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The Effectivity Of *Science Uno Card*-Assisted CIRC Method To Classification And Scientific Communication Skills

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Abstract

This study intended to examine the effectivity of science uno card-assisted CIRC method on solar system topic to classification and scientific communication skills. This is experimental research whose sample consisted of two classes; one as an experimental group and the other as a control group. The data of students' classification skills were gathered from posttest score on cognitive learning outcomes arranged based on four indicators. Observations were carried out in three-time learnings to obtain the data of scientific communication. The analysis of t-test of the total score of classification skills resulted in tcount=2.29 and ttable=2.00, meaning that the experimental group's classification skills were better than the control group. A Mann Whitney differential test of the total score of scientific skills resulted in Zcount=4.83 and Ztable=1.69 meaning that there was a difference of communication skills between the two classes. Based on the research results, it could be said that science uno card-assisted CIRC method on solar system topic was effective in improving classification and scientific communication skills.

Keywords*: CIRC, Science Uno Card, Classification Skills, Scientific Communication Skills.*

1. Introduction

The implementation of primary and secondary education, as stated in Government Regulation Number 17 of 2010 concerning Management and Implementation of Education aims to build the foundation for the development of potential students. The implementation of secondary education is one of them, namely through science learning. Science learning in Junior High School emphasizes the provision of hands-on learning experiences through the use and development of process skills and scientific attitudes (Ministry of National Education, 2007). Science process skills are essential for every student as they will make it easier for students to facilitate and apply the science concepts in everyday life (Saputri & Dewi, 2014). The basic skills of the science process consist of observing, classifying, predicting, measuring, inferring, and communicating (Dimyati & Mudjiono, 2009).

The results of observations made at Junior High School indicated that some aspects of student process skills remained to need some advancements, particularly the classification and communication skills. The observation results also showed that during the classroom learning when the teacher was delivering materials, the students had not actively expressed their opinions. Not all students were active in group discussion activities. As a result, when asked to present their discussion outcomes, some of them were quite doubtful to express ideas, opinions, ask questions, and respond to problems. This made the students continue to harbor problems which hinder the learning process and thereby impacts their learning outcomes.

Data on student learning outcomes in the previous materials emphasizing the classification aspect showed that an average of 70% of students who have not completed the mastery learning. The data also revealed that students' classification skills were not maximal due to the abstract, substantial scope of science materials as well as numerous foreign words objecting to understanding the materials. Thus, a particular learning method was needed to help students understand the materials. One of the topics having a substantial and abstract scope is the Solar System. The frequently occurring problem when learning this theme is the brief delivery of materials due to the limitations of the method and

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time allotment, while the abstractness and density of the materials often lead to lack of understanding.

The low level of student process skills is influenced by the classroom learning model in which students generally receive information from the teacher only; thus, innovation is required in learning (Darmayanti, Sadia, & Sudiatmika, 2013). The innovations needed include the development of learning design, instructional materials, learning methods, and strategies as well as evaluation systems (Wulandari & Mashuri, 2014). In this study, innovation is carried out on the learning method. Hence, it is expected to improve students' comprehension of the materials, and process skills during learning, especially in classification and scientific communication skills.

One of the innovative learning methods that can be applied is the CIRC learning method (Cooperative Integrated Reading and Composition). The main objective of the CIRC method is to use cooperative teams to help students learn the materials through reading comprehension skills that can be widely applied (Slavin, 2011). The use of the CIRC method has been extensively carried out and proven to be able to assist teachers in delivering materials. The use of CIRC learning techniques in the experimental class is more effective toward student learning achievement and retention compared to the traditional method (Durukan, 2011).

One of the efforts to attract students in reading activity is the provision of fascinating sources. A good source of learning should be able to involve students directly in learning so that they can refer to aspects of the product, process, and attitude (Rahayu et al., 2016). Moreover, the choice of media must be appropriate so that it can attract students' attention, be effective, and efficient and provide clarity of the object or materials being studied (Susanto et al., 2013). This kind of media is possibly be obtained through the adoption of daily games, which is modified and adjusted to the learning method. Recently, the uno card game is popular among teenagers (Sari & Lutfi, 2015), and this has inspired the researchers to adopt such a game as a learning media.

Modification of the game was carried out by integrating solar system materialS into uno cards to produce science uno card learning media. This science uno card media prioritizes the same questions and answers listed on the card.

The learning process using the CIRC method assisted with a modified science uno card from Suprijono (2010) is expected to develop classification and communication consisted of the following learning steps (1) forming heterogeneous member groups; (2) providing a discourse in the form of science uno card learning media in accordance with the topic of learning; (3) students collaborately read and find critical ideas by running the game, respond to the discourse and write on a piece of paper. At this stage, it is expected to develop students' skills in classifying material; (4) students present group discussion results. At this phase, it is expected to develop student communication skills; (5) the teacher draws conclusions with students; (6) closing, at this stage, students are given test questions compiled based on classification skill indicators.

The purpose of this research was to unveil the effectivity of science uno card-assisted CIRC method on solar system topic to classification and scientific communication skills.

2. Methods

The study was conducted in Junior High School, the academic year of 2016/2017. This research is an experimental study with a nonequivalent control group design. The research sample was selected using a purposive sampling technique. Class VII A was chosen as the experimental class, and class VII B was picked as the control class. The control class carried out learning with group discussion methods while the experimental class performed the learning of the CIRC method assisted with science uno cards.

The pretest and posttest were instruments for measuring classification skills. The test items were arranged based on four indicators of classification skills according to Rustaman (2005), namely: (1) looking for differences; (2) contrasting characteristics; (3) comparing; and (4) determining the basis of grouping. The observation sheet was used to measure scientific communication skills as outlined in five indicators according to Levy et al. (2008),

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namely: (1) information retrieval; (2) scientific reading; (3) listening and observing; (4) information representation; and (5) knowledge presentation.

The results of this study were analyzed descriptive-quantitatively. The data classification skills were normally distributed and homogeneous; hence, hypothesis testing was done using the t-test. On the other hand, the data of scientific communication skills were not normally distributed and homogeneous so that the Mann-Whitney differential test was employed for the hypothesis acquisition. In addition to being tested for differences using parametric or nonparametric statistics, the data on classification skills and scientific communication were also rated for each indicator. The data on student cognitive learning outcomes were also analyzed as supporting data.

3. Results and Discussion

The results on the effectiveness of the CIRC method assisted with science uno card on solar system topic at VII grade of Junior High School were obtained from data analysis of classification skills, scientific communication skills, and cognitive learning outcomes.

Classification Skills

The effectiveness of the science uno card-assisted CIRC method on classification skills was known from the results of quantitative analysis of the posttest scores on students' classification skills and descriptive analysis of the pretest and posttest values. The t-test results of the posttest values are presented in Table 1.

Table 1. The T-test Results of the Posttest on Classification Skills

No	Indicator	Class	Mean	S_i^2	T_{count}	t_{table}	Conclusion
1	Looking for differences	Experimental	8,80	1,64	2,14	2,00	Ha is accepted
		Control	8,06	2,58			
2	Contrasting characteristics	Experimental	13,20	6,64	2,07	2,00	Ha is accepted
		Control	11,83	8,68			
3	Comparing	Experimental	8,23	2,95	2,23	2,00	Ha is accepted
		Control	7,20	4,52			
4	Determining the basis of grouping	Experimental	6,11	0,81	3,18	2,00	Ha is accepted
		Control	5,31	1,40			
5	Total score	Experimental	36	23,94	2,99	2,00	Ha is accepted
		Control	32	36,84			

Based on the t-test results on the classification skills of both classes, the tcount value each indicator of classification skills was higher than the ttable, then the H0 was rejected, and Ha was accepted. This shows that the accepted hypothesis was that the experimental class classification skills were higher than the control class.

The descriptive analysis was performed based on the percentage of pretest and posttest results for both groups, which are displayed in Table 2.

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Table 2. The Percentage of Results and Criteria for Each Classification Skills Indicator

No	Indicator	Experimental Group		Control Group	
		Pretest	*Posttest*	*Pretest*	*Posttest*
1.	Looking for differences	58,57% Fair	90,57% Excellent	57,43% Fair	82,86% Good
2.	Contrasting characteristics	49,75% Less	77,65% Good	47,56% Less	69,58% Excellent
3.	Comparing	40,78% Less	74,81% Good	40,26% Less	65,45% Excellent
4.	Determining the basis of grouping	66,53% Fair	87,35% Excellent	64,08% Fair	75,51% Good

Table 2. shows the results obtained by the experimental class, which were higher than the control class due to the application of science uno card-assisted CIRC method. The science uno card game consisted of three types of cards; question, answer, and symbol. The three types of cards were used by students as learning media to study the solar system. The question cards contained statements or discourses and questions that the students must answer in groups. The items in the card were made based on indicators of classification skills. This is in line with the opinion of Rastegarpour & Marashi (2012) who stated that playing has a vital role in learning as a facility to help students understand abstract concepts and make students happy so that learning becomes fun and interactive. This condition continued in all playgroups during the process of finding answers to the questions contained in the science uno card according to the sub-themes being studied.

Classification skills in the experimental class did not only arise during science uno card games but also when students conducted group discussions about the problems given by the teacher. Problems were offered after the students have finished running the science uno card game through analysis. To simplify the discussion and references searching in answering questions presented in student discussion sheets, the students made use of the science uno card to recall the materials learned by reading the information or explanations contained in it. This is parallel with the opinion of Wasilah (2012) that the use of learning cards could attract attention and increase student activity as they could see, try, do, and think.

The development of classification skills in the control class was done by asking the students to discuss problems on the student discussion sheets as given in the experimental class, yet no game was played.

The difference in treatment given caused the distinct percentage of students' success in answering posttest questions between the experimental class and control class where the experimental class always achieved more excellent score on each indicator. This was because of the use of the CIRC method that could encourage students to be active in learning activities. This is in line with the opinion of Aulya et al. (2013) stating that the application of CIRC learning invites students to think both individually and in a group to promote critical thinking in obtaining the most appropriate answers. In addition, this is parallel with the research of Kuswandana et al. (2014) which explained that through the application of CIRC learning method, students were more interested in the following classroom learning as they are not only fixated in listening to the explanations by the teacher but discussing it and jointly solving problems with other students.

The different percentage of students' success in answering posttest questions was also influenced by the media used. This is supported by Rahmatin & Khabibah (2016), who argued that the use of learning media could attract students' interest in getting a deep understanding of the concepts they get. Learning media in the form of games can be used by students in their spare time, not only once in classroom learning activities. This usage repetition is expected to recall the materials being learned. This is in line with the opinion of

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Imamah (2012) who stated that the use of media in learning makes it easier for students to comprehend the materials being studied, strengthen memory, foster students' interest, and provide a connection between the content of subject matter and the real world.

The quantitative and descriptive analysis results of the posttest values indicated that the classification skills of students in the experimental class were better than the control class. This showed that the science uno card-assisted CIRC method was effective to improve student classification skills. The assessment results of students' classification skills in this study were supported by the Durukan (2011) who emphasized that the use of CIRC learning techniques in the experimental class was more effective on students' learning achievement and retention compared to the use of traditional methods.

Scientific Communication Skills

The scientific communication skills of students both in the experimental class and the control class were assessed using an observation sheet for three meetings. The assessment results through observing student activities in both groups were then used to compare the values of scientific communication skills for each indicator obtained at each meeting.

The non-parametric statistics of the Mann Whitney test was used to test the hypothesis of scientific communication skills. The Mann Whitney test results are presented in Table 3.

Table 3. Mann-Whitney Test Results on Observation Data of Scientific Communication Skills

No	Indicator	Class	R	U	Z_{count}	Z_{table}	Conclusion
1	*Information retrieval*	Experimental	1429,50	425,50	2,20	1,69	A difference is observed
		Control	1055,50	799,50			
2	*Scientific reading*	Experimental	1417	438	2,05	1,69	A difference is observed
		Control	1068	787			
3	*Listening and observing*	Experimental	1502	353	3,05	1,69	A difference is observed
		Control	983	872			
4	*Information representation*	Experimental	1414	441	2,01	1,69	A difference is observed
		Control	1071	784			
5	*Knowledge presentation*	Experimental	1476,50	378,50	2,75	1,69	A difference is observed
		Control	1008,50	846,50			
6	Total score	Experimental	1653,50	201,50	4,83	1,69	A difference is observed
		Control	831,50	1023,50			

The data analysis results, as seen in Table 3, informed the value of Zcount> Ztable so that H0 was rejected and Ha was accepted. This shows that the accepted hypothesis is that "there are differences in the scientific communication skills of the experimental class compared to the control class, and the prior one accomplishes better score." The percentage of information retrieval indicators can be observed in Figure 1.

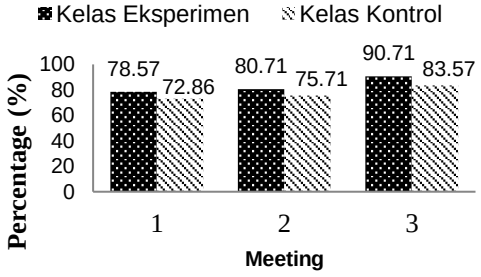

Figure 1. The Percentage of Information Retrieval Indicator

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Figure 1 informs the difference between the experimental class and the control class, where the information retrieval indicator achieved by the experimental group was higher than the control class. This was due to the influence of methods and media. In the control class, the method used was discussion, and the media was in the form of power points, which resulted in one-way communication. During a question and answer session, the students were rarely willing to ask questions or give responses. Nevertheless, the method and media adopted in the experimental class were relatively new for the students so that they were interested in learning. Consequently, the achievement of the experimental class' information retrieval was higher than the control class. This is in line with the findings of Setiawan et al. (2014), which concluded that the presence of media is a quite important matter in the teaching and learning process.

The second indicator's percentage results of students' scientific communication skills, namely scientific reading in each meeting between the experimental and the control group can be seen in Figure 2.

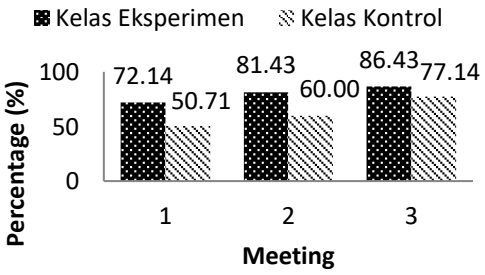

Figure 2. The Percentage Results of the Scientific Reading Indicator

The second indicator observed from students' scientific communication skills was scientific reading. The sub-indicators observed were the activities of students in reading relevant learning sources, the suitability of the materials with the learning objectives, and effectivity of learning media usage. In Figure 2, it can be seen that the scientific communication skills in both sample classes on the scientific reading indicator from the first to the third meeting generally increased.

The increase in the achievement of the scientific reading on the experimental class was not significant compared to the control class. This situation happens as the students of the experimental class have applied the CIRC method since the first meeting, which taught students to read and understand the material through reading. This continued until the third meeting. In contrast, not all students in the control group took part in the information seeking process. Most of them only relied on other students' answers. On the next meeting, the scientific reading skills of students in the control class began to experience an increase due to the teacher's guidance and motivation.

The scientific communication skills of the control class students on the scientific reading indicator experienced a higher increase than the experimental class. Nevertheless, the reading motivation of the experimental class has grown from the first to the third meeting; thus, the difference was not too significant. On the other hand, reading motivation of the control class was done in stages at each meeting. The absence of observations at the 0th meeting caused an overall increase in the initial conditions before the study was carried out until the research process was invisible. However, the achievement percentage obtained from the experimental group in each meeting was always higher than the control class. This was because the assessment of the experimental class on the scientific reading indicator was performed at the CIRC method stage when the students collaborated to read and find the main ideas of the given discourse. The discourse here was in the form of science uno card, student books, and additional materials from power points. Reading activities will help students understand the materials being studied. Similarly, Qodry et al. (2016) stated that to be able to explain the materials learned, each student should know

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what the purpose of learning is before reading and understanding every passage of the book.

The percentage results of the three indicators of students' scientific communication skills, namely listening and observing in each meeting between the experimental class and control are presented in Figure 3.

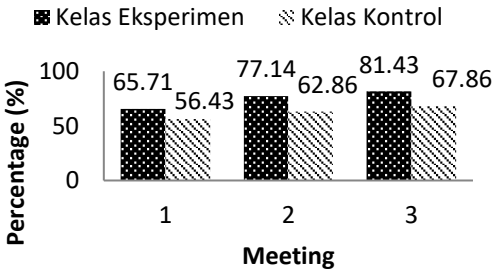

Figure 3. The Percentage of Listening and Observing Indicator Results

The third indicator of students' scientific communication skills is listening and observing. The sub-indicators observed were student activities in listening to information or opinions conveyed by friends, involvement in the process of collecting data for completing tasks, and contributions in designing and answering questions. Figure 3 informs that the scientific communication skills of students in both sample classes on the listening and observing indicator from the first to the third meeting generally increased. The increase in the experimental class was higher when compared to the control class. Likewise, when viewed from the percentage of achievement in the listening and observing indicators, the results of the experimental class were higher than the control class at each meeting. In other words, the use of the CIRC method assisted by science uno card was effective in improving scientific communication skills in listening and observing indicator.

The percentage of information representation indicator is observable in Figure 4.

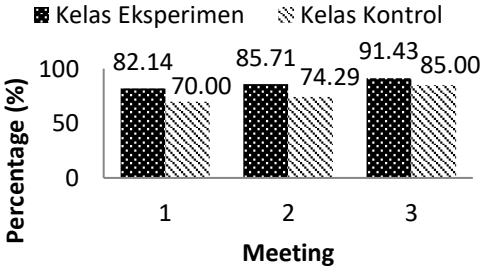

Figure 4. The Percentage Results of Information Representation Indicator

The fourth indicator of students' scientific communication skills is information representation. The assessment of this indicator was carried out by looking at the results of student discussion reports. The sub-indicators observed were reported writing by looking at the suitability of the report's content with learning objectives, the use of communicative language, and the convenience of report writing following the structure of the Indonesian language. In Figure 4, it can be observed that the scientific communication skills of students in both classes in the information representation indicator from the first to the third meeting experienced an increase.

The increase in the control class was higher than the experimental group as the later has applied the CIRC learning method assisted by science uno card. This is in line with the findings of Kuswandana et al. (2014), which showed that the application of CIRC learning methods could make students more interested in participating in classroom learning.

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Because the experimental class was treated with the same media-assisted learning method for each meeting, the increase in information representation indicator skills from the first to the third meeting was not that remarkable.

A significant increase may be seen if an information representation indicator was evaluated at the 0th meeting. By observing the 0th meeting in both classes, the initial conditions will be known before the treatment is applied so that the difference between the control and experimental group was revealed. In this study, no observation was made at the 0th meeting so that the initial conditions of the students were unknown.

The percentage results achieved at each meeting indicated that the outcomes achieved by the experimental class were more significant than the control class. This is because the application of the CIRC method assisted by media science uno cards in the experimental class helps students to understand the subject matter. Similarly, Levy et al. (2008) argued that scientific communication skills looking for relevant references could contribute ideas and communicate materials in the form of reports or summaries.
The result percentage of the knowledge presentation indicator is presented in Figure 5.

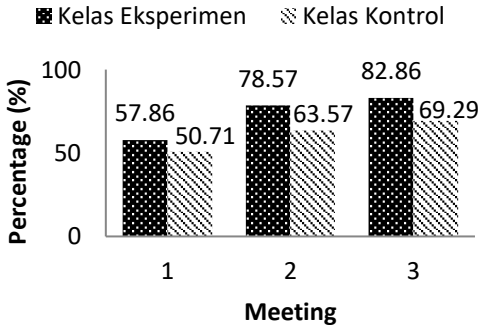

Figure 5. The Percentage of Knowledge Presentation Indicator Results

The fifth indicator of scientific communication skills observed was the knowledge presentation. An assessment of this indicator can be done at the presentation stage of the group discussion results. The assessment of this indicator was done based on the achievement of the sub-indicators contained in the assessment rubric, where the maximum value for this indicator can be achieved if three sub-indicators met. The sub-indicator comprised the ability to expose materials correctly and systematically according to the concepts studied, the use of excellent and standard language, and the ability to provide clear arguments according to the context studied. In the experimental class, the increase happened on the first to the third meeting. This is in line with the findings of Qodry et al. (2016) stating that the process of interaction and collaborative learning fosters an atmosphere of mutual trust, so, students have the opportunity to convey the discussion results as part of scientific communication both oral and written. Scientific communication skills on the indicator of knowledge presentation will help students comprehend the materials being studied. This is supported by Miftah's statement (2009) that communicants can absorb knowledge, one of them through presentation activities. In the control class of the first meeting, scientific communication skills on the knowledge presentation indicator were in reasonably good criteria, in the second and third meetings there was a slight increase with the same criteria as in the first meeting which was quite good. It happened as the students in the control class had less opportunity to develop communication skill and self-confidence. As a result, only the clever one dominated the activities, and others remained to be silent though they have something to argue.

The higher percentage results for each indicator of scientific communication in the experimental class showed that the CIRC method assisted by science uno card on solar system topic was effective in enhancing students' scientific communication skills. The assessment results of scientific communication in this study are supported by the study of

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Zulyka (2012) which unveiled that the application of the CIRC method significantly affected the learning outcomes of the effective and psychomotor domain.

Student cognitive learning outcomes were analyzed from the posttest value. The average difference test results obtained by the results of tcount = 2.99 and ttable = 2.00; in other words, there were significant differences between the control and experimental class where the average value of the experimental class posttest was higher than the control class. This showed a significant positive relationship between classification and scientific communication skills with cognitive learning outcomes.

This research on classification and scientific communication skills was supported by cognitive learning outcomes data obtained from the posttest value. Scientific communication skills influence cognitive learning outcomes. Scientific communication skills possessed by students can help students understand the materials. This is in line with the opinion of Miftah (2009) stating that through the activities of preparing reports and presentations, communicants can absorb the knowledge learned. Similarly, Sarwi et al. (2013) explained that there is a reasonably strong relationship between scientific communication and the final value. Moreover, Kulsum & Nugroho (2014) also elucidated that students who can analyze a problem thoroughly or have a good understanding of the concept will show excellent scientific communication. In short, there is a positive relationship between scientific communication with students' cognitive learning outcomes.

4. Conclusion

Based on the research results, it can be concluded that the Science Uno Card-assisted CIRC on solar system topic is effective in improving the classification and scientific communication skills of students.

References

Aulya, N. P., Sri, A., & Rif'ati, D. H. 2013. Penerapan Model Pembelajaran Cooperative Integrated Reading And Composition (CIRC) Berbasis Deep Dialogue Critical Thinking (DDCT) dalam Pembelajaran Fisika di SMP. *Jurnal Pendidikan Fisika*, *2*(3): 285–292.

Darmayanti, N. W. S., Sadia, W., & Sudiatmika, A. A. I. A. R. 2013. Pengaruh Model Collaborative Teamwork Learning Terhadap Keterampilan Proses Sains Dan Pemahaman. *E-Journal Program Pascasarjana Universitas Pendidikan Ganesha Program Studi Pendidikan Sains*, *3*(2).

Depdiknas. 2007. *Model-Model Pembelajaran Matematika dan Ilmu Pengetahuan Alam*. Jakarta: Direktorat PSLB.

Dimyati, & Mudjiono. 2009. *Belajar dan Pembelajaran*. Jakarta: Rineka Cipta.

Durukan, E. 2011. Effects of cooperative integrated reading and composition (CIRC) technique on reading-writing skills. *Educational Research and Reviews*, *6*(1): 102–109.

Imamah, N. 2012. Peningkatan Hasil Belajar IPA Melalui Pembelajaran Kooperatif Berbasis Konstruktivisme Dipadukan dengan Video Animasi Materi Sistem Kehidupan Tumbuhan. *Jurnal Pendidikan IPA Indonesia*, *1*(1): 32–36.

Kulsum, U., & Nugroho, S. E. 2014. Penerapan Model Pembelajaran Cooperative Problem Solving untuk Meningkatkan Kemampuan Pemahaman Konsep dan Komunikasi Ilmiah Siswa pada Mata Pelajaran Fisika. *Unnes Physics Education Journal*, *3*(2): 73–78.

Kuswandana, P. A., Dantes, N., & Margunayasa, I. G. 2014. Pengaruh Model Pembelajaran Kooperati Tipe CIRC terhadap Hasil Belajar IPS Siswa Kelas V di Desa Panarukan. *Jurnal Mimbar PGSD Universitas Pendidikan Ganesha*, *2*(1).

Levy, O. S., Eylon, B., & Ã, Z. S. 2008. Teaching communication skills in science : Tracing teacher change. *Teaching and Teacher Education*, *24*: 462–477.

Miftah, M. 2009. *Komunikasi Efektif Dalam Pembelajaran*. Semarang: Pustekkom Depdiknas.

Qodry, I., Nuroso, H., & Susilawati. 2016. Pengaruh Model Pembelajaran Problem Based Learning melalui Pendekatan Saintifik terhadap Kemampuan Berkomunikasi Ilmiah pada Kelas X di SMA Negeri 1 Rembang. *Jurnal Penelitian Pembelajaran Fisika*, *7*(1): 34–42.

ISSN: 2541-7207 DOI: 10.23887/jpi-undiksha.v8i1.11779

Rahayu, K. D., Widyatmoko, A., & Dewi, N. R. 2016. Efektivitas Model Make A Match Berbasis Guided Inquiry Tema Ekosistem Pada Sikap Ilmiah dan Keterampilan Proses Sains Siswa. *Unnes Science Education Journal*, *5*(2): 1297–1308.

Rahmatin, R., & Khabibah, S. 2016. Pengembangan Media Permainan Kartu Umath (Uno Mathematics) dalam Pembelajaran Matematika Pada Materi Pokok Operasi Bilangan Bulat. *Jurnal Ilmiah Pendidikan Matematika*, *1*(5).

Rastegarpour, H., & Marashi, P. 2012. The effect of card games and computer games on learning of chemistry concepts chemistry concepts. *Prosiding: Social and Behavioral Sciences*: 597–601.

Rustaman, N. Y. 2005. *Strategi Belajar Mengajar Biologi*. Malang: Univversitas Negeri Malang.

Saputri, V. A. C., & Dewi, N. R. 2014. Pengembangan Alat Peraga Sederhana Eye Lens Tema Mata Kelas VIII untuk Menumbuhkan Keterampilan Peserta Didik. *Jurnal Pendidikan IPA Indonesia*, *3*(2): 109–115.

Sari, R. R., & Lutfi, A. 2015. Kelayakan Permainan Uno Card Sebagai Media Pembelajaran Pada Materi Pokok Struktur Atom. *UNESA Journal of Chemical Education*, *4*(2): 186–194.

Sarwi, Rusilowati, A., & Khanafiyah, S. 2013. Implementasi Model Eksperimen Gelombang Open-Inquiry Untuk Mengembangkan Keterampilan Komunikasi Ilmiah Mahasiswa Fisika. *Jurnal Pendidikan Fisika Indonesia*, *9*(2): 123–131.

Setiawan, D., Waluyo, S. B., & Mashuri. 2014. Keefektifan PBL Berbasis Nilai Karakter Berbantuan CD Materi Segiempat Kelas VII. *Unnes Journal of Mathematics Education*, *3*(1): 15–20.

Slavin, R. E. 2011. *Cooperative Learning: Teori, Riset, dan Praktik.* Bandung: Nusa Media.

Suprijono, A. 2010. Cooperative Learning Teori dan Aplikasi PAIKEM. Yogyakarta: Pustaka Belajar.

Susanto, Dewi, N. R., & Irsadi, A. 2013. Pengembangan Multimedia Interaktif dengan Education Game pada Pembelajaran IPA Terpadu Tema Cahaya untuk SISWA SMP/MTs. *Unnes Science Education Journal*, *2*(1): 230–238.

Wasilah, E. B. 2012. Peningkatan Kemampuan Menyimpulkan Hasil Praktikum IPA Melalui Penggunaan Media Kartu. *Jurnal Pendidikan IPA Indonesia*, *1*(1): 82–90.

Wulandari, N., & Mashuri. 2014. Keefektifan Pembelajaran CIRC Dengan Pendekatan Openended terhadap Kemampuan Berpikir Kreatif Siswa Kelas VIII Materi Kubus-Balok. *Unnes Journal of Mathematics Education*, *3*(3): 231–240.

Zulyka, D. 2012. Pengaruh penerapan pembelajaran kooperatif tipe cooperative integrated reading and composition (CIRC) terhadap hasil belajar siswa kelas X SMA Negeri 8 Surakarta. *Jurnal Pendidikan Biologi*, *1*(1).