The variation pattern of cooperative learning models implementation to increase the students creative thinking and learning motivation

by R Hasan, M Lukitasari, O Darmayani S Santoso

Journal of Physics: Conference Series

The variation pattern of cooperative learning models implementation to increase the students creative thinking and learning motivation

IOP Conf. Series: Journal of Physics: Conf. Series **1157** (2019) 022075 doi:10.1088/1742-6596/1157/2/022075

The variation pattern of cooperative learning models implementation to increase the students creative thinking and learning motivation

R Hasan[1*], M Lukitasari[2], O Darmayani[1] and S Santoso[1]

[1]Prodi Pendidikan Biologi, Universitas Muhammadiyah Bengkulu, Jalan Bali 118 Bengkulu 38119, Indonesia
[2]Prodi Pendidikan Biologi, Universitas PGRI Madiun, Jl. Setiabudi No. 85, Madiun, Indonesia

[*]rusdihasan@gmail.com

Abstract. The learning process that uses less-varied learning model can cause students to feel bored during discourse process. This study aimed to find the right pattern of variation in applying cooperative learning model to improve the student creative thinking and learning motivation. The method was quasi-experiment by using pretest-posttest design. The research conducted at three classes of the fourth-semester students, i.e. classes of experiment I, II and control. Learning process at the class of experiment I used variations of Student Team Achievement Division (STAD), Numbered Head Together (NHT), and Group Investigation (GI) models, experiment II used STAD and GI models, and control used discussion, question-and-answer, and presentation. Essay test and questionnaire were used to collect the data that furtherly were analyzed using ANOVA test. The results showed that a significant difference in student creative thinking among experiment I, II and control classes. Students in experiment I showed the highest creative thinking ability, followed by experiment II and control, respectively. Student learning motivation in the class of experimental I and II was also significantly better than in control class. The findings indicate practicing the variation of cooperative learning models can improve both student creative thinking ability and learning motivation.

1. Introduction

The learning process requires teachers to be able to motivate their students to produce quality learning outcomes. Motivation is necessary to engage learning process [1]. The learning objectives can be achieved if the students have a strong motivation in achieving that goal, i.e. the willingness intrinsically to learn. Motivation plays an important role in fostering students' learning [2]. Student motivation will lead the students in achieving their learning goals [3], therefore, teachers need to use varied, creative and more innovative learning models to foster student learning motivation. Motivation will affect students' approach to school in general. Higher learning motivation correlates closely with academic achievement, conceptual understanding, and satisfaction towards school [4,5].

In addition to learning motivation, which needs to grow is the ability to think creatively. Creative thinking is an important issue in learning including in the field of biology. Creative thinking as a high-level thinking component is a cognitive process of problem-solving, generating useful ideas and producing plans that did not exist before [6]. People who are creative, innovative are those who are

potentially more advanced than others because they always have many ideas to produce something new. The ability to think creatively is not limited to the understanding of classroom learning materials but also the ability to deal in various areas [7]. Therefore, the ability to think creatively should be nurtured as early as possible in classroom learning).

Plant physiology is a course that requires high-order thinking skills to be able to understand concepts and to address problems in the environment with regard to plants. Students must have the skills in learning in order to seek information, utilize, and manage it in order to be able to answer various problems in the study of plant physiology. Therefore, it is necessary to continuously strive to improve the quality of student learning through improving the quality of learning especially in the field of plant physiology which develops high-level thinking ability especially the ability to think creatively.

One of the efforts made to achieve learning objectives in order to improve the quality of learning, especially in the course of plant physiology is to apply variations of the cooperative learning model. Cooperative learning has differences with other learning strategies. Cooperative learning is more emphasis on the process of cooperation in groups so that the results obtained not only oriented to the cognitive and academic but also social skills [8] can foster student creativity as well as to accept individual diversity [9].

Cooperative learning is one of Student-Centered Learning (SCL) that support student learning activities and gain high order thinking skill. In one learning activity can be applied some learning models, sequential, and continuous among one to another model. However, in the classes with students who relatively passive in discourse, it needs time to adapt some SCL gradually from simple to more complex models. Therefore, in the learning process, applying vary rather than one model might better in order to create an active learning atmosphere, fun, and not monotonous. Learning model that will be applied in this research is Student Team Achievement Divisions (STAD), (Numbered Head Together (NHT), and Group Investigation (GI). The use of cooperative model variation strategy model from the simple of STAD, then NHT and GI, is expected to find the appropriate variation pattern of cooperative learning to increase motivation and student creative thinking ability at the students who relatively passive and uncommon with SCL model in particular.

Method

This research was quasi-experiment with pre-test post-test design that conducted on three groups of the fourth-semester biology students. The groups were defined as an experiment I, experiment II and control classes. The experimental class I received learning with a variety of cooperative model of STAD, NHT and GI type; experimental class II with a variation of STAD and GI type cooperative model, and control class with conventional learning model in the form of lecture, question and answer, and presentation. The discourse was conducted for six meetings in each class with the topics consisted of translocation, transpiration, nitrogen assimilation, respiration, the light reaction of photosynthesis and dark reactions of photosynthesis. The experimental class I used a variation of STAD followed by NHT and GI in each of the two meetings, respectively. The experiment class II used the variation of STAD followed by GI in each of the three meetings, respectively. The control class uses conventional learning models in all six meetings.

The creative thinking ability instrument was pre-test and post-test while to address student's motivation as a questionnaire in the form of a detailed question with five alternate answers as Likert scale. The data were analyzed by one-way ANOVA test followed by Post Hoc test using SPSS Statistic 20 for windows.

3. Result and discussion

3.1. Creative thinking ability

Student creative thinking ability in this research was measured through pre-test and post-test throughout of experiment I, II and control classes. If the value of creative thinking ability among three classes shows the difference, then the measurement of students' creative thinking ability was decided by a gain value

between post-test value and post-test score. But if the pre-test among the classes was not different significantly, then the creative thinking ability was determined directly based on the result of the post-test score.

The data acquisition of this creative thinking ability used the essays test on six topics i.e. transpiration, translocation, nitrogen assimilation, respiration, the light reaction of photosynthesis and dark reactions of photosynthesis. Table I shows pre-test score of creative thinking ability in experiment I, II and control classes.

Table 1. Pre-test score of creative thinking ability of 4th-semester biology student on Plant Physiology subject.

Class	N	Mean	Sd	F	P
Experiment I	29	10.65	3.21	1.81	0.17
Experiment II	27	8.94	3.81		
Control	33	10.33	4.22		

Student creative thinking ability based on the pre-test score was 8.94-10.65. Statistical analyses of those score using one-way ANOVA test shows the creative thinking ability of experimental I, II and control class was obtained P value of 0.17 on α=0.05. Thus, the result of pre-test of creative thinking ability of students in experiment I, II and control classes were not significantly different. This suggests that the entire class has the same creative thinking ability at the beginning of the study. Therefore, the measurement of thinking ability among the three classes in this research will be decided directly by the post-test score obtained from each class.

Table 2. A post-test score of creative thinking ability of 4th-semester biology student on Plant Physiology subject.

Class	N	Mean	Sd	F	P
Experiment I	29	66.79	9.34	80.85	0.00
Experiment II	27	48.70	10.19		
Control	33	34.42	11.84		

Table 3. Multiple comparisons of student creative thinking among classes based on LSD test.

Class	Class	Mean Difference	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Exp. I	Exp. II	18.42273*	2.82983	.000	12.7972	24.0482
	Control	34.24765*	2.69331	.000	28.8935	39.6018
Exp. II	Exp. I	-18.42273*	2.82983	.000	-24.0482	-12.7972
	Control	15.82492*	2.74589	.000	10.3663	21.2836
Control	Exp. I	-34.24765*	2.69331	.000	-39.6018	-28.8935
	Exp. II	-15.82492*	2.74589	.000	-21.2836	-10.3663

* The mean difference is significant at the 0.05 level.

Table 2 shows the score of student creative thinking abilities at the end of the research. In case of the comparison of score obtained between pre-test and post-test, it shows the increase of creative thinking throughout the classes. To address the difference of creative tanking ability among three classes, then one-way ANOVA followed LSD test was conducted. Based on one-way ANOVA test there is a difference of creative thinking ability among experiment I, II and control classes (P-value 0.00 on α=0.05). At table 3 shows LSD test that indicates the differences between the three classes. The student

ability of creative thinking in experiment I class is significantly higher than both experiment II and or control classes. Similarly, student creative thinking ability in experiment II class is significantly higher than control class.

The strategy of cooperative learning variation can improve students' creative thinking ability rather than conventional direct learning in the form of lectures and asked questions. Cooperative learning gives impact to students in interacting and working together in improving decision making skill in order to achieve the expected goals [10]. Cooperative learning is powerful to foster mutual respect and teamwork among students in order to consistently improve student achievement [11]. The process of collaboration in working tasks, motivation and mutual support in cooperative learning provides positive interaction in improving student creative thinking ability to create something new [12]. In cooperative learning, the students are given the opportunity to discuss the problem, determine the solution strategy and link the problem with other problems that have been resolved before. Learning in cooperative groups can train students to listen to the opinions of others [13].

In a class that applies three cooperative variations (experiment I) has a higher creative thinking ability than other classes. It is suggested due to the phase of using a variety of learning type which has different characteristic and stages of complexity. It makes the students more energized and makes the teaching and learning atmosphere become more interesting, not boring and able to trigger the ability student creative thinking. Some learning models can be applied in the learning practices, sequentially and continuously between model one and others. Therefore, in the learning processes, to conduct vary rather than one learning model is suggested can create more innovative and better learning atmosphere.

Among cooperative learning models possess different complexity. STAD is simpler than NHT and NHT is simpler than GI. The learning practice to improve a high order thinking skill and activeness in a classroom with students who relatively passive and unfamiliar with SCL models, the direct application of complex learning models can be counterproductive because students need time to adapt. In this research, the variation of three cooperative models with the level of complexity is more achievable than the application of two models and conventional learning in improving students' creative thinking ability because students can gradually adapt well and produce high-level thinking ability. Some reports propose STAD learning model can be conducted in many subjects of discourse for better academic achievement [13–18]. Implementing of STAD learning model lead students to elevate their self-regulated learning [14] and encourage both student and teacher to create an innovative learning [15]. Likewise STAD, NHT improved student achievement effectively [19,20] even at students with behaviour and emotional disorders [21]. On the other hand, the GI learning model guides the student to solve a problem. The ability to solve problems can improve students' creative thinking skills and their components (fluidity, expansion, originality, and flexibility) more attention to different issues and expand their analysis to a problem [22,23].

The using of cooperative learning leads the students to achieve significantly higher scores on the achievement and knowledge retention post-tests than did students who were instructed using lecture-based teaching in higher education [24–26]. The results of this study propose the application of a variety of cooperative learning model type STAD, NHT and GI are feasible to try and serve as an alternative of biology learning in improving the quality of learning especially in class which is relatively passive and not yet accustomed to student-centered learning.

3.2. Student motivation in learning

Student motivation to learn was measured by questionnaire consisting of eight questions (diligent in doing the tasks and biology matter, studying the material first before class begin, trying to answer the questions to solve all problems faced, the curiosity of the subject matter by adding knowledge, the strong motivation to achieve achievement and passionate with the theme, trying to prepare for facing tasks and repetitions, trying to always ask teacher, friends or others about every problem) with five alternative answers based on Likert's scale.

Table 4 shows the average percentage of the eight indicators observed i.e. 152.24 in the experiment I class, 149.14 in the experimental II class, and 143.87 in the control class, respectively. Based on the

statistical analyses indicated that the student learning motivation in experiment I class was significantly different to that of either experiment II or control class. However, there was no difference in student learning motivation between experimental I and experimental II class, as well as between experimental II and control classes.

Table 4. The motivation of 4th-semester biology student to learn on Plant Physiology subject.

Components	Experiment I	Experiment II	Control
N	29	27	33
Highest score	183	171	174
Lowest score	138	125	129
Mean	152,24	149,14	143,87
Sd	11,73	11,85	11,16
Varians	137,61	140,59	178,67

Students in a class that study through three variations of the cooperative model (Experiment I) have a higher motivation to learn compared with other classes. It is suggested the implementation phase of discourse by using a variety of learning type which has different characteristic and stages make the students more energized and make the teaching and learning atmosphere become more interesting compared to the students who learned through the conventional model.

Motivation can influence by many aspects in supporting student academic achievement. However, there is a reciprocal relationship that the students who are more motivated perform better and student who perform better become more motivated [3]. Motivation consists of intrinsic and extrinsic motivation. Intrinsic motivation helps students to engage in authentic learning while extrinsic motivation serves to develop ritual involvement in students to learn [2,27]. There are many factors influencing student motivation and student achievement considerably on the basis of the engaging learning-teaching process in education systems effectively and efficiently such as psychological, social and cultural [2,28].

The student's role in education is crucial and should go beyond the traditional view of the student as customer or recipient of knowledge. There are five keys ingredient areas that the educator should notice that can impact on student motivation to learn i.e. the student, teacher, content, method/process, and environment [29]. Therefore, the learning model application in this study, whether an effect or not affect to student motivation might be influenced by other factors either intrinsically or extrinsically that vary among students.

4. Conclusion

The findings of this research show that application of a variety of cooperative learning models increases the student creative thinking ability as well as their motivation to study than students who study through traditional models in form of lecture and question and answer. Using more variation of learning model throughout discourse is better to achieve higher academic achievement. However, using different learning model in teaching is not simply affect the motivation of student to learn due to many aspects interfere student motivation to learn both intrinsically and extrinsically.

References

[1] Saeed S and Zyngier D 2012 how motivation influences student engagement: a qualitative case study *J. Educ. Learn.* **1** 2 p 252–267
[2] Yilmaz E, Turgut M and Kele A 2017 Variables affecting student motivation based on academic publications *J. Educ. Pract.* **8** 12 p 112–120
[3] Afzal H, Ali I, Khan MA and Hamid K 2010 A study of university students' motivation and its relationship with their academic performance *Int. J. Bus. Manag.* **5** 4 p 80–88
[4] Usher A and Kober N 2013 Student motivation an overlooked piece of school reform *Educ. Dig.* **78** p 9–16
[5] Hargrove R A 2013 Assessing the long-term impact of a metacognitive approach to creative skill

development *Int. J. Technol. Des. Educ.* **23** 3 p 489–517
[6] Hamza M and Griffith K 2006 Fostering problem-solving and creative thinking in the classroom: cultivating a creative mind *Natl. Forum Appl.* **19** 3 p 1–30
[7] Astuti S 2010 *Penggunaan metode belajar NHT disertai peta konsep dan LKS ditinjau dari motivasi dan kreatifitas siswa* (Thesis Universitas Sebelas Maret)
[8] Wardani I 2015 *Pengaruh pembelajaran kooperatif tipe NHT terhadap kemampuan berfikir kreatif dan hasil belajara matematika kelas VII di MTs Sultan Agung Jabalsari* (Institut Agama Islam Negeri Tulungagung)
[9] Asha I K and Al Hawi A M 2016 The impact of cooperative learning on developing the sixth grade students decision-making skill and academic achievement *J. Educ. Pract.* **7** 10 p 60–70
[10] Cottell P G and Millis B J 1994 Complex cooperative learning structures for college and university courses complex cooperative learning structures for college and university In *Professional and Organisational Development Network in HIgher Education* p 285–307
[11] Scager K, Boonstra J, Peeters T, Vulperhorst J and Wiegant F 2016 Collaborative learning in higher education: Evoking positive interdependence *CBE Life Sci. Educ.* **15** 4 p 1–9
[12] Sugiarti A 2012 *Pengaruh Penerapan Model Pembelajran Kooperatif Gi terhadap Pemahaman Konsep Kimia Dan Kemampuan Berfikir Kreatif Siswa SMAN 3 Denpasar* (Program Pascasarjana Universitas Pendidikan Ganesha)
[13] Hanafi A and Basuki I 2018 Student Team achievement divisions: its effect on electrical motor installation knowledge competence *IOPConf. Series* **336** p 1–4
[14] Arjanggi R and Setiowati E A 2014 The effectiveness of student team-achievement division to increase self-regulated learning *Proc. of INTED 2014 Conference Valencia, Spain* p 2379-2383
[15] Ling W N and Ghazali M I 2016 *The effectiveness of student teams-achievement division cooperative learning on mathematics comprehension among school students* **2** 4 p 30–35
[16] Jamaludin M and Mokhtar M F 2018 Students team achievement division *Int. J. Acad. Res. Bus. Soc. Sci.* **8** 2 p 570–577
[17] Wahyuni S, Tinggi S, Islam A and Kediri N 2015 Student teams-achievement division to improve students' writing skill *Inferensi* **8** 1 p 1–22
[18] Ghasemi Z and Baradaran A 2018 The comparative effect of student team-achievement division and cooperative integrated reading and composition on efl learners' speaking complexity *Int. J.Applied Linguistics and English Literature* **7** 3 p 67-72
[19] Indarti D, Mardiyana and Pramudya I 2018 Numbered head together with scientific approach in geometry learning *J. Phys. Conf. Ser.* **943** 012028
[20] Fausan M M 2016 Implementation of numbered head together strategy in setting stad model learning *J. Pend. Bio. Indonesia* **2** 2 p 154–160
[21] Hunter W and Haydon T 2013 Examining the effectiveness of numbered heads together for students with emotional and behavioral disorders *Beyond Behav.* **22** 3 p 40–45
[22] Nozari A and Siamian H 2014 The effects of problem-solving teaching on creative thinking among district 2 high school students in Sari City *Mater Socio. Medica* **26** 6 p 360–363
[23] Tanner K, Chatman L S and Allen D 2003 Approaches to cell biology teaching: cooperative learning in the science classroom beyond students working in groups *Cell Biol. Educ.* **2** 1 p 1–5
[24] Johnson D W, Smith R T and Smith K A 1991 Cooperative learning: Increasing college faculty instructional productivity *ASHE-ERIC Higher Education Report* p 3–8
[25] Tran V D and Lewis R R 2012 Effects of cooperative learning on students at An Giang University in Vietnam *Int. Educ. Stud.* **5** 1 p 86–99
[26] Tran V D 2014 The Effects of cooperative learning on the academic achievement and knowledge retention *Int. J. High Educ.* **3** 2 p 131–140
[27] Yang Y T C and Wu WCI 2012 Digital storytelling for enhancing student academic achievement, critical thinking *Computers & Education* **59** 2 p 339–352

[28] Singh K, Granville M and Dika S 2002 Mathematics and science achievement : effects of motivation , interest , and academic engagement *J. Educ. Res.* **95** 6 p 323–332
[29] Williams K C and Williams C C 2011 Five key ingredients for improving student motivation *Res. High Educ. J.* **12** p 1–23

The variation pattern of cooperative learning models implementation to increase the students creative thinking and learning motivation

ORIGINALITY REPORT

12%	10%	5%	11%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	Submitted to University of Huddersfield Student Paper	2%
2	Submitted to Universitas Negeri Surabaya The State University of Surabaya Student Paper	2%
3	ejournal.umm.ac.id Internet Source	1%
4	eprints.whiterose.ac.uk Internet Source	1%
5	Submitted to Pathfinder Enterprises Student Paper	1%
6	Submitted to University of KwaZulu-Natal Student Paper	1%
7	Submitted to Cleveland State University Student Paper	1%
8	Submitted to Grand Canyon University Student Paper	1%

9	Submitted to University of Sunderland Student Paper	<1%
10	garuda.ristekdikti.go.id Internet Source	<1%
11	Nozari, Ali, and Hasan Siamian. "The Effects of Problem-Solving Teaching on Creative Thinking among District 2 High School Students in Sari City", Materia Socio Medica, 2014. Publication	<1%
12	digitalcommons.liberty.edu Internet Source	<1%
13	www.e-journal.pendidikan-bhs-inggris.s1.ummy-solok.ac.id Internet Source	<1%
14	www.tandfonline.com Internet Source	<1%
15	Submitted to University of Wales Institute, Cardiff Student Paper	<1%
16	Submitted to University of Mindanao Student Paper	<1%

Exclude quotes	On	Exclude matches	< 10 words
Exclude bibliography	On		