Research Article doi: 10.12973/eu-jer.10.1.187

European Journal of Educational Research
Volume 10, Issue 1, 187 - 197.
ISSN: 2165-8714
https://www.eu-jer.com/

Science KIT Teaching Aid for the Earthquake in Improving Students' Collaboration Skills and Creative Thinking in Junior High School

Sri Atun*
Yogyakarta State University, INDONESIA

Veronica Purnama Sari Latupeirisa
Yogyakarta State University, INDONESIA

Received: August 22, 2020 ▪ Revised: December 11, 2020 ▪ Accepted: December 29, 2020

Abstract: This study aims to determine the effectiveness of the IPA KIT teaching aids for earthquakes science KIT in improving students' collaboration skills and creative thinking. The design of this research is a quasi-experimental research with a stratified random sampling technique. This study involved two classes, namely the experimental class (n = 32) and the control class (n = 33) with a pretest-posttest control group design. This research was conducted at SMP Negeri 5 Depok. The statistical analysis used to test the research hypothesis based on the pretest and posttest scores is the normality test, linearity test, homogeneity test, correlation test, effect size, and MANOVA test. The results showed that the use of IPA KIT teaching aids for earthquakes was more effective in improving students' creative thinking skills and collaboration. Therefore, teachers are advised to use the earthquake science KIT teaching aids for earthquakes to improve the creative thinking skills and collaboration of junior high school students.

Keywords: *Science KIT , earthquake, creative thinking, collaboration skills, teaching aid.*

To cite this article: Atun, S., & Latupeirisa, V. P. S. (2021). Science KIT teaching aid for the earthquake in improving students' collaboration skills and creative thinking in junior high school. *European Journal of Educational Research*, *10*(1), 187-197. https://doi.org/10.12973/eu-jer.10.1.187

Introduction

21st Century skills are important skills to be possessed by every individual. This set of skills includes communication skills, critical thinking, creative thinking, and collaboration skills. Collaboration is key to success in the twenty-first century (Splichal et al., 2018). Collaboration allows a group to make better decisions than doing it individually. This is because they will consider various perspectives (Bialik & Fadel, 2015). A set of skills, experiences, and resources in groups can be used to support and empower one another and to foster the development of each individual (Huang et al., 2018). Through collaborative activities, students are expected to be able to work together to create a pleasant atmosphere.

Efforts to empower collaborative skills are essential things. One of the learning requirements that support these efforts is to organize students to face several problems together (Yaqin et al., 2018). Learning-based collaboration can train students in theoretical skills and practical skills (Borah et al., 2019). Collaborative learning encourages students to see situations from different perspectives and to create an environment where they can practice social and leadership skills. The environment can also provide students a satisfying learning experience that significantly reduces anxiety (Valcárcel et al., 2014).

A study showed that the use of collaborative learning is not always adequate in the classroom. Understanding the causes of ineffective collaboration can help teachers to promote more successful and enjoyable collaborative learning experiences (Le et al., 2018). Popov et al. (2012) stated that problems of communication are caused by a lack of collaborative skills. They also stated that it can prevent students from engaging in group work and contributing to group outcomes. Previous studies suggested that a lack of collaborative skills may be one of the antecedents of collaborative problems that learners often experience during collaborative learning (Webb, 2009). Teachers are often difficult to assess the performance and achievement of students when they apply collaborative learning in the classroom at all levels of education (Strijbos, 2011). This is because of the low attention to collaborative aspects (Le et al., 2018)

* **Corresponding author:**
Sri Atun. Yogyakarta State University, Yogyakarta, Indonesia. ✉ sriatun@uny.ac.id

© 2021 The Author(s). **Open Access** - This article is under the CC BY license (https://creativecommons.org/licenses/by/4.0/).

Teaching a skill enables the creation of spaces where ideas can be shared, accepted, and applied (Bialik & Fadel, 2015). The main function of collaboration is to motivate so that students can be involved sustainably in complex tasks in which it can increase the opportunities for students to conduct research and dialogue together. Besides, the collaboration also has a function to develop students' social skills (Piirto, 2011). The role of the teacher in the learning process needs to involve collaborative skills so that students are accustomed to collaborating with various creative learning activities.

Creative teaching is necessary for a teacher so that the learning process at school is dynamic and fun. Also, students will always find new and interesting things. Therefore, they will always be excited and inspired by the creativity shown by the teacher in the classroom. Creativity is often described as seeing the same thing but thinking differently (Bacanli et al., 2011). Today's teachers are asked to work with other colleagues to design learning environments. Teachers must provide sufficient opportunities for students to develop their skills (Srikoon et al., 2018). Future people must become the builders of idea systems, be able to solve problems creatively and practically and find the best and effective solutions (Oprea, 2014).

Creative thinking skills have become a necessary and desirable competency for every professional. Creative thinking has acquired considerable significance over the last few years. This is becoming increasingly important by considering the role of new ideas in changing the world (Alkathiri et al., 2018). Through the discovery of new ideas in the learning process, it is hoped that students will like learning activities so that they can strengthen their skills. Students need to be aware that sustainable change is very important in society. They also need to be taught to deal with change by using different thinking patterns (Alzoubi et al., 2016). Creative problem-solving programs, if applied effectively, can increase the creativity of students (Cetinkaya, 2014). New ideas resulting from creative thinking must be useful and relevant to the problem (Wongpinunwatana et al., 2018). Creative thinking enables problem-solving in various fields and creates innovative and original solutions for the highest quality. This type of thinking is characterized by mental flexibility, curiosity, a well-developed imagination, interest in finding solutions, creation of metaphors, and goal-oriented thinking. Certain original or creative thinking produces creativity in certain fields (Udi & Amit, 2011).

Creative thinking skills are a process used to come up with new ideas, to provide new solutions to a problem, and to provide an original view of thought (Rivas, 2017). Teachers can provide learning media that stimulates the curiosity of students so that they will have a strong curiosity towards the lesson presented to them and become more active during the learning process (Hidayati & Wuryandari, 2012). Teachers can foster students' interest through the media they use and create a pleasant learning atmosphere to make students understand and absorb the taught material easily (Hidayati & Wuryandari, 2012). National education standards require creative learning models and media so that teachers as educators can play an important role in implementing the learning process to develop students' potential and creativity (Muslim et al., 2018). The media is a tool to convey the ideology that has been planned. The media can familiarize students with real-life contexts. The media uses different styles that can attract students' attention (Oroujloua, 2012).

The use of learning media is closely related to the stages of thinking because learning media can describe something concrete. In the science learning process, students have to not only understand concepts but also think creatively in solving social problems and issues in society. The development of science and technology in the field of education is increasing rapidly so that teachers and students are required to have broad insights (Diergarten et al., 2017).

The role of educational media is the factors that influence the learning process (Diergarten et al, 2017). The science KIT teaching aid (KIT in Indonesia is *Komponen Instrumen Terpadu* or in English is called the Integrated Instrument Components) is one of the learning media that can help science teachers to prepare the learning process easier and more precise (can be seen in Figure 1). Furthermore, by using it, teachers can carry out the learning process optimally so that the science learning situation can be more active, creative, effective, and enjoyable (Mokoginta & Buluati, 2017). According to Foley et al. (2013), "science KITs contain all (or nearly all) of the equipment, supplies, and curricular materials needed to investigate a particular science topic". Therefore, it is necessary to conduct a study on the use of the science KIT teaching aid for the earthquake to improve students' collaboration skills and creative thinking in junior high school level.

Figure 1. Earthquake IPA KIT

Research Objectives

This study aimed to find out the effect of using the science KIT teaching aid for the earthquake in improving students' collaboration skills and creative thinking. The research questions of this study are as follow.

1. Can the science KIT increase students' collaboration skills and creative thinking?
2. Is there a significant difference in the scores of the pretest and posttest on students' collaboration skills between the experimental class and the control class?
3. Is there a significant difference in the scores of the pretest and posttest on students' creative thinking between the experimental class and the control class?

Methodology

Research design

This study applied a quasi-experimental method using the control-group pretest-posttest design (Creswell, 2012). This study involved two classes, i.e. the experimental class and the control class. The design can be seen in Table 1.

Table 1. Control-group pretest-posttest design

Groups	Pretest	Treatment	Posttest
Experimental Class	Q_1	X_1	Q_2
Control Class	Q_3	X_2	Q_4

Source: (Creswell, 2012)

Note:

Q_1 = the initial ability (pretest) of participants in the experimental group

Q_2 = the final ability (posttest) of participants in the experimental group

Q_3 = the initial ability (pretest) of participants in the control group

Q_4 = the final ability (posttest) of participants in the control group

X_1 = science learning process using the science KIT for earthquake

X_2 = science learning process using conventional teaching aids

Setting and participants

Participants in this study were 32 students in the experimental class and 33 students in the control class. This research was conducted at Junior High School 5 Depok in Sleman, Indonesia. Each learning activity was carried out for 2 sections (2x40 minutes) per meeting. It was conducted for 4 meetings for each class.

Treatments

After obtaining permission to conduct the study at Junior High School 5 Depok, researchers firstly conducted classroom observations and interviews with science teachers. Then, researchers ensured that all students could attend every meeting. After that, researchers determined participants for the control and experimental classes and the assignments for each class. During the learning process, the participants in the experimental class used the science KIT for earthquake, while those in the control class used conventional teaching aids and materials provided by the teacher. Both classes studied the same topic which was earthquakes. The observation sheets and creative thinking questions used in the study had been validated by two experts.

Treatment in Experimental Class

For the learning process in the experimental class, the researchers utilized the science KIT for the earthquake using a scientific approach and the interactive learning method. Interactive learning was designed to make the learning atmosphere to be interactive. Furthermore, it is a student-oriented learning model in which students are directly involved in various learning activities in the classroom. During the learning process, students worked together in small groups consisting of 5-6 students. Before the core activities were carried out, students were given information about how to learn by using the science KIT for the earthquake. The learning process was carried out for four meetings. In each meeting, certain activities must be carried out. In the first meeting, students had to form the layers of the Earth using plasticine and simulate the movement of the Earth's plates using a sponge. In the second meeting, students had to design a simple seismograph. In the third meeting, students had to create a simple shelter and exhibit the earthquake process in the series of their shelters. Finally, in the fourth meeting, students had to conduct preparedness exercises

using brochures, maps, first aid kits, and whistles that had been provided in the science KIT for the earthquake. The steps for each meeting were listed in the student worksheets that were distributed in each meeting.

Treatment in Control Class

For the learning process in the control class, teachers applied a scientific approach (Musfiqon & Nurdyansyah, 2015). The learning process in this class did not use the science KIT for the earthquake. Researchers designed activities that almost resembled the experimental class. However, students dominantly learned using books, watching videos, and listening to explanations from the teachers in which it was mostly presented through Microsoft PowerPoint.

Data Collection

To evaluate students' collaboration skills and creative thinking, the instruments were used to assess students' abilities in the pretest and posttest. For collaboration skills, researchers used observation sheets. The observation sheet can be seen in table 1. Meanwhile, for creative thinking, researchers used essay questions. The observation sheet and essay questions were compiled by researchers and have been validated by 2 expert lecturers in the field of science education.

Collaboration Skills

Researchers developed the observation sheet to assess four aspects of collaboration skills, namely cooperation among students, mutual respect behavior, mutual information, and mutual motivation between students which consisted of 20 observation items. The assessment of the observation sheet applied a Likert scale, i.e. 5 (always), 4 (often), 3 (sometimes), 2 (rarely), and 1 (never). There were 4 postgraduate students from science education programs who observed learning activities before and during the learning process were carried out by utilizing the science KIT for the earthquake.

Table 2. Collaboration Skill observation sheet

No	Observation
1	Students contribute actively in groups
2	Students work productively with their group of friends
3	Students are responsible for completing the assigned task
4	Students want to learn from group members
5	Students help friends when asking for help
6	Students show flexibility in working together
7	Students receive criticism that is given as an improvement
8	Learners accept and respect the opinions of other group members
9	Students appreciate friends by showing a polite attitude
10	Students want to listen when friends are talking
11	Students appreciate the work of friends
12	Learners appreciate the results achieved by the group
13	Students provide ideas, suggestions, and solutions that are useful for solving problems
14	Students ask for ideas and opinions from group members in making decisions
15	Students ask group members if they have difficulties
16	Students arrange the schedule coherently
17	Students understand information about the distribution of tasks to group members
18	Students encourage each member to dare to express opinions
19	Students give praise to group members
20	Learners make team members feel strong and important

Creative Thinking

The creative thinking essay test that was developed covered four aspects, i.e. fluency, flexibility, originality, and elaboration in thinking. The test consisted of 9 essay question items. Furthermore, the test was carried out at the beginning and the end of the meetings. Indicators of creative thinking are:

1. Through a picture of the convection process that occurs in the earth can explain the cause of the movement of the earth's plate, related to the convection flow process! And analyze images about the movement of the earth's plates
2. Determine the divergent and transform plate motion images and can diverge the difference between the two
3. Provide an example of the impact of the earthquake on society and the environment
4. Analyzing the shear fault, normal and best fault images

5. Express opinions, about why the rocks on the plates change shape and relate the answers to the process of an earthquake
6. Express ideas about the importance of an evacuation route map
7. Explain how a sesismograph works
8. Explain why Indonesia is a disaster-prone area based on a map
9. Based on data due to the earthquake, namely the victims died, were injured and the recapitulation of damaged houses (houses) in Yogyakarta Province. Students can make efforts to minimize or reduce the number of victims and damage caused by earthquakes

Data Analysis

The statistical analysis used to test the research hypothesis based on the pretest and posttest scores were the normality test, linearity test, homogeneity test, correlation test, effect size, and MANOVA test. The Manova test aims to see the difference in value between the two sample groups by using three variables. The analysis was performed with a significant level (α) of 0.05. The manova test in this study was used to see the effectiveness of the earthquake science KIT props to increase creative thinking and collaboration. This test was to determine significant group differences using posttest creative thinking scores and students' collaboration skills between the control class and the experimental class. The prerequisites for the Manova test, namely the normality test and the multivariate homogeneity test, have been fulfilled, so it can be continued with the Manova test on the posttest score to answer the hypothesis. The results of the MANOVA test were used to determine whether there was an effect of using the science KIT for the earthquake in increasing students' collaboration skills and creative thinking. The assessment of the observation sheet applied a Likert scale and creative thinking questions using an assessment rubric.

Normality test

The normality test was conducted using SPSS v.16 for windows program with the Kolmogorov-Smirnov test and a significant level (α) of 0.05. The results of this test are presented in Tables 3 and 4.

Table 3.The results of the normality test for creative thinking variable

Class	N (Number of Samples)	sig.
Experimental	32	0.178
Control	33	0.200

Tabel 4. The results of the normality test for collaboration skill variable

Class	N (Number of Samples)	sig.
Experimental	32	0.200
Control	33	0.200

Based on Tables 3 and 4, the sig. values of the experimental and control classes show values greater than 0.05. Therefore, it can be concluded that H_0 is accepted because the data is normally distributed.

Linearity Test

The linearity test aims to find the similarity of the regression line between the independent variable and the dependent variable. Based on the linearity test for the data of the creative thinking towards the science KIT teaching aid for the earthquake, the obtained sig. value is 0.097. It indicates that the sig. value (0.097) is > α (0.05) meaning that the regression model is linear. Meanwhile, based on the linearity test for the data of the collaboration skills towards the science KIT teaching aid for the earthquake, the obtained sig. value is 0.733. It indicates that the sig. value (0.733) is > α (0.05) meaning that the regression model is also linear.

Homogeneity Test

To conduct the homogeneity test, Levene's test was carried out at the significance level (α) of 0.05. Based on the results of the analysis, H_0 is accepted if the sig. value is ≥ α. The requirement for the MANOVA test is the presence of similarity between the variance or covariance matrices in the same dependent variables. Based on the results of the Box's M test, the obtained sig. value for the creative thinking variable is 0.641, while that for the collaboration skill variable is 0.405. Overall, it can be concluded that sig. values is ≥ α, i.e. 0.641 ≥ 0.05 (creative thinking) and 0.405 ≥ 0.05 (collaboration skill). Therefore, based on the results of the analysis, H_0 is accepted.

Effect size

Effect size or influence is a measure concerning the magnitude of the effect of a variable on other variables, the magnitude of the difference, or the relationship that is free from the influence of the size of the sample. From those two variables, the data of partial eta squared is obtained and then presented in Tables 5 and 6.

Table 5. Test of between-subjects effects

Source	**Dependent Variable**	**Sig.**	***Partial Eta Squared***
Intercept	Creative Thinking	0.000	0.968
	Collaboration Skill	0.045	0.62

Table 6. Multivariate Tests

	Effect	**Partial Eta Squared**
Intercept	Pillai's Trace	0.973
	Wilks' Lambda	0.973
	Hotelling's Trace	0.973
	Roy's Largest Root	0.973
Treatment	Pillai's Trace	0.086
	Wilks' Lambda	0.086
	Hotelling's Trace	0.086
	Roy's Largest Root	0.086

The range of partial eta squared is 0-1 in which the higher the value is, the stronger the relationship between the independent and the dependent variables will be. In Table 5, it can be seen that the values are 0.0973 and 0.086. The results of the effect size of each variable are 0.968 for creative thinking or in the very strong category and 0.62 for collaboration skills or in the strong category.

Multicollinearity Test

The multicollinearity test is used to find out the absence of multicollinearity which means a situation that shows a correlation between two variables. Based on the result of this test, the correlation between creative thinking and collaboration skills is 0.066. It indicates that there is a correlation between variables by considering Pearson's correlation value.

Findings

Creative thinking & Collaboration skills

The variable of creative thinking was measured using a written test in the form of essay questions in the pretest and posttest. Measurement of increased mastery of students' creative thinking was carried out to test 4 aspects, i.e. fluency, flexibility, originality, and elaboration.

The variable of collaboration skill was measured using the observation sheet carried out during the learning process. In this study, 4 observers were involved in helping to fill in the observation sheet based on the condition in the classroom. They were postgraduate students of science education program batch 2018. Based on the MANOVA test, there is a significant difference in the average score between groups of students who use earthquake science KIT teaching aids and those who use conventional teaching aids, in terms of their creative thinking and collaboration skills. This means that the use of IPA KIT teaching aids is more effective in improving students' creative thinking skills and collaboration.

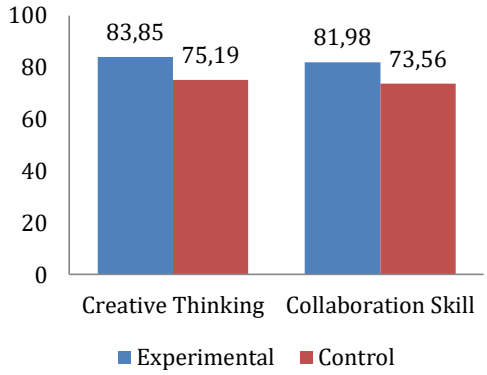

Figure 2. Diagram of posttest scores

Figure 2 illustrates that the posttest score for the experimental class is higher for all variables and to clarify differences in research results.

MANOVA Test

The MANOVA test aims to find out the difference in values between the two sample groups by using the two variables. The analysis was conducted using SPSS v.16 for Windows program at a significant level (α) of 0.05. The MANOVA test in this study was used to see the effectiveness of the science KIT teaching aid for the earthquake to improve students' creative thinking and collaboration skills. This test was to determine the significant differences in groups by using posttest cores of students' creative thinking and collaboration skills between the control class and the experimental class. The obtained data were then converted to interval data using MSI. The prerequisites for the MANOVA test were the normality test and the multivariate homogeneity test in which they had been fulfilled. Therefore, it can be continued to the MANOVA test on the posttest score to answer the hypothesis. The results of the multivariate test for the posttest scores of the two classes can be seen in Table 9.

Table 9. The results of the multivariate test for posttest scores

Test	F	Sig.	Conclusion
Hotelling's Trace	742.314	0.00	H_0 is rejected H_1 is accepted

In Table 9, the result of the Hotelling's Trace test shows that the significant value is 0.00 (sig. < 0.05) indicating that H_1 is accepted. In other words, there is a significant difference in the average scores between groups of students that used the science KIT teaching aid for the earthquake and that used the conventional teaching aid, in terms of creative thinking and collaboration skills. This means that the use of the science KIT teaching aid is more effective in increasing students' creative thinking and collaboration skills. Based on the data obtained, there are no data outliers based on the results.

Effect size

Effect size or influence is a measure concerning the magnitude of the effect of a variable on other variables, the magnitude of the difference, or the relationship that is free from the influence of the size of the sample. From those two variables, the data of partial eta squared is obtained and then presented in Tables 10 and 11.

Table 10. Test of between-subjects effects

Source	Dependent Variable	Sig.	*Partial Eta Squared*
Intercept	Creative Thinking	0.000	0.968
	Collaboration Skill	0.045	0.62

Table 11. Multivariate Tests

	Effect	Partial Eta Squared
Intercept	Pillai's Trace	0.973
	Wilks' Lambda	0.973
	Hotelling's Trace	0.973
	Roy's Largest Root	0.973
Treatment	Pillai's Trace	0.086
	Wilks' Lambda	0.086
	Hotelling's Trace	0.086
	Roy's Largest Root	0.086

The range of partial eta squared is 0-1 in which the higher the value is, the stronger the relationship between the independent and the dependent variables will be. In Table 5, it can be seen that the values are 0.0973 and 0.086. The results of the effect size of each variable are 0.968 for creative thinking or in the very strong category and 0.62 for collaboration skills or in the strong category.

Discussion

This study was conducted to find out the effect of the science KIT teaching aid for the earthquake in increasing students' creative thinking and collaboration skills. Based on the results of the pretest and posttest, there are differences that indicate that the scores for the experimental class are higher than that for the control class from both the pretest and posttest These results show that the science KIT teaching aid has an effect on increasing students' creative thinking and collaboration skills. The use of the science KIT teaching aid makes students more interested in

following the learning process. The learning process using the science KIT teaching aid for the earthquake can stimulate students to be able to think creatively, foster cooperation between groups, and foster their preparedness in facing the real earthquakes. KIT teaching aids as learning media can foster student motivation in the teaching and learning process, especially in conducting experiments and observations (Satria, 2019). Media is a means of learning communication. Students can learn from teachers and other students (Smaldino et al., 2011). The use of instructional media in collaborative learning in the classroom can enhance collaborative learning and student involvement in the classroom. Thus, student learning performance has increased rapidly (Balta & Awedh, 2017).

Practical activities, observation, and experimentation are activities that must be carried out (Angreni & Azkiya, 2018). Various techniques have been introduced to make learning more efficient and effective (Wicks et al., 2015). Students are trained to be able to work together and think creatively in carrying out all those activities. Fun learning will affect students' academic achievement and learning success (Saputro et al., 2019). Learning in groups can improve students' collaborative skills (Kristiansen et al., 2019). Collaboration is designed to maintain or increase the level of learning innovation (Darun et al., 2019). Collaborative learning significantly influences the student learning process (Balta & Awedh, 2017).Learning through collaboration can stimulate the best manifestation of active and creative students in the classroom (Oprea, 2014). Collaborative learning helps students to develop skills such as critical thinking, gain a deeper understanding of topics, improve individual reasoning skills, and the ability to express themselves through interactions with peers (Scheuer et al., 2010). Based on the calculation of the effect size, the data of partial eta squared for creative thinking is in the very strong category and that for collaboration skills is in a strong category. Based on the result of the Hotelling's Trace test, it shows a significant difference in the average scores between groups of students that used the science KIT teaching aid for the earthquake and that used the conventional teaching aid, in terms of creative thinking and collaboration skills. Therefore, the use of the science KIT teaching aid can be declared more effective. KIT teaching aids as a learning medium can foster students' motivation in the teaching and learning process, especially in conducting experiments and observations (Satria, 2019). Learning environments that provide students with authentic experiences can increase students' self-efficacy (Mataka & Kowalske, 2015). Student response systems have facilitated active learning of physics, and have helped students to be more involved in the classroom (Coco & Slisko, 2013). Creative thinking is not always an innate talent, but an ability that can be improved through effective materials and approaches (Wu et al., 2018). Creative thinking skills train students to develop ideas and arguments, ask questions, admit correct arguments, and influence students to think openly and be more responsive to different perspectives (Tendrita et al., 2016). One of the efforts to improve creative thinking skills is through quality education. Quality education can be improved through thinking training with the right learning model (Maskur et al, 2020). Learning using learning media can improve collaboration skills (Muiz, 2016). Likewise with increased creative thinking (Noviani & Wangid 2018)

The learning process will be effective when each individual, who is involved in it, actively participates in carrying out their respective tasks. If students have direct experience with something to see, hold, feel, and involve physical activity, they will have certain experiences that build their knowledge. Teachers also need to provide students with opportunities to exploit themselves in the learning process so that they have a good learning experience. Cognitive and affective aspects of learning can increase if supported with the availability of media that can contribute to fostering students' interest (Sung et al., 2012). Quality human resources are the result of a quality education process. Quality education can equip students with thinking skills (Zubaidah et al., 2017). Students need to be made aware that sustainable change is very important in society and they need to be taught to deal with change by using different thinking patterns (Alzoubi et al., 2016). The teacher stimulates and guides students. Motivation comes from enthusiastic teacher participation (Oprea, 2014). Through this condition, an idea can be created that will lead to concrete action. Students with creative thinking will have in-depth knowledge through effective learning (Sdouh, 2013).

Conclusion

Based on the results of this study on the use of the science KIT teaching aid for the earthquake in improving students' creative thinking, it indicates that the pretest score of the experimental class is 36.82 and that of the control class is 22.26, while the posttest score of the experimental class is 83.85 and that of the control class is 75.19. Meanwhile, for collaboration skills, it indicates that the pretest score of the experimental class is 79.28 and that of the control class is 69.39, while the posttest score of the experimental class is 81.98 and that of the control class is 73.56. Therefore, the overall results of the pretest and posttest scores for the creative thinking and collaboration skills variables show that the experimental class is superior to the control class. Furthermore, based on the results of the MANOVA test, the Hotelling's Trace value is 0.00 (<0.05), meaning that H_0 is rejected. Therefore, the science KIT teaching aid for the earthquake is considered effective in increasing students' collaboration skills and creative thinking.

Recommendations

Earthquake Science KIT can be used as a learning medium to help facilitate the teaching and learning process to make it more interesting. It is recommended that future researchers be able to develop other KIT Disasters in order to motivate students to study disasters in various countries in order to create preparedness.

Limitations

The development of this learning media can only be used for one type of disaster, namely the earthquake disaster. In addition, it must also be adjusted to the learning topic at the Junior High School level. This study does not consider gender and previous learning experiences that affect students' skills. This research is limited to the topic of layers of the earth for class VII junior high school 2013 curriculum.

References

Alkathiri, F., Alshreef, S., Alajmi, S., Alsowayan, A., & Alahmad, N. (2018). A systematic review: the relationship between learning styles and creative thinking skills. *English Language and Literature Studies, 8*(10), 34–44. https://doi.org/10.5539/ells/v8n1p34

Alzoubi, A. M., Qudah, M. F. A., Albursan, I. S., Bakhiet, S. F., & Abduljabbar, A. S. (2016). The effect of creative thinking education in enhancing creative self-efficacy and cognitive motivation. *Journal of Educational and Developmental Psychology, 6*(1), 117–130. https://doi.org/0.5539/jedp.v6n1p117

Angreni, S., & Azkiya, H. (2018). Development of practical instructions for media integrated instruments components science natural science elementary school approach skin process approach. *International Journal of Recent Scientific Research Research, 9*(7), 27537-27540.

Bacanli, H., Dombaycı, M. A., Demir, M., & Tarhan, S. (2011). Quadruple thinking: Creative thinking. *Procedia-Social and Behavioral Sciences, 12,* 536–544. https://doi.org/10.1016/j.sbspro.2011.02.065

Balta, N., & Awedh, M. H. (2017). The effect of student collaboration in solving physics problems using an online interactive response system. *European Journal of Educational Research*, *6*(3), 385–394 https://doi.org/10.12973/eu-jer.6.3.385

Bialik, M., & Fadel, C. (2015). *Skills for the 21st Century: What Should Student Learn?* Center for Curriculum Redesign.

Borah, D., Malik, K., & Massini, S. (2019). Are engineering graduates ready for R&D jobs in emerging countries? teaching-focused industry-academia collaboration strategies. *Research Policy, 48*(9), 1–15. https://doi.org/10.1016/j.respol.2019.103837

Cetinkaya, C. (2014). The effect of gifted student' creative problem solving program on creative thinking. *Procedia-Social and Behavioral Sciences, 116,* 3722–3726. https://doi.org/10.1016/j.sbspro.2014.01.830

Coco, D. M., & Slisko, J. (2013). Software Socrative and smartphones as tools for implementation of basic processes of active physics learning in classroom: An initial feasibility study with prospective teachers. *European Journal of Physics Education, 4*(2), 17-24.

Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative* (4th ed.). Pearson Education, Inc.

Darun, M. R., Palm, D., Athinarayanan, R., Hummel, V., & Leipzig K. V. (2019). The learning factory–a new stimulus to enhance international collaboration. *Procedia Manufacturing, 31,* 290–295. https://doi.org/10.1016/j.promfg.2019.03.046

Diergarten, A. K., Möckel, T., Nieding, G., & Ohler, P. (2017). The impact of media literacy on children's learning from films and hypermedia. *Journal of Applied Developmental Psychology, 48*, 33–41. https://doi.org/10.1016/j.appdev.2016.11.007

Foley, J. M., Bruno, B. C., Tolman, R. T., Kagami, R. S., Hsia, M. H., Mayer, B., & Inazu, J. K. (2013). C-MORE science kits as a classroom learning tool. *Journal of Geosscience Education, 16,* 256–67.

Hidayati, N., & Wuryandari, A, I. (2012). Media design for learning Indonesian in junior high school level. *Procedia - Social and Behavioral Sciences*, *67*, 490–499. https://doi.org/10.1016/j.sbspro.2012.11.354

Huang, C., Hsu, H., Yang, L., Chen, C., Yang, Y., Chang, C., Chuang, C., Lee, W., Lee, F., & Hwang, S. (2018). Peer-assisted learning model enhances clinical clerk's procedural skills. *Journal of the Chinese Medical Association, 81*(8), 747–753. https://doi.org/10.1016/j.jcma.2017.06.028

Kristiansen, S. D., Burner, T., Johnsen, B. H., & Yates, G. (2019). Face to face promotive interaction leading to succesful cooperative learning: A review study. *Cogen Education, 6*(1), 1-19 https://doi.org/10.1080/2331186X.2019.1674067

Le. H., Janssen, J., & Wubbels. (2018). Collaborative learning practices: teacher and student perceived obstacles to effective student collaboration. *Cambridge Journal of education 48*(1), 103–122. https://doi.org/10.1080/0305764X.2016.1259389

Maskur, R., Sumarno, Rahmawati, Y., Pradana, K., Syazali, M., Septian, A., & Palupi, E. K. (2020). The effectiveness of problem based learning and aptitude treatment interaction in improving mathematical creative thinking skills on curriculum 2013. *European Journal of Educational Research*, *9*(1), 375–383. https://doi.org/ 10.12973/eu-jer.9.1.375

Mataka, L. M., & Kowalske, M. G. (2015). The influence of PBL on students' self-efficacy beliefs in chemistry. *Chemistry Education Research and Practice, 16*(4), 929–938.

Mokoginta, D., & Buluati, I. D. (2017). The use of teaching aids for kit ipa in improving student learning outcomes in light energy material in class V SDN 03 Telaga, Gorontalo district. *Journal of Education, Social and Culture, 3*(4), 479–88.

Muiz, A., Wilujeng, I., Jumadi, & Senam. (2016). Implementation of the lewis-horsley ausan model on communication and collaboration of junior high school students. *Unnes Science Educational Journal, 5*(1), 1079–1084. https://doi.org/10.15294/usej.v5i1.9565

Muslim, S., Gitama, N.P., Suprianto, B., Rahmadyanti, E., & Kusumawati, N. (2018). Influence of learning media based on adobe flash professional to psychomotor domain learning outcomes on PLC courses viewed from level of creative thinking student. *Journal of Vocational Education, 8*(3), 267–276. https://doi.org/10.21831/jpv.v8i3.21552

Musfiqon, H., & Nurdyansyah, D. (2015). *Scientific learning approach*. Nizamia Learning Center.

Noviani, S., & Wangid, M. (2018). Developing inquiry-based lectora multimedia in order to increase the logical ability and the creative thinking. *Prima Educasia Journal, 6*(1), 89–101. https://doi.org/10.21831/jpe.v6i1.9653

Oprea, C. L. (2014). Interactive and creative learning of the adults. *Procedia-Social and Behavioral Sciences*, *142,* 493–498. https://doi.org/10.1016/j.sbspro.2014.07.654

Oroujloua, N. (2012). The importance of media in foreign language learning. *Procedia - Social and Behavioral Sciences, 15,* 24–28. https://doi.org/10.1016/j.sbspro.2012.08.113

Piirto, J. (2011). *Creativity for 21st century skills how to embed creativity into the curriculum*. Sense Publishers.

Popov, V., Brinkman, D., Biemans, H. J. A., Mulder, M., Kuznetsov, A., & Noroozi, O. (2012). Multicultural student group work in higher education. *International Journal of Intercultural Relations, 36*(2), 302–317.

Rivas, P. (2017). Strategies for teaching and dissemination of artistic heritage by promoting critical and creative thinking among future primary education teachers. *Procedia-Social and Behavioral Sciences*, *237*, 717–722. https://doi.org/10.1016/j.sbspro.2017.02.112

Saputro, A. D., Irwanto, Atun, S., & Wilujeng, I. (2019). The impact of problem solving instruction on academic achievement and science process skills among prospective elementary teachers. *Elementary Education Online, 18*(2), 496-507.

Satria, E. (2019). Problem based learning approach with science kit Seqip to enhancing students' scientific process skills and cognitive learning outcome. *AKRAB Journal Champion, 4*(2), 101–114.

Scheuer, O., Loll, F., Pinkwart, N., & McLaren, B. M. (2010). Computer-supported argumentation: a review of the state of the art. *International Journal of Computer-Supported Collaborative Learning*, *5*(1), 43–102. https://doi.org/10.1007/s11412-009-9080-x

Sdouh, W. M. (2013). The Effect of using the strategies of brainstorming and computer education in academic achievement and the development of creative thinking skills of sixth grade students in Jordan and their attitudes towards learning mathematics. *European Scientific Journal, 9*(13), 220–238.

Smaldino, S. E., Lowther, D. L., & Russell, J. D. (2011). *Instructional technology & media for learning.* Kencana.

Splichal, J. M., Oshima, J., & Oshima, R. (2018). Regulation of collaboration in project-based learning mediated by CSCL scripting *reflection*. *Computers & Education, 125,* 132–145. https://doi.org/10.1016/j.compedu.2018.06.003

Srikoon, S., Bunterm, T, Nethanomsak, T., & Tang, K. (2018). Effect of 5P on academic achievement, creative thinking, and research characteristics. *Kasetsart Journal of Social Sciences, 39*(3), 488–495. http://doi.org/10.1016/j/kjss.2018.06.011

Strijbos, J. W. (2011). Assessment of (computer-supported) collaborative learning. *IEEE Transactions on Learning Technologies, 4*(1), 59–73.

Sung, E. M., Hwang K. A., & Lee, J. Y. (2012). The effect of new media use of adolescents, second-year students in middle school, on cognition, emotion, and social development. *Search Report, Korea Institute for Youth Development, 12*, 1–200.

Tendrita, M., Mahanal, S., & Zubaidah, S. (2016). The empowerment of creative thinking skills through remap think pair

share. *Proceeding Biology Education Conference*, *13*(1), 285-291

Udi, E. A., & Amit, M. (2011). Developing the skills of critical and creative thinking by probability teaching. *Procedia-Social and Behavioral Sciences, 15,* 1087–1091. https://doi.org/10.1016/j.sbspro.2011.03.243

Oprea, C. L. (2014). Interactive and creative learning of the adults. *Procedia-Social and Behavioral Sciences, 142,* 493–498. https://doi.org/10.1016/j.sbspro.2014.07.654

Valcárcel, A. G. Basilotta, V., & Salamanca, C. L. (2014). ICT in Collaborative Learning in the Classrooms of Primary and Secondary Education. *Media Education Research Journal, 42,* 65-74. https://doi.org/10.3916/C42-2014-06

Webb, N. M. (2009). The teacher's role in promoting collaborative dialogue in the classroom. *British Journal of Educational Psychology, 79*(1),1–28. https://doi.org/10.1348/000709908X380772

Wicks, D. A., Craft, B. B., Mason, G. N., Gritter, K., & Bolding, K. (2015). An investigation into the community of inquiry of blended classrooms by a Faculty Learning Community. *The Internet and Higher Education*, *25*(1), 53-62. https://doi.org/10.1016/j.iheduc.2014.12.001

Wongpinunwatana, N., Jantadej, N., & Jantachoto, J. (2018). Creating creative thinking in students: A business research perspective. *International Business Research, 11*(4), 47–56. https://doi.org/10.5539/ibr.v11n4p47

Wu, M., Siswanto, I., Suyanto, W., Sampurno, Y. G., & Tan, W. (2018). Creative thinking curriculum infusion for students of teachers' education program. *Journal of Technology and Vocational Education, 24*(1), 1–13.

Yaqin, M. A., Indriwati, S. E, & Susilo, H. (2018). Think-pair-square learning: Improving student's collaborative skills and cognitive learning outcome on animal diversity course. *Indonesian Journal of Biology Education*/ *Jurnal Pendidikan Biologi Indonesia, 4*(2), 135–142.

Zubaidah, S., Fuad, N. M., Mahanal, S., & Suarsini. (2017). Improving creative thinking skill of students through differentiated science inquiry integrated with mind map. *Journal of Turkish Science Education, 12*(4), 77–91.