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The effectiveness of the integration of open-ended and collaborative (OE-C) learning strategies in reducing gaps of elementary school students' creative thinking skills

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Abstract: This study examines a blend of open-ended and collaborative learning strategies (OE-C) in comparison to other strategies in minimizing the gap of creative thinking skills between Upper Academic (UA) and Lower Academic (LA) students. The population of this study was 136 fifth grade students of an elementary school in Salatiga, Indonesia. The sample consisted of each 68 UA and 68 LA students categorized by intact group technique sampling. Research method employed was the 4x2 factorial design. The students' creative thinking skills were measured with open-ended validated problem testing, focusing on students' fluency, flexibility, originality, and elaboration. Data were analysed using ANCOVA with the pre-test score as the covariate. Findings suggest that OE-C learning strategy is the most effective learning method to elevate students' creative thinking skills. Further, the OE-C learning strategy also serves as the most efficient to reduce gaps of creative thinking skills.

Keywords: Creative thinking, open-ended, collaborative, lecture method

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INTRODUCTION

The industry 4.0 period has been characterized mainly by the fast pace of innovation in all aspects of human life (Prayitno, Suciati, & Titikusumawati, 2018). The key survival talent for individuals in the industry 4.0 era is the creative thinking skills. It is the generator for new innovations in all fields (Santi, Prayitno, & Muzzazinah, 2018). All of institutions that contributes to the development of human resources from the elementary schools to the universities must be able to train their students to think creatively. The habituation of students' creative thinking skills also has a positive correlation with the comprehension of their learning outcomes (Kincal, Avcu, & Kartal, 2016).

Creative thinking skills could be defined as students' competencies in solving problems and creating something new (Bacanli, Dombayci, Demir, & Tarhan, 2011). The indicators include aspects of fluency, flexibility, originality, and elaboration. The aspect of fluency indicates the number of ideas produced by students when solving problems. While, the aspect of flexibility refers to the students' capability in making feasible and diverse contextual ideas. In addition, the aspect of originality defines as the students' ability to create authentic ideas unthinkable by other individuals. Lastly, the aspect of elaboration refers to the students' capability in developing and enriching their own ideas or other people's ideas (Sitorus & Masrayati, 2016).

A large number of studies showed an alarming profile of Indonesian students' creative thinking skills. Martin prosperity institute survey on the *Global Creative Index* (GCI) exhibited less encouraging results from year to year. In 2011, Indonesia ranked 86 out of 88 countries on their GCI indexes. In 2015, Indonesia ranked 115 out of 139 countries surveyed (Florida, Mellander, & King, 2015). In line with the GCI data, research has shown a similar concern in several regions in Indonesia (Santi, Prayitno, & Muzzazinah, 2018).

Aside from the low creative thinking skills of Indonesian students, another problem such as the high gap between Upper Academic (UA) and Lower Academic (LA) students arises. The creative thinking skills are influenced by students' academic abilities as it serves as a representation of their intelligence (Prayitno, Corebima, Susilo, & Ramli, 2017). In addition, learning time allocation also becomes a determinant of students' learning outcomes (Ozden, 2008). It is assumed that LA sudents would reach similar learning outcomes with UA students if they are given the appropriate study time. Unfortunately, learning time allocation in Indonesian schools are uniform. On the other hand, students who have different academic abilities that fall into three categories are learning in the same classroom, as a result, gaps between UA and LA students' creative thinking skills becomes apparent.

Creative thinking skills could be trained through learning strategies that invite students to produce numerous original ideas when solving problems in classroom situation (Kashani, Afrooz, Shokoohi, Kharrazi, & Ghobari, 2017). Open-ended learning strategy serves as the most suitable method of teaching creative thinking skills. It starts with providing open problems to the students, and then asks the students to finish the problem in many different ways possible to produce correct answers (Ramaraj & Nagammal, 2016). The method of open-ended problem solving will train students' creative thinking skills, such as fluency*, flexibility,* originality*,* and elaboration optimally (Ramaraj & Nagammal, 2016; Tan, Najiha, & Abdul, 2012).

Collaborative learning strategy implementation could minimize the gap in creative thinking skills between UA and LA students. The strategy has been proven to optimize scaffolding from UA to LA students via discussions, tutorials, and peer-learning activities (Prayitno & Suciati, 2017). Optimum scaffolding would deliver LA students entering their proximal development zone, which further narrowing the gap of creative thinking skills between UA and LA students. Appropriate scaffolding from UA students provides the ideal learning time allocation as needed by LA students (Prayitno, Corebima, Susilo, Zubaidah, & Ramli, 2017).

Syntax integration between open-ended and collaborative (OE-C) learning strategies is vital both for elevating creative thinking skills and for minimizing its gaps. The application of a single open-ended learning strategy has the potential to improve students' creative thinking skills but has less ability to narrow gaps of thinking skills between UA and LA students, as it is competitive and is not specifically designed to encourage scaffolding between students with varied academic abilities. On the other hand, the implementation of single collaborative learning strategy encourages the decreasing gap between UA and LA students' creative thinking skills while less able to drill students to think creatively.

Previous studies had contributed in the development of the OE-C learning strategy. The OE-C learning strategy is designed to strengthen students' open-ended problem solving competencies in a collaborative teamwork. The procedure includes (1) Phase 1, students' orientation; (2) Phase 2, formation of collaborative groups; (3) Phase 3, task learning structuring; (4) Phase 4, open-ended activities in collaborative groups; (5) Phase 5, evaluation and grading. Table 1 shows the visual procedure of the OE-C learning strategies.

Research on creative thinking training had been dominated by single learning strategy such as open-ended, problem-based learning, project-based learning, and other (Ramaraj & Nagammal, 2016; Siew, Chong, & Lee, 2015; Tan, Najiha, & Abd, 2012). According to Yusnaeni, Corebima, Susilo, & Zubaidah (2017) if students are normally distributed in their academic abilities, then being given uniform learning quality and learning time allocation, their learning outcomes would further follows a normal curve distribution, which divides students into Upper Academic (UA), Moderate Academic (MA), and Lower Academic (LA) abilities. The gap of UA and LA students could be narrowed if LA students are given more time allocation for learning, depending on their needs. The competitive learning strategies have caused the said gaps as students' learning time allocation unvaried. It is assumed that the integration of open-ended and collaborative (OE-C) learning strategies would be able to resolve the problem as collaboration characterised by tutorial as scaffolding that fills the different learning time allocation problem. Based on the background above research testing whether OE-C learning strategy has the most effective capabilities in minimizing gaps of creative thinking skills between UA and LA students compared to other learning strategies is necessary.

Table 1. *The procedure of O-EC learning strategy*

Step	Teacher's Activity
Students' orientation	· Enabling students' prior knowledge related to learning materials by triggering cognitive conflict on students' mind.
The formation of collaborative groups	· Forming collaborative groups that encourage simultaneous interactions, positive dependence individual responsibility, and peer participation. The group formation considers group heterogeneity such as the academic abilities. · Agreeing on team recognition rules with students.
Task learning structuring	· Designing open-ended problems to be solved by students.
Open-ended activities in collaborative groups	· Enquiring students to find rules or relationships amongst open-ended problems that will be solved. · Asking students to solve the open-ended problems. · Ordering students to check their problem solving results. · Requesting students to look at other groups' problem solving results and methods. · Asking students to compare their works and to test different ideas. · Demanding students to modify or develop their own ideas.
Evaluation and grading	· Instructing students to report their results in front of the class, while teacher evaluates their problem solving results. · Teacher gives individual test. · Teacher provides team recognition by considering the contribution of each individual in the team.

METHOD

Research Design

This study employed quasi-experiment method with a 4x2 factorial design. During the experiment, students were divided into four treatment classes regarding the learning strategy compared, which are OE-C, open-ended, collaborative, and varied lecture method. Before and after treatment, students were being given pre-test and post-test assessing their creative thinking skills. The pre-test score was used as the covariate to control variations in students' initial creative thinking skills. The learning strategies as treatments were given three times for 3x35 minutes. The research design is visualised in Table 2.

Table 2. *Research design*

Academic Ability	Learning Strategies			
	OE-C (X1)	Open-ended (X2)	Collaborative (X3)	Lecture (X4)
Upper Academic (Y1)	X1Y1	X2Y1	X3Y1	X4Y1
Lower Academic (Y2)	X2Y2	X2Y2	X3Y2	X4Y2

Population and Sample

The research population was all of fifth grade students in one of elementary schools in Salatiga, Indonesia, totalling 136 students, which were further divided into four classes. This research utilized a total sampling. On each class, there were 17 UA and 17 LA students distributed evenly, so that UA and LA students group were each comprised of 68 people. The Classification of UA and LA students was based on students' previous semester report cards. The determination of the treatment classes was utilizing intact group technique by testing the equality of treatment classes based on students' report cards in advance. The equality testing used ANOVA. The ANOVA test results showed the value p= .253 is greater than .050 so that the classes used in the treatment are inferred in the initial equivalent condition.

Instrument and Procedures

Students' creative thinking skills were measured using essay test consisting of open-ended problems requiring students constructing varied ways towards correct answers. The students' creative thinking skill were further assessed by a rubric of creative thinking skills aspects of fluency, flexibility, originality, and elaboration from their problem solving answer sheet (Piawa, 2010). Test sheet and rubric of creative thinking skills as the instruments were developed by the researchers. Three experts focusing on the accuracy of the open-ended problems and the accuracy of creative thinking aspects assessed the validity. The results concluded that the research instruments are in a valid and appropriate category for use in data collection phase.

There were four learning strategies employed during the treatment classes, which are: OE-C, open-ended, collaborative, and varied lecture. Steps of OE-C learning strategies treatment were developed scientifically by the researcher, adopting ideas of Husain, Bais, Hussain, & Abdul (2012). Steps of collaborative learning strategy refer to ideas, which is developed by Laal & Laal (2012). In addition, steps of varied lecture strategy follow common learning activities in school, which is dominated by teacher explaining materials to students. The learning tools were developed by the researchers and tested by three experts. The feasibility test conducted had assessed the learning tools' accuracy towards learning steps and the ability to achieve learning objective. The assessment results state that the learning tools are feasible. Before the treatment, partner teacher were trained to apply the learning tools for the implementation during the experiment. The training aimed to ensure the accuracy and consistency of partner teacher in implementing the learning strategies during the treatment. Three observers were supervising and assessing partner teachers' consistency in applying the determined learning strategies in class.

Data Analysis

The hypothesis of this study is that there is an influence of the integration of OE-C learning strategies to minimize the gap in creative thinking skills between Upper Academic (UA) and Lower Academic (LA) students in comparison to open-ended, collaborative, and lecture method. Data were analysed with ANCOVA with pre-test score as the covariate. The normality test was using Kolmogorov Smirnov test, which showed pre-test score of p= .216 and post-test score of p= .145 is greater than .050, so that it could be concluded that the data did not deviate from the normal distribution. The variant homogeneity test was using Levene's test, which showed pre-test score of p= .068 and post-test score of p= .131 is greater than .050, so that it could be stated that inter group variant is homogeneous. The test of significance of the average value difference was using LSD test. Statistical calculations were using SPSS software version 16,0 at the .050 significance levels.

RESULTS

The ANACOVA test results on the effect of learning strategies, academic abilities, and interaction between learning strategies and academic abilities towards students' creative thinking skills are visualised in Table 3.

Table 3. *The influence of strategy, academic ability, and its interactions towards students' creative thinking skills*

Data Source	Sum of Squares	df	Mean Square	*F*	*P*
Corrected Model	40064.682a	8	5008.085	73.587	.000
Intercept	10619.656	1	10619.656	156.040	.000
Pre-test	1609.690	1	1609.690	23.652	.004
Learning strategy	17336.824	3	5778.941	84.913	.000
Academic	1946.101	1	1946.101	28.595	.000
Learning strategy * Academic	2679.013	3	893.004	13.121	.000
Error	8643.251	127	68.057		
Total	768933.000	136			
Corrected Total	48707.934	135			

a. R Squared = .770 (Adjusted R Squared = .755)

The data source of learning strategy in Table 3 shows the value of p= .000 is greater than .050, so it could be concluded that there is a highly significant effect of learning strategy towards students' creative thinking skills. The results of analysis of the potential differences in the variety of learning strategies towards students' creative thinking skills via the LSD test is visualized in Table 4.

Table 4. *The potential difference of the variations of learning strategies towards students' creative thinking skills*

Learning strategy	Mean pre-test	Mean post-test	Difference	Corrected Mean	Notation
Lecture method	40.2941	49.3529	9.0588	52.088	a
Collaborative	51.8235	78.5882	26.7647	76.331	b
Open-ended	38.2941	74.3529	36.0588	77.954	b
OE-C	56.0294	88.7941	32.7647	84.715	c

Table 4 indicates that students who learned with OE-C learning strategy have higher skill of creative thinking compared to students who learned with other strategies of open-ended, collaborative, and lecture method. There was no significant difference of students' creative thinking skills after learning with open-ended and collaborative learning strategies, but higher than students who learned with lecture method. The students who learned with lecture method had the lowest creative thinking skills amongst the four learning strategies tested.

Table 3 exhibits that in the academic data source, the value is p= .000 is greater than .005, so it could be inferred that there is an influence of academic ability towards students' creative thinking skills. UA students have higher creative thinking skills than LA students. The results of the analysis of creative thinking skills difference between UA and LA students are visualized in Table 5.

Table 5. *The difference of UA and LA students' creative thinking skills*

Academic Ability	Mean pre-test	Mean post-test	Difference	Corrected Mean
Lower Academic (LA)	41.6029	66.1324	24.5295	68.301
Upper Academic (UA)	51.6176	79.4118	27.7942	77.243

In the data source of Table 3 containing interaction between learning strategy and academic ability (*learning strategy* academic*), it is obtained the value of p= .000 is greater than .005, so that it could be concluded that there is an interaction between learning strategies and academic abilities towards students' creative thinking skills. The results of the analysis of interaction between learning strategy and academic ability by the LSD test is visualized in Table 6.

Table 6. *Interaction between learning strategy and academic ability towards creative thinking skills*

Strategy	Academic	Pre-test	Post-test	Difference	Corrected Mean	Notation
Lecture	Lower (LA)	38.1765	47.2353	9.0588	50.887	a
Lecture	Upper (UA)	42.4118	51.4706	9.0588	53.289	b
Open-ended	Lower (LA)	43.8824	62.8824	19.0000	64.064	c
Collaborative	Lower (LA))	31.4118	69.6471	38.2353	76.228	d
Collaborative	Upper (UA))	45.1765	79.0588	33.8823	79.680	d
OE-C	Lower (LA)	52.9412	84.7647	31.8235	82.023	d
OE-C	Upper (UA)	59.1176	92.8235	33.7059	87.408	de
Open-ended	Upper (UA)	59.7647	94.2941	34.5294	88.598	e

Table 6 shows the following results: 1) The UA students who learned with open-ended strategy have equal creative thinking skills with UA students who learned with OE-C; 2) UA students who learned with open-ended learning strategy have higher creative thinking skills than LA students who learned with open-ended, OE-C, collaborative and lecturer method; 3) UA students who learned with OE-C have equal creative thinking skills with LA students who learned with OE-C; 4) UA students who learned with OE-C have higher creative thinking skills than UA and LA students who learned with collaborative and lecturer method; 5) LA students who learned with OE-C have equal creative thinking skills with UA and LA students who learned with collaborative method; 6) LA students who learned with OE-C have higher creative thinking skills than LA students who learned with collaborative and lecturer methode, and UA students who learned with lecture method; 7) UA and LA students who learned with collaborative have equal creative thinking skills; 8) UA and LA students who learned with collaborative have higher creative thinking skills than LA students who learned with open-ended, and both UA and LA who learned with lecture method; 9) UA students who learned with lecture method have higher creative thinking skills than LA students who learned with the same method.

OE-C and collaborative strategies are proven able minimizing the gap between UA and LA students' creative thinking skills. It is indicated that there was no differences in mastery of creative thinking skills between UA and LA students. Open-ended and lecture learning strategies are proven unable to minimize the gap between UA and LA students. The most optimal strategy in training the creative thinking skill and minimize the gap between UA and LA student is OE-C strategy.

DISCUSSION and CONCLUSION

Discussion

The study shows that there is a significant influence between learning strategies and students' creative thinking skills. Table 4 further indicates that by order, OE-C learning strategy has the higher success rate in improving creative thinking skills, followed by open-ended, collaborative, and varied lecture method. Students who learned with varied lecture method have the lowest creative thinking skills. The method is dominated by teacher who is during the teaching activities predominantly explaining the learning materials, giving problems, and asking students to finish the problems given (Kurniati, Purwanto, & As'ari, & Dwiyana, 2019). The findings also confirm statements of Sa'dijah, Nurrahmawati, Sudirman, Muksar, & Anwar (2018) that varied lecture method has less capability to optimize students' problem solving skills. Further, the optimum empowerment of students' creative thinking skills requires freedom to express wide-ranging ideas when solving problems (Kashani, Afrooz, Shokoohi, Kharrazi, & Ghobari, 2017). In addition, a number of researches confirm that a varied lecture method is less able to empower students' creative thinking skills (Yusnaeni, Corebima, Susilo, & Zubaidah, 2017).

Students who learned using collaborative strategy have higher creative thinking skills than students who learned using varied lecture method. The collaborative strategy demand students to cooperate in achieving the learning goals set by the teacher (Chan, Wan, & Ko, 2019). The students learned by discussing, having dialogue, and maybe debating when completing tasks given by the teacher. It also involves peer-learning activities that encourage scaffolding between students with different creative thinking skill level (Prayitno & Suciati, 2017). The said activities in collaborative learning strategy stimulates students to be involved in ideas exchange, so that the students tend to have higher creative thinking skills than students who learned with varied lecture method. A number of research also argue that collaborative learning implementation would promote creative thinking skills empowerment (Duane & Satre, 2014).

Students who learned using open-ended learning strategies have higher creative thinking skills than students who learned with collaborative strategies or varied lecture method. Open-ended learning strategies are strongly related to creative thinking skill training (Ramaraj & Nagammal, 2016). It begins with the provision of open problems that demand students to solve the problems with varied possible correct ways (Surif, Ibrahim, & Dalim, 2014). When being stimulated to think varied ideas and to test the constructed correct answers, creative thinking aspects such as *fluency, flexibility, originality*, and *elaboration* are being trained effectively (Ramaraj & Nagammal, 2016). Numerous researches claim that open-ended learning strategies are proven able to exercise students' creative thinking skills (Tan, Najiha, & Abd, 2012).

Students who learned with OE-C strategy have the highest creative thinking skills compared with other learning strategies. The OE-C strategy develops by integrating open-ended and collaborative syntax. Open-ended characteristic requires students to solve open problems with varied answers and to test whether the ideas produced are applicable or not (Husain et al., 2012). The activities within open-ended strategy are proven able to stimulate students' creative thinking skills. On the OE-C learning strategy, the open-ended strategy advantages are also being strengthened by collaborative strategy characteristic. Students learning with OE-C strategy adopt collaborative group activities of discussing, exchanging, and debating insights and ideas, which exercise students' optimal creative thinking skills. Effective scaffolding potential from collaborative learning strategy also boosts LA students' creative thinking skills to be in the same level with UA students (Azizah, Masykuri, & Prayitno, 2017)

Table 3 illustrates that there is a significant influence of academic abilities towards students' creative thinking skills. Table 5 shows that UA students have higher creative thinking skills than LA students. Academic ability is the representation of students' intelligence. Students who have good intelligence are characterized with: (1) High curiosity; (2) Ability to produce many ideas; (3) Thinking flexibly; (4) Eagerness to try for new things; (5) Happiness when being involved in problem solving activities, and; (6) Capability to instantaneously capture causal relationships (Murphy, Bianchi, McCullagh, & Kerr, 2013). Smart students who have higher-order thinking skills are more superior in comparison to less intelligence students.

Table 3 demonstrates that there is a significant interaction between learning strategies and academic abilities towards students' creative thinking skills. Table 6 depicts that UA students who learned with varied lecture method have higher creative thinking skills compared with LA students who learned with the same strategy. All of UA and LA students who learned with varied lecture method have lowest score of creative thinking skills compared with students who learned with other learning strategies. This finding indicates that lecture method has the less ability to minimize gaps of creative thinking skills between UA and LA students, and has the lowest potential in effectively training students' creative thinking skills.

The varied lecture method nuance with teacher-centred learning, positioning teacher as the information centre. Students treated with lecture method learn conventionally by listening to the teacher's explanation. The success of the learning activities is measured by how much students memorized information given by the teacher (Prayitno, Corebima, Susilo, & Ramli, 2017). Students are rarely being involved in activities that require them to express insights during the learning process; as a result, UA and LA students' creative thinking skills are dormant. Students are also seldom being involved in discussion and peer tutorial which is optimal in

narrowing gaps of UA and LA students' creative thinking skills. The lack of scaffolding activities further causing gaps between UA and LA students' creative thinking skills..

LA students who learned with open-ended strategy earn lower creative thinking skills in comparison to UA and LA students who learned with collaborative strategy and OE-C strategy, and UA students who learned with open-ended strategy. UA students learning with open-ended strategy achieve higher creative thinking skills compared with UA and LA students who learned with conventional strategy and collaborative strategy, and LA students who learned with OE-C strategy. UA students who learned with open-ended strategy have the highest creative thinking skills, equivalent with UA students who learned with OE-C strategy.

These findings indicate that LA students who learned with open-ended strategy experienced hardships in solving open-ended problems during the class, so their creative thinking skills had not been empowered. The findings also demonstrate that open-ended strategy are less able to minimize the gap between UA and LA students' creative thinking skills, which in fact, the score difference of creative thinking skills between UA and LA students was the highest compared to students who learned with other learning strategies.

The open-ended strategy begins with the provision of open problems that require students to construct varied attempts towards the correct answers (Surif , Ibrahim, & Dalim, 2014). The highest advantage of open-ended strategy is the strong stimulation of students' creative thinking skills. Students with high intelligence score tend to effortlessly follow open-ended learning than students with lower intelligence score. Students' academic ability is the representation of intelligence (Prayitno, Suciati, & Titikusumawati, 2018). LA students struggled to learn with open-ended strategy, as a result, their creative thinking skills failed developing; even their creative thinking skills are lower than LA students who learned with collaborative strategy. Open-ended strategy is competitive in nature, lacking capabilities in narrowing gaps of students' creative thinking skills. Open-ended strategy has fewer abilities to facilitate ideal scaffolding between UA and LA students, as it is not specifically designed for strong peer learning activities.

LA students who learned with collaborative learning strategy and had on par creative thinking skills with AA students who learned with the same strategy, earned score higher than LA students who learned with open-ended strategy and all of students who learned with conventional strategy. The finding indicates that collaborative strategy have abilities to minimize gap of creative thinking skills between UA and LA students, but less optimal compared with open-ended and OE-C strategies.

Collaborative strategy is developed particularly for training students to team up (Harvey & Uren, 2018). Students are deliberately organized to collaborate in achieving the defined learning outcomes. They are learning in groups, which encourage optimal scaffolding between UA and LA students. The scaffolding from UA to LA students in peer-learning activities is proven able to minimize gap of creative thinking skills between the students. However, collaborative strategy is not specifically designed for training creative thinking skills as the open-ended learning strategy is, consequently the outcome of creative thinking skills training is not as satisfactory as open-ended strategies.

LA students who learned with OE-C strategy have equal creative thinking skills with UA students who learned with OE-C strategy, and higher than UA and LA students who learned with conventional and collaborative strategies, and LA students who learned with open-ended strategy. This finding suggest that OE-C strategy is able to lessen gap of creative thinking skills between UA and LA students, and is proven to be the most optimal in training creative thinking skills to UA and LA students compared to other learning strategies.

The OE-C strategies develop by integrating open-ended and collaborative learning strategies. The open-ended strategy have been developed to train students' creative thinking skills, in particular aspects such as fluency, flexibility, originality, and elaboration (Piawa, 2010). The weakness of the open-ended strategies is lacking effective facilitation of scaffolding, which causing distress to LA students. This weakness in OE-C strategy is being covered with the strong feature of collaborative strategy. As mentioned before, collaborative strategy is developed specifically for training students' peer learning in achieving defined learning outcomes (Chan,

Wan, & Ko, 2019). Collaborative strategy involve discussion, ideas exchange, dialogue, debate, and peer-learning activities during the class to achieve the defined learning outcomes. The peer-learning activities ensure optimal scaffolding, so both UA and LA students were well adapted to learn with OE-C strategies (Acar & Ader, 2017). Optimum creative thinking skills training supported with ideal peer-learning activities in OE-C strategies is effective in minimizing gap of UA and LA students' creative thinking skills and also places OE-C as the most optimal strategy in training creative thinking skills compared to open-ended, collaborative, and varied lecture method.

Conclusions

Data analysis shows that the OE-C blended learning strategies tested as the most effective to empower creative thinking skills compared to open-ended, collaborative, and lecture method. Both OE-C and collaborative learning strategies are proven effective in minimizing gap of UA and LA students' creative thinking skills, but OE-C strategy is more optimal in training creative thinking skills. Either open-ended strategies or lecture methods have fewer capabilities in narrowing gap of creative thinking skills. Competitive learning as main characteristic of open-ended and lecture method has made scaffolding less effective, further causing gaps between UA and LA students' creative thinking skills. Collaborative learning characteristic in OE-C and collaborative strategy have optimized scaffolding activities between UA students to LA students, so the creative thinking skills of UA and LA students become comparable. Teacher is advised to apply the OE-C learning strategy when taking an effort to minimize gap between their UA and LA students' creative thinking skills.

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