's ability to find several alternative answers. In this research, by using qualitative research methods, students' creative thinking is developed through learning with Problem-based Learning model on the perimeter material of prism nets. The purpose of this study is to improve student creativity. Creative thinking of students is analyzed against student learning outcomes based on predetermined guidelines. In addition, through the implementation of learning this study aims to reduce the formula of the number of perpendicular triangular prism nets with upright sides clustering and circumference; The number of perpendicular rectangular prism nets with upright sides clustering and circumference; and the number of the perpendicular pentagon prism nets with upright sides clumping and perimeter which are then formulated in general by the researcher. The result of this research is the formulation of the number of the perpendicular regular n-facet prism nets with the upright side clumped ie n^2, and the circumferential formula of the perpendicular regular n-facet prism nets with the upright side clumped ie $K_{jn} = 2\ ((2n - 2)a + t)$, $n \geq 3$.

Keywords: *Problem-based Learning*, creativity, the nets of prism.

1. Introduction

The tendency of children to think convergently is to get a definite answer through a certain way in solving problems often forget that there are still many other ways to solve the problem is often called divergent thinking. Divergent thinking is a hallmark of creativity. Creativity is one's ability to find several alternative answers to a problem that is emphasized on quantity, usability and also the diversity of answers [9]. The number of appropriate and problematic answers that arise in a problem indicates a person's high creative ability. Creative thinking is different from critical thinking. Critical thinking is an organized process of reasoning. Thinking divergently or creatively is exploring possibilities for a problem [10]. The creative person according to Guilford [12] has the characteristics of originality, flexibility, fluency, and elaboration.

Prism is one of the geometry material taught in school. The prism is the wake of space constrained by two congruent and parallel facing sides, and the other sides intersecting according to the parallel ribs [1]. The congruent and parallel sides are more commonly known as the base and the top. Based on its upright rib, [11] distinguishes the prism into two, namely the upright prism and the sloping prism. The upright prism is a prism whose ribs are upright perpendicular to the sides of the base and the upper side. The sloped prism is a prism whose ribs are upright not perpendicular to the sides of the base and the upper side. The sloped prism is also called the skewed prism. Based on the base form, there are triangular prisms, rectangular prisms, pentagon prisms, and so on. If the base is irregularly shaped, it is called a regularly arranged prism. The height of the prism is the distance between the sides of the base and the upper side. The cube and the beam can be viewed also as an upright prism, which is a rectangular prism. Each side of the cube or beam can be regarded as the sides of the base or top side, and the ribs perpendicular to the sides of the base and the upper side as the upright ribs. Prism material has been taught from the foundation level, but the discussion of the circumference of the prism nets has not been touched upon in the learning process.

One of the learning models recommended in the 2013 curriculum, is *Problem-based Learning*. *Problem-based Learning* is a learning model that uses real problems as the main focus and as a tool for students to develop skills in solving problems, critical and creative thinking and building new knowledge through open ended solutions. *Problem-based Learning* uses real problems as a trigger of student learning before they know the formal concept [1]. The main purpose is to explore the

creativity of students in thinking and motivating students to continue learning [8]. Students identify relevant information and strategies and conduct investigations to resolve the problem. By solving problems, students acquire and build certain knowledge and also develop critical and creative thinking skills as well as problem-solving skills. Knowledge obtained by students may still be informal, but through the process of knowledge discussion that can be consolidated so that the formal knowledge that is intertwined with the knowledge of previous students.

From the description above, researchers intend to discuss about how to improve students' creative thinking skills in learning prism nets through *Problem-based Learning*?

2. Research Methods

In this research, by using qualitative research method, through learning model of *Problem-based Learning*, creative thinking of student is analyzed to test result of student learning based on determined guidance. Analysis of the students' creativity measurement data is by analyzing each of the *Problem-based Learning* phase on the subject high and low and the results of student learning outcomes. The answer sheet of the student learning outcomes was analyzed to measure his creativity. In addition, through the implementation of the study the researchers also derived the formula of the number of perpendicular triangular prism nets with upright sides clumping and circumferences of perpendicular triangular vertical nets with upright sides clumped together; the number of perpendicular rectangular prism nets with upright sides clustering and circumferences of vertical quadrilateral prisms with upright sides clumped together; and the number of perpendicular pentagon prism nets with the upright sides clustering and the circumference of the perpendicular pentagon prism nets with the sides clumped together. Then the number of continuous vertical nodes of prisms with upright sides clumping and circumference of vertical nodes of straight-faced prisms with upright sides are grouped formulated in general by the researchers.

3. Results and Discussion

Based on the analysis results in each phase of *Problem-based Learning* concluded that the subject of high groups are able to solve every step while the low group through the guidance of teachers able to complete each stage in learning. Here is an analysis of some images of students' creative thinking through the results of work on their Learning Results Test (LRT).

3.1 A description of students' creative thinking on the circumference of perpendicular triangular prism nets

Students have largely not yet used the formula around straight uniformly straightened prism nets, but the concept steps around the perpendicularly straight prism nets are already attached to the students. Students apply the concept around the regularly erected prism nets that have been taught correctly. Student answers are presented in Figure 1.

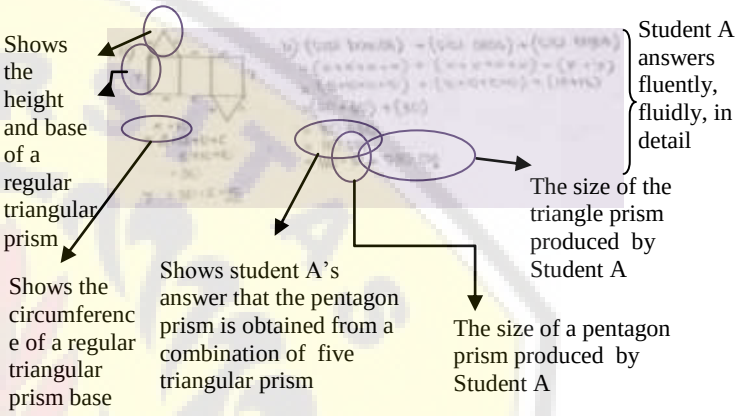


Figure 1: Student answer A about Test no. 1

By figure 1, student A answers no. 1 in a coherent, fluid and smooth manner in searching the circumference of the perpendicular triangular prism nets and the perpendicular pentagon prism and illustrating the triangular regular triangular nets with the upright sides clustered. Student A searches for a high-sized prism first before calculating the circumference of the prism nets and applying the concept around the prism nets that are taught correctly and completely.

3.2 A description of students' creative thinking on the circumference of the rectangular quadrilateral prism nets

All students are working on problem no 2 correctly and correctly. All students describe quadrilateral prism nets with upright sides clustered. The answer of no 2, the student must first calculate the size of the prism ribs by using the concept of the area of the regular rectangular prism. After the size of the ribs is obtained, students can measure the circumference of the perpendicular quadrilateral prism nets. In figure 2 presented student answer on problem no 2.

DOI: 10.18535/ijsrm/v5i8.28

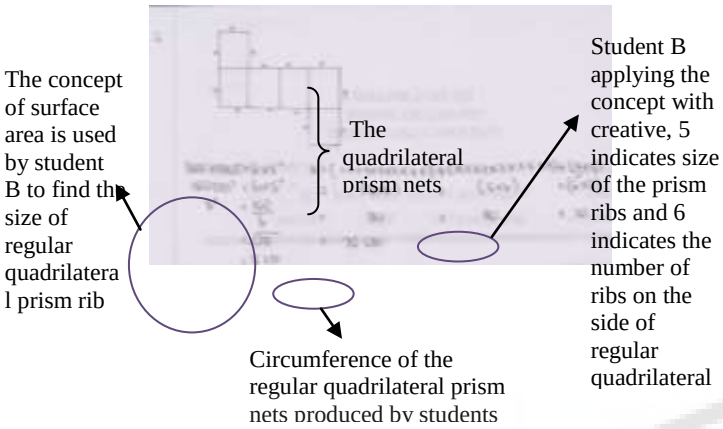


Figure 2: Student answer B about Test no. 2

By figure 2, student B answers the question of no 2 coherently, smoothly and applying the formula around the regular rectangular prism nets. Student B looks for the size of the prism ribs using the prism surface area concept first and then calculates the circumference of the regular quadrilateral prism nets. The quadrangle prismatic mesh image made by student B is a net with side ups clumped together.

Through learning to build a flat side room on the prism using *Problem-based Learning* model of this ability of student creativity can be more increased compared with learning using conventional learning model. This is in line with research conducted [4] that using *Problem-based Learning* can improve students' understanding of conceptual problems. That is reinforced [3] that student learning outcomes can be maximized through *Problem-based Learning*. With *Problem-based Learning* [6] also suggested that students' understanding in the complex can be further enhanced through the involvement of students in learning activities with model of *Problem-based Learning*.

Students through learning geometrical model with the flat side of *Problem-based Learning* has gained a new concept of circumreference of the regular n-facet prism nets upright with straight sides will be clustered. [5] also said that with the initial knowledge that students have, through *Problem-based Learning* can enable new concept information to students. The use of the *Problem-based Learning* model in the student worksheet appears at each phase, beginning with the presentation of the real problem at the beginning of the lesson. The ability of student creativity can be developed by teachers in teaching, especially in the fourth phase and the fifth phase of *Problem-based Learning* models contained in the student worksheet so hopefully will be able to deliver the children to develop their creativity.

3.3 Formulas Around The Prisms

The prism is a flat-sided geometrical bounded by two opposite sides are congruent and parallel, known as the base and the top side, and the other sides are intersected by ribs parallel hereinafter known as the straight side. The prism nets is flat field which is a series of sides of a prism so that it can form a prism [2]

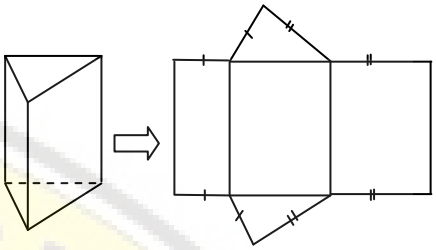
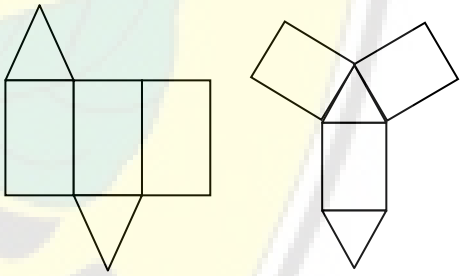


Figure 3: Prism and Prism Nets

There are two groups of prism nets, ie, vertically arranged prism nets that are of the regular n-facet prism nets with upright sides clumped and of the regular n-facet prism nets with erect side edges. Examples of the regular n-facet prism nets with upright sides are clumped and the n-hemispherical prism nets with upright sides are given in Figure 4.



(a) (b)

Figure 4: a) The perpendicular triangular vertical nets with upright sides clustered; b) Uniform triangular vertical triangular nets with erect side spreads.

In a perpendicular triangular prism, there are all 9 vertical triangular prism nets with vertical upright sides and a roving formula of perpendicular triangular prism nets with upright sides clustered, ie $Kj_3 = 2\ (4x + y)$.

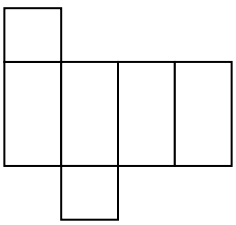


Figure 5: Perpendicular quadrilateral prism nets with upright sides clustered

Whereas in the perpendicular quadrilateral prisms, there are all 16 perpendicular quadrilateral prism nets with vertical upright sides and a roving formula of perpendicular quadrilateral prism nets with the upright sides clustered, ie $Kj_4 = 2\ (6x + y)$.

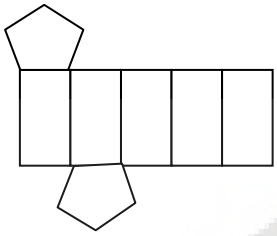


Figure 6: Perpendicular pentagonal prism nets with upright sides clustered

In the perpendicular pentagonal prism prisms, there are 25 fully perpendicular pentagonal prism nets with vertical upright sides and a roving formula of continuous pentagonal prism nets with upright side groups, ie $Kj_5 = 2\ (8x + y)$.

In the perpendicular regular n-facet prism nets, there are all n^2 pieces of the perpendicular regular n-facet prism nets with clumped upright sides and the circumferential formula of the perpendicular regular n-facet prism nets with upright sides clumped:

$$K_{jn} = 2((2n-2)x + y,\ n \geq 3 \quad (1)$$

Information:

Kj_n = The circumference of the perpendicular regular *n*-facet prism nets with the sides clumped together

n = The number of base ribs of the perpendicular regular *n*-facet prism

x = length of the base ribs of the perpendicular regular *n*-facet prism

y = height of the perpendicular regular *n*-facet prism

Once associated with the concept of surface area and volume of prisms that have been taught at the junior high school, the researcher formulates the number of the perpendicular regular *n*-facet prism nets with upright sides clumped ie n^2, and the circumference of the perpendicular regular *n*-facet prism nets with sides clumped:

$$K_{jn} = 2((2n-2)a + t,\ n \geq 3 \quad (2)$$

Information:

Kj_n = The circumference of the perpendicular regular *n*-facet prism nets with the sides clumped together

n = The number of base ribs of the perpendicular regular *n*-facet prism

a = length of the base ribs of the perpendicular regular *n*-facet prism

t = height of the perpendicular regular *n*-facet prism

4. Conclusions and Recommendations

4.1. Conclusions

Problem-based Learning is a learning strategy that involves students in solving problems to acquire knowledge and concepts that later can nurture students' creativity. Students engage in investigations for problem solving that integrate the skills and concepts of various subject matter content. The results of this research is through learning model of *Problem-based Learning* students can grow the creativity that develops within them, especially on the subject of building the flat side space sub-subject around the prism nets.

In addition, in this study also produced n^2, $n \geq 3$, the number of the perpendicular regular *n*-facet prism nets with upright sides clumped and the circumferential formula of the perpendicular regular *n*-facet prism nets with upright sides clumped as follows:

$$K_{jn} = 2((2n-2)a + t,\ n \geq 3$$

Informatian:

Kj_n = The circumference of the perpendicular regular *n*-facet prism nets with the sides clumped together

n = The number of base ribs of the perpendicular regular *n*-facet prism

a = length of the base ribs of the perpendicular regular *n*-facet prism

t = height of the perpendicular regular *n*-facet prism

4.2. Recommendations

Associated with *Problem-based Learning* research to develop student creativity which has been implemented by researchers, there are some suggestions and inputs for other researchers who will conduct similar research.

1. *Problem-based Learning* based research to develop student creativity still needs to be done on other materials.
2. The material used by the researchers has not been given to the students of junior high school so that it can be used as enrichment material by the teachers in carrying out the learning in class.
3. The number of nets and circumferences of the perpendicular regular *n*-facet prism nets with vertically spread edges still have not been derived from the formula so that research is needed such as qualitative research or through development research.

References

1. Adinawan, MC & Sugijono. "Seribu Pena Matematika SMP Kelas IX". Jakarta: Erlangga. 2006.
2. Asyono. "Matematika SMP/MTs Kelas VIII". Jakarta: Bumi Aksara. 2013.
3. Barret, T. "Problem-based Learning Process as Finding and Being in Flow". Ireland: University College Dublin, Dublin. 2010.
4. Bilgin, Ibrahim. "The Effects of Problem-Based Learning on University Students' Performance of Conceptual and Quantitative Problems". Turkiye: University of Mustafa Kemal, Hatay. 2009.
5. Capon, Noel. "What's So Good About Problem-Based Learning". Graduate School of Business Columbia University.2004.
6. Graaff, Erik."Characteristics of Problem-Based Learning". Netherlands: Delft University of Technology. 2003.
7. Hosnan, M. "Pendekatan Saintifik dan Kontekstual dalam Pembelajaran Abad 21". Bogor : Ghalia Indonesia. 2014.
8. Kurniasih, I. & Sani, B. "Ragam Pengembangan Model Pembelajaran untuk Peningkatan Profesionalisme Guru". Yogyakarta: Kata Pena. 2015.
9. Munandar,U. "Creativity and Education.A Study of the Relationships Between Measures of Creative Thinking and a Number of Educational Variables in Indonesian Primary and Junior Secondary Schools". Jakarta: Departemen Pendidikan dan Kebudayaan. 1977.
10. Munandar, U. "Pengembangan Kreativitas Anak Berbakat". Jakarta: Rineka Cipta. 2014.
11. Nuharini, D. Wahyuni, T. "Matematika Konsep dan Aplikasinya Untuk SMP/MTs Kelas VIII". Jakarta: Departemen Pendidikan Nasional. 2008.
12. Salahudin, A & Alkrienciehie, I. "Pendidikan Karakter Pendidikan Berbasis Agama & BUdaya Bangsa". Bandung: CV Pustaka Setia. 2013.

Author Profile

Susanti Hessyreceived the S.Si. and M.Pd. degrees in Mathematics Education from University of Jember in 1999 and 2015, respectively. During 2004-2017, she stayed in Junior High School of Jember.