Learning Strategy Implementation Cooperative Script Combined Problem Posing and Ability Academic Student to Metacognitive Skill

Ferny Margo Tumbel

Department of Biology, Faculty Mathematics and Natural Sciences, Manado State University, Indonesia

Abstract: ***Learning strategy implementation cooperative script combined problem posing and ability academic student to metacognitive skill have been done. With respect to metacognitive skill variable, there is an effect of learning strategy and academic capability on students' metacognitive skill. The average of students' metacognitive skill in Cooperative script plus Problem posing(63.73) learning strategy is obviously different from those in Cooperative script(61.16) only, Problem posing(58.78) only, and conventional learning strategies (55.47). The average of high performed students' metacognitive skill is 61.74, which is obviously different from low performed students' metacognitive skill with 57.83.***

Keywords: Cooperative Script, Problem Posing, Metacognitive Skill, Thinking Ability, and Conceptual Understanding

1. Introduction

The general description of teaching and learning process in Bitung City has not been effective yet. In the implementation, the teacher still has not implemented the learning pattern that empower the thinking for the students. Substitution of curriculum has not been followed by changes in how to think how innovative learning efforts should be done by teachers. So far, the condition of high school biology teacher in Bitung City still has not applied learning strategy which has characteristic of thinking empowerment.

The empirical condition shows the weakness of the students in understanding the subject matter which is considered difficult because it is not supported by innovation and creativity of strategic learning pattern such as reading and summary activities. This issue is more related to biology teachers in high schools in Bitung City because they do not know and empower metacognitive in biology learning. The low creativity of high school biology teachers in Bitung city still apply conventional learning strategy that impact on the decrease of student achievement and the quality of biology subject study itself.

Science learning can not be simplified by learning in the form of memorizing facts, but how to understand and verify the validity, reliability and reliability of the information received (Gun et.al, without years). Thus, the learning process, including biological science learning, should have emphasized the process of thinking empowerment because of several quotes, namely: de Sancez in Corebima (2009) states that "developtment of thingking skills is not a natural accorrence, an accidental outcome of experience, automatic by product of study in a subject area ". One other form of thinking that is also important to be empowered in learning is metacognition.

Metacognitive has been known to be closely related to the acquisition of learning. Schraw (1995) explains that students who can achieve mastery in learning are students who have good metacognitive knowledge. Students who are accustomed to using metacognitive skills in learning will develop into independent learners and can control their cognitive processes including thinking skills.

Green Corebima, 2006) that cooperative learning encourages or empowers the development of metacognitive learning.

Hadi (2007) and Warouw (2010) who concluded that students who studied with Cooperative script learning strategies had a higher metacognitive skill score and higher crisk thinking than the average metacognitive skills score and thought of students learning with conventional learning strategies . In addition to Cooperative Script, other learning strategies that can empower metacognitive skills and students' thinking skills are Problem Posing learning strategies.

According to Kojima et al (2009), Problem Posing learning strategy requires productivity in thinking because students have to create questions (problems) in various ways and not just those contained in textbooks.

Lavy and Shriki (2007) explained that Problem Posing helps in reducing students' dependence on teachers and textbooks and giving students the persuasion becomes more involved in their education. Brown & Walter in Lavy and Shriki (2007) concluded that posing problems can broaden students' perceptions of mathematics and enrich and consolidate basic concepts. Xia, et al (2008) also concluded that posing problem learning strategy plays an important role in improving students 'interest in mathematics as well as increasing students' inquiring and math ability. Learning Posing problems are expected to help students with low academic ability to achieve maximum learning outcomes.
The results of a survey conducted by Tumbel (2010) on high school biology teacher in Bitung City, biology teacher has not known and apply Cooperative Script and Problem Posing learning strategy in learning process.

Thus, the importance of empowering students 'metacognitive skills and thinking skills by incorporating the Cooperative

Script and Problem Posing strategies to improve students' conceptual understanding.

2. Methods

Research subject

Subjects in this study were all teachers of Biology at SMA in Bitung City, as many as 14 people.

Research Instruments

The instrument used in this study is a questionnaire for teachers. The questionnaire before it was given to the teacher, has been validated by the expert as well as the Promoter.

a) Data Collection

Data collection in survey research was done by distributing questionnaires to biology teacher at SMA in Bitung City. In addition through questionnaires, biology learning data on high school in Bitung City is also obtained by interviewing techniques with teachers.

b) Data Analysis

Questionnaire data obtained, analyzed by using descriptive statistic in the form of percentage.

A. Experimental Research

Learning tools developed consist of Learning Preparation Plans and Student Activity Sheets. The way of device development is adapted from the development of a 4-D model device, developed by Thiagarajan, Semmel and Semmel (Ibrahim, 2000) consisting of 4 stages of "Define, Design, Develop and Disseminate" or adapted into a 4-P Model; define, design, development and dissemination.

1) Syllabus

The syllabus is prepared according to BSNP format. The syllabus format sequence contains: name of school, subject, class / semester, competency standard, basic competence, instructional material, indicator, learning activity, assessment, time allocation, tools / materials / learning resources. The syllabus is composed of cooperative script strategy syllabus, problem posing, and cooperative script combined Problem posing. Each syllabus is distinguished by a learning experience tailored to each learning strategy's syntax.

2) Learning Implementation Plan (RPP)

RPP prepared according to BSNP format. The sequence of the RPP format includes: the name of the school, the subjects, the class / semester, the time allocation, the competency standard, the basic competencies, the indicators, the learning objectives, the learning materials, the learning strategy, the learning steps (the introduction, the core activities, the cover) tools / learning materials, assessment. Learning Plan (RPP) developed in the study there are 3 types, namely: 1) RPP Cooperative Script learning strategy, 2) lesson strategy strategy Problem posing and 3) Cooperative script combined Problem posing

3) Development Stage (Develop)

This stage is done to produce learning tools that is Syllabus, RPP and LKS have been revised. Revisions were made based on the results of validation of senior teachers and biology learning experts (Counselors). Advice from validator for RPP format in accordance with BSNP, adjust the material with time allocation, using more appropriate language.Validation. Questions on LKS need to be developed in accordance with the students' abilities, developed in accordance with each syntax, taking into account the work procedures undertaken by students on the LKS.

4) Disseminate Stage

This stage is an experimental trial in experimental class, but limited trials have limitations to determine the effectiveness of instructional tools so this research refers to the result of modification of Corebima (2009), that is by substituting the diseminate stage to be experimental experimentation. Quasi experimental research was conducted to determine the effect of learning devices on, metacognitive skills, thinking ability and understanding of high school students concept in Bitung City. Flowchart of learning device development characterized by Cooperativeve Script and Problem Posing.

B. Experimental Research Design

This research is a quasi experimentalexperimental research conducted by using pretest-postest Non-equivalent Control Group Design design using 4 x 2 factorial design.

1) Population

The population is all the high school X grade students in Bitung City North Sulawesi where there are 12 schools covering private and public schools, academic year 2016/2017.

2) Sample

The sample of the research is a number of individuals performed using multiple stage sampling technique that is gradual sampling, with details: 1) determination of high academic and academic high school is done by stratified sampling technique. The determination of high academic ability and low academic is done by considering the value of biological science result of National Exam (UN). 2) the determination of experimental class is done by random sampling technique which is random sampling by drawing to get 6 classes of experimental class consisting of 3 high academic class and 3 low academic class for application of learning strategy developed. Furthermore, two classes of controls were taken with 1 class at high academic schools and 1 grade in low academic schools. Thus the number of classes used in this study is 8 classes.

3) Research Instruments

The instruments used in this study consist of:

a) Test Instruments

The test instrument is an essay test that aims to measure concept comprehension. The cognitive aspects measured are the process dimensions of Bloom's revived cognitive domain of cognitive taxation including C1, C2, C3, C4, C5, C6, Before the instrument of question is used then first tested the validation, reliability, test the level of difficulty problems and test different power questions.

b) Scrap Rubric

The data of each dependent variable in this study was obtained by using scoring rubric. The rubric used consists of:

- Metacognitive skill metrics adapted from Corebima (2006) consisting of a scale of 0 to 7.
- Rubric of thinking ability adapted from Hart (1994) with indicator referred to Structured of the Observed Learning outcome (SOLO) Taxonomy model, in the form of ability: a) to formulate problem, b) give argument, c) induction, d) perform deduction, e) evaluate, f) decide and implement. The scale used is a 0 - 4 scale.
- The concept comprehension rubric adapted from Hart (1994) with interval 0-4 This score was obtained through tests: C1 (memory), C2 (understanding), C3 (application), C4 (Analysis), C5, (synthesis), C6 (creating).

C. Test Validation, Reliability, Level of Difficulty and Differentiating Power of Test Instruments

1) Instrument Validity Testing

The data obtained in the experiment were analyzed using correlation formula proposed by Pearson known as Product Moment Correlation as follows (Sugiyono, 2008):

$$r_{xy} = \frac{n\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{\{n\Sigma x^2 - (\Sigma x)^2\}\{n\Sigma y^2 - (\Sigma y)^2\}}} \text{ di mana:}$$

Trials were conducted on 30 respondents as part of the population but were not selected as samples. Calculation of instrument validity test was analyzed by using SPPS 16 For windows program.

2) Instrument Reliability Test

Testing of instrument reliability in this research used Alpha Cronbach formula (Ary, et al., 1982) as follows:

$$r_{xy} = [\frac{k}{k-1}][\frac{Sx^2 - S1^2}{Sx^2}] \text{ di mana:}$$

Sugiyono (2008) said that an instrument is considered reliable if it has reliability of 0.70 or more with the following criteria:

0.00 - 0.19 = very weak or very low correlation
0.20 - 0.39 = weak or low correlation
0.40 - 0.69 = moderate or sufficient correlation
0.70 - 0.89 = strong or high correlation
0.90 - 1.00 = very strong or very high correlation

To test the reliability of the instrument used analysis tool with SPPS program version 16 for windows.

3) Problem Level Problem Test

Numbers that indicate difficult and easy a problem are called difficult indices and are denoted by P (difficulty index). So to look for the difficulty index using the formula below.

$$P(x) = \frac{\Sigma X}{SmN}$$

Category of difficulty:
Value p Criteria
P, 0.3 Hard
$0.3 \leq p \leq 0,7$ Medium
P> 0.7 Low
(Source: Arikunto, 2006)

4) Different Power Test

Differentiation test is the ability of a problem to distinguish between students who are smart (high-ability) with students who are less (low-ability). The way to determine the different power problem is the same as the way used to determine the level of difficulty of the problem only before the calculation is done first sorting scores obtained from high to bottom. The formulas used to obtain high or low ability level students are:

Information:
P (x): score of difficulty level of each subject matter (item) student up / down
 X: the number of scores per student (upper) subject matter
Sm: maximum score of each question (item)
N: number of test takers (number of students) capable of up / down

The formula to find different power problems:
Differential power test = P capability up - P down ability
Classification of distinguishing power:
Value p Criteria
0,00-0,20 Bad (Poor)
0.21-0.40 Enough (satisfactory)
0.41-0.70 Good
0.71-1.00 Very good (exellent)
(Source: Arikunto, 2006)

D. Data Collection

1) Preliminary test (pre test), conducted to know metacognitive skills, thinking ability and understanding of student concept before applying of learning strategy.
2) The final test, to know metacognitive skills, ability to think and understanding the concept of students after treatment with learning strategies.
3) Observation, conducted through observation of cooperation during learning activities with observation sheets, conducted by researchers and teachers during facilitating student learning.
4) Questionnaire, given to teachers and students to find out their response to the implementation of learning strategies.

E. Data Analysis

The data collected will be analyzed using the following statistics:

1) Descriptive analysis, to see the picture related to the percentage of metacognitive skills, the ability to think and understanding the concepts of students before and after learning.
2) Analysis of Covariance, to see the influence of learning strategies and academic ability to metacognitive skills, thinking ability and understanding of student concepts. If there is a significant effect, proceed with Least Significance Difference (LSD) different test.

To facilitate the process of data analysis then used SPPS 16 for Microsoft Windows.

3. Results and Discussion

In this section, we will describe the results of research consisting of survey research, and experimental research. Survey research data includes characteristics of biology learning in Bitung City and experimental research in the form of the influence of learning strategy and academic ability on conceptual comprehension, thinking ability and metacognitive skills of students. In detail, the sequence of explanations of each research variable will be explained as follows:

Hypothesis testing

1. Normality Test

As a requirement of covariance analysis, firstly tested the assumption to know the normality of data groups of each data variable. Normality data analysis was done by using non parametric statistical test One Sample Kolmogorov-Smirnov. Summary of normality data test results against the dependent variable can be seen in Table 1.

Table 1: Summary of Data Normality Test Results by One Kolmogorov-Smirnov Test of Test against Dependent Variables

No.	Variable	Signifikansi (2-tailed)			Alpha	Ket.
		Pretes	Mid	Pos		
1.	Understanding Concepts	0.000	-	0.001	0.05	abnormal
2.	Thinking Ability	0.000	-	0.001	0.05	Normal
3.	Metacognitive Skills	0.000	-	0.054	0.05	Normal

Based on Table 1, it shows that the probability value (sig.) Of each dependent variable tested is smaller than the alpha value used is 0.05. Thus H0 is rejected, it means that there is deviation to the normality of data of each independent variable so that the data of the dependent variable is declared not normally distributed. Although the research data indicates a deviation to the normality of the data but the descriptive analysis results in Appendix (8) also shows the distribution of data following the normal curve distribution. Therefore, this research data can still be continued inferencing test.

2. Data Homogeneity Test

Data homogeneity test was performed on corrected data from each study data group that is average score of concept comprehension, thinking ability and metacognitive skills. The result of homogeneity test between variants done by statistical technique of Leven's Test of Equality of Error Variances on the dependent variable is presented in more detail in Appendix (9), while the summary of homogeneity test results among variant data can be seen in Table 2 below.

Table 2: Summary of Homogeneity Test Results among Variant Bounded Data Variable

Data Varian	F	df1	df2	Sig.	alpha	
Understanding Concepts	1.626	7	162	0.132	0.05	Homogeneous
Thinking Ability	2.060	7	162	0.051	0.05	Homogeneous
Metacognitive Skills	1.313	7	162	0.247	0.05	Homogeneous

Based on Table 2, it shows that the probability value (sig.) Of each dependent variable tested is greater than the alpha value used is 0.05. Thus H0 is accepted, meaning that there is no variant difference between groups of data so that the dependent variable data is declared homogeneous.

Based on the normality and homogeneity test data above, it can be seen that the dependent variable data group has a normal distribution and the variant between the data groups is homogeneous. Thus, the data of the research results have been qualified to be analyzed with inferential statistics.

3. The Influence of Learning Strategy and Academic Ability to Understanding Metacognitive Skills

Metacognitive skills is one of the learning result variables analyzed in this study. Students' metacognitive skills are measured using the assessment rubric developed by Corebima (2009). The rubric is used to assess the results of the student essay tests conducted before and after the lesson. The data obtained were then analyzed by using covariance analysis which can be seen in Appendix (7). A summary of the results of the analysis is presented in Table 4.19.

a) Learning strategies

The result of covariance analysis shows that Fcount of learning strategy variable is 23,657 with level of significance 0.000 which is still smaller than alpha 0,05 which is used as test standard. Thus H0 rejected and research hypothesis stating that there is influence of learning strategies on metacognitive skills students accepted. In other words, it was concluded that the application of different learning strategies led to the acquisition of different metacognitive skills.

Table 3: Summary of Covariance Analysis Results

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2189.817[a]	8	273.727	13.927	.000
Intercept	30559.730	1	30559.730	1.555E3	.000
Y1	19.567	1	19.567	.996	.320
X1	1394.842	3	464.947	23.657	.000
X2	613.982	1	613.982	31.239	.000
X1 * X2	58.188	3	19.396	.987	.401
Error	3164.307	161	19.654		
Total	626629.000	170			
Corrected Total	5354.124	169			

Based on the results of the analysis in Table 3, which showed a significant influence, then the analysis continued with the LSD test to determine the difference in average metacognitive skills of students at each level of learning strategies. The full analysis is presented in Appendix (16) while the summary is presented in Table 4.

Based on Table 4, it can be seen that the average of students' metacognitive skill is highest in group of cooperative script learning strategy combined Problem posing is 63,739 then average of metacognitive skill of student in group of Cooperative script learning strategy equal to 61,164 learning strategy Problem posing 58,781 and most the lowest is the average metacognitive skills of students in the group of conventional learning strategies of 55.471.

Table 4: Summary of LSD Test Results

Strategy	Pre	Post	PosCor	LSD
Conventional Strategy	11.27	55.52	55.471	a
Strategy Pp	11.75	59.57	58.781	b
Strategy CS	12.24	61.18	61.164	c
Strategy CS plus PP	9.52	63.98	63.739	d

Based on the difference of notation, it can be explained also that the average of metacognitive skill of students in group of cooperative script learning strategy combined with posing problem is significantly different and 4.04% higher than the average of students' metacognitive skill in group of Cooperative script learning strategy, 7,78% of the average metacognitive skills of students in the problem posing strategy group and 12.97% of the average metacognitive skills of students in the conventional learning strategy group.

Furthermore, the LSD test results also show that the average of students 'metacognitive skills in the Cooperative script learning strategy group is significantly different and 3.90% higher than the average of students' metacognitive skills in the learning strategy group Problem posing but significantly different and higher 9, 31% of the average metacognitive skills of students in the conventional learning strategy group. Similarly, the average metacognitive skills of students in the learning strategy group is significantly different and 5.63% higher than the average metacognitive skills of students in the conventional learning strategy group.

b) Academic Ability

The result of covariance analysis shows that the Fcount of academic ability is 31,615 with 0,000 significance level which is smaller than alpha 0,05 so that H0 is rejected. With the rejection of H0, the hypothesis of research that states that there is influence of academic ability to metacognitive skills of students accepted. In other words, the academic ability of different students leads to differences in metacognitive skills. The result of analysis also shows that the average of metacognitive skill of students of high academic group is 61,74 significantly different and 6,80% higher than average of metacognitive skill of low academic student equal to 57,83.

c) Interaction of learning strategies and academic ability

The result of covariance analysis shows that Fcount of interaction variable of learning strategy and academic ability is 0,987 with significance level 0,401 bigger than alpha 0,05 so that H0 is accepted. With the acceptance of H0, the research hypothesis states that there is influence of learning strategy interaction and academic ability to students' metacognitive skills rejected.

Although there is no significant effect on the level of covariance analysis, the analysis can still proceed with the LSD test to find out the difference in mean metacognitive skills of students at each interaction level. The results of the complete analysis can be seen in Appendix (17) while the summary is presented in Table 5.

Based on Table 5, it can be explained that the average metacognitive skills of students from the highest seen in the group of Cooperative script learning strategies combined High posing and academic problems of 66.442 and the average metacognitive skills of the lowest students seen in the group of conventional learning strategies and academic low of 54.484.

Table 5: Summary of LSD Test Results

Strategy	Academic	Pre	Post	PosCor	LSD
Conventional Strategy	Low Academic	10.31	54.38	54.484	a
Conventional Strategy	High Academis	12.18	56.59	56.458	a
Strategy PP	Low Academic	11.60	56.60	56.543	a
Strategy CS	Low Academic	12.87	59.50	59.280	ab
Strategy PP	High Academic	11.83	61.10	61.018	abc
Strategy CS combined PP	Low Academic	10.10	60.90	61.036	abc
Strategy CS	High Academic	11.52	63.10	63.048	abc
Strategy CS combined PP	High Academic	9.11	66.18	66.442	abcd

Based on the difference of notation, can be explained as follows:

1) Correctly corrected metacognitive skills of students with high academic ability in Cooperative script learning combined. Problem posing is significantly different and higher 5.11% of the corrected average metacognitive skills of students with high academic ability on Cooperative script learning, 8.16% corrected skills of metacognitive skills of students with high academic ability in learning Problem posing and 15.03% of average corrected metacognitive skills of students with high academic ability on conventional learning. Meanwhile, the corrected average metacognitive skills of students with high academic ability in Cooperative script learning did not differ significantly with the corrected average metacognitive skills of students with high academic ability on learning Problem posing but significantly different and higher 10.45% of corrected average students have high academic ability on conventional learning. Similarly, the corrected average metacognitive skills of students with high academic ability in the learning strategy Problem posing is not significantly different and 7.47% higher than the corrected average metacognitive skills of students with high academic ability on conventional learning.
2) Mean corrected metacognitive skills of students with high academic ability in Cooperative script learning combined Problem posing is significantly different and higher 8.14% of the average metacognitive skills of students with low academic ability in Cooperative script learning combined Problem posing. Similarly, the corrected average metacognitive skills of high academic students on Cooperative script learning differ significantly and 5.98% higher than the corrected average metacognitive skills of low academic students on Cooperative script learning. The same is also seen in the corrected average metacognitive skills of high academic students on learning Problem posing is significantly different and 7.33% higher than the corrected average metacognitive skills of low academic students on learning Problem posing.

ISSN (Online): 2319-7064
Index Copernicus Value (2016): 79.57 | Impact Factor (2015): 6.391

References

[1] Arikunto, S. 2006. *Prosedur Penelitian, Suatu Pendekatan Praktis*. Jakarta: Rineka Cipta
[2] Ary, D., Jacobs, L. C. and Razavieh, A. Tanpa tahun. *Pengantar Penelitian Pendidikan*. Terjemahan oleh Arief Furchan. 1982. Surabaya: Usaha Nasional.
[3] Corebima, A. D. 2005. Pelatihan PBMP (*Pemberdayaan Berpikir Melalui Pertanyaan)* pada Pembelajaran Bagi Para Guru dan Mahasiswa Sains Biologi dalam Rangka RUKK VA. 25 Juni.
[4] Corebima, A.D. 2006. Metakognisi: *SuatuRingkasanKajian*. Makalahdisajikandalam Pelatihan Strategi Metakognitifpada PembelajaranBiologiuntuk guru-guru biologi SMA, LembagaPengabdiankepadaMasyarakat (LPKM) UNPAR, Palangkaraya, 23 Agustus
[5] Corebima, A. D. 2006. *Pembelajaran Biologi yang Memberdayakan Kemampuan Berpikir Siswa*. Makalah disajikan dalam Pelatihan Strategi Metakognitif pada pembelajaran biologi untuk guru-guru biologi SMA, Lembaga Pengabdian Kepada Masyarakat (LPKM) UNPAR, Palangkaraya, 23 Agustus.
[6] Hadi, S. 2007. Pengaruh Strategi Pembelajaran Cooperative Script terhadap Keterampilan Berpikir Kritis, Keterampilan Metakognitif, dan kemampuan Kognitif Biologi pada Siswa SMA Laboratorium Universitas Negeri Malang. *Tesis Tidak Dipublikasikan*. Malang: PPs Universitas Negeri Malang.
[7] Ibrahim, M. 2000. *PembelajaranKooperatif*. Surabaya: University Press UNESA.,
[8] Lavy I and Shriki A. 2007.Problem posing as a means for developing mathematical knowledge of prospective teachers.Proceedings of the 31st conference of the international group for the psychology of matematics education. Vol. 3, pp. 129-136. (online: http://proquest.umi.com)
[9] Orlich, D. C., Harder, R. J.m., Calahan, R. C., Gibson, H.W., 1998. Teaching Straetegies: A guide to Better Instruction. New York: Houghton Milflin Company.
[10] Sugiyono, 2007. *Statistika untuk Penelitian*, Bandung, Alfabeta.
[11] Warouw, Zusje W. M. 2009. *PengaruhPembelajaranMetakognitifdalamStrategi Cooperative Script dan Reciprocal Teaching padaKemampuanAkademikBerbedaterhadapKemampuandanKeterampilanMetakognitif, BerpikirKritis, HasilBelajarBiologiSiswa, sertaRetensinya di SMP Negeri Manado.*Disertasi.Tidakditerbitkan Program StudiPendidikanBiologi Program PascasarjanaUniversitasNegeri Malang.
[12] Xia X, Lü C, Wang B.2008. Research on Mathematics Instruction Experiment Based Problem. PosingJournal of Mathematics Education December 2008, Vol. 1, No. 1, pp.153-163.