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Effectiveness of the Creative Attitude Model in Science Learning (CASL) to Train Creative Thinking Skills for Elementary School Teacher Education Students

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ABSTRACT

Students must have superior competencies to answer the demands of 21st century skills and the Industrial Revolution 4.0, one of which is creative thinking skills. The purpose of this study was to produce a Creative Attitude in Science Learning (CASL) learning model as a valid, practical, and effective product/product as an effort to improve creative thinking skills and positive attitudes towards PGSD Science students. The development research design used refers to the development model design according to McKenny, consisting of: (1) preliminary study phase, including needs analysis, literature study, and field survey; (2) the model design phase includes model design, validation, revision; and (3) the model testing phase. The research subjects were 3 classes of the Elementary School Teacher Education study program. The data collection method used a creative thinking skills test sheet. The data analysis technique used is descriptive qualitative and quantitative. Based on the results of the study, it can be concluded that the CASL model can be used to train the creative. thinking skills of elementary school teacher education students.

INTRODUCTION

College is one of the places that can be used to train and develop student creativity (Daud, et al., 2012). This is reinforced by the opinion of Beckers et al. (2017), which states that universities must provide students with skills based on 21st century skills and the Industrial Revolution 4.0, one of which is creative thinking skills. Presidential Decree No. 8 of 2012 Article 5 concerning the Indonesian National Qualifications Framework a student must have competence according to level 6. Students must have superior competence with various demands for 21st century skills and the Industrial Revolution 4.0, one of which is creative thinking skills. When creative thinking skills are not developed in students in Indonesia, the graduates produced by Educational Institutions and Education Personnel will not be able to survive and compete with other global communities (Musa et al., 2012). Science learning in Educational Institutions and Education Personnel is still oriented to conventional learning that focuses on a product and memorization, so that learning that emphasizes students' creative skills is neglected (Kemenristik Dikti, 2015; Bappenas, 2014) and students who study physics are not interested and have no understanding after studying physics (Irving et al., 2015).

The Creative Attitude in Science Learning (CASL) model was chosen by researchers to inspire educators in teaching students creative thinking skills and positive attitudes towards science. Every human being in everyday life is faced with problems that need to be addressed immediately, both at home, in the classroom, and in society. The development of the CASL model follows the path of solving problems by John Dewey (Arends, 2012) and

the framework of the scientific creativity hypothesis (Hu & Adey, 2010), and is supported by the latest learning theories which include; cognitive learning theory, constructivism learning, sociocognitive learning, complex cognitive processes, advanced organizer, and scaffolding. Students will feel a learning atmosphere that evokes a positive attitude towards science to learn, relax, and have fun so as to make students' enthusiasm and concentration high during learning (Anggoro et al., 2017). Students are accustomed to designing, planning, and conducting creative experiments and problem solving related to everyday life (Rannikmae, 2016). Guilford & Vaughan (1965) further stated that creativity is the product of divergent thinking. Authenticity will indicate a person's ability to come up with unusual or newer ideas and how unique those ideas are (Cohen & Ambrose, 1999; Fisher, 2005). Guilford & Vaughan's concept of creativity is in line with the opinions of several educational psychologists (Santrock, 2009; Moreno, 2010).

Hu & Adey (2010) recommend The Scientific Structure Creativity Model (SSCM) as a theoretical basis for measuring creative thinking. The creative thinking assessment was developed in the form of an essay test. Essay tests allow students to produce answers that meet the criteria of fluency, flexibility, and originality (Eggen & Kauchak, 2013). Lecturers must be able to create a learning atmosphere that is free, open, democratic, meaningful, and has a positive attitude that can encourage students' creativity in solving the problems they face (Hu & Adey, 2010; Hu et al., 2013; Nur, 2014). Creative thinking skills can be taught in learning, one of which is through scientific methods and scientific activities (Pekmez et al., 2009; Ozgelen, 2012; Torrance, 2013; Ayas & Sak, 2014).

RESEARCH METHOD

The type of research used is an experiment with a one group pretest-posttest design. This pattern is used to see the effectiveness of the CASL model in training creative thinking skills of elementary school teacher education students using two universities, namely: Surabaya State University (*Unesa*) and Nadlatul Ulama University Sidoarjo (*Unusida*). Before the learning activities are carried out, a pretest will be carried out followed by giving treatment for four times and ending with a posttest. For more details on the design of the CASL learning model effectiveness test, it is in Table 1.

Tabel 1. One group pretest-posttest design.

	Pretest	**Treatment**	**Postest**
Surabaya State University	O_1	x	O_2
Nadlatul Ulama University Sidoarjo	O_3	x	O_4

Whereas:
O_1, O_3 : Initial Test of Creative Thinking Skills (Pretest)
O_2, O_4 : Final Test of Creative Thinking Skills (Posttest)
x : Learning using the CASL model

The data collection method used tests and the instruments used were creative thinking skills test sheets. The data analysis technique after being obtained uses descriptive statistics, both qualitative and quantitative.

RESULTS AND DISCUSSION

Creative thinking skills in each individual have differences that affect the individual in solving a problem encountered. Before participating in learning using the CASL model based on test data, students majoring in Elementary School Teacher Education at the State University of Surabaya class 2019C and 2019F had low levels of creative thinking skills, as well as students of Nadlatul Ulama University Sidoarjo Elementary School Teacher Education class 2020C and 2020B, there are similarities, namely having a low level of creative thinking ability towards science learning.

Students are not accustomed to formulating problems, formulating hypotheses, identifying variables, making operational definitions of variables, designing data tables, designing experimental procedures, analyzing data, and drawing conclusions correctly. The factors that underlie the low level of student creativity include: (1) The covid outbreak, science learning has experienced obstacles in conducting practicum and experimentation; (2) The implementation of practicum with a certain number of topics and in turns, so that the practicum material is sometimes different from the material being studied; (3) The implementation of the practicum according to the procedures in the manual, so that designing experiments is less trained. An effective solution to deal with low creative thinking skills in students is to form students in groups and collaborate effectively in learning. Each group member needs to share with others what students can and cannot do, what students know and do not know. Everyone needs to contribute their fair share towards the group's goals. And to collaborate effectively, students need to know and use a variety of cooperative skills, for example, encouraging others to participate. Classes provide time to learn scientific literacy skills and to monitor the use of students' skills.

The application of the CASL model to the limited trial was strengthened by the extensive trial which was applied to three classes with two different university names. This shows an increase in students' creative thinking skills towards solving problems in science. Based on the implementation data from phase 1 to phase 5, it shows that lecturers are able to apply learning with the CASL model well. Students are also accustomed to formulating problem formulations, formulating hypotheses, identifying variables, making operational definitions of variables, designing data tables, designing experimental procedures, carrying out experiments, analyzing data, drawing conclusions, and scientific communication. Students are given the freedom to choose the formulation of the problem to be investigated and the logistics used. Laboratory-based investigations are able to improve creative thinking skills in learning. ICT-based investigations facilitate effective decision-making and problem-solving processes. Strengthened by MFI data that students are able to use creative thinking skills and apply creative processes to solve problems in MFIs well. It is very important for prospective teachers to have a solid foundation of scientific knowledge and skills to be able to teach scientific inquiry to students. To determine the effectiveness of learning by applying the CASL model, the first step taken by researchers is to find out the normality of the data obtained when conducting research.

Based on the results of the analysis of the data obtained, it can be seen that the research data is known to have been distributed normally and homogeneously (Tables 1, Table 2, and Table 3), then the next step is a paired t-test to determine the correlation between the pretest given before participating in the study by applying the CASL model with the posttest. after students take part in learning by applying the CASL model. Based on Table 4, it can be seen that there is a significant difference between the pretest and posttest scores because the value obtained in the 2-tailed sig (0.000) < (0.05), the average posttest score is greater than the

average pretest score. This means that there is a significant increase in the average pretest and posttest scores.

Paired t-test in the wide trial class in Table 5 shows a 2-tailed sig value of 0.000 < (0.05) so it can be seen that the paired t-test is related to the development of creative thinking skills and positive attitudes towards science in learning science experienced a significant increase in the average pretest and posttest and there were significant differences regarding the pretest and posttest given. Furthermore, as a support for the effectiveness of the applied CASL model, the N-gain test was carried out in each class that received treatment. In Table 6, it is known that the n-gain test shows that the CASL model is effective in training students' creative thinking skills and positive attitudes towards science. This is known based on the acquisition of an n-gain score that is in accordance with the research objectives.

Based on the findings above, it can be synthesized that CASL has proven to be effective for training creative thinking skills in limited trials and broad trials. Students have the potential for good creative thinking skills by implementing model development that is integrated in the learning process in the classroom. The CASL model developed is feasible to be used as an alternative model to train students' creative thinking skills. Developing creative thinking skills related to argumentation and finding that they can develop effectively using a more open inquiry approach using the context of socioscientific problems (SSI). An investigative approach using the context of a socioscientific problem (SSI) has proven successful in developing prospective teacher skills and scientific literacy knowledge.

CONCLUSION

Based on the results and analysis conducted, it is concluded that the CASL model can be used to train students' creative thinking skills. This is shown in the results of the limited trial in the medium criteria and in the wide trial in the medium/high criteria, and the increase is significant. As for suggestions for further research, learning the CASL model can be carried out with the help of the Phet Simulation program to provide students with opportunities for exploration that emphasizes creative thinking skills without fear of damage when trying to design or design virtual-based experiments.

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Appendix

Table 1. Normality test results (*Kolmogorov Smirnov)*.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Class	**Statistic**	**Df**	**Sig.**	**Statistic**	**Df**	**Sig.**
Pretest Unesa limited trial 2019C	**.121**	**41**	**.134**	**.963**	**41**	**.193**
Posttest Unesa limited trial 2019C	.125	41	.104	.966	41	.255
Pretest Unesa wide trial 2019F	.115	43	.178	.985	43	.827
Posttest Extensive trial Unesa 2019F	.131	43	.061	.966	43	.226
Pretest Unesa wide trial Unusida 2020C	.129	43	.068	.976	43	.504
Posttest Extensive trial Unusida 2020C	.115	43	.184	.968	43	.265
Pretest Unesa wide trial Unusida 2020B	.127	43	.078	.968	43	.278
Posttest Extensive trial Unusida 2020B	.127	43	.080	.940	43	.026

Table 2. Homogeneity test results of pretest questions.

Test of Homogeneity of Variances

HASIL_KREATIVITAS

Levene Statistic	df1	df2	Sig.
.298	3	166	.827

Table 3. Results of homogeneity test of posttest questions.

Test of Homogeneity of Variances

HASIL_KREATIVITAS

Levene Statistic	df1	df2	Sig.
.361	3	166	.781

Table 4. Paired t-test results in a limited trial class.

Paired Samples Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	**Std. Deviation**	**Std. Error Mean**	**Lower**	**Upper**	**t**	**df**	**Sig. (2-tailed)**
Pair 1	PRETEST - POSTTEST	-5.512	5.211	.814	-7.157	-3.867	-6.773	40	.000

Table 5. Paired t-test results in the broad trial class.

Paired Samples Test									
		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
Pair 1	PRETEST - POSTTEST	-3.388	5.218	.459	-4.297	-2.479	-7.374	128	.000

Table 6. N-Gain test results.

No.	Activity	Pretest	Posttest	*Skor N-gain*
1.	Limited Trial (PGSD Unesa 2019C)	71,9	77,5	0,20
2.	Extensive Trial (PGSD Unesa 2019F)	74,0	77,47	0,13
3.	Extensive Trial (PGSD Unusida 2020C)	74,2	78,35	0,16
4.	Extensive Trial (PGSD Unusida 2020B)	75,5	78,28	0,11