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Effectiveness Stimulus Environment Problem Solving Learning Model for Increase High-level Thinking Skills

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ABSTRACT

Learning with Stimulus Environment Problem Solving (SEPS) is an involved learning process student in a way active good in network nor outside network in reading, writing, doing experiment, and analyze, as well look for solution to the problem social related science environment public. This study aims to know the effectiveness of the Stimulus Environment Problem Solving (SEPS) learning model so that can increase ability think level high among students biology education Universitas Muhammadiyah Surakarta. Method in study this is correlate ability think critical and solving problem 2 groups student a total of 40 students where is one group totaling 20 students use learning model of Stimulus Environment Problem Solving (SEPS) and other groups with Project based Learning. Analysis hypothesis using the t test and effect size. Based on application of the Stimulus Environment Problem Solving (SEPS) model in the classroom experiment experience increase in t test results significant in cycle I and cycle II. Based on the effect size test, the effectiveness of the Stimulus Environment Problem Solving (SEPS) model is included in category tall with value 3.244 so effectiveness of the Stimulus Environment Problem Solving (SEPS) model on Skills think level tall own category tall.

KEYWORDS

Problem Solving Model
Higher Level Thinking

1. Introduction

The 21st century is a global computing era marked by the development of information technology. In the era of global computing, high quality human resources are demanded. Higher education institutions must be able to produce outcomes that have quality capabilities and are competitive. The ability to think critically and solve problems is one of the important abilities needed in modern education in the 21st century. Modern education involves people's lives in being able to think critically which must be mastered to learn how to be competitive in the era of global computing. Critical thinking skills are gathered from observation, experience, reflection, reasoning, or communication, as a guide for action (Bialik & Groff, 2017) . Critical thinking ability is a process that includes induction, deduction, classification, and reasoning (Krulik & Rudnick, 1996) . This critical thinking ability drives the ability to analyze and evaluate facts, identify questions, draw logical conclusions, understand the impact of arguments (Friedrichsen, 2001) . According to (McMurarry, Beisenherz, & Thompson, 1991) critical thinking is a very important activity to be developed in schools and colleges.

Apart from that, problem-solving abilities are also important for students to develop as preparation for life in modern society in the 21st century. When students have proper critical thinking, they will have problem-solving abilities. Critical thinking is an important element of inquiry, innovation, and problem solving (Thompson, 2011). Students who have critical thinking will be able to effectively solve problems in their lives (Snyder & Snyder, 2008). The ability to solve problems is one of the basic competencies that students must have in the 21st century (Adeoye, 2010; Greiff et al., 2013). It aims to promote new experiences in students by finding solutions and solving problems. Problem solving activities are integrated into the learning process (Mauke et al., 2013) thereby helping students to build new knowledge (Mukhopadhyay, 2013).

Problem environment at the moment This Already become problem it 's hard inside life public . Increasing damage environment Because caused the large volume of waste and how to deal with it overall , increasing material waste liquid housing and industry that pollute water bodies , or its height emissions of polluting gases air , giving influence big to quality life man . A number of effort handling problem environment has done , for example through activity education environment in a way law based on letter decision together ministry Environment Life and Ministry of National Education (2010). One of objective this policy is grow and develop knowledge, values, attitudes, behavior, and insight as well as concern environment life students and society. This policy taken through development and implementation education environment life shared by all path , level , and type education .

Learning program environment Already Lots done at college tall Good in a way independent as well as cooperation programs . Factor contextuality so understanding is needed environment , because scope problem environment related to life in a society that is not only related with knowledge , but also need attitudes and abilities For act and overcome problem environment that occurs in society . With I see , understanding environment should managed and implemented using a capable model overcome problem contextuality that is for students can socialize with problem real in the environment To use push formation Skills 21st century is one of them ability think critical and solving problem . System contemporary education has directed For prepare student living in the 21st century .

Face problems that have been displayed , then need implement the model or approach appropriate learning . Possible solution attempted For overcome problem the is application of a model that emphasizes ability think students' critical thinking and problem solving during the pandemic . Learning the can done with a learning model socioscientific Blended Project-Based Learning (PjBL). Learning with the Blended PjBL model help student become learner independent in network nor outside networks in the era of global computing . Student will make strong relationship between concepts and facts learned so that student active Work For look for information and produce A product learning , no only as learner just passive accept information .

Learning with a learning model socioscientific Blended PjBL is applied learning real problems in the learning process . Contextual problems applied to learning is problem social relations in the community with science . Development of learning models socioscientific Blended PjBL aligned with theme Study Program research education Biology that is enhancement quality and innovation learning Biology For creating professional teachers excel in the 21st century . One criteria curriculum on learning 21st century that is motivating student For capable apply material learning to environment society (Solomon, 2001). Socioscientific facilitate condition Study actually have it opportunity For develop ability scientific argumentation , exploring moral problems, developing moral understanding (moral reasoning), and understanding reflective judgment (Zeidler, 2009). Student will can take decision to problems existing in the environment social in a way scientific and useful social .

Learning with model socioscientific blended Project-Based Learning possible an involved learning process occurs student in a way active Good in network nor outside network in reading , writing , doing experiment , analyze , as well look for solution to problem social science that occurs in society . Application of learning models socioscientific blended Project-Based Learning can train and get used to student For sensitive to surrounding conditions as well as can hook theory or concepts obtained with condition social surrounding community . Ability student in hook theory science with problem social events that occur in society can practice student For look for solution solution problems that occur in society .

One of points skills that can be grown develop through learning environment is Skills think critical reflective For state conclusion and solve problem based on argument certain (reflective judgment) that leads level progress literacy someone on the aspect collect and study information from various data and make base state based decisions fact or proof real (Callahan, 2009; Zeidler , et.al, 2009). Although Still limited , study about the potential of SSI on learning science has too carried out in Indonesia. Related with teaching materials , Subiantoro and Fatkhurohman (2009) identified appearance ability think critical student through learning biology make use of newspaper media with issue depletion layer ozone and building without house gas glass . Study Herlanti, et.al (2012) stated exists achievement of the level of

argumentation highest in oneself student from discussion issue polemic bacteria E. sakazakii via weblog directly social , though individual achievements classified currently .

Based on the background explained above, researchers are interested in conducting research with the title "Effectiveness learning model Stimulus Environment Problem Solving (SEPS) For increase high-level thinking skills". The contribution of this research is to provide a new theory regarding learning models that can be easily used to improve high-level thinking skills.

2. Method

Type this study based on his approach is quantitative with design study is study experiment pseudo (quasi-experiment). This study using 2 groups student a total of 40 students where is one group totaling 20 students use learning model Stimulus Environment Problem Solving and other groups with learning Problem Based Learning .

Place research carried out in the Biology Education Study Program Universitas Muhammadiyah Surakarta. This study held in September 2023-January 2024 odd semester year teachings 2023/2024. Population that will researched is all over 5th semester student biology education Universitas Muhammadiyah Surakarta odd semester 2023/2024. Samples in this research is 5th semester student classes D and E Biology Education Universitas Muhammadiyah Surakarta odd semester 2023/2024 . In this study technique data retrieval with technique purposive sampling with choose two classes in a way random that is class experiment class D uses the Socioscientific Blended Project-Based Learning model and the control class class E uses a project based learning model .

Data analysis techniques used is Two Independent Sample Test (Mann Withney U Test) or test 2 (two) samples essentially free as an alternative test from statistics parametric independent sample T test with precondition analysis free It means capable used For ordinal data types and not need assumption normally distributed . This test used For set is mark variable certain different between two independent groups (Budiyono, 2017). Hypothesis testing procedure can see the variations that emerge Because exists treatment for conclude There is or not average differences in populations. Once it is known that there is a significant difference, it is then tested using the effect size to determine the effectiveness of the model. Decision making provisions follow the rules presented by Cohen (1988), namely ES < 0.3 is in the low category, $0.3 \leq ES \leq 0.8$ is in the medium category, and ES > 0.8 is in the high category.

3. Results and Discussion

The results of the high-level thinking skills test for cycles I and II were then t-tested to determine the differences in these skills in the experimental and control classes. The results of the t-test can be seen in Table 1.

Table 1 Results of t-test of high-level thinking skills in cycles I and II

Cycle	*Type of Test*	*Sig.*
I	Independent Sample T-test	0,039
II	Independent Sample T-test	0,036

Based on Table 1, it can be seen that the results of the analysis using SPSS show a significance in Cycle I of 0.039<0.05 so it can be concluded that there is a difference in the average value of high-level thinking skills for the experimental class and the control class. In cycle II, it shows a significance of 0.036<0.05 so it can be concluded that there is a difference in the average value of high-level thinking skills in the experimental class and the control class.

After knowing the difference between the experimental class and the control class, we can see the effectiveness of the Stimulus Environment Problem Solving model by conducting an effectiveness test using effect size . The effect size results from the implementation of cycles I & II can be seen in Table 2. The effect size calculation in cycle I obtained a value of 2,576 so it is included in the high category. In cycle II, a score of 3,244 was obtained so it was also included in the high category. This shows that the Stimulus Environment Problem Solving model is effectively used in the high effectiveness category to improve high-level thinking abilities.

Table 2. Effect Size Results Using the model in cycles I & II

Cycle	*Experiment Class*			*Control Class*			*Effect Size*	*Category*
	Mean	SD	N	Mean	SD	N	Cohen's d	
I	21,34	3,116	20	19,56	3,121	20	2,576	High
II	27,44	3,624	20	24,41	3,411	20	3,244	High

Based on the results of the t-test, it can be concluded that there is a difference and there has been an increase in the application of the Stimulus Environment Problem Solving model to high-level thinking skills from cycles I and II. The biggest influence occurred in cycle II, this was because in this cycle students felt comfortable and enjoyed the learning process using the Stimulus Environment Problem Solving model . Apart from increasing the t-test value and the percentage increase in each cycle, other evidence of increasing high-level thinking skills is tested by effect size . Using effect size can determine how big the effect or influence of Problem Solving Environment Stimulus is on students' higher-order thinking skills. In cycle I, an effect size of 2.5 76 was obtained and in cycle II an effect size of 3, 244 was obtained . The effect size results in cycles I and II are included in the high category.

Learning is a process of interaction between lecturers and students and the elements contained therein. Lecturers are the most dominant factor in determining the quality of learning. Moreover, we have now entered an era where we are required to adapt to global developments with the demands of 21st century learning skills, the development of the industrial revolution 4.0, and society 5.0 (Ratih, et.al., 2021). Learning by integrating socioscientific problems with project based learning will also produce good high-level thinking skills. High-level thinking abilities are not only mastery of material but also skills in identifying, analyzing and solving problems (Ndemo & Mtetwa, 2022). Learning biology is not just about studying concepts, but also includes the nature of biology, scientific practice, scientific inquiry, as well as the relationship between biology, technology and society. Inquiry activities include high-level thinking skills which will be the basic capital for solving problems (Heong et al., 2012; Osman et al., 2013; Turiman et al., 2012). Therefore, during biology learning, students need to develop higher order thinking skills.

Higher order thinking skills are the development of mental skills that originate from the basic abilities possessed by a person. High-level thinking skills encourage students to discover facts, knowledge concepts for themselves and develop the required attitudes and values (Afandi, Sajidan, Akhyar, & Suryani, 2019). So that students are accustomed to finding their own knowledge, not relying on lecturers as a source of information and the knowledge that students gain is not just rote memorization of concepts, facts or principles that require high-level thinking skills, but students are given direct experience with the objects being studied.

4. Conclusion

Application of the Stimulus Environment Problem Solving model effective with category tall For empowering Skills think level high on the t-test results significant in the class that implements the model Stimulus Environment Problem Solving . Based on the effect size test effectiveness of the Stimulus Environment Problem Solving model including category high and impactful tall to Skills high level thinking .

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