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Improving Critical Thinking Skills through Module Solubility and Solubility Results Based on Discovery Learning with Probing Prompting Techniques at SMAN 1 Pariaman

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Abstract - This study aims to determine the improvement of student critical thinking based on *discovery learning* using modules that help investigate questions that encourage questions about solubility and solubility results. The research design used was the Non-Equivalent Post-test Group Design. The population in this study was students of class XI IPA SMAN 1 Pariaman academic year 2018/2019. The selection of sample classes is done by *cluster purposive* sampling technique. The sample in this study was class XI IPA 1 as the control class and XI IPA 2 as the experimental class. The experimental learning class uses modules based on *discovery learning* with techniques *probing prompting*, while the control class without using modules. The research instrument used was a test of the results of learning critical thinking questions. The results of the study show that module based *discovery learning* with techniques *probing prompting* can improve students' critical thinking skills, as evidenced by the average increase in posttest results. The results of testing for normality and homogeneity state that the critical thinking value of the two distributed samples is normal and homogeneous. Hypothesis test results obtained by GIS. (2-tailed) of 0.016 <0.05 means that the value of critical thinking learners who use modules is based on *discovery learning* by techniques *probing prompting* differ significantly.

Keywords - Solubility Module and Solubility Results, *Discovery Learning*, *Probing Prompting*, Critical Thinking.

I. INTRODUCTION

Chemistry is the study of matter and the changes that accompany it (Chang, 2010: 4). Chemistry is obtained and developed based on experiments to find answers to the questions of what, why, and how the symptoms of nature, especially about composition, structure and properties, changes in matter and energy that accompany it. Scientists study natural phenomena through certain scientific processes and attitudes; therefore chemical learning should also be carried out through a scientific or scientific approach.

Discovery learning model is one of the suggested learning models in implementing the 2013 curriculum, because the syntax of this model is in accordance with the scientific approach. Model *discovery learning* is a learning model that encourages students to be actively involved in finding their own concepts learned (Hosnan, 2014: 282). The stages of model of *discovery learning* is stimulation *(stimulation)*,the identification of problems *(problem statement)*,collect data *(data collecting)*,data processing *(data processing)*,verify *(verification)* and conclude *(generalization)*.The results of the study have proven that the application of the model *discovery learning* in learning

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can improve learning outcomes (Uside *et al*, 2013: 351), improve investigative abilities (Balim, 2009: 1), mathematical analogy abilities (Maarif, 2016: 114), reduce misconceptions (Tompo *et al*, 2016: 5676) and increase understanding of concepts and critical thinking skills (Yuliani, 2015: 116).

Probing prompting is learning by the way the teacher presents a series of questions that are digging and guiding so that a thought process occurs that links each student's knowledge and experience with the new knowledge being studied. Learning techniques *Probing prompting* also as learning that refers to students 'thinking power, encourages thinking more actively, develops students' skills in expressing opinions and provides extensive knowledge to students (Shoimin, 2014: 126).

Learning technique *Probing prompting* is learning that can develop and improve students' critical thinking skills, because students are directly involved in the learning process. Students are given a series of questions to a high level that are digging and guiding, so that high-level thinking processes occur that link the knowledge of students' attitudes and experiences with new knowledge that is being studied.

Critical thinking is an organized process that allows students to evaluate the evidence, assumptions, logic and language underlying other people's statements. Critical thinking students will find the truth between the many events and information they receive. Students are given the opportunity to use thinking at a higher level, so they will be accustomed to building arguments using reliable evidence and logical logic (Johson, 2002: 184). Students' critical thinking skills can be developed by teaching students how to look for answers to questions and problems objectively and with an open mind, then teach students how to investigate the causes of an event (Lang, 2006: 461). The learning process should be able to train students to think critically. Critical thinking about how a concept is applied to real life situations can deepen the quality of students' understanding and ability to apply prior knowledge to new situations (Zivkovic, 2016: 107).

In the learning process, teaching materials are certainly needed. The selection of teaching materials with appropriate learning models or methods can support the success of the learning process (Isworini, 2015). There are three reasons for the need to develop teaching materials, namely the availability of teaching materials that are in accordance with the demands of the curriculum, target characteristics and demands for learning problems (Ministry of National Education, 2008: 8), one of the teaching materials that can be developed is a module. Learning with modules makes students more independent (Directorate of Education Personnel, 2008: 3), learning activities are arranged to help students achieve a number of objectives formulated specifically and clearly(Nasution, 2015: 205) and students can measure their level of mastery of the material discussed in the module (Prastowo, 2014: 209).

The use of modules can increase students' motivation to learn because the module is equipped with concept maps, colored charts and images. Concept maps in modules make it easier for students to remember information, focus attention and improve understanding. Color charts and images make the brain more active and increase students' pleasure (Ellizar et al, 2013).

Modules based on *discovery learning* using techniques *probing prompting* can be an alternative to solving these problems. Module based *discovery learning* uses techniques *probing prompting* equipped with teaching material that contains *discovery learning* where students are introduced to the teacher presents a series of questions that are guiding and the teacher acts as a facilitator and student learning motivator so that it can jump-start thinking processes that can link students' knowledge and experience with new knowledge that is being studied.

II. Literature Review

Critical thinking is reflective thinking that makes sense or according to reasonable reasoning focuses on determining what to believe and do (Ennis, 1990: 68). Critical thinking is cognitive skills to effectively identify, analyze, and evaluate arguments to find and overcome personal prejudices, form and present compelling reasons to support conclusions, make reasonable and intelligent decisions (Bassham et al, 2011: 1). In short, critical thinking involves evaluating the correctness of information (Lang, 2006: 461).

Enis classifies critical thinking skills into five aspects, provides basic clarification, makes basic decisions (the basis for decision), summarizes conclusions, provides further explanation (further clarification) and establishes strategies and tactics (Ennis, 1990: 68-69).

Module based *discovery learning* based on *discovery learning* with techniques *probing prompting*. According to Jacobsen (2009: 184) through probing questions teachers

try to make students explain answers to increase the depth of student understanding. While encouraging questions are questions that involve the use of cues, or instructions that are used to help students answer correctly.

The application of questions that encourage inquiry is adjusted into scientific learning steps. The stage of observing *discovery learning* students is given a problem that will require students to be able to identify the problem by probing the questions that encourage. At this stage students are given the opportunity to identify problems based on the observation stage. At this stage of data collection, students are given the opportunity to read various references to provide questions about Focusing questions Analyzing arguments asking and answering questions.

Determine an action Interact with other people the questions asked, conduct laboratory experiments if the answers to those questions need scientific proof. Student's class.

This post-test score is used to do a hypothesis test, are assisted by questions that explore and guide themselves to find themselves concepts learned through the data collection stage. Furthermore, the associating stage is to develop and deepen the concepts that have been found. At the communication stage students are not only required to understand the material and solve the problems given in learning, but students must also be able to communicate the ideas or answers they have both orally and in writing.

III. METHODOLOGY

Type of research used is experimental research. This experimental design is the *Non-equivalent Control Group* Posttest *Only Design*. The population in this study was students of SMAN 1 Pariaman. The selection of sample classes is determined by *purposive cluster* sampling which is a sampling technique by selecting classes (not individual types). The steps we have taken to select this sample, first collect the initial knowledge data in the form of students' daily test scores, namely solubility materials and solubility results. Second, look for and calculate the value of the normality and homogeneity of each class. And then, select two classes of homogeneity namely XI IPA 1 and XI IPA 2.

Table 1. Design Implementation Trial Field

	Treatment Test	Final
Experiment Class	X	T
Control Class	Y	T

Description:

X = The treatment given for experimental class is learning using modules based on discovery learning by using the probing technique prompting the solubility material and solubility results.

Y = The treatment given to the control class is learning using teaching materials used in school.

T = Post-test scores in the control class and experimental class. The instrument of this research is five critical thinking questions.

IV. RESULT AND DISCUSSION

Analysis of learning outcomes data is determined systemically starting with knowing the contradiction scores of the experimental class and the control class, normality tests, homogeneity tests, and t-tests. Both of these sample classes are taken based on the percentage score of students who think critically. The score of students' critical thinking after being treated during the learning process, the average post-test experimental class was higher than the control before doing this test we get a normality test and a homogeneity test. The normality test used is *Kolmogorov-Smirnov*. The results of the test normality can be observed from Table 2.

Table 2.Normality Test Results

Class	α	Sig.	Distribution
Experiment	0,05	.093	Normal
Control		.500	Normal

Based on the table above, the sample data has a significant value > 0.05 real standard α = 0.05. However, the post-test score data of two samples were normally distributed. The homogeneity of the test used is the Levene test. The results of homogeneity tests can be observed in Table 3 as follows.

Table 3.Homogeneity Test Results

Class	α	Sig.	Distribution
Experiment	0,05	.053	Normal
Control			

Based on the table above, sample data has a significant score> 0.05 in the real standard α = 0.05. However, the posttest data score (critical thinking) of these two samples

has a variance in homogeneity. And the results point is determined that the sample class can be distributed normally and have a homogeneous variant. Therefore, to do the hypothesis used is the *independent sample t-test*. Acceptance criteria if the value of sig *(2-tailed)* > 0.05 then Ho is accepted and if the value is sig . *(2-tailed)* <0.05 so Ho is rejected. And the results of this critical thinking in Table 4 are as follows:

Table 4. Hypothesis Test Results; Critical Thinking Scores in sample

Class	Sig. (2-tailed)	Distribution
Experiments	.016	H_0 rejected
Control		

Based on the above table the sample class has a sig *(2- tailed) lwer value of 0,05* IS 0.016, it can be concluded that Ho is rejected. Rejection of Ho's decision defines that students 'critical thinking uses solubility modules and solubility results based on *discovery learning* with techniques *probing prompting* and without solubility modules and solubility results based on *discovery learning* using techniques to *probing* prompting encourage improvement in students' critical thinking performance.

Similarly, what happened in Siti's study (2015: 38) found that the application of questions that encourage questions can improve student learning outcomes because of the average increase in the second cycle. In line with the research conducted by Ririn (2018: 125) found that learning outcomes of students who learn to use modules based on scientific approaches and without modules differ significantly. The use of a buffer solution module based on a scientific approach that is assisted by probing the questions posed in a group learning system can make students work together in building their understanding and knowledge, so students are easier to remember and understand (Hanson, 2006: 4). This is known when students answer probing questions and encourage students to work together and discuss in answering this question. Thus learning becomes more effective and will have a positive effect on scientific attitudes, students' thinking skills and student learning outcomes.

According to (Jacobsen, 2009: 184) through questions probing teachers try to make students explain answers to improve student understanding. While the questions asked are questions that involve the use of signals, or instructions that are used to help students answer correctly.

V. Conclusions

The effectiveness of solubility modules and solubility results based on *discovery learning* by using techniques *probing prompting* can improve the performance of students who think critically and can be observed with a comparison score of critical thinking students in the experimental class and control class with a significant 95% confidence level (α) 0.05. Hypothesis testing shows that the results of students' critical thinking learning with solubility modules and solubility results are based on *discovery learning* by using techniques *probing prompting* and without module margins and solubility results differ significantly. Which means using solubility and solubility results based on *discovery learning* by using techniques *probing prompting* on student learning outcomes that are higher than without modules and can help improve student performance in critical thinking.

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References

[1] Akker, JV and Tjeerd Plomp. 1994. Educational Development in Developing Countries. In Skutsch, Margaret M., Opda, J. Hans M. And Nordholt, Nico G Schulte (Eds.), Towards Sustainable Development. Enschede: Universityof Twente Tecnology and Development Group.

[2] Aprilia Safitri, et al. 2015. "Probing Prompting Application to Improve Students' Critical Thinking Ability on Social Studies Learning",UPI Anthology Journal. 3 (2): 6-7

[3] Anderson and Krathwohl. 2001. Framework for Learning, Teaching and Assessment: Revised Taxonomy of Bloom Education. Translation by Agung Prihantoro. 2010. Yogyakarta: Student Library.

[4] Arikunto, Suharsimi. 2009. Research Management. Jakarta: Rineka Cipta. Boslaugh.

[5] Sarah and Paul AW 2008. Statistics in A Nutshell, A Desktop Quick Reference. Beijing, Cambridge, Famham, Cologne, Sebatopol, Taipei, Tokyo: O'Reilly.

[6] Chang, Raymond. 2010. Tenth Edition Chemistry.

New York: The McGraw-Hill Companies, Inc.
[7] Bassham, Gregory, William Irwin, Henry Nardone and James M. Wallace. 2011.Critical Thinking: A Student's Introduction. New York: McGraw-Hill Companies Inc.
[8] Birgili, Bengi. 2015. Creative and Critical Thingking Skills in Problem-based Learning Environments. Journal of Gifted Education and Creativity. Vol 2 (2): 71-80.
[9] Dahar, Ratna Wilis. 2011. Theories of Learning and Learning. Jakarta: Erlangga.
[10] Daryanto and Aris Dwicahyono. 2014. Development of Learning Devices (Syllabus, RPP, PHB, Teaching Materials). Yogyakarta: Gava Media.
[11] Dyah Ayu Astuti, et al. 2014. "Application of Probing Prompting Learning Model to Improve Science Learning Achievement of Class IV Students of SD Negeri 2 Antosari, Selemadeg Barat District".e-
[12] Journal MIMBAR PGSD. 2 (1): 5-6
[13] Dewi Kurnia Sari, et al. 2014. "Experimentation of Cooperative Learning Model Type Group Investigation and Probing Promting with Scientific Approach on Algebra Operational Material Judging from Mathematics Learning Anxiety Grade VIII Middle School Students"Learning Electronic Journal Mathematics, 4 (4): 444-456
[14] Directorate of Education Personnel. 2008. Writing Module. Jakarta: Ministry of National Education.
[15] Ellizar, 2012. Development of Programs Learning. Padang: UNP Press. Ellizar, Bayharti and Andromeda. 2013. The Effect of Chemistry Motivation and Learning Using Modules and Without Modules on Chemistry Learning Outcomes at RSMA-BI. Semirata Proceedings of the University of Lampung FMIPA: 117-124.
[16] Elsa. 2015. Application of Probing-Prompting Learning Model to Improve Ability Mathematical Critical Thinkingof Students of Class XI Science MAN 1 City of Bengkulu ". Journal of Raflesia Mathematics Education, 2 (1): 97-100
[17] Ennis, Robert H. 1990. "Goals for A Critical Thinking Curriculum"; in Costa, Arthur L. 1991. Developing Minds: A Resource Book for Theaching Thinking.Alexandria: Association for Supervision and Curriculum Development.
[18] Hartinah, Siti. 2010. Student Development. Bandung: Refika
[19] Aditama. Hamalik, Oemar, 2002. Curriculum and learning. Jakarta: PT. Earth Aksara.
[20] Herron, Dudley J, Luis L Cantu, Richard Ward and Venu Srinivasan. 1977. Problems Associated with Concept Analysis. Science Education. 2: 185-200.
[21] Hosnan, M. 2014. Scientific and Contextual Approach in 21st Century Learning: The Key to the Success of 2013 Curriculum Implementation. Bogor: Graha Indonesia.

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