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Implementation of Problem Based Learning on Critical Thinking to Increase Learning Outcomes and Student Activities

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***Abstract*:** *Learning is required to always be creative in presenting learning materials, such as using learning models that can foster student enthusiasm in participating in the learning process, so students are happy and interested in exploring the lesson in the hope that their learning outcomes will be better. The purpose of this study is to determine whether the increase in student learning outcomes taught with the Problem Based Learning model based on critical thinking is greater than the Direct Instruction model, and determine whether there is an influence of the Problem Based Learning model based on critical thinking on learning activities students on acid base material. From the results of the study, it was found that student learning outcomes in the experimental class were 77%, while those in the control class were 62%. The result of the difference in increasing learning outcomes between the two classes is 15%. From the t distribution data obtained t-table = 1.676 while based on calculations obtained price tcount = 3.73 means that Ho is rejected and Ha is accepted, based on this analysis means there is an influence of the Problem Based Learning model Learning based on critical thinking towards student learning activities.*

***Keywords*:** *Critical Thinking, Acid-Base, Student Learning Outcomes, Student Learning Activities.*

INTRODUCTION

In theory, the difficulty that is frequently encountered in learning is student learning interest. This difficulty may be solved by employing an effective, efficient, and enjoyable learning paradigm, which can introduce pupils to previously unknown facts and concepts. Critical thinking-based PBL focuses on transformation to encourage students to think critically. PBL is not only a problem-solving process, but also a constructivist pedagogy with real problems designed to learn with the surrounding environment where there are processes of discovery, independent learning, information processing, discussion, and collaboration between groups for problem solving in order to improve the notion that learning chemistry is difficult (Janawi, 2013).

Human education is a fundamental necessity that must be met throughout one's life. Humans cannot live and develop in accordance with their ambitions to advance, succeed, and be happy without education

(Supardi, 2012). Chemistry is divided into two categories: chemistry as a product and chemistry as a process. As a product, chemistry encompasses a body of knowledge comprised of facts, ideas, and principles. The discovery of a notion is linked to chemistry as a process (Ozgelen, 2012).

One of the advantages of Problem-Based Learning, the learning paradigm is that it makes it easier for students to understand the ideas they are learning to overcome real-world challenges. So that the application of this model is expected to make students more focused in the learning process and improve student learning outcomes. One of the Graduate Competency Standards (SKL) in Chemistry is "Having procedural and metacognitive knowledge in science, technology, art, and culture with an insight into humanity, nationality, statehood, and civilization regarding the causes of phenomena and events". This learning model has been studied by several researchers and is proven to improve student learning outcomes as in research by Hasni (2010).

Based on the research results of Siregar et al., (2014) showed that there was a significant effect on learning outcomes between students who were taught with the Net-PBL learning model and the Net-DI learning model with the DI learning model in acid-base learning. Other research also shows that the development of students' character, namely critical thinking, increases in cycle II after the teacher conveys to students the results of the evaluation in cycle I at the beginning of learning and instructs students to analyze the questions before working on them. . Likewise, students' curiosity can be seen from the activeness of students in listening to the teacher's explanation, asking about material that is not yet understood, and reading books related to the material being studied increases in cycle II because the motivation at the beginning of the meeting is in the form of appreciation for active students (Munandar et al., 2017).

Critical thinking according to Iskandar (2009) is a reasoning activity that is reflective, critical and creative which is oriented to intellectual processes involving the formation of concepts, applications, analysis, assessing information collected (synthesis) or generated through observation, experience, reflection, communication as a basis beliefs and actions. Improving learning outcomes according to Hamalik (1995) in Jamalong (2012) is a process of changing the subject's behavior which includes cognitive abilities in certain situations thanks to repeated experiences.

LITERATURE REVIEW

1. *Problem Based Learning*

Problem Based Learning (PBL) is a learning method that challenges students to "learn to learn", work together in groups to find solutions to problems. Problems in this learning are used to connect curiosity and analytical skills as well as students' initiative with the subject matter. PBL prepares students to think critically and analytically, and find and use appropriate learning resources as cited by Amin in Anggraini (2013).

The characteristics of the Problem Based Learning learning model are: (1) Problems become the starting point in learning; (2) Problems challenge students' knowledge, attitudes, and competencies which then require identification of learning needs and new areas of learning; (3) Utilization of various sources of knowledge, use, and evaluation of information sources is an important process in PBL; (4) Learning is collaborative, communication, and cooperative; (5) Developing inquiry and problem solving skills is as important as mastering the content of knowledge to find solutions to a problem; (6) PBL involves evaluating and reviewing students' experiences and learning processes. (Rusman, 2011).

Sanjaya (2007) suggests several advantages of the Problem Based Learning model, including: (1) Challenging students' abilities and providing satisfaction for discovering new knowledge for students; (2) Increase students' motivation and learning activities; (3) Assist students in transferring

student knowledge to understand real-world problems; (4) Help students develop their new knowledge and be responsible for the learning they do; (5) Develop students' critical thinking skills and develop adaptability with new knowledge; (6) Provide opportunities for students to apply their knowledge in the real world; (7) Develop students' interest in learning continuously even though formal education has ended; and (8) Facilitating students in mastering the concepts learned to solve problems in the real world.

2. Critical Thinking

The thought process is the experience of processing problems to obtain and determine a new idea as an answer to the problem at hand. So according to him critical thinking is a critical assessment of the truth of phenomena or facts. And also everyone has the potential to think critically which can be developed optimally in achieving a better life. Critical thinking is logical and reflective thinking that focuses on deciding what to believe or do. Haladyna stated that the preparation of a critical thinking ability test can measure the mastery of concepts that require analytical thinking, inference, and evaluation. Critical thinking is very necessary in learning chemistry. This refers to the nature of various scientific disciplines, that each science has principles that characterize science as rational so that logical thinking is needed. (Haladyna, 2004).

There are five critical thinking frameworks in analyzing concepts according to Ennis in Costa, namely: (1) providing simple explanations; (2) build basic skills; (3) concluded; (4) make further explanations as well; (5) implementing strategies and tactics (Ennis, 1985)

3. Direct Instruction

Direct teaching is a teacher-centered learning model, which in practice has 5 steps, namely preparing students to receive lessons, demonstrations, guided exercises, feedback, and further (self-directed) exercises. According to Arends (1997) in Trianto (2011) quoted from Sakti, et al (2012), the direct learning model is a teaching approach specifically designed to support student learning processes related to well-structured declarative knowledge and procedural knowledge, which can be taught gradually, step by step, structured activity patterns, directing student activities, and maintaining a focus on academic achievement.

4. Learning Outcomes

Learning outcomes are the result of the interaction between learning and teaching. From the teacher's point of view, the act of teaching ends with the process of evaluating learning outcomes. From the student's point of view, learning outcomes are the end of the experience and the culmination of the learning process as suggested by Dimyati and Modjiono (2002). According to Hamalik (2002) states that learning outcomes are changes in student behavior as a result of learning. Changes in behavior are caused by students achieving mastery over a number of materials provided in the teaching and learning process. Sudjana (2005) states that "Learning outcomes are changes in behavior which include the cognitive, affective, and psychomotor fields that students have after gaining a sense of security in learning.

Slameto (2010) says that: "Several factors that can affect student achievement are external factors and internal factors. External factors come from outside the individual, while internal factors come from individual students which include; activities, interests, knowledge base intelligence and learning methods.

METHOD

This research is an experimental research conducted using 2 different learning. This research was be conducted at Smart Murni Medan High School in the even semester of the 2019/2020 academic year, namely September 2019–February 2020. The samples used in this study were 2 students of class XI IPA SMA Smart Murni Medan, a total of 52 students. student.

The sample in this study consisted of two classes which were taken by purposive sampling because the sample members from

the population were taken based on recommendations from the teacher seeing the amount of material that had been received by the sample class with the assumption that the teacher's abilities in the two classes were balanced. So that two classes are obtained, namely the first class is used as an experimental class whose learning uses the Problem Based Learning model based on critical thinking and the second class is used as a control class whose learning uses the Direct Instruction model.

RESULTS AND DISCUSSION

In carrying out research, the use of the Critical Thinking-based Problem Based Learning learning model has steps that must be carried out, namely first giving problem orientation to students by way of the teacher (researcher) discussing learning objectives, describing and motivating. . students to engage in problem solving activities. Second, organizing students to research in a way the teacher helps students to define and organize learning tasks related to problems. Third, assisting investigations independently or in groups by encouraging students to get correct information, conduct experiments, and seek explanations and solutions. Fourth, developing and presenting work results in a way that the teacher assists students in planning and preparing appropriate results, namely in the form of reports and models that help them convey to others. Fifth, the teacher asks students to analyze the pattern of their findings in the form of conclusions. At this stage, students can write down the strengths and weaknesses during the activity, with the help of the teacher, to be repaired systematically.

The data contained in this study were obtained from the pretest which was tested before the learning process was carried out in the two sample groups (experimental class and control class) and the posttest which was tested after the learning process was carried out using Problem Based Learning. Models Based on Critical Thinking in the experimental class and the Direct learning model. Instructions in the control class.

1. Learning Outcomes

Based on the student learning outcomes data obtained in this study and after the data is tabulated, the average and standard deviation of the pretest and posttest data for the experimental class and control class are obtained as shown in table 1 below:

Table 1. Value of Learning Outcomes

Class	Average Score		Standart Deviation	
	Pretest	Posttest	Pretest	Posttest
Experiment	22	82	7.897	7.249
Control	23	71	6.66	9.624

2. Learning activity

The calculation results can be directly searched from the average value of critical thinking and cooperation obtained by students for each of the two classes (experimental class and control class). Presentation of data can be seen in table 2 below:

Table 2. Value of Learning Activities

Realm	Class	Average
Student activity	Experiment	70
	Control	55

3. Hypothesis Test

a. Hypothesis Test I

The alternative hypothesis (Ha) for hypothesis I is that the increase in student learning outcomes taught by the Problem Based Learning model based on critical thinking is higher than the increase in student learning outcomes taught by the Direct Instruction model. Data from the calculation of the first hypothesis test can be seen in Table 3.

Table 3. Data on Hypothesis Test Results I

Class Data		t_{count}	t_{table}	Category
Experiment	Control			
$\bar{X}_1 = 0.77$ $S^2 = 0.0089$	$\bar{X}_1 = 0.62$ $S^2 = 0.01688$	4.66	1.676	Ha accepted Ho rejected

Based on the hypothesis testing criteria, namely reject Ho if the t count is in the critical area. The critical area is at t > 1.676. From these calculations, it is obtained that the t count of increasing learning outcomes is 4.66 and is located in a critical

area, then Ha is accepted and Ho is rejected. This means that the increase in student learning outcomes that receive a Problem Based Learning model based on critical thinking is higher than the increase in student learning outcomes with the Direct Instruction model on Acid-Base material. From the research results it is known that student learning outcomes in the experimental class are 77%, while those in the control class are 62%. The result of the difference in increasing learning outcomes between the two classes is 15%.

b. Hypothesis Test II

Once it is known that the data are normally distributed and homogeneous, then hypothesis II can be tested using a statistical test, namely the t test. This test is to find out whether the hypothesis in this study is accepted or rejected. Test criteria if t count > t table then the alternative hypothesis (Ha) is accepted and the null hypothesis or null hypothesis (Ho) is rejected and if t count ≤ t table then Ho is accepted, with degrees of freedom $(db) = (n1 + n2) - 2$ and $\alpha = 0.05$. Data from hypothesis testing results can be seen in table 4 below:

Table 4. Data on the Results of Hypothesis Testing II

Class Data		t_{count}	t_{table}	Category
Experiment	**Control**			
$\bar{X}_1$ = 69.87 S = 13.16 S^2 = 173.267	$\bar{X}_1$ = 55.56 S = 14.49 S^2 = 209.876	3.73	1.676	Ha accepted Ho rejected

From the t distribution data it is obtained t-table = 1.676 while based on the calculation it is obtained t-count = 3.73 meaning that Ho is rejected and Ha is accepted, based on this analysis it means that there is an influence of the Problem Based Learning model based on critical thinking in student learning activities on Acid-Base material.

DISCUSSION

The results of testing the first hypothesis obtained student learning outcomes in the experimental class, namely 77%, while in the control class, namely 62%. The result of the difference in increasing learning outcomes between the two classes is 15%. Although this research succeeded in improving student learning outcomes, individual completeness cannot be said to be 100% complete because there are still some students (control class) whose posttest scores have not reached KKM (Minimum Completeness Criteria) 80 for chemistry subjects at school. This can be attributed to the factors causing students not to meet the KKM, namely the complexity aspect related to the level of difficulty of the subject matter being tested, the aspect of supporting resources related to the facilities and infrastructure available at school and aspects related to the intellectual level. student. However, apart from the posttest scores, student completeness can also be assessed from daily scores, student activeness in learning activities and changes in student behavior after learning.

The results of testing hypothesis II using the Problem Based Learning model based on Critical Thinking, the researcher wants to see how student activities in class with this application get the result that Ho is rejected and Ha is accepted, meaning that there is an influence on the Problem Based Learning Model based on critical thinking on student activities on the material Acid-Base.

Based on the results above, there are several factors that support the successful application of the effect in the experimental class, including first, the model used makes it easier for students to understand the material, second, by applying a scientific approach more easily. so that teachers can teach and understand what needs to be done in a more structured class teaching designed in such a way that students play an active role, the third is by asking questions in class can provide development in student activities. So based on research that has been done at SMA Smart Murni Medan, it can be concluded that there is an influence on learning outcomes and student activities that are taught using the Problem Based Learning

learning model based on critical thinking on Acid-Base material for class XI.

CONCLUSION

The conclusions obtained from the results of the study include increasing the learning outcomes of students who receive the Problem Based Learning learning model based on critical thinking which is higher than the learning outcomes of students with the Direct Instruction model on Acid-Base material. From the calculation, it is obtained that the t count of increasing learning outcomes is 4.66 and is located in a critical area, then Ha is accepted and Ho is rejected. In addition, the critical thinking-based Problem Based Learning learning model influences student activity with an average activity value in the experimental class is 70 and in the control class 56. Based on the calculations obtained tcount = 3.73, the results obtained are Ho rejected and Ha accepted, meaning there is the effect of the Critical Thinking Problem Based Learning model on student activity in Acid-Base material.

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