

Application of the CIRC Model to Improve Learning Outcomes on Solar System Material in Class VII of SMPN 4 Tambang

 Y. Z. Sa'adah¹,  Syahril^{2*},  Z. Fakhruddin³

^{1,2,3}Physics Education, Faculty of Teacher Training and Education, Universitas Riau

*Corresponding Author. Email: syahril@lecturer.unri.ac.id

Keywords

CIRC,
Learning Outcomes,
Solar System.

This open access article is distributed under a (CC-BY SA 4.0 License)



Phone*: +62822-8817-8847

Abstract

The research aims to improve students' cognitive learning outcomes on Solar System material in the experimental class with the CIRC learning model and the control class with conventional learning. The research was conducted in May-June, the Even Semester of the 2022/2023 Academic Year at SMPN 4 Tambang, Tambang District, Kampar Regency, Riau Province. The population was all students of class VII which consisted of 10 classes and 315 students. The sample was selected using a purposive sampling technique. Class VII-B was selected as the experimental class and VII-C as the control class. The research was Quasi-Experimental with a posttest-only, Non-equivalent Control Design. The research showed that the posttest score in the experimental class was higher with a mean score of 77.9 in the category of good (B). Meanwhile, the control class obtained a score of 68.5 in the sufficient category (C). Inferential analysis with SPSS 25 was used to test the normality, homogeneity, and hypothesis. The normality and homogeneity tests showed the distribution of the both two classes were normal and homogeneous. Based on the hypothesis test with the Independent Sample T-test, a significance of 0.001 was obtained that there has been a significant increase in students' cognitive learning outcomes through the application of the CIRC model on the Solar System material in class VII of SMPN 4 Tambang.

History

Received:
September
2, 2023

Revised:
December 3,
2023

Accepted:
January 12,
2024

How to cite:

Sa'adah, Y. Z., Syahril, S. & Fakhruddin Z. (2024). Application of the CIRC Model to Improve Learning Outcomes on Solar System Material in Class VII of SMPN 4 Tambang. *Journal of Science Education Research*, 8(1), 106-113. doi:<https://doi.org/10.21831/jserv8i1.65656>.

INTRODUCTION

Education is one of the important aspects of human life (Salsabila et al., 2020). Education is a key to all quality progress and development (Adnan, 2017). Education plays a big role in optimizing the quality of Human Resources (HR), such as raising their level, intelligence, and morals, and making humans more useful and beneficial to others (Waroka et al., 2020). Law no. 20 of 2003 Chapter II Article 3 states that "National education functions to develop abilities and build the character and civilization of a dignified nation in order to educate the life of the nation, aiming to develop the potential of students to become human beings who believe and devoted to God Almighty, have a noble character, healthy, knowledgeable, capable, creative, independent, and a democratic and responsible citizen" (UU RI No 20, 2003).

Curriculum and education are a tied relationship (Syam, 2017). The curriculum is a very important and useful part of achieving educational goals (Martin & Simanjorang, 2022). The changes to the revised curriculum 2013 to become Curriculum Merdeka Belajar (Independent learning curriculum) provide good changes in terms of approaches, strategies, methods, and learning models. The curriculum is a more flexible curriculum framework that focuses on essential material and helps students develop their character and competencies following the Profile of Pancasila Student (Barlian et al., 2022). The curriculum changes aim to improve the quality of education, including science learning (Agustami et al., 2017).

Science learning is a series of planned activities to facilitate students in acquiring attitudes,

processes, and knowledge about nature or scientific events (Nugraha, 2022). Scientists gain knowledge about objects, things, and natural phenomena through scientific thinking and research. This knowledge is known as Natural Science. Science also includes information such as concepts, facts, principles, and laws that have been tested and validated through various scientific actions (Hafsah, 2022). At the SMP/MTs (junior high school) level or Package B Program, science is a separate subject. This, of course, provides greater opportunities for students to study topics in scientific fields, including chemistry, physics, and earth and space (Kemendikbudristek, 2022).

Success in a teaching and learning process is basically being able to provide change in a positive direction, both during and after the teaching and learning process (Anggraeni, 2019). The learning process must be effective and efficient to achieve success in learning. Such a condition of learning allows students to learn in an easy, fun way, and, of course, achieve the learning objectives. The learning process is effective if it produces high-quality learning, namely a learning that requires intensive participation and appreciation from students (Junaedi, 2019).

A problem in learning, especially science learning, has not been fully resolved till today is the students' perception that science is difficult to comprehend and understand (Rizkiyah et al., 2020). And, abstract scientific concepts conveyed verbally by teachers can lead students to not be able to process the information. The reason is the student's inability to understand scientific concepts, which results in low or incomplete learning outcomes (Ismiyanti, 2020). The low interest in reading or literacy among students also makes Human Resources (HR) uncompetitive due to a lack of mastery of technology and science. However, the learning process depends on students' reading or literacy skills. If each student has sufficient reading skills, their level of performance and success in educational institutions such as schools and society will also increase (Kesumadewi et al., 2020).

The research activities began with initial observations at SMPN 4 Tambang, by interviewing and asking questions and answers with the science subject teacher. The teacher states the problem in the science learning process in class VII. The students still completely relied on the teacher's knowledge, so students tended to be less active in participating and passive during the learning process. It is seen from the listed material in the provided learning resources, but students are less or even unwilling to explore their knowledge by looking for information before learning. This makes students are not focused and more silent in discussing the material of the subject. Students' low

interest in reading also results in exam results, which obtain low cognitive learning outcomes and do not meet the Learning Goal Achievement Criteria.

Thus, a learning model that focuses on students is needed by a teacher to encourage students to participate more actively in the learning process. It aims to increase students' understanding of the material and increase the student's learning outcomes. One of the learning models is the cooperative learning model. The cooperative model is based on constructivism theory which is based on knowledge that grows and develops from construction activities (building step by step), not through a process of transferring knowledge from a teacher to students (Masgumelar & Mustafa, 2021).

One of the cooperative learning models in science lessons that is characterized by effective learning and can increase student activity in learning is the CIRC (Cooperative Integrated Reading and Composition) type (Pratiwi et al., 2023). Awatik stated that using the CIRC learning model will create a collaborative and communicative learning activity where students will work in groups to discuss problems with each other and achieve the desired goals (Awatik, 2019). By working in groups, students can interact, share, and exchange ideas with other students to complete the assignments. To achieve this goal, each group member is asked to share their opinions with others and apply the obtained knowledge to complete the tasks. As a result, students' understanding and learning experiences last longer (Masrofa et al., 2021). This learning model is actively used to encourage students to understand the material, conducted either individually or in groups (Yamin & Suci, 2022).

The application of the CIRC learning model which has been successfully implemented and influence on student learning outcomes is supported by Kurniati. She concluded that student learning outcomes in class X at SMAN 1 Sungai Raya have a difference in learning outcomes between students who are taught using the CIRC model compared to conventional learning, especially on colloidal materials. Also, the use of the CIRC model has an influence on learning outcomes in this class of 43%, which is in the medium category (Kurniati et al., 2017). Then, Sartika et al concluded that the CIRC model had an effect on student learning outcomes in SPLDV material in class VIII MTsN 4 Bima for the 2020/2021 academic year. This was proven by the obtained value of $t_{\text{count}} > t_{\text{table}}$. It concluded that learning using the CIRC model had an effect and was successful in improving the learning outcomes of class VIII MTsN 4 Bima students (Sartika et al., 2022).

Based on the previous explanation, this investigation aims to find out whether students' cognitive learning outcomes in the Solar System material are better by applying the CIRC model in the experimental class than in the control class, which applies conventional learning. And, it tries to see whether there is a significant improvement in the class which applies the CIRC model to the Solar system material.

RESEARCH METHOD

The research was conducted in May-June, the Even Semester of the 2022/2023 Academic Year at SMPN 4 Tambang, Tambang District, Kampar Regency, Riau Province in class VII-B and VII-C. The learning material was Solar System. The population was all students of class VII which consisted of 10 classes and 315 students.

The sampling selection technique used purposive sampling, which is a sampling method based on certain or special considerations in determining the sample (Sugiono, 2015). The considerations are equal students' academic abilities, the same subject material, and poor learning outcomes. The samples were two classes, class VII-B as the experimental class for CIRC learning and class VII-C as the control class for conventional learning.

The data consisted of primary and secondary data. Primary data was obtained during the research, namely the posttest scores on the Solar System material after the implementation of science learning with CIRC in the experimental class and the application of conventional learning in the control class. Meanwhile, secondary data was obtained from the STS (Mid Semester Summative) scores, obtained from the science teacher. The learning tools were ATP (Learning Objective Flow), teaching modules, and Students' Worksheet. Meanwhile, the data collection instrument is a cognitive learning outcomes test in the form of post-test questions on the Solar System material in 15 multiple choice questions.

This research was Quasi-Experimental (Artiningsih & Nurohman, 2020; Chotimah et al., 2023; Creswell, 2017). The type of design was Posttest only, Non-equivalent Control Design, which is presented in Table 1. So, this research only provides posttest questions (after treatment), and there is no pretest (before treatment) in data collection on students' learning outcomes. This step follows the suggestion and discussions with lecturers that if they are given a pretest, of course, the learning outcomes will certainly be poor, which is due to the lack of knowledge and insight. And, to compare to know the increase in student learning outcomes is only seen from the student's grades in

the Even Semester STS (exam) for the 2022/2023 academic year.

Table 1. Type of *Posttest only, Non-equivalent Control Design*

Class	Treatment	Posttest
Experiment	X ₁	O ₁
Control	X ₂	O ₂

Source: (Sugiono, 2015)

Table 1 shows the experimental class received treatment X₁. The treatment is the application of the Cooperative Integrated Reading and Composition (CIRC) learning model, while the control class uses conventional learning methods. After learning ends, posttest questions are given to find out whether students' cognitive learning outcomes have improved or not. The research procedures are shown in Figure 1.

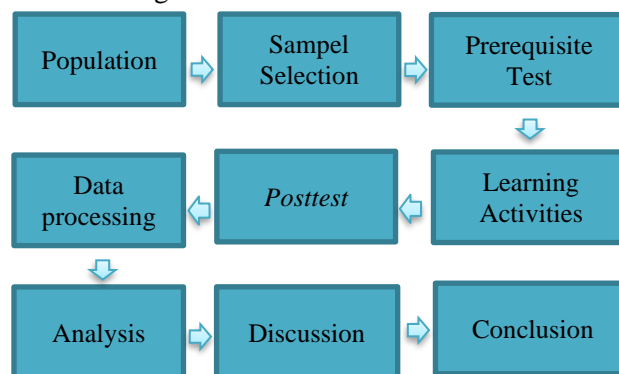


Figure 1. Research Procedures

Figure 1 shows the research procedure, which begins by collecting population data. After that, the sample is determined based on certain conditions, including the classes have the same academic abilities, equal in material, have learning difficulties, and obtain STS scores for the Even Semester 2022/2023, especially poor scores in science or have not yet reached the Learning Goal Achievement Criteria. This is shown by the mean value of the two classes. Next, normality and homogeneity tests were carried out in the two classes. The experimental class is class VII-B and the control class is class VII-C. After the learning activities, both classes were given post-test questions. The posttest is processed and analyzed descriptively and inferentially for further discussion. And, it ends with conclusions.

The research used 2 data analysis techniques, namely descriptive and inferential analysis. The purpose of descriptive analysis is to describe the increase in students' cognitive learning outcomes when the Cooperative Integrated Reading and Composition (CIRC) learning model is implemented in the experimental class and conventional learning methods are implemented in

the control class. Posttest assessment of cognitive learning outcomes is calculated using the equation:

$$\text{Score} = \frac{\text{score obtained by the students}}{\text{Maximum Score}} \times 100 \quad (1)$$

The students' scores are grouped based on the criteria for success in cognitive learning outcomes, as presented in Table 2.

Table 2. Criteria for Success in Cognitive Learning Outcomes

Score Interval	Criteria	Description
$85 \leq X \leq 100$	BS	Excellent
$75 \leq X < 85$	B	Good
$65 \leq X < 75$	C	Sufficient
$55 \leq X < 65$	K	Poor
$0 \leq X < 55$	KS	Very Poor

Source: (Fatikasari et al., 2020)

Inferential analysis aims to process research data, which was posttest scores, aiming to determine differences in improvements in students' cognitive learning outcomes with SPSS software version 25. Before the hypothesis test, 2 prerequisite tests are carried out, normality and homogeneity tests. The test aims to find out whether the data is distributed normally or not and homogeneous or not.

RESULT AND DISCUSSION

This research aims to find out and determine the improvement in cognitive learning outcomes for class VII at SMPN 4 Tambang. The students are provided a posttest with 15 multiple-choice questions on the Solar System material. These questions have been validated and approved by the supervisor and adapted to cognitive learning outcome indicators based on Bloom (which have been revised by Aderson and Krathwohl).

A. Descriptive Analysis of Posttest Data on Solar System Material

This research used descriptive analysis to find out the increasing of students' cognitive learning outcomes in the Solar System material in class VII of SMPN 4 Tambang. A descriptive analysis was carried out of the STS Science scores for the Even Semester of the 2022/2023 Academic Year in the research class, as presented in Table 3.

Table 3. Data of STS Science scores for the Even Semester of the 2022/2023 Academic Year

Result of STS	Research Class	
	Experiment	Control
Mean	62,4	62,9
Standard Deviation	11,1	11,8
Minimum Score	40	40
Maximum Score	95	85

Table 3 concludes that the differences in mean between the two classes are not too far and only 0.5. However, the mean of learning outcomes is still poor or has not reached the specified Learning Goal Achievement Criteria of 75. Therefore, treatment of the application of the CIRC learning model was given in the experimental class, which aims to improve students' cognitive learning outcomes, especially in the Solar System material. And, it applied conventional learning to the control class. Next, data from the posttest results on the Solar System material after the treatment are analyzed, presented in Table 4.

Table 4. Data of Posttest Results for Solar System Material

Result of Posttest	Research Class	
	Experiment	Control
Mean	77,9	68,5
Standard Deviation	10,6	9,4
Minimum Score	59,4	52,8
Maximum Score	99	92,4

Table 4 concludes that using the CIRC model in science learning can improve student learning outcomes as seen from the increased mean in a good direction and has reached the Learning Goal Achievement Criteria (especially the experimental class). The mean score in the experimental class was 77.9 with the highest score of 99, while the lowest score was 59.4. In the control class which uses conventional learning methods, the mean was 68.5 with the highest score of 92.4 and the lowest score was 52.8. The difference in mean was 9.4.

The findings follow the research by Khasanah that there was an influence of using the CIRC-type cooperative model on the ability to solve essay questions. It is proved by the mean in the experimental class that applied the CIRC model, which has a higher score than the control class with conventional learning. In sum, the application of the CIRC model is better compared to conventional learning (Khasanah et al., 2020). Then, Denis Indria concluded that the application of the CIRC model was better than conventional learning, as seen the mean of the experimental class which used the CIRC model was 69.8, with the highest score of 95.3 and the lowest score of 36.9. Meanwhile, the control class was 54.3, with the highest score of 100 and the lowest score of 29.2 (Tarelluan & Rufiana, 2017). Furthermore, Ningrum et al concluded that there was an influence of using the CIRC model on the students' learning outcomes of class IV MIN 4 Kota Medan compared with conventional learning. It is seen the mean in the experimental class of 83.33 and 76.33 in the control class (Ningrum et al., 2020).

The post-test results for each indicator of cognitive learning outcomes are presented in Figure 2. The post-test results for students that were

grouped based on the criteria for success in cognitive learning outcomes (according to Table 2) are presented in Table 5.

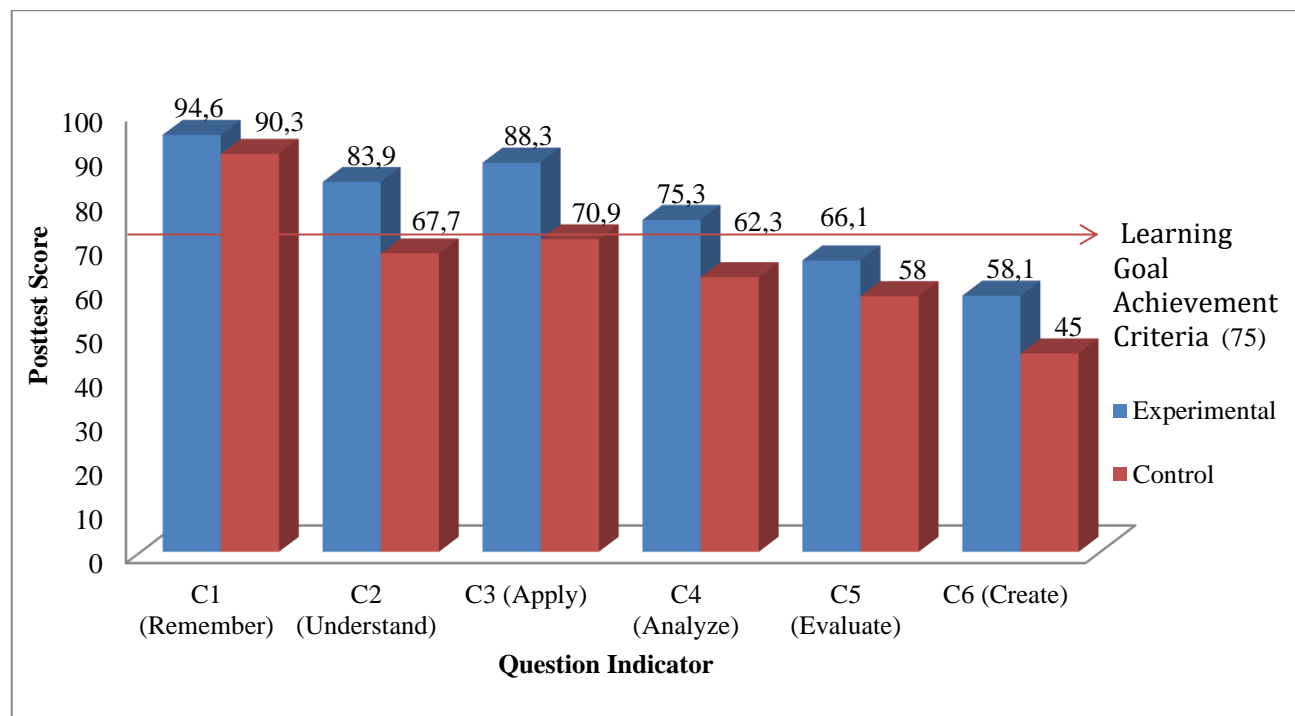


Figure 2. Graph of Posttest results for each cognitive learning outcome indicator

Table 5. Posttest Results Based on Success Criteria for Cognitive Learning Outcomes

Interval	Cognitive Learning Outcomes				
	Criteria	Experiment Class		Control Class	
		N (Students)	Percentage (%)	N (Students)	Percentage (%)
$85 \leq X \leq 100$	Excellent (BS)	10	32,2	2	6,4
$75 \leq X < 85$	Good (B)	7	22,6	4	13
$65 \leq X < 75$	Sufficient (C)	13	42	16	51,6
$55 \leq X < 65$	Poor (K)	1	3,2	6	19,3
$0 \leq X < 55$	Very Poor (KS)	0	0	3	9,7
N total		31	100	31	100

Description: N= Total

Table 5 shows the percentage of student scores in both classes. In the experimental class, 10 students (32.2%) obtained an interval score of 85-100, which classified them as excellent (BS). 13 students (42%) obtained an interval score of 65-75, which classified them as sufficient (C). Meanwhile, in the control class, 16 students (52.6%) obtained an interval score of 65-75, which classified them as sufficient (C) category. In short, students in the experimental class obtained better posttest scores or had fulfilled the specified Learning Goal Achievement Criteria, namely in the score interval of 75-100 of 54.8% (17 out of 31 students) and in the control class only 19.4% (6 out of 31 students).

The findings are in line with Rahmawati's that the students' learning outcomes in the experiment class with the CIRC model achieved higher learning completeness above the KKM than the control

class. Her research showed that the students' completeness had reached 83% (40 out of 48 students) in the experimental class and 53% (24 out of 45 students) in the control class (Rahmawati, 2016). Then Banun concluded that improving science learning by applying the CIRC model could increase the students' mean, where student completion after improving learning in cycle I increased to 64.7% and cycle II to 100% of students who successfully completed (Banun, 2021).

B. Inferential Analysis of Posttest Data on Solar System Material

Posttest data on cognitive learning outcomes were analyzed inferentially using SPSS version 25. The inferential analysis was normality, homogeneity, and hypothesis test. The prerequisite

tests of normality and homogeneity tests are performed before the hypothesis test.

The normality test is carried out using the Kolmogorov-Smirnov test, which aims to find out whether data was normally distributed or not. The significance value in the experimental class is 0.112, which indicates that the significance value in the experimental class is ≥ 0.05 . Likewise, in the control class, it is 0.056. This shows that the significance value for the control class is ≥ 0.05 . In short, the post-test score data in the two classes is normally distributed.

The second prerequisite test is the homogeneity test. The test is carried out using the Levene test. The results show that the variants in the two groups are homogeneous, with a significance value of 0.441. In other words, the sig value is above 0.05 (≥ 0.05). In short, the data in the two classes were homogeneous.

After the two prerequisite tests, it was followed with a hypothesis test using the independent sample t-test. According to the output value of the independent sample t-test, the significance value (2-tailed) is 0.001 or <0.05 . Therefore, H_0 is rejected and H_a is accepted. The conclusion was drawn that there was a significant increase in students' cognitive learning outcomes through the application of the CIRC model to the Solar System material for class VII SMPN 4 Tambang. The CIRC model implemented in the experimental class provides better cognitive learning outcomes than conventional learning in the control class.

C. Discussion of Posttest Results Based on Cognitive Learning Outcome Indicators

The application of the CIRC model to the experimental class shows an increase in students' learning outcomes, which is seen from the mean class score increased in the experimental class by 77.9 in the good category (B), while the control class with conventional learning was 68.5 in the category sufficient (C). Then, the application of the CIRC model can improve students' cognitive learning outcomes, especially in the Solar System material, that occurred in the experimental class.

The findings are in line with S. Ratnayanti's investigation that there was an increase in student learning outcomes after being treated using the CIRC learning model. This is seen by an increase in the mean score of students' learning outcomes in cycle I of 73.59 and cycle II of 81.56 (Ratnayanti, 2020). Then Halim concluded that the mathematics learning outcomes for class XI, Science C, SMAN 3 Palopo increased after being treated using the CIRC model. This was seen by the mean score in cycle I of 63.87 and cycle II of 77 (Halim, 2020).

Based on Figure 2, data on students learning outcomes (Posttest) for each indicator of cognitive learning outcomes is described as follows:

a. Remember (C1)

Remembering is the ability to re-recognize knowledge, concepts, and facts from learning (Nafiati, 2021). Based on the findings, the mastery score for the C1 learning outcome indicator in the experimental class tends to be better than the control class. The average score for C1 questions in the experimental class was 94.6, categorized as excellent (BS). Meanwhile, the control class was 90.3 in the very good category (BS). However, the two classes have an average that is not much different and only 4.3.

b. Understand (C2)

Understanding is the student's ability to construct and understand learning messages, in line with the opinion, written and described by (Nafiati, 2021). In accordance with the research findings, the mastery score of the learning outcome indicators for C2 questions in the experimental class tends to be better than the control class and the average score for C2 questions in the experimental class is 83.9, which is categorized as good (B). Meanwhile, the control class is 67.7, which is categorized as sufficient (C). This is in line with Ulya that the control class has a lower average score than the experimental class because the experimental class treated with the CIRC model has an exploration stage where students are required and guided to collect, discover their knowledge, and understand the reading gradually based on experiences during the learning process (Ulya, 2019). The findings are also in line with Piliandini who concluded that students' understanding of the subject had increased significantly after using the CIRC model (Piliandini, 2022).

c. Apply (C3)

Applying is the ability to use thoughts and concepts to solve problems in real situations or conditions (Nafiati, 2021). Based on the research results, the mastery value of the learning outcome indicators for C3 questions in the experimental class was better than the control class. The experimental class obtained an average score for question C3 of 88.3, which is categorized as excellent (BS), while the control class was 70.9, categorized as sufficient (C). The findings are in line with Ulya that the average obtained by the control class is lower than the experimental class because experimental class learning with the CIRC model has an application phase, namely a case study is given to students after gaining knowledge from exploring various learning sources so that students can apply the knowledge by solving the problems (Ulya, 2019).

d. Analyze (C4)

Analyzing is a student's ability to use information to classify, categorize, and determine the correlation of information with other information between concepts and facts, and arguments and conclusions (Nafiati, 2021). The findings showed that the experimental class had better scores for the C4 learning outcome indicators than the control class. The experimental class obtained an average score of 75.3, which was categorized as good (B), while the control class was 62.3, which was categorized as poor (K). The findings are in line with Arifin that using the CIRC model can improve students' analytical skills (Arifin, 2017). Furthermore, Utami concluded that the use of the classical CIRC-type cooperative model improves the analytical skills of class XI on the science subject of Homeschooling. It is seen from the average score of cycle I of 71 and the increase in cycle II of 76.83 (Utami, 2019).

e. Evaluate (C5)

The ability to assess an object, things, or information based on certain criteria is known as evaluation (Nafiati, 2021). The research shows that the learning outcome indicators in the experimental class have better scores than the control class. The experimental class obtained an average score of 66.1, which was categorized as sufficient (C). Meanwhile, the control class obtained an average score of 58.06, which was categorized as poor (K). However, on this indicator (C5), the scores produced by both classes are below average or have not reached the Learning Goal Achievement Criteria because, during the learning process, there were not many C5 cognitive domain questions presented. It resulted in students not being trained in solving these questions and having difficulty in solving the C5 questions presented in the posttest questions with Solar System Material.

f. Create (C6)

Creating is the ability to re-arrange existing information and combine it with information that obtained or received to create something new (Nafiati, 2021). The research shows that the C5 learning outcome indicator in the experimental class was better than the control class. The average score for C5 questions in the experimental class was 58.1, which was in the poor category (K). Meanwhile, it was 45 in the control class, which was in the very poor category (KS). However, on this indicator, the two classes still produce scores below the average or have not yet reached the Learning Goal Achievement Criteria because there is only one occasion of experiment during the learning process. However, due to time constraints, the activities are carried out at home and presented it at school only. It leads to a lack of supervision

which results in several undesirable activities occurring.

Based on the posttest scores for each of the cognitive learning outcome indicators, it concluded that indicators of C1, C2, C3, and C4 are above Learning Goal Achievement Criteria 75 for the experimental class and only C1 for the control class. This shows that most of the learning outcome indicators are in the incomplete category or have not yet reached the Learning Goal Achievement Criteria because the stages of the CIRC learning model direct students in the experimental class to find their knowledge, underline important material, understand reading material from sources, exchange ideas with each other, and demand collaboration in achieving learning goals.

The CIRC learning model might be used as a solution in science learning because it improves students' cognitive learning outcomes, especially in experimental classes compared to control classes with conventional learning. This was proven by the hypothesis test, which obtained a sig value. of 0.001, which means <0.05 , so that there is a significant increase in the student's cognitive learning outcomes who treated with the CIRC learning model (experimental class) to the Solar System material in class VII of SMPN 4 Tambang.

The findings are in line with investigations by Putri Awalia Nur who explained significant differences in physics learning outcomes in class X at SMAN 6 Jenepono, which applied the CIRC learning model and conventional learning (Nur, 2022). Furthermore, Sirait found an increase in students' learning outcomes when implementing the CIRC model. The average score obtained in the experimental class was 82.6 while the control class was 77, with a difference of 5.6 (Sirait et al., 2022). Then Agnafia concluded that science learning using the CIRC-type cooperative model could improve students' learning outcomes and science process skills. This is proven by the increase in students' learning outcomes from cycle I to cycle II, where cycle I scored 46.6% and cycle II scored 83.3% for students' completeness (Agnafia et al., 2023). Furthermore, Mayasari concluded that the CIRC-type cooperative learning model was effectively implemented in the science learning process for class VIII SMPN 7 Salatiga in the 2018/2019 academic year, which is seen by the differences in posttest scores and N-gain scores between experiment and control class, where the experimental class obtained higher score compared to the control class. In the experimental class, the posttest score was 79.26 and in the control class was 68.19 (Mayasari, 2019).

CONCLUSION

Conclusions based on the results of investigations concerning the application of the CIRC model to improve learning outcomes in class VII on Solar System material of SMPN 4 Tambang are:

1. The CIRC learning model that applied in the experimental class obtained higher cognitive learning outcomes than the application of conventional learning in the control class. This is seen by the average posttest score for the Solar System material in the experimental class is higher than the control class. The experimental class obtained a score of 77.9, which is categorized as good (B), while the control class obtained a score of 68.5, which is categorized in the sufficient category (C). So, it concluded that the use of the CIRC model is better than conventional learning in improving students' learning outcomes.
2. The application of the CIRC model on Solar System material in the experimental class shows a significant increase in students' cognitive learning outcomes. This was proven by hypothesis test using the Independent Sample T-test, which obtained a significance value (2-tailed) of 0.001, which indicated it was lower than 0.05. Therefore, H_0 was rejected, and H_a was accepted. So, there is a significant increase in students' cognitive learning outcomes through the application of the CIRC learning model to Solar System material in class VII of SMPN 4 Tambang.

The CIRC learning model in this research was applied for the purpose of obtaining students' cognitive learning outcomes, especially the Solar System material, which was implemented well, but still has shortcomings. For example, it has not been able to solve the indicators for questions C5 and C6 well or above the Learning Goal Achievement Criteria. Thus, the study recommends to readers or other researchers who wish to carry out similar research to present more C5 and C6 questions that aim to train students in solving more complicated problems.

REFERENCES

- Adnan, M. (2017). Urgensi Penerapan Metode PAIKEM bagi Guru dalam Meningkatkan Mutu Pembelajaran PAI. *CENDEKIA: Jurnal Studi Keislaman*, 3(1), 133–150.
- Agnafia, D., Anfa, Q., Zahrotin, A., & Sutra. (2023). Peningkatan Keterampilan Proses Sains dan Hasil Belajar IPA Siswa SD Melalui Model Pembelajaran Cooperative Integrated Reading and Composition (CIRC). *Jurnal Konstruktivisme*, 15(2), 187–197. <https://doi.org/10.35457/konstruk.v15i2.2953>
- Agustami, R., Wijayanto, & Alimah, S. (2017). Persepsi Guru dan Siswa Terhadap Pembelajaran IPA Terpadu Serta Implikasinya di SMP. *JISE: Journal of Innovative Science Education*, 6(1), 97–103. <http://journal.unnes.ac.id/sju/index.php/jise>
- Anggraeni, N. (2019). Strategi Pembelajaran Dengan Model Pendekatan Pada Peserta Didik Agar Tercapainya Tujuan Pendidikan Di Era Globalisasi. *ScienceEdu*, 11(1), 72–79.
- Arifin, J. (2017). Peningkatan Kemampuan Menganalisis Unsur Instrinsik Dengan Model Pembelajaran Cooperative Integrated Reading and Composition. *Meretas: Jurnal Ilmu Pendidikan*, 3(3), 206–219. <https://jurnal.upgriplk.ac.id/index.php/meretas/article/view/34>
- Artiningsih, A., & Nurohman, S. (2020). Analysis of investigative skills based on the use of tracker video analysis for 21th century skill. *Journal of Science Education Research*, 3(2). <https://doi.org/10.21831/jser.v3i2.30621>
- Awatik. (2019). Pembelajaran dengan CIRC dalam Meningkatkan Kemampuan Menemukan Pokok Pikiran. *Trapsila: Jurnal Pendidikan Dasar*, 1(2), 56–68.
- Banun, S. (2021). Penggunaan Model Pembelajaran Cooperative Intergrated Reading and Composition (CIRC) untuk Meningkatkan Hasil Belajar IPA Siswa Kelas V SD Negeri 004 Rantau Bakung Tahun Ajaran 2017/2018. *Jurnal Pendidikan Tambusai*, 5(3), 5957–5963.
- Barlian, U., Solekah, S., & Rahayu, P. (2022). Implementasi Kurikulum Merdeka Dalam Meningkatkan Mutu Pendidikan. *JOEL: Journal of Educational and Language Research*, 1(12), 2105–2118.
- Chotimah, A. N., Setyawarno, D., & Rosana, D. (2023). Effect of Guided Inquiry Model by PhET Simulations Worksheet on Science Process Skills and Mastery of Concepts. *Journal of Science Education Research*, 7(2), 100–105. <https://doi.org/10.21831/jser.v7i2.63953>
- Creswell, J. W. (2017). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.
- Fatikasari, R., Matius, B., Junus, M., Fisika, P., Keguruan, F., & Pendidikan, I. (2020). Hasil Belajar Kognitif Peserta Didik Melalui Penerapan Model Pembelajaran Inkuiri Berbantuan Media Simulasi PhET Kelas XI IPA SMA Negeri 1 Anggana Materi Fluida Statis. *JLPF: Jurnal Literasi Pendidikan Fisika*, 1(1), 65–72.

- <http://jurnal.fkip.unmul.ac.id/index.php/jpfp/index>
- Hafsah, N. (2022). Penerapan Model Pembelajaran Cooperative Integrated Reading and Composition (CIRC) Untuk Meningkatkan Hasil Belajar IPA Topik Organ Gerak Manusia. *PEDAGOGIA: Jurnal Ilmiah Pendidikan*, 14(2), 65–70. <http://journal.unpak.ac.id/index.php/pedagogia>
- Halim, A. (2020). Peningkatan Hasil Belajar Matematika melalui Pembelajaran CIRC pada Siswa Kelas XI IPA C SMA Negeri 3 Palopo. *Jurnal Studi Guru Dan Pembelajaran*, 3(2), 310–318. <https://doi.org/10.30605/jsgp.3.2.2020.313>
- Ismiyanti, N. (2020). Perancangan Pembelajaran IPA Menggunakan Software Videoscribe. *VEKTOR: Jurnal Pendidikan IPA*, 1(2), 50–58. <http://vektor.iain-jember.ac.id>
- Junaedi, I. (2019). Proses Pembelajaran yang Efektif. *JISAMAR: Journal of Information System, Applied, Management, Accounting and Research*, 3(2), 19–25.
- Kemendikbudristek (Kementerian Pendidikan Kebudayaan Riset dan Teknologi) Nomor 008/H/KR/2022. (2022). *Capaian Pembelajaran pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, dan Jenjang Pendidikan Menengah pada Kurikulum Merdeka*.
- Kesumadewi, D., Agung, A. A. G., Rati, N.W. (2020). Model Pembelajaran CIRC Berbantuan Media Cerita Bergambar Meningkatkan Hasil Belajar Bahasa Indonesia Siswa SD. *Mimbar PGSD Undiksha*, 8(2), 303–314. [journalhomepage: https://ejournal.undiksha.ac.id/index.php/JJP_GSD%0AM](https://ejournal.undiksha.ac.id/index.php/JJP_GSD%0AM)
- Khasanah, N., Supriyanto, D., & Susanto, S. (2020). Pengaruh Model Pembelajaran Kooperatif Tipe Cooperative Integrated Reading and Composition (CIRC) Terhadap Kemampuan Menyelesaikan Soal Cerita Matematika Kelas V. *Jurnal Pendidikan Modern*, 5(2), 48–53.
- Kurniati, E., Sahputra, R., & Hadi, L. (2017). *Pengaruh Model Pembelajaran CIRC Pada Materi Koloid Terhadap Motivasi dan Hasil Belajar Siswa SMA*. 1–10.
- Martin, R., & Simanjorang, M. (2022). Pentingnya Peranan Kurikulum yang Sesuai dalam Pendidikan di Indonesia. *Journal Mahesa Center*, 1(1), 122–134. <https://doi.org/10.34007/ppd.v1i1.180>
- Masgumelar, N., & Mustafa, P. (2021). Teori Belajar Konstruktivisme dan Implikasinya dalam Pendidikan dan Pembelajaran. *GHAITSA: Islamic Education Journal*, 2(1), 49–57. <https://siducat.org/index.php/ghaitsa>
- Masrofa, D., Muzakki, M., & Adilla, U. (2021). Penerapan Model Pembelajaran Cooperative Integrated Reading And Composition (CIRC) Untuk Meningkatkan Kemampuan Membaca Bahasa Indonesia Kelas III Sekolah Dasar Negeri No. 196/II Taman Agung Kecamatan Bathin III Kabupaten Bungo. *El-Madib: Jurnal Pendidikan Dasar Islam*, 1(1), 1–20. <https://fatimah1.wordpress.com>.
- Mayasari, H. (2019). Efektivitas Model Pembelajaran Kooperatif Tipe CIRC Terhadap Keterampilan Siswa dalam Menyelesaikan Soal Cerita Matematika. *Jurnal Hipotenusa*, 1(1), 83–89.
- Nafiati, D. A. (2021). Revisi taksonomi Bloom: Kognitif, afektif, dan psikomotorik. *Humanika*, 21(2), 151–172. <https://doi.org/10.21831/hum.v21i2.29252>
- Ningrum, A., Salminawati, & Rambe, R. (2020). Pengaruh model pembelajaran circ (cooperative integrated reading and compotision) terhadap hasil belajar siswa pada mata pelajaran bahasa indonesia di kelas iv min 4 medan. *NIZHAMIYAH*, X(2), 31–38.
- Nugraha, D. M. D. P. (2022). Hubungan Kemampuan Literasi Sains Dengan Hasil Belajar IPA Siswa Sekolah Dasar. *Jurnal Elementary*, 5(2), 153–158. <http://journal.ummat.ac.id/index.php/elementary>
- Nur, P. (2022). *Pengaruh Model Cooperative Integrated Reading and Composition (CIRC) Terhadap Hasil Belajar Fisika Peserta Didik SMAN 6 Jeneponto*. Skripsi. Pendidikan Fisika FKIP Universitas Muhammadiyah Makassar.
- Piliandini, Y. (2022). Peningkatan Keterampilan Membaca Pemahaman Melalui Model CIRC pada Pembelajaran Tematik Sekolah Dasar Yuli Piliandini Sekolah Dasar Negeri Jajartunggal III / 452 Surabaya. *Jurnal Basicedu*, 6(5), 8886–8896. <https://doi.org/10.31004/basicedu.v6i5.3968>
- Pratiwi, N., Perangin-angin, L., Lubis, W., Manurung, I. F., & Simanihuruk, L. (2023). Pengaruh Model Cooperative Integrated and Reading Composition (CIRC) dalam Meningkatkan Keaktifan Belajar Siswa Sekolah Dasar. *Jurnal Pendidikan Tambusai*, 7(2), 15311–15322.
- Rahmawati, A. (2016). *Pengaruh model pembelajaran cooperative integrated reading and composition terhadap aktivitas dan hasil belajar ips kelas iv di sdn gugus mawardi kendal*. Skripsi. PGSD Fakultas Ilmu Pendidikan Universitas Negeri Semarang.
- Ratnayanti, S. (2020). Penerapan Model

- Pembelajaran Cooperative, Integrated, Reading, and Composition (CIRC) Untuk Meningkatkan Hasil Belajar Peserta Didik Pada Mata Pelajaran IPA. *Jurnal Teknologi Pendidikan*, 9(2), 173. <https://doi.org/10.32832/tek.pend.v9i2.3197>
- Rizkiyah, Z., Hariyadi, S., & Novenda, I. (2020). The Influence Of Project Based Learning Models On Science Technology, Engineering and Mathematics Approach To Collaborative Skills and Learning Results of Student. *ScienceEdu*, III(2), 1–6.
- Salsabila, U., Ilmi, M., Aisyah, S., & Saputra, R. (2020). Peran Teknologi Pendidikan dalam Meningkatkan Kualitas Pendidikan di Era Disrupsi. *Journal On Education*, 03(01), 104–112.
- Sartika, D., Musyifah, S., & Syarifuddin. (2022). Pengaruh Model Pembelajaran Kooperatif Integrated Reading and Composition (CIRC) terhadap Hasil Belajar Siswa di Kelas VIII MTsN 4 Bima. *DIKSI: Jurnal Kajian Pendidikan Dan Sosial*, 3(1), 38–50. <https://doi.org/10.53299/diksi.v3i1.139>
- Sirait, R. M., Napitupulu, R. ., & Sidabutar, Y. . (2022). Pengaruh Model Cooperative Integrated Reading And Composition (CIRC) terhadap Hasil Belajar Siswa pada Pembelajaran Subtema 3 Ayo Cintai Lingkungan Kelas IV SDN 097319 Siopat Suhu. *Jurnal Pendidikan Dan Konseling*, 4(6), 4172–4182.
- Sugiono. (2015). *Metode Penelitian Pendidikan (Pendekatan Kuantitatif, Kualitatif, dan R&D)* (ke 22, Agu). ALFABETA CV.
- Syam, A. (2017). Posisi Manajemen Kurikulum dan Pembelajaran dalam Pendidikan. *MUADDIN*, 07(01), 33–46.
- Tarelluan, D., & Rufiana, I. . (2017). Pengaruh Model Pembelajaran Cooperative Integrated Reading And Kemampuan Menyelesaikan Soal Cerita The Effect Of Cooperative Integrated Reading And Composition (Circ) Learning Model With Strategy Of Writing Mathematical. *Jurmas: Jurnal Mahasiswa Universitas Muhammadiyah Ponorogo*, 1(1), 30–40.
- Ulya, N. I. (2019). *Perbandingan Model Pembelajaran CIRC (Cooperative Integrated Reading and Composition) dan GI (Group Investigation) Terhadap Hasil Belajar Pada Materi Pencemaran Lingkungan Siswa Kelas X MA Madani Pao- Pao*. Skripsi. Pendidikan Biologi Fakultas Tarbiyah dan Keguruan UIN Alauddin Makassar.
- Undang-Undang Republik Indonesia Nomor 20 Tahun 2003 Tentang Sistem Pendidikan Nasional*.
- <https://doi.org/10.24967/ekombis.v2i1.48>
- Utami, N. H. (2019). Meningkatkan Kemampuan Analisis dan Komunikasi Siswa Homeschooling melalui Implementasi CIRC pada Materi Sistem Ekskresi. *BIO-INOVED : Jurnal Biologi-Inovasi Pendidikan*, 1(2), 83–89. <https://doi.org/10.20527/binov.v1i2.7861>
- Waroka, F., Ansori, I., & Rahman, A. (2020). Pengembangan Lembar Kerja Peserta Didik Berdasarkan Keragaman Capung Di Persawahan Kualo Bukit Aceh Kota Bengkulu. *Diklabio: Jurnal Pendidikan Dan Pembelajaran Biologi*, 4(2), 218–226. <https://doi.org/10.33369/diklabio.4.2.223-231>
- Yamin, & Suci, A. I. (2022). Pengaruh Model Cooperative Integrated Reading and Composition (Circ) Terhadap Hasil Belajar Membaca Siswa. *Journal of Elementary School (JOES)*, 5(1), 97–105. <https://doi.org/10.31539/joes.v5i1.3967>