

The Comparison Cognitive Competency Between The Application Problem Based Instruction (PBI) Learning Model With Creative Problem Solving (CPS) Based Prior Knowledge From Class XI Students Of Adabiah Senior High School Padang

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Abstract – This study aims to determine the differences in students' cognitive competencies between those using the Problem Based Instruction (PBI) learning model and the Creative Problem Solving (CPS). This type of research is a quasi-experimental research design with Randomized Control Posted Only Design. The population in this study were students of class XI IPA SMA Adabiah Padang who were registered in the 2019/2020 school year. The sample was determined by purposive sampling technique and obtained class XI MIA 3 as the experimental class 1 and class XI MIA 4 as the experimental class 2. The instrument used was a multiple choice question sheet. Analysis of research data using normality test, homogeneity test, and hypothesis testing with t-test using the SPSS application.

Keywords – *Cognitive Competency, Problem Based Instruction, Creative Problem Solving.*

I. INTRODUCTION

The purpose of the 2013 curriculum is to develop the competence of students in a balanced manner between attitude, skill and knowledge competencies. These three competencies should be applicable to students in schools and communities.

The 2013 curriculum for Senior High Schools that is implemented consists of groups of compulsory subjects and specialization subjects. One of them is Biology.

Biology is one of the subjects where the learning process requires students to think critically, creatively and have the expected competences in the cognitive, affective and psychomotor domains. This is in line with Permendikbud Number 22 of 2016 which states that the learning process in educational units is held in an interactive, inspirational, fun, challenging manner, motivates

students to actively participate, and provides sufficient space for initiative, creativity, and independence according to their talents, interests, and the physical and psychological development of students.

Permendikbud Number 21 of 2016 states that students must have the competence to be able to apply principles, concepts, and laws in the field of Biology to solve real and environmental problems.

These competencies produce students who have the knowledge and skills in solving problems that will be faced in the future in the midst of society.

According to Simamora (2014) the ability to solve problems is the ability shown since recognizing problems, finding alternative solutions to problems, choosing an alternative problem solving, and evaluating the answers that can be obtained.

Along with the statement Kolesnik in Lufri (2007), Problem Solving is a reorganization of concepts to overcome difficulties or obstacles and to achieve goals, while Woods in Lufri (2007) defines Problem Solving as an unknown activity which is finally known through a good way.

According to Sudiarta (2005), a person is said to have the ability to think critically if he has competence in collecting material, information, skills to be used in solving problems.

The ability to think critically in solving problems is very much inherent in biology subject matter, especially in the material of the Human Reproductive System and the Human Body Defense System.

The material of Human Reproductive Systems and Human Body Defense Systems requires the competence of students to think critically in analyzing the relationships that exist in human organs. This is in line with Bloom's cognitive application where the ability to analyze requires students to be able to identify the constituent parts and functions of a process or concept, as well as develop a methodology or process, make qualitative assessments of elements, relationships, values and measure requirements or needs will be implemented through critical thinking skills. This condition requires teachers to be critical in determining the models, methods and media that will be used in the learning process.

Through observations made by researchers of class XI MIPA SMA Adabiah from 19 October to 19 November 2019, it was found that students' learning competencies in Biology subjects were still not satisfactory. This can be seen from the mean score of the students' midterm I test scores that have not yet reached the minimum completeness criteria (KKM).

After carrying out observations and interviews with the teacher concerned, it was found that the students were still not able to solve the given questions properly. Students have not been able to solve different practice questions with example questions. Students are not able to solve problems or find answers to questions when presented in a different way. Students often focus on one answer only and have not been able to find multiple answers. Students have not been able to solve biology problems in which there are elements to link one idea to another that are interrelated in the Biology learning process.

According to Nasution (2015), the initial ability factor has a contribution to students' creative thinking abilities that students will get in the learning process. As stated in the Ministry of National Education in 2005, it is stated that the initial ability of students is important for the teacher to know before he starts with his lessons, because it can be seen whether students already have knowledge which is a prerequisite for following what will be presented.

The initial ability of students is a requirement that must be possessed in order to participate in learning smoothly and can be used as a benchmark to find out that a student has thought creatively in solving a problem. Svinicki (2003) states that one of the benefits of early abilities is to help students connect their initial abilities with new concepts so that good understanding of concepts can be formed by students. However, Based on interviews and direct observations to the Biology teacher at SMA Adabiah, Padang, it is known that the initial abilities of students have not been taken into consideration in the learning process.

Trianto (2009: 92) states that problem-based teaching is an effective approach to teaching higher-order thinking processes. One learning model that can be applied that can spur the development of students' creative thinking skills is Problem Based Instruction (PBI).

According to direct observations and interviews, The teacher has tried to apply a problem-based learning model, namely Problem Based Instruction (PBI).

Problem Based Instruction (PBI) is one of the various learning models that teachers can use in activating students in learning. The teacher is obliged to lead students to carry out teacher activities as problem presenters, provide instructions, discussions, provide encouragement and support that can increase the growth of inquiry. The PBI learning model has several advantages including students are actively involved in learning activities. Students are trained to be independent and cooperate with other students. Meanwhile, the shortcomings of the PBI learning model are requires teachers to make lesson plans that are more mature and take a long time. In addition, students are only fixated on the instructions and problems given and are not used to being given different instructions or problems.

By using the PBI model, it is known that the student learning process has started to appear active. However, they have not been able to provide an increase in student competence. Based on these symptoms, the researcher offers a problem-based alternative learning model which is expected to be able to increase student competence according to the 2013 curriculum, namely the Creative Problem Solving learning model.

Treffinger & Isaksen (2005) said that the Creative Problem Solving Model (CPS) is the latest model applied to teach critical thinking skills and metacognitive strategies, especially in education. The CPS model is a learning model that focuses on problem-solving skills, which is followed by strengthening creativity. This is in line with the statement of Chant et al (2009) where CPS can assist in producing innovative educational programs and creative activities as well as informing pedagogy.

The advantages of the model CPS is that students have problem-solving skills, can stimulate the development of students' thinking abilities creatively, rationally, logically, and thoroughly, education in schools becomes more relevant to life, raises the courage in students to express their opinions and ideas. In line with Morton's (1998) statement, CPS offers a deeper and broader analysis of the existing problem or potential problem. So, creative problem solving offers a more useful global approach. While the weakness of the CPS model is that it requires a variety of learning sources and teachers are really required to make thorough preparations.

The CPS model is a learning model that focuses on teaching and problem-solving skills followed by strengthening skills. With the CPS model, students are expected to improve their knowledge competencies. This corresponds to Kadayıfçı (2008) which states that the CPS model has a positive impact on students' creative skills.

Based on the description above, the researcher is interested in conducting a study entitled "Comparison of Learning Competence against the Application of Problem Based Instruction (PBI) Learning Model with Creative Problem Solving (CPS) in terms of the Initial Ability of Class XI Students of SMA Adabiah Padang."

II. METHODOLOGY

This research is a quasi-experimental research design with a randomized control group posttest only design. In this study students were divided into two classes, namely the experimental class 1 and the experimental class 2. The experimental class 1 was treated by applying the learning model commonly used in the school, namely *Problem Based Instruction (PBI)* while in the experimental class 2 the learning model was applied *Creative Problem Solving (CPS)*. After that, both classes, both experimental 1 and experiment 2 were given a posttest. The instrument used was a knowledge test question sheet in the form of multiple choice questions. Data analysis using normality test, homogeneity test, and hypothesis testing using the SPSS application.

III. RESULTS AND DISCUSSION

1. Result

The results of the measurement of knowledge competencies can be seen in Table 1.

Table1.Cognitive Competency Measurement Results

Class	Cognitive Competence	N	$\bar{X}$	%
Experiment 1	High	13	84.12	100%
	Low	12	80,80	0%
Experiment 2	High	13	92.44	100%
	Low	12	83.20	0%

Table 1 shows a summary of knowledge competencies where the experimental group 1 obtained an average score of 80.80 for students with low initial abilities and 84.12 for high initial abilities, while the experimental group 2 obtained an average score of 83.20 for students with high initial abilities. low starting ability and 92.44 with high initial ability. It can be seen that the results of the Cognitive Competency of the experimental group 2 are better than the experimental class 2. Furthermore, the analysis prerequisite test will be carried out which includes the normality test, the homogeneity test, and the t-test between the knowledge competencies of students learning using the PBI model with students learning using the model. CPS and the results can be seen in Table 2.

Table 2.Results of the Prerequisite Test for Cognitive Competency Analysis

Parameter	Class		Information
	Experiment1 (PBI)	Experiment2 (CPS)	
Average	84.12	92.44	Experiment 1 > Experiment 2
Normality test	0.184		Normally Distributed
Homogeneity Test	Sig = 0.309		Homogeneous Variance
Hypothesis testing	Sig = 0,000 with an F value of 32,377		CPS is better than PBI

Table 2. shows the average value of the Cognitive Competency of the experimental group 1 and the experimental group 2 along with the values of the normality test, homogeneity test and t test. With the average value of the Cognitive Competency of the experimental group 2 which is higher than the experimental group 1 and the data that is homogeneous and normally distributed, while the significance value is <0.05 , it can be concluded that the knowledge competence of students who learn using the CPS learning model is better than PBI learning model.

2. Discussion

Based on the research results described above, it shows that the knowledge competence of students using the CPS model is higher than the knowledge competence of students who use the PBI model. Students who learn with the CPS model get a knowledge score of 92.44. Meanwhile, students learning with PBI mode obtained a knowledge score of 84.12.

The knowledge competence of students who apply the Creative Problem Solving (CPS) model is higher than the cognitive competence of students who apply the Problem Based Instruction (PBI) model. Students who studied with the Creative Problem Solving (CPS) model obtained a cognitive average score of 80.76. While students who learn with the problem based instruction (PBI) model get a cognitive average score of 80.12, as well as the interaction between students' initial abilities and students' cognitive competencies with a significance value at $f < \alpha$, namely $0.000 < 0.05$ and f value is 32.377.

Increasing the ability of problem solving models of creative problem solving and problem based instruction seen from the cognitive aspect both have a good impact on the initial abilities of students. Through the Science Process Skills Approach students will get an understanding that is truly appreciated because students themselves find the generalized concept of their work (the results of their observations and findings) so that it can be one of the factors to foster intrinsic motivation in students. With this motivation in students, it will motivate students to be active in learning, so that their learning outcomes increase

This is in accordance with what Baroody revealed that learning by using problem solving can improve problem solving skills, types of problems and their use. In addition, according to Hobri (2009) the purpose of such learning is to change non-routine problems into routine problems. In addition, according to Hudojo (2017) teaching students to solve problems allows students to be more analytical in making decisions so that learning Biology in this way can be seen as something that can improve their skills. Competence of student learning by paying attention to students' initial abilities (Hudojo, 2017).

In line with research conducted by Fatuni (2013) regarding the comparison of the application of creative problem solving learning models and problem based instruction in laboratory activities to improve problem-solving abilities, the results show that the creative problem solving learning model is more effective than the problem-based instruction learning model in increasing solving abilities. problem. Students who get learning with creative problem solving models in my practical activities have higher problem solving abilities than students who only get problem-based instruction learning models. This can be seen from the psychomotor abilities of students when doing practicum, completion of student worksheets, results of practicum evaluation, post-test, and individual practicum reports.

Research conducted by Nursiami and Soeprodji (2015) on the effectiveness of the interactive flash-assisted creative problem solving learning model on learning outcomes shows that the average estimation test shows the average learning outcomes of the experimental class from 86.25 to 87.35 and the control class from 81.45 to 82.55, so it can be concluded that the Creative Problem Solving learning model is proven to be effective in applying the solubility material and solubility product.

The results of the analysis of the research results showed that student learning outcomes increased after treatment with the CPS and PBI learning models. The increase in learning outcomes indicates an increase in students' problem solving abilities. In addition, learning outcomes have also increased in student psychomotor abilities and student worksheets. From the improvements that occurred showed an increase in student problem-solving abilities.

So it can be concluded that the creative problem solving learning model is better than the problem based instruction model seen from the average value obtained by creative problem solving is higher than the problem based instruction learning model. And there is an interaction between students' initial abilities and students' cognitive competencies.

IV. CONCLUSION

Based on the results of the research that has been done, it can be concluded that there is a difference between the use of the PBI learning model and the CPS learning model on the knowledge competence of students, where the knowledge competence of students using the CPS model is higher than the knowledge competence of students using the PBI model.

ACKNOWLEDGMENT

Thanks to Mrs. Dr. Dwi Hilda Putri, M. Biomed as the supervisor, Mr. Prof. Dr. Lufri, MS and Mrs. Dr. Moralita Chatri, MP as a contributing lecturer. And Special thanks to Mrs. Dra. Dani Charnali and Mila Karmila, M. Pd as Biology teacher at Adabiah Senior High School in Padang City.

REFERENCE

- [1] Aryanti, Nurhidayati, dkk. 2013. Penerapan Model Pembelajaran Problem Based Instruction sebagai Upaya Pembentukan Kemandirian Mahasiswa Pada Mata Kuliah Teknik Pondasi. Jurnal IPTEK. Vol. VI. No. 1. Januari. 2013.
- [2] Depdiknas. 2002. Ringkasan Kegiatan Belajar Mengajar. Jakarta: Depdiknas.
- [3] Depdiknas. 2005. Panduan Pengembangan Bahan Ajar. Jakarta: Depdiknas.
- [4] Dian, Febrintina S. 2016. Perbandingan Model Cps dan Pbl Meningkatkan Kemampuan Berfikir Kritis dengan Minat Belajar.
- [5] Farida Utami, dkk. 2019. Efektivitas Penerapan Model Pembelajaran Creative Problem Solving (CPS) terhadap hasil belajar siswa pada materi luas permukaan bangun ruang sisi datar. Jurnal Math Educator Nusantara, Vol. 5. No. 1. Mei 2019.
- [6] Fian Totiana, dkk. 2012. Efektivitas Model Pembelajaran Creative Problem Solving (Cps) Yang Dilengkapi Media Pembelajaran Laboratorium Virtual terhadap Prestasi Belajar siswa Pada Materi Pokok Koloid Kelas XI Ipa semester Genap Sma Negeri 1 Karanganyar Tahun Pelajaran 2011/2012. Jurnal Pendidikan Kimia (JPK), Vol. 1 No. 1 Tahun 2012.
- [7] Hobri. (2009). Model-Model Pembelajaran Inovatif. Jember: Center for Society Studies.
- [8] Hudojo, Herman. 2017. Mengajar Belajar Matematika. Jakarta: Departemen Pendidikan dan Kebudayaan.
- [9] Kadayıfçı, H. (2008). Yaratıcı düşünme yedatılı öğretim modelinin öğrencilerin maddelerin ayrılması ile ilgili kavramları anlamaları ve bilimsel yaratıcılıklarına etkisi. Yayınlanmamış Doktora Tezi, Gazi Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.
- [10] Lufri. (2007). Strategi Pembelajaran Biologi. Padang: Unp Press.
- [11] Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia nomor 65 tahun 2013 tentang Standar Proses Pendidikan Dasar dan Menengah.
- [12] Peraturan Menteri Pendidikan dan Kebudayaan Republik Indonesia nomor 69 tahun 2013 tentang Kerangka Dasar dan Struktur Kurikulum Sekolah Menengah Atas/ Madrasah Aliyah.
- [13] Richard H, Chant, dkk. (2009). Curriculum Construction and Teacher Empowerment: Supporting Invitational Education with a Creative Problem Solving Model. University of North Florida. Journal of Invitational Theory and Practice. Vol. 15. 56-67. 2009.
- [14] Simamora, M. C., Siburian dan Gardjito. 2014. Analisis Kemampuan Metakognisi Siswa Dalam Pembelajaran Biologi Melalui Asesmen Pemecahan Masalah di SMA Negeri 5 Kota Jambi. FKIP: Universitas Negeri Jambi
- [15] Siti Nursiami dan Soeprodjo. Keefektifan Model Pembelajaran Creative Problem Solving berbantuan Flash Interaktif Terhadap Hasil Belajar. Jurnal Inovasi Pendidikan Kimia, Vol 9, No. 1, 2015, hlm 1440-1449.
- [16] Sudiarta, P. 2005. Pengembangan Model Pembelajaran Matematika berorientasi Pemecahan masalah kontekstual Open-Ended. Jurnal Pendidikan dan Pengajaran IKIP Negeri Singaraja, Vol. 15, No. 2, pp. 95-101.

- [17] Svinicki, M. 1993. What They Don't Know Can Hurt them: The Role of Prior Knowledge in Learning. The Professional & Organizational Development Network in Higher Education. 5(4):1-5.
- [18] Treffinger, D. J., Selby, E. C., & Isaksen, S. G. (2008). Understanding individual problem-solving style: A key to learning and applying creative problem solving. *Learning and Individual Differences*, 18(4), 390-401.
- [19] Treffinger, D. J., & Isaksen, S. G. (2005). Creative problem solving: History, development, and implications for gifted education and talent development. *Gifted Child Quarterly*, 49(4), 342.
- [20] Trianto. 2009. *Mendesain Model Pembelajaran Inovatif Progresif*. Surabaya: Kencana.
- [21] Wena, M. 2011. *Strategi Pembelajaran Inovatif Kontemporer*. Jakarta: Bumi Aksara.
- [22] Wood, C. 2006. The Development Of Creative Problem Solving in Chemistry. *The Royal Society of Chemistry*. 7(2):96-113. Workbook. Waterbury: Optimist International.