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Effectiveness of the CIRC model using mind mapping method toward student learning outcomes

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Effectiveness of the CIRC model using mind mapping method toward student learning outcomes

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Abstrak. Tujuan dari penelitian ini untuk mengetahui perbedaan hasil belajar aspek kognitif dan psikomotor siswa, antara model pembelajaran CIRC menggunakan metode *mind mapping*, dan model pembelajaran CIRC menggunakan *concept mapping*. Penelitian ini tergolong penelitian *quasi experimental*, dengan desain *nonequivalent control group*. Instrumen pengumpulan data menggunakan tes hasil belajar kognitif, dan pengamatan hasil belajar psikomotor. Tes hasil belajar dilakukan sebanyak 2 kali yaitu *pretest* dan *posttest*. Peningkatan hasil belajar kognitif diperoleh melalui perhitungan nilai *N-Gain score*, sedangkan pengamatan hasil belajar ranah psikomotor dilakukan 1 kali oleh 2 orang pengamat. Uji statistik melalui uji beda yang dilakukan setelah uji normalitas. Hasil penelitian menunjukkan bahwa rata-rata *N-Gain score* dari hasil belajar kognitif CIRC-*mind mapping* yaitu 74, sedangkan pada CIRC-*concept mapping* adalah 64. Nilai hasil belajar aspek psikomotor berdasarkan kesepakatan antar pengamat adalah 96 pada CIRC-*mind mapping*, sedangkan pada CIRC-*concept mapping* yaitu 93. Dapat disimpulkan bahwa hasil belajar aspek kognitif dan psikomotor siswa lebih tinggi pada pembelajaran dengan CIRC-*mind mapping*, daripada model CIRC-*concept mapping*.

Kata Kunci: CIRC; *Mind Mapping*; *Concept Mapping*; Hasil Belajar

Abstract. *The purpose of this study was to determine the differences in students' cognitive and psychomotor learning outcomes between the CIRC learning model using the mind mapping method and the CIRC learning model using concept mapping. This research was a quasi-experimental study with a nonequivalent control group design. The data collection instrument used a learning outcome test-cognitive and psychomotor learning outcome observations. Cognitive learning outcomes tests were carried out two times, namely, pretest and posttest. The increase in cognitive learning outcomes obtained by calculating the N-Gain score. Observation of psychomotor learning outcomes was carried out once by two observers. The statistical test in this study was a different test carried out after the normality test. The results showed that the average N-Gain score from cognitive learning outcomes CIRC-mind mapping was 74, while CIRC-concept mapping was 64. Psychomotor learning scores based on the agreement between observers were 96 on CIRC-mind mapping, while CIRC-concept mapping was 93. The cognitive and psychomotor learning outcomes of students using CIRC-mind mapping are higher than using CIRC-concept mapping.*

Keywords: CIRC; Mind Mapping; Concept mapping; Learning Outcomes

INTRODUCTION

Primary education, according to the Republic of Indonesia Law Number 20 of 2003, is the level of education that underlies secondary education at the level of knowledge of elementary (*Madrasah Ibtidaiyah*) and junior high (*Madrasah Tsanawiyah*). Junior high school students include the group of adolescent children transitioning from children to adults (Babakr, Mohamedamin, & Kakamad, 2019). Cognitive abilities in adolescence (11 to 15 years) have developed and are at a formal operational stage where cognitive skills begin to think of experiences outside of concrete experiences (Ahmad et al., 2016). At the proper active stage, children already have abstract, idealistic, and logical thinking (Babakr, Mohamedamin, & Kakamad, 2019), while students are said to be able to think abstract if they can learn by imagining the concepts of the material they studied (Widodo et al., 2018).

Several subjects need to be studied at the junior high school level; one of them is Natural Sciences (*Ilmu Pengetahuan Alam*). Science is a subject that deals with how to find out about nature in a systematic way, not only mastering knowledge of facts, concepts, or principles but also must be able to find an idea (Regulation of the National Education Minister's of Indonesia Number 22 years 2006). Science materials in junior high schools are mostly abstract (Wibowo, 2017). Therefore, students can understand conceptual material if it is already in the formal operational stage (Babakr, Mohamedamin, & Kakamad, 2019). From some of the arguments of the experts, we conclude that students who are in the formal operational stage can think abstractly, logically, and idealistically so that students can understand the concept of the material well.

Meanwhile, one of the results of identifying learning difficulties for junior high school students in science in Sumenep, East Java, is understanding the concept (Anekawati, Habibi, & Sayyida, 2014). Its caused by students not being able to think abstractly (Wati & Siswati, 2015). Therefore, we need a learning model that helps students solve abstract problems. One of them is the CIRC model that can help students solve and understand the meaning of conceptual issues (Agustinah, 2017). CIRC is a learning model that uses heterogeneous teams to work together to solve a problem (Mubarok & Sofiana, 2017). By involving students reading and writing to find the main ideas, main ideas, or themes in a reading (Varışoğlu, 2016), increasing students' ability to understand a concept and solve abstract problems (Sukiastini, Sadia, & Suastra, 2013). Students who are still having difficulty thinking in the abstract are not yet at the formal operational stage (Santrock, 2017), so concrete operations need to be assisted through visual media such as images and other visible events (Wati & Siswati, 2015). Therefore, middle school students still need a visual press to understand the material (Santrock, 2017). One of them is through the mind mapping method because it can store information for a long time (Wati & Siswati, 2015). Making mind mapping not only involves the ability of the left brain but also consists of the power of the right brain, making it easier for students to understand concepts (Karim, 2018). The mind mapping method develops students' way of thinking in an orderly and conceptualized manner in which there are concrete explanations in the form of writing and drawing (Yunus & Chien, 2016). The mind mapping method consists of central ideas that branch out to produce ideas with flexible relationships (Bukhari, 2016). This mind mapping method guides students to create their own learning media in the form of mind maps (Salem, 2017).

The learning process following the stages of cognitive development of junior high school students includes formal thinking stages, is student-centered, and accommodates three learning styles. In this way, students are expected to have better learning outcomes. Therefore, learning models and methods following the above objectives are Cooperative Integrated Reading and Composition (CIRC) learning models with mind mapping methods.

The CIRC learning model, combined with the mind mapping method, is innovative learning (Masnaini, Copriady, & Osman, 2018). The CIRC model is applied to train students to play an active

role in reading to solve problems by giving ideas in groups, outlined by the mind mapping method in individual mind maps. Making mind maps involves the right brain and left brain, causing a balance of learning and becoming more effective (Parikh, 2016). The CIRC model with mind mapping can create a pleasant learning atmosphere; learning material is easy to remember, raises ideas, and time will be more effective, so learning outcomes can be satisfying. The CIRC model was carried out by (Ristanto et al., 2018), which showed that the model had a significant effect on student learning outcomes. Likewise, the research result (Masnaini, Copriady, & Osman, 2018) said that the CIRC learning model with mind mapping could improve learning outcomes and motivation for chemistry lessons.

In contrast to the research conducted by (Syaputri & Djulia, 2018), which uses the CIRC model with the concept mapping method, the results of these studies also have a significant effect on student learning outcomes. However, no researcher has yet compared the effectiveness of CIRC using mind mapping with CIRC using concept mapping. Therefore this research is important to do.

Researchers are interested in comparing the effectiveness of CIRC using mind mapping with CIRC using concept mapping. The purpose of this study was to determine the differences in student learning outcomes in cognitive and psychomotor aspects between the CIRC learning model and the mind mapping method, and the CIRC learning model with the concept mapping method. In particular at Junior High School 4 Sumenep in science subjects.

RESEARCH METHODS

The research was implemented in the first class of Junior High School 4 Sumenep in Lenteng street Batuan District, Sumenep Regency, on the material of the Solar System. The cognitive learning outcomes measured in Basic Competencies 3.11 Analyzing the solar system, the rotation and revolution of the earth, the rotation and revolution of the moon, and their impact on life on earth. While psychomotor learning outcomes are measured in Basic Competencies 4.11, Presenting work of the effects of the rotation and revolution of the earth and the moon on life on earth, based on the results of observers or tracking various information.

This research is a quasi-experimental study with a nonequivalent control group design. Before the sample selection is carried out, homogeneity tests will take first to ensure students in the CIRC-mind mapping class and the CIRC-concept mapping class have the same variant. The CIRC-mind mapping class uses the CIRC learning model with the mind mapping method, while the CIRC-concept mapping class uses the CIRC learning model with the concept mapping method.

Data collection instruments to be used are tests of cognitive learning outcomes and observations of psychomotor learning outcomes. Researchers took the learning outcomes of the cognitive aspects of students twice. Namely, in the form of pretest and posttest, increased student cognitive learning outcomes between before and after treatment obtained through the calculation of the N-Gain score. Before the statistical test, the N-Gain score was calculated first. The statistical test used on cognitive learning outcomes is the t-test for two free samples if the N-Gain score data distributed normally.

Observation of psychomotor learning outcomes is done only once by two observers. The data analysis technique used is the Mann-Whitney test. It because psychomotor learning outcomes data not distributed normally.

RESULTS AND DISCUSSION

The data on cognitive and psychomotor learning outcomes of the CIRC-mind mapping class and CIRC-concept mapping class is summarized already in **Figure 1**.
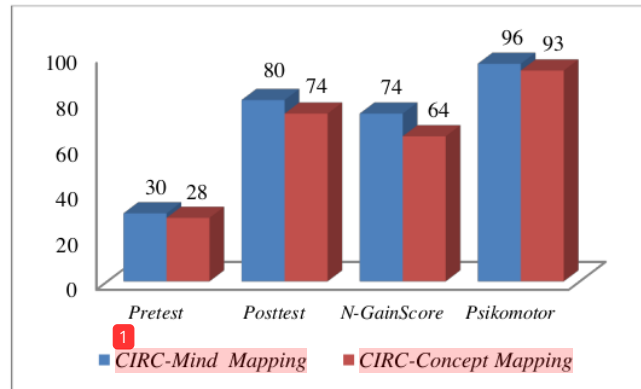
Figure 1. Cognitive and psychomotor learning outcomes data

Prerequisite test results that use normality test results. **Table 1** below is a summary of the results of the N-Gain Score normality test.

Table 1. N-Gain score normality test results

Variable	Significance		Decision	Statistic test
	CIRC-*mind mapping*	**CIRC-*concept mapping***		
Cognitive Learning Outcomes	0,200	0,200	Normal	T test for 2 free samples
Psychomotor Learning Outcomes	0,000	0,038	Abnormal	Mann-Whitney Test

Table 1 shows that cognitive learning outcomes in the CIRC-mind mapping class and the CIRC-concept mapping class are the same, that is, 0.200, more than 0.05, which means that the data normally distributed. Therefore, a statistical test can be performed using the t-test for two samples. Psychomotor learning outcomes in the CIRC-mind mapping and CIRC-concept mapping are 0,000 and 0.038 less than 0.05, which means the data not normally distributed. Thus a statistical test was performed using the Mann-Whitney test. Statistical test results are shown in **Table 2**.

Table 2. Statistical test results

Variable	P-value	Significance Value	Information
Cognitive Learning Outcomes	Less than 0.05	0,007	There is a difference
Psychomotor Learning Outcomes	Less than 0.05	0,018	There is a difference

Table 2 shows differences in students' cognitive and psychomotor learning outcomes between the CIRC-mind mapping class and the CIRC-concept mapping class. The student learning outcomes of CIRC-mind mapping were better than CIRC-concept mapping with a difference of N-Gain Score is 10. This condition occurs because when making mind mapping, students are required to be creative. Students who can come up with several ideas show that they are very creative. Students who can produce several ideas show that they are very creative. The making of mind mapping leads students to create many ideas about a concept, trains students to have original abilities because they are given freedom in writing ideas, and can develop each image in all directions (Karim, 2018). The opinions written by students in mind mapping are different. It shows that students are involved in finding their concepts through their ideas in making mind mapping. Ausubel's theory explains that students learn not only by accepting but must learn by discovering (Fathurrohman, 2017). Learning by taking just to memorize it, but learning by finding concepts found by students can be more meaningful. Ausubel explained that meaningful learning occurs when students learn by associating new information with their knowledge

(Fathurrohman, 2017), so information learned meaningfully will be remembered longer (Parikh, 2016). When students learn meaningfully by generating many ideas, they will retain information better and maintain it in long-term memory (Santrock, 2017). Information in long-term memory can last a long time. Students can quickly answer questions if they have learned meaningfully so that students' cognitive learning outcomes are better. This phenomenon is in line with the results of research from Wibowo (2017) that meaningful learning can improve student learning outcomes in cognitive aspects.

The ability to think creatively activates the performance of the right brain and the left brain (Nur, 2016). Learning that leads students to think creatively can use the overall performance of the brain. The mind mapping learning method used in CIRC learning involves the ability of the right brain and the left brain (Karim, 2018). The mind map method uses curved branches, colors, and images. Students make mind mapping using various components, colors, and pictures. The ability of the left brain is involved in verbal processing, namely in the aspect of language (Santrock, 2017), which functions in the use of language, numbers, sequences, writing, and logic (Sumardi, 2014). The ability of the right brain is involved in non-verbal processing (Santrock, 2017), which functions in imagination, creativity, music, images, and colors (Sumardi, 2014). The use of flexible branches, photos, and colors has involved the performance of the right brain based on student creativity.

The learning process that involves the ability of the right brain and left brain can improve cognitive learning outcomes (Niswani & Asdar, 2016). The method of noting without creativity only involves the ability of the left brain, while the power of the right mind is not used. The ability of the right brain as a whole turned out to be 90% of the total brain capacity, while the left brain is only 10-12% (Niswani & Asdar, 2016). The use of flexible branches, colors, and images can make it easier for students to remember information. Agree with the opinion of Niswani and Asdar (2016) that the ability of the right brain can record information quickly, and the results will be stored in the memory of the brain for a long time. Therefore, the CIRC learning model and the mind mapping method can lead students to think creatively so that students' cognitive learning outcomes improve (Kurniawati, 2017). Which states that students who think creatively can improve cognitive learning outcomes. Besides, the study of Wibowo (2017), which also supports this research, states that the mind mapping method involves students' creative thinking abilities to improve cognitive learning outcomes.

Differences in learning outcomes occur not only in cognitive aspects but also in psychomotor aspects. The psychomotor learning outcomes of CIRC-mind mapping class students are better than the CIRC-concept mapping class. Applying the CIRC learning model with the mind mapping method leads students to create their learning media based on individual creativity. Creativity is related to the ability to think creatively. If students can think creatively, the more imagination they have (Kurniawati, 2017). Creativity leads to creating something new, unique, and different, both in the form of ideas and works (Yasin, 2017). In making mind mapping, the students' work is a form of student creativity. Indicators of psychomotor learning outcomes are reassembling, completing, and making mind mapping. The average "rearranging" hand in the CIRC-mind mapping class is the same as the intermediate CIRC-concept mapping class because reassembling is in the P1 (imitating) category and is at the most comfortable level (Saparingga, 2013). Therefore, students can perform skills with indicators reassembling.

The average "completing" indicator in the CIRC-mind mapping class is greater than the CIRC-concept mapping class. Students can complete mind mapping well because they complete concepts that are under the interrelationships between concepts. Mind mapping does have a more flexible nature compared to concept mapping, so students in the CIRC-mind mapping class can easily improvise. Some new information can combine immediately without changing the mind-mapping structure (Hayati, 2013). The addition of further data based on student creativity. In making mind mapping, students can produce an idea in detail based on individual creativity (Wibowo, 2017). Therefore, students can complete and add information according to the interrelationships between concepts. The average "make" indicator in the CIRC-mind mapping class is greater than the CIRC-concept mapping class. Students

who have been able to complete work well then they will also be able to make work well too. It happens in CIRC mind-mind class students who can complete mind mapping well. They are easier to make mind mapping based on their creativity. However, students in the CIRC-concept mapping class are still not good at completing concept mapping, so they have difficulty making concept mapping. Therefore, making mind mapping easier so that it can improve student psychomotor learning outcomes. Agree with the study by Noviasari, Legowo and Lilik (2015), which states that making mind mapping involves student creativity in improving psychomotor learning outcomes.

CONCLUSION

Based on the results and discussion, we conclude that there are differences in learning outcomes in the cognitive and psychomotor aspects of students. Between learning with the CIRC using the mind mapping and the CIRC using concept mapping, especially in grade 7th Junior High School 4 Sumenep East Java.

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