Proceeding
The 1st International Seminar on Chemical Education 2015
September, 30th 2015

Research Methods Teaching of based Problem Solving Reviewed From Cognitive Ability and Critical Thinking Ability

Julia maulina[1,*], Wilda Wani Siregar[2], Adilah Wardhani Lubis[3], Susilo Sudirman[4]

[1* 2, 3, 4] Chemistry Education Department, Islamic University of North Sumatera
Jl. Sisingamangaraja – Teladan Medan *email: Julia-pangan@yahoo.com

Abstract

This study shows the influence methods of problem solving on cognitive abilities and critical thinking skills in materials research methods. This study used an experimental method, which was implemented in January 2015 until July 2015. The sample consisted of one class student of Chemical Education FKIP UISU TA. 2014/2015. The results were obtained using a cognitive test is a multiple choice test and the ability to thinking critical of making a research proposal.
From the results analysis, there is a method of problem solving influence on learning outcomes of students Learning of Score (LS), LS critical thinking and multiple-choice tests on the material Research Methods. There is no effect LS on the multiple choice test for LS research method teaching. there is no interaction between the two test method with the use of methods of problem solving, but no effect using problem solving method on critical thinking skills of students in LS the material LS Research Methods teaching.

Keywords: problem solving method, critical thinking, cognitive learning, research method teaching

Introduction

Education very important in human life. With the education, it will be able to help people to develop themselves so as to face the problems that occurred in his life. Thus, it is necessary efforts to further improve the quality of education all the time.

Education can not be separated with teaching and learning activities is designed to follow the typical educational principles, namely focus on the students active in building meaning or understanding. Thus, in teaching, teachers should encourage students to use the authority or the right to construct ideas. Remain the responsibility of learning on students and teachers only responsible for creating situations that encourage initiative, motivation, and student responsibility for learning on an ongoing basis or a lifetime. (Muijs, 2008)

Research Method learning is a science that provide concepts in conducting a study. Purpose learnings research methods so that students can make a research proposal and carry out research in accordance with the scientific. Therefore we need an innovative learning model according to the syllabus applied to facilitate students understand the material teaching. One model appropriate learning and teaching materials can be applied to study the model problem solving. This model train students in finding their own concept to practice solving problems

in the learning process. In the model of problem solving guided students to think critically and to use his reason in completing something of a problem(Creswell, 2013).

According to Ennis (1996) Critical thinking is a process to make a sensible decision about something believed and done. Component used is a sensible decision and reasoning include: interpretation, analysis, cause and effect, evaluations and conclusions. According to Bloom in the Ministry of Education (2003) cognitive domain is the domain associated with the competence to think, acquire knowledge, recognition, understanding, conceptualization, determination and reasoning.

The purpose of this study is to determine the presence of: 1) the influence of the learning model of problem solving to test the cognitive form of multiple-choice and critical thinking test by making proposals of research papers on LS the methods Research teaching, 2) the correlation between the two assays for LS on the research methods teaching.

Material and Method

This research was conducted on students of Chemistry Education FKIP UISU implemented in the second semester of the academic year 2014/2015 for 6 months in January 2015 until July 2015.

The dependent variable in this study was the achievement of students in research method teaching, while the independent variable is the use of problem solving model. Samples in this study is the sixth semester students of Chemistry Education FKIP UISU who take the Research Methods teaching.

Data collection techniques in this study using (1) method tests the achievement of students in the cognitive with a grain of multiple choice questions and in the form of article creation proposal students as test critical thinking ability of student, results in the second test tool is searched correlation to student learning outcomes the Research Methods teaching of final exams.

Instruments used syllabus, Lesson plan and critical thinking skills test in the form of paper making proposals and multiple-choice tests. Tests have been tested validity.

Analysis data was performed with SPSS 17 by Kolmogorov-Smimov normality test, test form multicollinearity test, autocorrelation test, regression analysis, partial test and ANOVA test simultaneous form.

Result and Discussion

Data obtained by the score of student learning outcomes were tested with multiple-choice tests, learning of score critical thinking in the form of a paper-making research proposal, shown in Table 1 and 2.

Table 1. Results of Student Learning with Multiple-choice Tests Learning

Learning Models	Students score of Learning (multiple choice)	Students (person)	Cognitive
Problem Solving	High	7	97.50
	Low	8	63.75

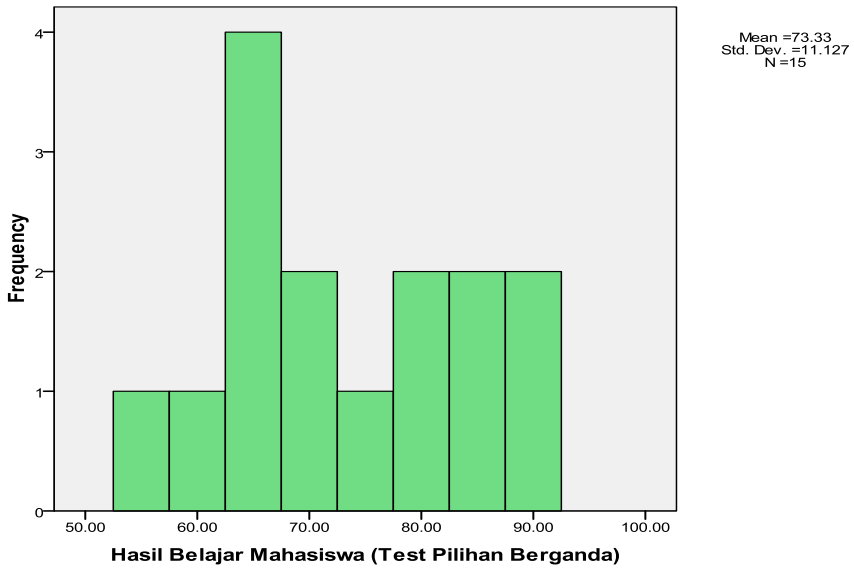


Fig. 1 Influence Problem Solving method to Students learning of score for Research method teaching

Table 2. Results of Students Learning with Critical Thinking

Learning Models	Students score of learning (critical thinking)	Students (Person)	Cognitive
Problem Solving	High	10	84
	Low	5	61

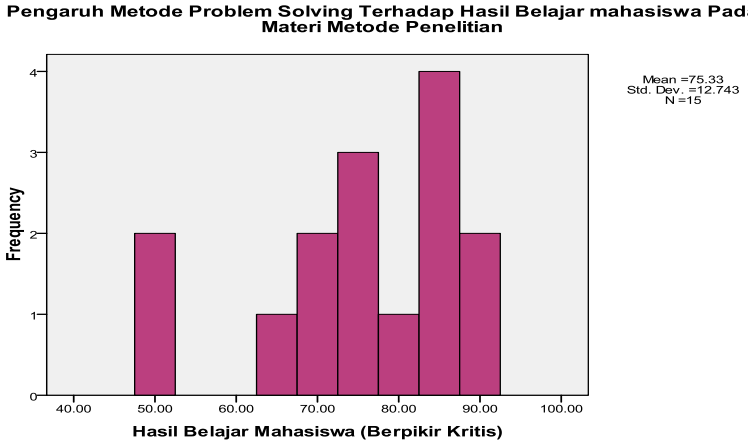


Fig. 2 Influence Problem Solving method to Students learning (Critical Thinking) of score for Research method teaching

Calculation of SPSS 17 is obtained two samples LS are normal distribution. The results of regression analyzes in Table 3 suggest a link between LS with multiple-choice tests to LS of finally exam research method teaching and depend of LS critical thinking finally exam research method teaching.

Table 3. The regression of Analysis Learning Score Multiple Choice and Learning Score Critical Thinking to Learning Score Finally Exam Student of Research Method Teaching

Model		Nonstandard Coefficients		Standardized Coefficients	t	Sig.	Col-linearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	6.33	16.543		0.383	0.709		
	x1	0.055	0.226	0.045	0.246	0.81	0.791	1.265
	x2	0.858	0.197	0.802	4.355	0.001	0.791	1.265

a. Dependent Variable: y

Autocorellation analysis in table 4.

Table 4. Corellation of learning score multiple choice and learning score critical thinking to finally exam student of research methode teaching

Model Summary[b]

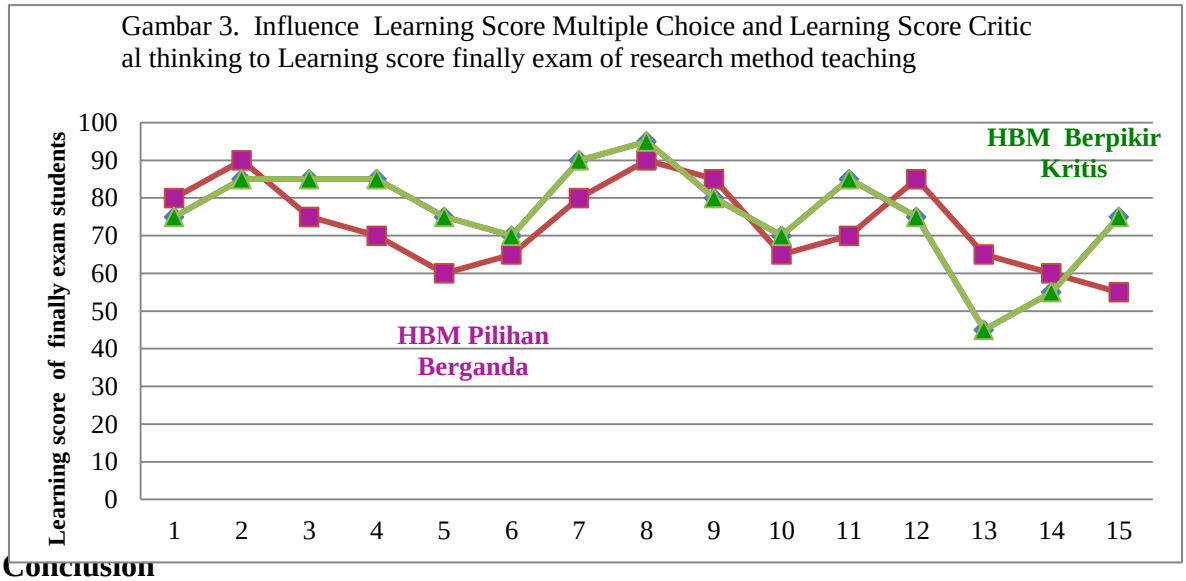
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.824[a]	.678	.625	8.34799	2.184

a. Predictors: (Constant), x2, x1

b. Dependent Variable: y

There LS effect with multiple options for finally exam students in research methods teaching and no influence LS thinking critically about the finally exam research methods teaching, but there is no direct correlation between the two LS shown in Fig. 3.

Gambar 3. Influence Learning Score Multiple Choice and Learning Score Critic al thinking to Learning score finally exam of research method teaching



Conclusion

Methods of problem solving using both multiple-choice test and critical thinking in the form of a research paper proposal could increase the LS finally exam research methods teaching. Students who have good LS critical thinking also has a good LS multiple-choice and contribute LS well be increase finally exam of research method teaching, but the good LS. Multiple choice does not in increase LS of critical thinking.

References

Astuti, P.,2012, Pembelajaran *Problem Solving* berbantuan Web Dan Buku Disertai LKS pada Prestasi Belajar Kimia Pokok bahasan Minyak Bumi Dengan memperhatikan Minat Belajar Siswa, *Tesis*, Universitas Sebelas Maret Surakarta, 8-11.

Depdiknas, 2003, Standar Kompetensi Kurikulum 2004, Jakarta: Direktorat Pendidikan Menengah Umum Depdiknas.

Ennis, R.H., 1996, Critical Thinking and Subject Specificity: Clarification and Needed Research. *Educational Research.* Informal Logic Vol. 18(2) : 165-182.

Creswell, J.W., 2013, Research Design Pendekatan Kualitatif, Kuantitatif dan Mixed edisi 3, 191-215.

Muijs, D dan Reynolds, D. (2008). *Effective Teaching;* Teori dan Aplikasi. Pustaka Pelajar: Yogyakarta

Pidekso, A., 2009, SPSS 17 untuk Pengolahan Data Statistik, PT Wahana Komputer, 215-232.

Raehana, Mulyani, S., and Saputro, S., 2014, Pembelajaran Kimia menggunakan Model P*roblem Solving T*ipe *Search Solve Create And Share* (SSCS) dan *Cooperative Problem Solving* (CPS), Ditinjau dari Kemampuan Berpikir Kritis dan Kemampuan Matematis , Jurnal Inkuiri, 3:19-27.

Pusporini, S., Ashadi, and Sarwanto, 2013, Pembelajaran Kimia Berbasis *Problem Solving* Menggunakan Laboratorium Riil dan Virtuil Ditinjau dari Gaya Belajar dan Kemampuan Berpikir Kritis, *Tesis,* Program Studi Pendidikan Sains Program Pascasarjana Universitas Sebelas Maret Surakarta, 57126, Indonesia