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# The Effect Of "Cerdas" Learning Models On Students 'Science Learning Outcomes

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**A B S T R A K**

Masalah yang mendasari penelitian ini adalah rendahnya hasil belajar siswa, sehinga diperlukan penggunaan model pembelajaran yang inovatif agar menciptakan suasana pembelajaran yang bermakna dan menyenangkan. Penelitian ini bertujuan untuk mengetahui pengaruh model pembelajaran "CERDAS" terhadap hasil belajar IPA siswa. Jenis penelitian ini adalah penelitian *quasi experiment* dengan rancangan *post-test only control group design.* Populasi penelitian ini adalah 128 siswa yang tersebar ke dalam delapan Sekolah, dan sampel penelitian ini adalah 43 siswa dengan menggunakan teknik *intact group random sampling.* Metode pengumpulan data dilakukan dengan metode tes yang menggunakan instrumen tes hasil belajar berbentuk pilihan ganda. Teknik analisis data pada penelitian ini menggunakan analisis statistik kualitatif dengan uji-t. Hasil penelitian menunjukkan bahwa memperoleh hasil Uji t dengan nilai sig. (2-tailed) 0,000 < 0,05. Jadi dapat disimpulkan bahwa model pembelajaran CERDAS berpengaruh positif terhadap hasil belajar IPA siswa kelas IV. Implikasi penelitian ini adalah selain meningkatkan hasil belajar siswa, model pembelajaran CERDAS dapat mengembangkan kecerdasan majemuk dan penguasaan konsep

***A B S T R A C T***

*Underlies this research, the problem is the low student learning outcomes, so it is necessary to use innovative learning models to create a meaningful and enjoyable learning atmosphere. This study aims to determine the effect of the "CERDAS" learning model on students' science learning outcomes. This type of research is a quasi-experimental study with a post-test only control group design. The study population was 128 students who were spread over eight schools. The sample of this study was 43 students using the intact group random sampling technique. The data collection method was carried out by a test method that used a multiple-choice learning outcome test instrument. The data analysis technique in this study used qualitative statistical analysis with t-test. The results showed that obtaining t-test results with sig. (2-tailed) 0.000 <0.05. So it can be concluded that the CERDAS learning model has a positive effect on fourth-grade students' science learning outcomes. This research implies that in addition to improving student learning outcomes, the CERDAS learning model can develop multiple intelligences and mastery of concepts.*

## 1. Introduction

Natural science learning activities in elementary schools have several obstacles, as described (Nurbaity et al., 2010; Yuliati, 2013) in learning activities in elementary schools, especially science learning, teachers carry out learning activities that are still limited to minds-on and have not developed hands-on, learning places more emphasis on developing rote knowledge. From the facts, the authors indicate that elementary school teachers' competence in managing science learning is still low.

Many factors can cause low student learning outcomes. According to (Cahyaningsih et al., 2020; Pramana & Suarjana, 2019), two factors influence students' learning: external and internal factors. External factors come from outside the student, including learning management factors, infrastructure, and learning environment or climate in the classroom. Learning management factors include many more factors, such as teachers' ability to manage learning, which includes approaches, strategies, methods, techniques, or learning models used by teachers in the classroom's learning process. Low student achievement or learning outcomes in science are closely related to the learning process that has not provided opportunities for students to develop critical thinking skills. Science learning in schools is an interaction between students and their surroundings. This results in science learning need to prioritize



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the role of students in teaching and learning activities. (Rusman, 2014; Wijanarko et al., 2017). So that the learning that occurs is student-centered learning and the teacher as a facilitator in the learning. Teachers are obliged to improve students' learning experiences to achieve science learning goals.

Student activeness in the science learning process is at the core of the learning pattern. It is reflected in students' activeness in linking concepts during the discussion, students making observations, and students being able to criticize a problem in the surrounding environment. Science lessons are important subjects to be instilled in students because through science learning. Students can act scientifically in solving the problems they face (Kariani et al., 2014; Saputra, 2017). Such learning can foster student attitudes in formulating problems and drawing conclusions. Students can think critically through science learning. From the explanation above, it can be concluded that science learning is emphasized on critical thinking skills that provide direct experience to remember, identify, and apply their knowledge scientifically. Therefore, teachers must be guided by the curriculum to plan to learn.

To improve quality, we need to identify the problems that exist in science learning. Some of the problems that have been identified by (Gunarta, 2019; Purbarani et al., 2018), among others: (1) Often science is presented only as a rote by students, as a result, when a learning evaluation is held, the collection is mixed up and becomes tangled in the minds of students; (2) In delivering science material, it does not pay attention to the proportion of material and systematics of its delivery, and does not emphasize basic concepts, so it feels difficult for students; (3) Less varied learning, tools, and analogies that can clarify the material are rarely used; (4) There is an assumption that the teacher is the most capable person and master the lesson compared to students. Therefore it has an impact on student science learning outcomes. In simple terms, what is meant by student learning outcomes is the ability a child gets after going through learning activities because learning itself is a process of someone trying to obtain a form of relatively permanent behavior change. (Marudut et al., 2020; Safitri, S. R., & Budhi, 2017). In learning activities or instructional activities, usually, the teacher sets learning goals. These children are successful in learning, children who succeed in achieving learning goals or instructional goals.

(Erina & Kuswanto, 2015; Wati et al., 2018) Learning outcomes occur in students, both relating to cognitive, affective, and psychomotor aspects as a result of learning activities. These problems can be fixed if educators realize that there are problems. Without realizing there are problems, the science teacher will continue to carry out these bad habits and assume there are no problems. Awareness of problems can also be said to identify problems in science learning. After that, they make various efforts to fix it.

Based on the results of observations at SD Gugus VII, Kecamatan Sukasada on 21-23 October 2019, there were several obstacles in learning science, including: (1) Learning is still dominant in the use of the lecture method so that communication takes place in one direction, (2) Learning has not used learning models or media innovative learning in science learning, (3) Students are less motivated in science learning. These observations were also in line with the results of the documentation study of students' science learning outcomes, which were taken from the fourth grade in the first-semester test scores of the fourth-grade students of SD in Gugus VII Kecamatan Sukasada. There are 128 students, 67 fourth grade students. Elementary schools get science learning outcomes under the KKM, and 61 students have reached the KKM. Therefore this problem needs to be found a solution. The teacher's solution of the learning models that can be used is the CERDAS learning model. CERDAS means Cermin diri, Ekspose konsep, Rumuskan keingintahuan, Dalami konsep, Akui bakat, Simpul ingatan.

According to (Nulhakim & Berlian, 2020; Winarti et al., 2015) The CERDAS learning model was developed based on Howard Garner's Multiple Intelligence learning theory, Piaget's theory of cognitive development, and Vygotsky's theory of Social Constructivism. These three theories underlie the model development process and are implemented in each stage of the CERDAS learning model syntax. Students have different intelligence because students will find it easier to understand the lesson if the material is presented following the intelligence that stands out in students (Aryani, 2015; Yasa et al., 2017). Because students' intelligence in the class varies, teachers in any field of study need to enter and process the material to be taught according to these students' intelligence. They need to teach with a variety of models so that each student feels helped appropriately. Therefore, it would be very good if each teacher tries to identify what intelligence their students have before teaching.

The CERDAS learning model is developed based on multiple intelligences, has a high student-centered learning pattern by implementing cooperative strategies. The CERDAS learning model was developed based on Howard Garner's Multiple Intelligence learning theory, Piaget's theory of cognitive development, and Vygotsky's Social Constructivism theory. These three theories underlie the model development process and are implemented in each stage of the CERDAS learning model syntax. The multiple intelligence learning model's importance is that students can learn while increasing their intelligence's full potential because intelligence can be stimulated, developed to the greatest extent through enrichment, good support, and teaching. (Ernawati et al., 2019; Nulhakim & Berlian, 2020). The stages in the CERDAS learning model syntax are designed to improve multiple intelligences that are still weak. On the other hand, they aim to optimize the students' dominant intelligence. It is based on opinion (Astuti et al., 2019; Inapi, 2018) that learning should help students develop weak intelligence and optimize dominant intelligence.

Several previous studies that are relevant to this research, such as (1) research conducted by (Winarti et al., 2015), those who obtained the results of the research were the CERDAS model, which showed an increase in concept mastery and higher learning completeness; (2) research conducted by (Hazmiwati, 2018), the results were the application of the STAD cooperative learning model to increase the student's science learning outcomes; (3) research conducted by (Zainudin, 2018), The results obtained were the application of the scramble model to increase motivation and science learning outcomes.

The purpose of this study was to analyze the effect of the CERDAS learning model (Cermin diri, Ekspose konsep, Rumuskan keingintahuan, Dalami konsep, Akui bakat, Simpul ingatan) on the fourth grade students' science learning outcomes of Gugus VII Kecamatan Sukasada in the 2019/2020 school year.

## 2. Method

This research is a quasi-experimental design that uses a post-test only control group design. This study's purpose is a smart learning model for the fourth-grade students' science learning outcomes of Gugus VII Kecamatan Sukasada in the 2019/2020 academic year. This study's population were all fourth grade students of SD Gugus VII, Kecamatan Sukasada, 2019/2020 academic year. The number of population members in this study were 128 students spread over eight schools. The sampling technique used in this study was the intact group random sampling technique. Of the six population schools, two samples were selected to be used as research samples, SDN 1 Selat and SDN 2 Selat. Before the sample is selected, the sample's equivalence test to be used is carried out first.

The method used to collect data in this study is the test method. The test is a tool that can be used to measure students' abilities in following a lesson (Dewi et al., 2019; Lisnani, 2019). In this study, the test used was a science learning outcome test. Science learning outcomes test is used to measure how students' ability to understand the teacher's science material.

The research instrument is a tool used to collect research data (Sukardi & Rozi, 2019; Yulianti, 2016). The type of instrument used in this study was a test of the fourth-grade students' science learning outcomes in which the test questions would be made in the form of multiple-choice of 40 questions. This learning outcome test is also adjusted to the science material indicator for fourth-grade elementary school on the syllabus. The research instrument first analyzed the test, test the difference power test, test the level of difficulty of the test, and test the effectiveness of questioners.

The data obtained in this study were students' science learning outcomes, which were quantitative data and were analyzed by inferential statistics. Inferential statistics are all investigations based on statistical data and clues about the accuracy and reliability of decisions made based on probability theory. Describing data for student learning outcomes is based on data tendencies, including mean, median, mode, standard deviation, and variance. Before testing to get conclusions, the data obtained needs to be tested for normality with the Kolmogorov Smirnov test, homogeneity test with the F test, and hypothesis testing using the t-test.

## 3. Result and Discussion

This research was conducted in eight meetings in the experimental group and in the control group, where the experimental group was given seven treatments and one post-test. In contrast, the control group studied seven times and one post-test. The description of the data from the results of this study describes the mean, median, mode, standard deviation, variant, minimum, maximum, and range of science learning outcomes data for fourth-grade students at SD N 1 Selat and fourth-grade students at SD N 2 Selat for the 2019/2020 academic year. Both are taught by applying the INTELLIGENT learning model and students who are taught using conventional learning models. These calculations were carried out with Microsoft Office Excel 2007 and SPSS 25 numerical processing programs. The descriptions of the experimental group's learning outcomes and the control group showed in Table 1.

**Table 1.** Science learning outcomes of the experimental group and the control group

| Analysis Results | Experiment Group | Control Group |
|---|---|---|
| N | 22 | 21 |
| Mean | 23,6 | 18,8 |
| Median | 23,5 | 19,1 |
| Mode | 25,70 | 19,5 |
| Standard Deviation | 3,67 | 3,84 |
| Variance | 13,50 | 14,76 |
| Maximum Score | 29 | 27 |
| Minimum Score | 16 | 13 |

Based on Table 3, the mean score of learning outcomes for the experimental group through the CERDAS learning model is 23.6 with a variant of 13.50 and a standard deviation of 3.76. The maximum score obtained by the students was 29, while the minimum score obtained was 16. At the same time, the average score of learning outcomes for the control group through the conventional learning model was 18.8 with a variant of 14.76 and a standard deviation of 3.84. The maximum score obtained by students was 27, while the minimum score obtained was 13. Based on these data, the scores of science learning outcomes in the experimental group through the CERDAS learning model were higher than the control group with conventional learning models.

This research's statistical technique is a descriptive statistical technique to describe the object under study through the data from the sample to determine the learning outcomes after carrying out the learning process through the science learning outcomes test (post-test). In addition to descriptive statistical techniques, this study also used inferential statistics. The inferential statistic used is the t-test, but before the t-test analysis, it must first fulfil several statistical assumptions, the Normality Test and the Homogeneity Test.

The normality test is carried out to test whether an empirical distribution follows normal characteristics. The data normality test was carried out on the post-test data on science learning outcomes in the experimental and control classes. The calculation is assisted by using SPSS 25. As for the test criteria, if the significance> 0.05, then H0 is accepted and the data is normally distributed, whereas if the significance <0.05, then H0 is rejected, and the data is not normally distributed. A summary of the results of the normality test can be seen in Table 2.

**Table 2.** Normality Test Results

| | | ***Test of Normality Kolmogorov-Smirnov[a]*** | | |
|---|---|---|---|---|
| | **Group** | **Statistik** | **df** | **Sig.** |
| Learning Outcomes | Experiment | 0,145 | 22 | 0,200 |
| | Control | 0,118 | 21 | 0,200 |

The results of calculations using the Kolmogorov-Smirnov formula with SPSS 25, the experimental group student learning outcomes test 0.200> 0.05, which means that the post-test results of the experimental group students were normally distributed. In contrast, the data from the post-test results for the control class was 0.200> 0.05, which means that the data from the post-test results for the control group were normally distributed. Based on the data, the post-test results proved that both the experimental group and the control group were normally distributed. The homogeneity test was carried out on the experimental and control groups using SPSS 25 with the sig's data criteria. > 0.05, then H0 is accepted, and the variance is homogeneous, whereas if it is sig. <0.05, then H0 is rejected, and the variance is not homogeneous. The summary of the homogeneity test results is shown in Table 3.

**Table 3.** Homogeneity Test Results for Experimental Group and Control Group

| | ***Test of Homogeneity of Variance*** | | | | |
|---|---|---|---|---|---|
| | | ***Levene Statistik*** | **df1** | **df2** | **Sig.** |
| Learning outcomes | *Based on Mean* | 0,000 | 1 | 41 | 0,986 |
| | *Based on Median* | 0,004 | 1 | 41 | 0,950 |

| Test of Homogeneity of Variance | | | | |
|---|---|---|---|---|
| | *Levene Statistik* | df1 | df2 | Sig. |
| *Based on Median and with adjusted df* | 0,004 | 1 | 40,996 | 0,950 |
| *Based on trimmed mean* | 0,000 | 1 | 41 | 0,992 |

Based on the table above, it can be seen that sig. Based on the Mean 0, 986> 0.05, H0 is accepted, and the variance is homogeneous. It shows that the experimental and control group data have homogeneous variances. After the experimental class and control class's science learning outcomes were declared normal and homogeneous, it was continued at the next stage, testing the hypothesis using the t-test. The results of the t-test analysis showed in Table 4.

**Table 4.** Summary of t-test results

| | | *Independent Samples Test* | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | t | df | *Sig.(2-tailed)* | *Mean Difference* | *Std.Error Diferrence* | *95% Cinfidence Interval of the Difference* | |
| | | | | | | | *Lower* | *Uper* |
| Learning Outcomes | Equal Variances | 4,563 | 41 | 0,000 | 5,165 | 1,132 | 2,879 | 7,450 |
| | Equal Variences not Assumed | 4,560 | 40,813 | 0,000 | 5,165 | 1,132 | 2,877 | 7,452 |

Based on the summary of the t-test results with the help of SPSS, the sig value results are obtained. (2-tailed) 0.000 <0.05. Thus H0 is rejected, which means that there is an effect of the INTELLIGENT learning model on science learning outcomes of fourth-grade students of SDN Gugus VII, Kecamatan Sukasada. The CERDAS learning model is designed to develop students' multiple intelligences and mastery of concepts. CERDAS means Cermin diri, Ekspose konsep, Rumuskan keingintahuan, Dalami konsep, Akui bakat, Simpul ingatan. Piaget's theory states that the educational experience must be built around the learner's cognitive structure. Optimal education requires a challenging experience for learners so that the process of assimilation and accommodation can produce intellectual growth. Besides, according to (Gunawan & Palupi, 2012; Pantiwati, 2012), the development of this intelligence requires others' participation because social interactions with others spur the development of new ideas and enrich students' intellectual development. By applying these three main ideas, the CERDAS learning model is developed based on multiple intelligences. It has a high student-centered learning pattern by applying cooperative strategies. With cooperative learning, students who do not understand learning can be assisted by students who already understand. Learning can exchange ideas, interact and build cooperation. It is in this collaboration that Vygotsky's theory fits into the CERDAS model. According to (Adawiyah, 2018; Rosdianto, 2017) social interaction with others stimulates new ideas and enriches students' intellectual development.

Students know themselves by assessing their work and reflecting on learning progress. It aims to increase student motivation and build a positive self-image. In the Concept Exposure phase, students pay attention to the introduction of concepts given by the teacher regarding the various styles and demonstration of one style to understand the concept of style better. This phase can provide more meaningful learning to students because students can see firsthand the teacher's demonstrations to understand the style can be more concrete.

In the third phase, formulate curiosity, students in groups discuss formulating questions they want to know about the material style. Students' desire to know is honed through the questions they make about material styles in this phase. By continuing to explore students 'curiosity, it will further increase students' self-confidence.

In the fourth phase, deepen the concept, students solve problems given by the teacher regarding the material style. In this phase, students are given a concrete problem, then the students and the group solve the problem based on the concepts they have learned. It aims to develop students' abilities to solve concrete problems and relate them to the knowledge they have acquired. This phase can further strengthen students' understanding of the learning material because students can deal directly with concrete problems.

In recognizing talent, students express the concept of style they have learned through activities they like, such as composing poetry, composing songs, drawing, etc. Students can draw examples of gravitational force such as apples falling from a tree, or draw a catapult that will be thrown to repel birds in the fields, and so on.

The last phase is the conclusion of memory. Students summarize a notecard the overall material they have learned. It is useful for reminding students of the learning they have learned not easily to forget the learning. With these six phases, students' science learning outcomes can improve.

According to (Nulhakim & Berlian, 2020; Winarti et al., 2015), CERDAS learning model was developed based on Howard Garner's Multiple Intelligence learning theory, Piaget's theory of cognitive development, and Vygotsky's theory of Social Constructivism. These three theories underlie the model development process and are implemented in each stage of the CERDAS learning model syntax. Students have different intelligence because students will find it easier to understand the lesson if the material is presented following the intelligence that stands out in students (Aryani, 2015; Yasa et al., 2017). Because students' intelligence in the class varies, teachers in any field of study need to enter and process the material to be taught according to these students' intelligence. They need to teach with a variety of models so that each student feels helped appropriately. Therefore, it would be very good if each teacher tries to identify what intelligence their students have before teaching.

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Several previous studies that are relevant to this research, such as (1) research conducted by (Winarti et al., 2015), those who obtained the results of the research were the CERDAS model, which showed an increase in concept mastery and higher learning completeness; (2) research conducted by (Hazmiwati, 2018), the results were the application of the STAD cooperative learning model to increase the student's science learning outcomes; (3) research conducted by (Zainudin, 2018), The results obtained were the application of the scramble model to increase motivation and science learning outcomes.

The implication of the CERDAS learning model for the fourth-grade students' science learning outcomes of SDN Gugus VII Kecamatan Sukasada is that in addition to improving student learning outcomes, the CERDAS learning model can develop multiple intelligence and mastery of concepts.

## 4. Conclusion

Based on the discussion and summary, it can be concluded that there is an effect of the CERDAS learning model on the fourth-grade students' science learning outcomes of SDN Gugus VII, Kecamatan Sukasada. It is indicated by the average score of students' science learning outcomes test in the experimental group is greater than the control group and the t-test results. So it can be concluded that CERDAS learning model has a positive effect on the fourth-grade students' science learning outcomes at SDN Gugus VII, Kecamatan Sukasada. CERDAS learning model for fourth-grade students of SDN Gugus VII Kecamatan Sukasada.

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