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The Influence of Powtoon-Assisted Group to Group Exchange and Powtoon-Assisted Talking Chips Learning Models in Primary Schools

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ABSTRACT

The element of creativity in learning mathematics in elementary school is lack of attention. Whereas, in solving the mathematic problem, creative thinking and ideas are needed in formulating and solving mathematical models of mathematic problems. Creative thoughts and ideas will emerge and develop if the process of learning mathematics in the classroom uses appropriate learning approach. The purpose of this study is to determine the influence of students' mathematical creative thinking ability on Powtoon-Assisted Group to Group Exchange and Talking Chips learning models to students' creative thinking ability. This research is a correlative quantitative research. The population was all the sixth grade students of Pedurungan Tengah 1 State Primary School in Semarang. The samples were class VI C (experiment 1), VI D (experiment 2), and VI B (control). The data were obtained from a post-test with open-ended answers. The analysis result of Anava test indicated that there was a difference on the mean of students' creative thinking ability in those three classes. Based on the Scheffe Test calculation, students' mathematical creative thinking ability with GGE model was better than the class with conventional learning model. Another result of Scheffe Test calculation indicated that students' mathematical creative thinking ability with Talking Chips model was better than the class with conventional learning. In addition, the Simple Linear Regression equation in both classes with GGE and Talking Chips models resulted in positive value equation. It could be concluded that Powtoon-Assisted Group to Group Exchange and Talking Chips learning models have a positive influence on students' creative thinking ability.

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1. INTRODUCTION

The rapid development of science and information technology in the global era, ultimately encourage individuals to develop themselves into qualified human beings and capable to critically and creatively think in answering all challenges. The challenge also comes to the education sector. The rapid development of technology demands our education to continuously change along with the times. Education is required to keep on improving the concept of technology-based learning, includes the learning of mathematics. Technology can facilitate mathematical problem solving, developing deep understanding of mathematics, communication, reasoning, proof; moreover, technology can provide students with opportunities to explore different representations of mathematical ideas, support them in making connections

both within and outside of mathematics, and allow student to focus on decision making [1]. Later, Guzel and Gunhan also argued that technology is important in mathematics education to aid in concept development [1].

All this time, teachers only prioritize the logic and computing (counting) ability so that creativity is not considered as something important in teaching and learning process in the classroom [2]. Based on these statements, creativity is less considered in the learning of mathematics. Whereas, in solving the mathematic problem, creative thinking and ideas are needed in creating (formulating) and solving mathematical models problems along with interpreting the solution of mathematical. This is in line with Livne and Milgram's argument that this is especially true when the criterion for creative thinking ability in mathematics was solving problems which offered the possibility of generating more than one correct answer at varying levels of quality of solution [3]. Therefore, creative thinking is correlated with the ability to make decisions. Creativity is not something that reflects individual action only. It is rather a decision taken by a social system over the product created by an individual [4]. There is a debate over opinions on creative thinking in mathematics. Creativity in mathematics is a domainspecific ability, in which the important role of ideational fluency is highlighted. General creative thinking was found to be undoubtedly important for domain-specific creative ability in mathematics, and probably constitutes a necessary but a not sufficient component in generating mathematical creative thinking. General creative thinking, frequently operationally defined as ideational fluency, has been widely criticized as of little value in predicting real-world creative performance [3]. Creative thoughts and ideas will emerge and develop if the process of learning mathematics in the classroom uses the appropriate learning approach.

Based on the interview with teachers of Pedurungan Tengah 01 State Primary School in Semarang, students' interest in learning mathematics can be classified into three types: students who like mathematics with high ability, students who like mathematics but have low ability, and students who do not like mathematics and also have low ability. For the students who do not like mathematics, they considered mathematics as a burden so they do not have the spirit of learning and it affected their learning outcomes. In response to this issue, teachers who play a role as educator should be able to foster positive motivation to learn mathematics. In addition, to change students' negative mindset of mathematics, they need a more exciting method or learning model that can emerge their mathematical creative thinking ability in order to improve students' mathematics learning outcomes. Many researches have been conducted to improve mathematics learning outcomes, but it is rare to find researches that seek to improve mathematical creative thinking ability. Mathematical creative thinking is important to develop in schools. This is supported by Noh's statement that creative thinking abilities and imagination have become powerful drivers for individual and national development. It also gives people the opportunity to explore new possibilities for the future, to explore and imagine by especially emphasizing creative thinking abilities [5].

Based on the stated problems, it is necessary to grow mathematical creative thinking of the students who do not like mathematics to improve their learning outcomes. Cooperative learning promotes creative thinking by increasing the number of ideas, quality of ideas, feelings of stimulation and enjoyment, and originality of expression in creative problem solving [6]. The statement explains that cooperative learning can foster creative thinking by improving the quality of ideas, feelings and originality of expressions in creative problem solving. In producing a good learning process require a variety of learning strategies appropriate with the conditions in the classroom, if students are less active then they are given the model student learning center that is able to make them more active, if students understanding on the subject are not too much then they are given the model of a teacher center learning so that students can easily understand the Material [7]. Based on these statements, it requires a model of learning that is able to make students more active and media that can support students' mathematical creative thinking ability. Mohanty agreed by stating that the school education should be a platform of know-what, know-how, and know-why to foster students' creative thinking in a constructive environment (with multi sensory and collaborative learning experiences) [8].

Alghafri & Ismail gave a study recommendation that more number of empirical research studies are required in creativity training and applications field. The classroom instructions designed to promote creative thinking can also increase the probability of academic success among the low achievers. The current-age researchers have also advocated for teaching the thinking skills to primary-level schoolchildren and that strategic teaching, critical, and creative thinking should be well integrated in the school curriculum [9]. Therefore, it is necessary to conduct an applied research to find the learning models suitable to support the ability of mathematical creative thinking in primary school. Kampylis, Saariluoma, & Prominent stated that researchers and educationists have already recommended for creativity-fostering strategies at primary education level, which are equally oriented toward conducive environment (CE), creative process (CP), and creative sudent (CS) [10]. Another study has also confirmed by Amin & Regander that school contexts and classroom environment influence the creative abilities of children [11].

Group to Group Exchange and Talking Chips are some of learning models considered suitable and appropriate to improve students' mathematical thinking ability. Group to Group Exchange is one of the learning models that invite students to actively think about what they are learning. Here, the students have the opportunity to discuss, ask, share, and exchange ideas about the knowledge gained to other friends. This learning model requires grouping, presentations, questioning, sharing knowledge with others, and mastering both the material provided by teachers and peers [12]. Education today must enable students to meet the challenges ahead and demands of the work environment and of daily living. Thus, students not only need knowledge but also communication skills, problem solving skills, creative and critical thinking skills in the years ahead [13]. Based on these statements, Group to Group Exchange learning model is considered capable of fostering challenges for the students to understand and explain the knowledge they gained to their friends.

The Talking Chips learning model was first developed by Spencer Kagan. The word "chip" in Talking Chips means buttons. Therefore, talking chips can be interpreted as buttons to talk. Talking Chips is a learning technique that uses chips as a requirement before starting a conversation or activity in learning. On the implementation of talking chips, every student is given some chips. Furthermore, the students are divided into several small groups. When a student asks questions, answers questions and expresses opinions, the student hands one of the buttons s/he has to the teacher. In the learning activity implementing this technique, each group member gets an opportunity to contribute and listen to the views and thoughts of other members [14]. On the other hand, Talking Chips consists of two social processes i.e. social group and mastery of the matter process is a process that involves students in a discussion, concept clarification, and problem solving [15]. The chips meant by Kagan can be small colorful and interesting objects such as buttons, red beans, walnuts, pieces of straws, stalks, ice cream scoops etc.

In the implementation of Talking Chips every group members are holding chips which has to be used before talking such as questioning, answering question, hesitating, uttering ideas, clarifying, or classifying [16]. Then, Talking Chips is a learning model which builds interdependency or reciprocal relationship between the group members consequence by the same existing objective [17]. The intended reciprocal relationship is interdependency in the group in order to answering questions and uttering ideas or arguments to reach the learning expectation [17]. Many studies have proved that talking chip has a positive impact on students' development and social relationships. Therefore, this study examines other possibilities in the implementation of Talking Chips learning model on the ability to mathematical creative thinking.

Group to Group Exchange learning model has been implemented by Arini et. al. who found a positive influence from Group to Group Exchange learning model in improving student learning outcomes [18]. Group to Group Exchange active learning model requires students to think about what they are learning, utilize the opportunity to discuss with friends, ask questions, and share knowledge gained to others [19]. Involving student's participation in teaching and learning process will be able to increase students' activeness in asking, responding, and collaborating with members of the group so that each student can deeply understand the subject matter learned. In addition, students can exchange ideas with other group members, these shared ideas can foster student's creativity.

The use of Talking Chips learning model in Hartiningrum and Yanti's research showed a positive influence on student learning outcomes in mathematics learning [20]. In Talking Chips learning model, students are divided into small groups, when a student asks questions, answers questions and expresses opinions, he/she should submit one of his/her chips to the teacher [14]. Through this model, each student gets an opportunity to be active in expressing his ideas and thoughts to other students, thus, the students not only sit still and listen to the teacher's explanation but they also engage in a more interesting learning and educating process, because in addition to it will increase the activeness and make it easier for the students to understand the subject matter [14]. In the implementation of Talking Chips, students can be motivated because they are gaining the same treatment and chance to apply this model [21]. The advantage of Talking Chips according to Anava is that talking chips can engage students to speak up and utter their arguments in fun situation [22]. A study about The Implementation of Cooperative Learning Model Talking Chips also resulted in a conclusion that Talking Chips can improve students' motivation and learning outcome in learning social science [23].

Mathematics learning should be associated with its application in technology and daily life so that students can consider mathematics as a meaningful science. The use of technology in the form of appropriate learning media will make students more easily understand the learning and teachers will also be helped by the media. One of the technology-based media is video. Vídeos educativos poderão apoiar na clarificação de conceitos e na explicação e compreensão de fenómenos [24]. Based on the statement above, Cruz explained that educational videos can help in clarifying concepts, explanations and understanding of phenomena. One of media supporting it is Powtoon, an app that makes presentation more creative and captures students' attention [24].

The use of Powtoon's learning media in presenting learning material can also boosts students' enthusiasm in paying attention to the lesson. Powtoon media can display material videos equipped with animations that can facilitate students in understanding the material being explained, so that their creative imaginations arise in capturing the lessons. Powtoon is an online service for creating exposures that has excellent animated features including handwritten animation, animated cartoons, and more lively transition effects as well as easy timeline setting. It provides a wide selection of animated characters, objects, backgrounds, sounds and video additions as well as tools and objects necessary to plan the video material to be created. Powtoon also offers some of its content creation facilities for free, it is an ideal tool for teachers to produce their own materials [25]. Based on the analysis their findings, Karamete & Günaydin describes the advantages of Powtoon, namely: the messages conveyed in the video are clear and easy to understand, the visuals are beautiful and interesting so it is not boring to see them, and the displayed text can also be voiced so it is easier to understand. As a follow up of some researches described above, the researchers are eager to find out whether the application of Powtoon-Assisted Group to Group Exchange and Talking Chips also has positive influence in mathematics learning, particulrly in improving students' mathematical creative thinking ability.

The purpose of this research are 1) To identify the differences of students' mathematical creative thinking ability in the class applying Powtoon-Assisted Group to Group Exchange and Talking Chips and the class applying conventional learning model. 2) To prove that students' mathematical creative thinking ability using Powtoon-Assisted Group to Group Exchange learning model is better than students' using conventional learning model. 3) To prove that students' mathematical creative thinking ability using Powtoon-Assisted Talking Chips learning model is better than students' using conventional learning model. 4) To examine whether there is any influence of students' activeness towards the ability of mathematical creative thinking on Powtoon-Assisted Group to Group Exchange and Powtoon-Assisted Talking Chips learning models.

2. RESEARCH METHOD

This research was conducted in Pedurungan Tengah 01 State Primary School in Semarang, odd semester of academic year 2017/2018 which to determine the influence of students' mathematical creative thinking ability on Powtoon-Assisted Group to Group Exchange and Talking Chips learning models to students' creative thinking ability. The research population was all the sixth grade students of Pedurungan Tengah 01 State Primary School in Semarang. This research used purposive sampling technique, by taking the sample based on the researchers' consideration that was observed from the initial data analysis result. Three classes were then selected, namely class VI C as experimental class I, class VI D as experiment class II, class VI B as control class and class VI A as trial class.

The data collection techniques used in this research were: 1) Documentation, i.e. data taken from school records or documents about students' names, number of students and the grade list of the final mathematic test on even semester, 2) Observation, i.e. conducting observation in the school, 3) Test, i.e. the examination used to identify students' mathematical creative thinking ability after the learning process, 4) Interview, i.e. orally getting information from math teachers on the condition of students, class as a place of teaching and learning process implementation, and the material taught.

The instrument used was a trial test questions in the form of open-ended answer. The result of this trial was then analyzed to determine the test validity, reliability, difficulty, and differentiator. Out of 14 questions, 11 items could be employed. This research selected 7 questions to used. The indicators of mathematical creative thinking ability used in this research were novelty, skill, flexibility, and elaboration. The procedures were: 1) Getting coordination and permission, 2) Conducting initial observation, 3) Determining the research sample, 4) Determining the trial class followed by testing the instrument, 5) Analyzing the initial data, 6) Preparing learning tools, including preparing syllabus, Learning Implementation Plans, test item prediction, problems and answers, 7) Giving treatment to experiment class and control class.

3. RESULTS AND ANALYSIS

Based on the preliminary data analysis identifying the student's initial ability, the normality test was computed to determine whether the samples taken from the population were normally distributed. Normality test was done using Lilliefors test with 5% significant level which is shown in the following table, then the statistic result of Kolmogrov smirnov is obtained. The calculation of normality test using SPSS obtained the results as in table 1.

Table 1 The Analysis of Preliminary Normality Test (SPSS)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Controlled	,168	36	,120	,909	36	,060
Exp. 1	,122	36	,192	,941	36	,054
Exp. 2	,154	36	,055	,918	36	,110

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on Table 1, the initial normality test of the three classes shows $\alpha = 0.05$ with the acceptance test criteria H0 if the sig. value is > 0.05 therefore it can be concluded that the samples are normally distributed. For the experiment class I, it obtained sig. = 0.054 that is more than 0.05 therefore H0 is accepted. For the experiment class II, it obtained sig. = 0.110 that is more than 0.05 therefore H0 is accepted. For the control class I, it obtained sig. = 0.060 that is more than 0.05 therefore H0 is accepted. It can be concluded that samples derived from the three classes or normally distributed. To find out whether the sample came from a homogeneous population, it was necessary to test the homogeneity of the calculated sample for the initial homogeneity test by using SPSS. The homogeneity test results can be seen in Table 2.

Table 2 The Analysis of Homogeneity Test of Variances (SPSS)

	Value			
Levene Statistic	df1	df2	Sig.
3.274	2	105	,071

Based on Table 2, the results of homogeneity test analysis obtained sig. value = 0.071, since 0.071 > 0.05 thus H0 is accepted. It can be concluded that the variances in the control class and the experimental class 1 and the experimental class 2 are the same or all three groups are homogeneous.

Having known the equality of mean values between experiment group I, experimental group II and control group, it was tested with ANAVA. The calculation results show that the comparison of Ftable with Fcount. Because Ftable > Fcount (3.08 > 3.022), therefore H0 is accepted. Thus, it can be concluded that the three means value of populations are identical, in other words the population's mean of students' mathematical creative thinking values for all three classes are equal.

Furthermore, based on the analysis of the final data on hypothesis 1 test calculation to compare the class applying Powtoon-Assisted Group to Group Exchange, Powtoon-Assisted Talking Chips and conventional learning model with Anava test, all three classes obtained Fcount > Ftable > H0 (21.951 > 3.08) therefore it was rejected. There is a difference in the mean of mathematical creative thinking ability between students who were taught with Powtoon-Assisted Group to Group Exchange, Powtoon-Assisted Talking Chips and conventional learning model.

To test hypothesis 2 comparing the class applying Powtoon-Assisted Group to Group Exchange to conventional learning model, scheffe test was used and obtained sig = 0.000 < 0.05 therefore H0 was rejected. It means students' mathematical creative thinking ability of the class applying Powtoon-Assisted Group to Group Exchange is better than the class applying conventional learning model with difference value = 13.167.

To test hypothesis 3 comparing the class applying Powtoon-Assisted Talking Chips to conventional learning model, scheffe test was used anf obtained sig = 0.000 < 0.05 therefore H0 was rejected. It means students' mathematical creative thinking ability of the class applying Powtoon-Assisted Talking Chips is better than the class applying conventional learning model with difference value = 15.889.

Hypothesis 4 test calculation was done to know the influence of activeness in Powtoon-Assisted Group to Group Exchange class by using regression test, it obtained positive b value 0.481, tcount 2.108 > ttable 2.03 therefore H0 was rejected. Hence, there is positive influence on student activeness to the ability of mathematical creative thinking on Powtoon-Assisted Group to Group Exchange learning model. Furthermore, the influence of activeness in Powtoon-Assisted Talking Chips class was searched by using regression test with positive b value 0.7416, it obtained tcount 2.512 > ttable 2.03 therefore H0 was rejected. Hence, there is positive influence on student activeness to the ability of mathematical creative thinking on Powtoon-Assisted Talking Chips learning model.

sThus, this study indicates that the Powtoon-Assisted Group to Group Exchange and Talking Chips learning models have positive influences on students' mathematical creative thinking ability compared to conventional learning model. This is in line with a research conducted by Arini, et. al. showing that Group to Group Exchange learning model has a positive influence on students' learning outcomes [18]. In addition, a

research conducted by Hartiningrum and Yanti shows that Talking Chips learning model has a positive influence on students' learning outcomes [20]. On the other hand, Livne and Milgram's research shows that no significant correlations were found between general intelligence and index of domain-specific creative thinking abilities in mathematics [3]. It means that achieving high score on every examination does not make a student has a mathematical creative ability. The result of this study can be a reference for teachers that the improvement of learning outcomes and learning achievement alone is not enough, teachers should also improve students' mathematical creative thinking skills.

The ability to generate a number of ideas, some of which are unusual and high quality, in the process of general problem-solving, contributes to the production of creative, that is, unusual and high quality, solutions to problems in mathematics [3]. The creative abilities of secondary schoolchildren did not correlate with their achievement scores. Hence, the relationship between creativity and academic intelligence has again become debatable [8]. So far as the relationship of creativity with other cognitive processes is concerned, a recent study by Anwar et al. revealed that at school level, high achievers are not significantly different from low achievers in terms of creative thinking abilities [26].

Mohanty (2015) assume that creative thinking is a significant component of (human) higher-order thinking process, and in case of children, it remains in a very primitive, fluid form; it requires a combination of other ingredients such as right environment, skills, personality attributes, as well as nourishment/training for getting manifested into a more crystallized form of creative product/outcome. The results of this study prove that the classroom environment can affect students' mathematical creative thinking. One of them is by implementing Powtoon-Assisted Group to Group Exchange and Powtoon-Assisted Talking Chips learning models. Mohanty suggested that to stimulate the creative thinking and enhance the information processing skills among our children, we need to introduce certain reforms in our school education system, such as (a) curriculum to be based on problem-solving approach, (b) emphasis to be given on using effective processing strategies during learning, (c) to encourage self-learning and problem-based learning, (d) creating avenues for innovative ideas and original contributions, (e) flexibility and openness in teaching– learning process and pedagogy, (f) adopting brainstorming technique in the instructional process to encourage creative thoughts, and (g) encouraging the use of metacognitive strategies for self-evaluation and knowledge construction [8].

4. CONCLUSION

The results of this study can be concluded as follows. (1) There is a difference in the mean of mathematical creative thinking ability between students who were taught with Powtoon-Assisted Group to Group Exchange, Powtoon-Assisted Talking Chips and conventional learning model, the result analysis of Anava test obtained Fcount = 21.951 > Ftable = 3.08; (2) The students' mathematical creative thinking ability of the class applying Powtoon-Assisted Group to Group Exchange is better than the class applying conventional learning model with a difference value = 13.167, scheffe test was used and obtained sig = 0.000 < 0.05; (3) The students' mathematical creative thinking ability of the class applying Powtoon-Assisted Talking Chips is better than the class applying conventional learning model with a difference value = 15.889, scheffe test was used and obtained sig = 0.000 < 0.05; (4) There is significant influence of students' activeness and mathematical creative thinking ability. It is because the significance test of simple linear regression coefficient on the class applying Powtoon-Assisted Group to Group Exchange with positive b value 0.481 obtained tcount 2.108 > ttable 2.03. While the significance test of simple linear regression coefficient on the class applying Powtoon-Assisted Talking Chips with positive b value 0.7416 obtained tcount 2.512 > ttable 2.03.

Given the implementation of the research from beginning to its end, the researchers suggest that Powtoon-Assisted Group to Group Exchange and Talking Chips should be alternatively applied in learning mathematics because both learning models have been proven as effective in the learning process. In addition, Powtoon media is an interesting medium to use. Moreover, further research is necessary for the development of this research, especially about the students' mathematical creative thinking ability.

REFERENCES

[1] E. B Guzel and B. C. Gunhan. "Prospective Mathematics Teachers' Views about Using Flash Animations in Mathematics Lessons," *International Journal of Human and Social Sciences*, vol. 5, pp. 154-159, 2010.

[2] A. A. Saefudin. "Pengembangan Kemampuan Berfikir Kreatif Siswa dalam Pembelajaran Matematika dengan Pendekatan Pendidikan Realistik Indonesia (PMRI)," *Jurnal Pendidikan Dasar Islam,* vol. 4, pp. 37-48, 2012.

[3] N.L. Livne and R.M. Milgram. "Creative thinking in mathematics in Israeli high school students," *Gifted Education International*, vol. 20, pp 155-165, 2005.

[4] E. Heila. "Creative thinking of adolescents in Estonian society," *Nordic Journal of Youth Research SAGE Publication,* vol. 14, pp 235-255, 2006.
[5] Y. Noh. "A study of the effects of library creative zone programs on creative thinking abilities," *Journal of Librarianships and Information Scienc,* vol. 49, pp. 380-396, 2017.
[6] Roger and D. W. Johnson. "Creativity and collaborative learning, " *An Overview Of Cooperative Learning*, pp 1-21, 2009.
[7] A. Buchori, P. Setyosari, I. W. Dasna, S. Ulfa, I. N. Degeng, and C. Sa'dijah. "Effectiveness of Direct Instruction Learning Strategy Assisted by Mobile Augmented Reality and Achievement Motivation on Students Cognitive Learning Results," *Asian Social Science Journal,* vol 13, pp. 137-144, 2017.
[8] A. Mohanty. "Information Processing and Creative Thinking Abilities of Residential and Non-Residential School Children: A Pilot Study," *Journal of SAGE*, pp. 1-12, 2015.
[9] A. S. R Alghafri and H. N. B. Ismail. "The effects of integrating creative and critical thinking on school students thinking". *International Journal of Social Science and Humanity*, vol. 4, pp. 518-525, 2014.
[10] P. G. Kampylis, P. Saariluoma and E. Berki. "Fostering creative thinking: What do primary teachers recommend Hellenic," *Journal of Music, Education, and Culture,* Available from www.hejmec.eu, vol. 2, 2011
[11] J. Amin and J. Regander. "The effect of competition on the creativity and motivation of Swedish school children" (Bachelor thesis), Department of Psychology, Lund University, Sweden, 2011.
[12] A. Sahid and I. A. Buditjahjanto. "Pengaruh Strategi Pembelajaran Group-To-Group Exchange terhadap Hasil Belajar Siswa dengan Motivasi Berprestasi Berbeda pada Standar Kompetensi Menerapkan Dasar-Dasar Teknik Digital," *Jurnal Learning Strategy Peer Lessons ,* Vol *2*, pp. 451-458, 2013.
[13] E. Zakaria and Z. Iksan. "Promoting Cooperative Learning in Science and Mathematics Education," *Eurasia Journal of Mathematics, Science & Technology Education,* vol. *3*, pp. 35-39, 2007.
[14] M. A. Dewi, I. M. Sugiarta, and I. M. Suarsana. "Penerapan Pembelajaran Kooperatif Teknik Kancing Gemerincing untuk Meningkatkan Keaktifan dan Prestasi Belajar Matematika Siswa SD," *Jurnal Jurusan Pendidikan Matematika,* vol. 3, pp. 1-10, 2015.
[15] M. Fitri, W.V. Sari, Eliyati and N. Aisyah. "The Effect Of Applying Talking Chips Technique On The Students' Achievement In Speaking Ability," *Proceeding of the Fourth International Seminar on English Langguange and Teaching*, pp. 62-67, 2016.
[16] R. Oktaviana. "Implementattion Of Cooperative Learning With Talking Chips Technique On Solids Material," *Proceeding of International Conference On Research*, pp. 439-444, 2014
[17] Sugiyono. 2013. Penelitian pendidikan. Bandung: Alfabeta.
[18] O. D. Arini, R. Rasana, and N. K. Suami. "Pengaruh Strategi Pembelajaran Aktif Tipe Group To Group Exchange terhadap Hasil Belajar Matematika Kelas V SD," *Jurnal Mimbar PGSD,* vol. 1 (1),pp. 1-10, 2013.
[19] L. Wahyuni. "Pengaruh Pembelajaran Active Learning Tipe Group To Group Exchange (Gge) Terhadap Kemampuan Pemahaman Konsep Matematika Siswa Kelas VIII MTSN Koto Majidin Tahun Pelajaran 2014/2015," *Jurnal Penelitian Universitas Jambi Seri Humaniora,* vol. 17, pp. 19-25, 2015.
[20] E. S. Hartiningrum and N. R. Yanti. "Pengaruh Model Pembelajaran Kooperatif Teknik Kancing Gemerincing Terhadap Hasil Belajar Matematika Siswa Kelas XI SMK Telekomunikasi Peterongan Jombang," *Journal of Mathematics Education,* vol. *3*(1), pp. 1-8, 2017.
[21] Hariyanto, Y. "Pengaruh Metode Pembelajaran Tipe Talking Chips Terhadap Hasil Belajar Siswa Pada Kompetensi Dasar Memahami Model Atom Bahan Semi Konduktor di SMK Negeri 1 Jetis Mojokerto," Jurnal Pendidikan Elektro, Universitas Negeri Surabaya, vol. 4 (3), pp. 999-1005, 2015.
[22] E. Aravah. "Teaching English To Large Multilevel Classes Majoring in Math, Biology and Chemistry by using 'Burst the Balloon' and Talking Chips' techniques," *TEFLIN International Conference,* vol. 6 (1), pp. 1034-1038, 2014.
[23] Masikem, B.E. Soetjipto, and Sumarmi. "The Implementation of Cooperative Learning Model Talking Chips and Quick on The Draw to Enhance Motivation and Social Studies Learning Outcome," *IOSR Journal of Research & Method ini Education (IOSRJRME),* vol. 6(3), pp. 110-122, 2016.
[24] S. Cruz. "Apps para dispositivos móveis: manual para professores, formadores e bibliotecários," *Powtoon: apresentações criativas*, pp. 247-256, 2015.
[25] A. Karamete and S. Günaydin. "Material Development to Raise Awareness of Using Smart Boards: An Example Design and Development Research". *European Journal of Contemporary Education,* vol. 15(1), pp. 114-122, 2016.
[26] M. N. Anwar, S. Shamim-Ur-Rasool, and R. Haq. "A comparison of creative thinking abilities of high and low achievers secondary school students". *International Interdisciplinary Journal of Education,* vol. 1, pp. 23-28, 2012.

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