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THE EFFECT OF *DISCOVERY LEARNING IMPLEMENTATION* ON SCIENCE LITERATURE ABILITY REVIEWING FROM *SELF REGULATION LEARNING* ELEMENTARY SCHOOL STUDENTS

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Abstract: This study aims to determine the effect of Discovery Learning model on scientific literacy skills in terms of Self Regulation Learning in class V Cluster II students, Jembrana District. The research design is 2x2 factorial experimental design. The number of population members is 137 students, and number of sample members is 116 students drawn by random sampling. Science literacy ability data was collected by multiple choice test and Self Regulation Learning data was collected by questionnaire. Analysis of the data used in this study was two-way ANOVA and *t-Scheffe test* assisted by *SPSS 17.0 for windows*. The results of study showed 1) there are differences in scientific literacy skills between students who follow the Discovery Learning model and students who follow the conventional model 2) there is an interaction effect between the learning model and Self Regulation Learning 3) there are differences in scientific literacy skills between students who follow the Discovery Learning model and students who follow the conventional model of students who have high Self Regulation Learning 4) there are differences in scientific literacy skills between students who follow the Discovery Learning model and students who follow the conventional model of students who have low Self Regulation Learning.

Keywords: discovery learning, literacy skills, self-regulation learning.

PRELIMINARY

At the elementary school level, one of main subjects taught is Science or Natural Science. Susanto (2014: 170) stated that, "Science learning is learning based on principles, a process which can foster students' scientific attitudes towards Natural Science concepts ". Referring to the purpose of being taught Natural Science, in simple terms the goal of learning Natural Science in elementary school is not to make students experts in the field of Natural Science, but rather to make students become people who are literate in science or scientific literacy. Hayat & Suhendra (2011) stated that scientific

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literacy is related to the capacity of students to understand information about the process of occurrence of science and facts that exist in everyday life and their relation to the future, and the ability to apply knowledge in daily life.

In the 2018 PISA *Framework* (OECD, 2019) it is explained that there are four domains in scientific literacy, namely: context, knowledge, competence, and attitude domains. However, in reality, the purpose of teaching Natural Science in elementary schools has not been maximally achieved. Based on PISA 2018 out of 79 countries surveyed, Indonesia is ranked 74th in scientific literacy. The report shows that scientific literacy skills are still very low. This also happened in cluster II Jembrana District. The low scientific literacy ability of students is certainly influenced by the implementation of teaching and learning process. The implementation of learning in Indonesia is usually dominated by the following things: (1) teachers do not use innovative learning, in learning the dominant teacher uses the lecture method, (2) the interactions that occur are mostly only interactions between teachers and students, (3) most of the students are passive in learning, (4) teachers do not use media in learning, (5) the classroom atmosphere does not motivate students to be actively involved in learning. The implementation of such learning certainly leads to low student learning outcomes.

If this continues, students will have difficulty working on scientific literacy questions with the characteristics of questions that require students to have abilities to understand reading, use and identify information in reading, and reflect and evaluate reading. Based on a study of research conducted by Rubini et al (2016) regarding " *Identify Scientific Literacy from the Science Teacher Perspective* " it was revealed that the ability of teachers to scientific literacy or scientific literacy was as many as 20% of teachers in the low category, as many as 65% in the medium category, and as many as 20% of teachers in the low category. 15% categorized as high.

Overcoming these problems, to improve the quality of education, it is necessary an enhancement and improvement education which is closely related to improving the quality of operational learning process. One alternative learning that can encourage this improvement is by applying *Discovery Learning*. According to Durajad (2008) *the Discovery* learning model is a learning theory that is defined as a learning process that occurs when students are not presented with lessons in their final form but are expected to

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organize themselves. Meanwhile, according to Effendi (2012) Discovery learning is learning that involves students in problem-solving for the development of knowledge and skills. In addition to the learning model, student characteristics also affect students' scientific literacy skills. One of the characteristics of students that affect students' literacy skills is self-regulation in learning. According to Diaz, Neal & Amaya (in Anindyta & Suwarjo, 2014) defined self-regulation *is* the capacity of learners to plan, guide, and monitor their behavior from within and is flexible following changing conditions. Zimmerman (in Anindyta & Suwarjo, 2014) stated that self-regulation is a circular process. *Self Regulation Learning* that a person has, give an impact on a person's scientific literacy ability. Based on research conducted by Riva & Thomas (2015) on " *Effect of Self-Regulating Behavior on Young Children 's Academic Success* " and research conducted by Kitsantas, Anastasia et al (2009) on " *The Role of Self-Regulated Strategies and Goals Orientation in Predicting Achievement of Elementary School Children* " got the research results that self-regulation in young children does affect their academic results. Children who have good self-regulation will achieve more academic success than those who are not self-regulated. Likewise in elementary school students, where effective self-regulation provides an important influence for students to succeed in all academic domains.

Based on some of the descriptions that have been described, it appears that *Discovery Learning* affects students' scientific literacy abilities as well as students' self-regulation abilities. So the purpose of this research is to empirically reveal the effect of the application of the *Discovery Learning learning model* on scientific literacy skills in terms of self-regulation of fifth-grade Elementary School (SD) students in Cluster II, Jembrana District.

METHOD

This research is quasi-experimental, this research involves *Self Regulation Learning* as a moderator variable, so this research design is called a factorial design (more precisely *two-factor design*). The experimental design can be described in Table 1. as follows.

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Table 1. 2 x 2 . Factorial Experimental Design

A B	A_1	A_2
B_1	A_1B_1	A_2B_1
B2 _	A_1B_2	A_2B_2

(modified from Dantes, 2017:20)

Sugiyono (2008:61) explained that, " Population is a generalization area consisting of: objects/subjects that have certain qualities and characteristics that are applied to be studied and then drawn conclusions ". Based on Sugiyono's explanation of the population, population in this study was a group of fifth-grade Elementary School (SD) students in Cluster II, Jembrana District. The distribution of population members is presented in Table 2.

Table 2. Composition of Population Members

No.	Elementary School (SD)	Class	Total students
1	SD N 1 Batuagung	V	31
2	SD N 2 Batuagung	V	9
3	SD N 3 Batuagung	V	31
4	SD N 4 Batuagung	V	12
5	SD N 5 Batuagung	V	31
6	SD N 6 Batuagung	V	23
AMOUNT			137

(Source: School documents at SD Cluster V, Jembrana District)

RESULTS

Table 3. Summary of Equivalence Test Results with One Path ANOVA

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Source Variance	JK	Db	RJK	F_{hit}	F_{tab} (5%)	Decision
Among	150.27	5	30.05	1.74	2.28	**Non-Significant**
In	2256.84	131	17.23			
Total	2407.11	136				

Table 4. Research Sample Members

No	Group	Class V	Number of Shiva	Total
1	Experiment	SDN 1 Batuagung	31	62
		SDN 3 Batuagung	31	
2	Control	SDN 5 Batuagung	31	54
		SDN 6 Yehsumbul	23	

Table 5. Composition of Research Class

Treatment	**Learning Model *Discovery Learning***		**Conventional Learning Model**	
Self-Regulatory Learning	Class V	Amount	Class V	Amount
Tall	SDN 1 Batu Agung	62	SDN 5 Batu Agung	62
	SDN 3 Batu Agung		SDN 6 Batu Agung	
Low	SDN 1 Batu Agung	54	SDN 5 Batu Agung	54
	SDN 3 Batu Agung		SDN 6 Batu Agung	

DISCUSSION

In this study, as many as 116 students as a sample consisting of 62 students were the experimental group who took part in learning with the Discovery Learning model and 54 students in the control group who participated in learning with the conventional-learning model. Each group is classified based on the students' self-regulation learning

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which is classified by dividing 33% of each group so that the results in the high Self Regulation Learning experimental class consist of 20 students and the low Self Regulation Learning consists of 20 students. Likewise in the control group, high Self Regulation Learning consisted of 18 students and low Self Regulation Learning consisted of 18 students. From the treatment in each group, data were collected from the post-test results which were tabulated according to the needs of analysis. The data obtained are described based on each variable, while the data collected include: (1) Results of students' scientific literacy abilities who follow the Discovery Learning model, (2) Results of students' scientific literacy abilities who follow the conventional learning model, (3) Results of the scientific literacy ability of students who follow the Discovery Learning model and have high Self Regulation Learning, (4) Results of the scientific literacy ability of students who follow the Discovery Learning model and have low Self Regulation Learning, (5) Results of the scientific literacy ability of students who follow the learning model conventional learning and have high Self Regulation Learning, and (6) Results of the scientific literacy ability of students who follow the conventional learning model and have low Self Regulation Learning.

To analyze the data, it was used descriptive statistics and inferential statistics. Descriptive statistics are used to describe the data of variables studied including the number of scores obtained, highest score, lowest score, mean, median, mode, standard deviation, variance, range, histogram, and categorization of each variable being studied. Meanwhile, inferential statistics were used to test hypotheses including the effect of different learning models from each group on students' scientific literacy skills. To analyze the data, two-way ANOVA is used, which is one part of the statistics that serves as a tool to analyze data. The data were analyzed with the help of *Microsoft Excel*. Summary of data based on descriptive statistics is presented in Table 6. below.

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Table 6. Recapitulation of Students' Science Literacy Test Scores

Statistic Data	A_1	A_2	A_1B_1	A_1B_2	A_2B_1	A_2B_2
N	62	54	20	20	18	18
Mean	14,35	12,80	17,20	11,40	13,39	12,89
Median	14,44	12,70	17,22	11,50	13,30	12,50
Modus	14,50	12,00	17,10	12,08	13,16	12,16
SD	3,625	2,602	2,015	2,088	2,592	2,166
Varians	10,66	6,77	4,06	4,36	6,72	4,69
Range	12	11	8	8	9	9
Minimum Score	9	7	13	9	10	9
Maximum Score	20	18	20	16	18	17

From the description of data for each group that has been described, a summary table can be made according to Table 7. below.

Table 7. Summary of Data Description of Science Literacy Ability of Each Group

Learning model ***Self-Regulatory Learning***	**Learning Model *Discovery Learning* (A_1)**	**Conventional Learning Model (A_2)**
	Mean Score Post-Test	
Height (B_1)	17,20	13.39
Low (B_2)	11.40	12.89
Total Average	28,60	26.28

The description of data from Table 7 can be concluded that: (1) mean score of the scientific literacy ability of the group of students who take part in Discovery Learning is 28.60 higher than the group of students who follow the conventional learning model with a mean score of 26.28; (2) mean score of the scientific literacy ability of the

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group of students who follow the Discovery Learning model and have high Self Regulation Learning is 17.20 higher than the group of students who follow the conventional learning model and have high Self Regulation Learning ; (3) mean score of the scientific literacy ability of the group of students who follow the Discovery Learning model and have low self-regulation learning is 11.40, this mean score is lower than the mean score of the group of students who follow the conventional learning model and have low self-regulation learning with a mean score 12.89.

Before analyzing data using two-way ANOVA, the statistical analysis requirements test was carried out first, namely the normality test and homogeneity test. After doing the Kolmogorov-Smirnov (KS) test, it was found that the sample came from a normally distributed population. Then the results of *F-Leneve 's* test with the help of *SPSS 17.0 for Windows* found results that have the same or homogeneous variance.

Therefore, hypothesis testing with two-way ANOVA can be continued. Hypothesis testing in this study used two-way analysis of variance (ANAVA). The test criteria are if $F_{hit} > F_{tab}$ so there are differences between groups. After knowing that there is an interaction between the learning model and Self Regulation Learning on students' scientific literacy skills, then proceed with the t-Scheff test. The t-Scheff test was conducted to determine the superiority and the highest interaction effect and interaction of learning models and Self Regulation Learning on students' scientific literacy skills. The results of calculation of data analysis using two-way analysis of variance (ANAVA) of scientific literacy skills with the help of *SPSS 17.0 for Windows* can be seen in Table 8. below.

Table 8. Two Pathways ANOVA for Scientific Literacy Ability

Source Variance	JK	Db	RJK	F_{count}	Sig	F_{tab} (5%)	Note:
Among	25.544	1	25.544	5,195	< 0.05	3.97	Significant
Deliver B	188.005	1	188.005	38,232	< 0.05	3.97	Significant
Inter AB	133,058	1	133,058	27.058	< 0.05	3.97	Significant
In	354,056	72	4,917				
Total	15087,000	76					

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The results of two-way ANOVA test in Table 10 show that: (1) $F_{A\ count} = 5, 195$ and significance (p) < 0.05 or $F_{A\ count} = 5, 195 > F_{table} = 3.97$; (2) the value of $F_{B\ count} = 3\ 8{,}232$ and significance (p) < 0.05 or $F_{B\ count} = 3\ 8{,}232 > F_{table} = 3{,}97$; (3) F value $_{AB\ count} = 2\ 7.058$ and significance (p) < 0.05 or $F_{AB\ count} = 2\ 7.058 > F_{table} = 3.97$.

Table 9. Summary of *t-Scheffe. Advanced Test*

Group	t_{hit}	t_{tab} (5%)	Information
$t_{A1B1 - A2B1}$	5.29	1.99	Significant
$t_{A1B2 - A2B2}$	2.07	1.99	Significant

Based on the results of calculations using descriptive statistics and two-way ANOVA summarized in Table 10 and the *t-Scheffe test* summarized in Table 9, the results of hypothesis test can be formulated as follows.

1. First Hypothesis Test

Results of the two-way ANOVA test showed that the F value between the levels of factors in learning model obtained $F_{a\ count}$ of 5.195 while the value F_{table} for db in the $db_{numerator} = 1$ and $db_{denominator} = 72$ with a 5% significance level of 3.97. It turns out that the $F_{a\ count}$ is greater than the F_{table} ($F = 5{,}195$; $p < 0.05$). Based on this analysis, the null hypothesis (H_0) which states that there is no significant difference in scientific literacy ability between students who follow the Discovery Learning model and students who follow the conventional learning model, is rejected. Meanwhile, the alternative hypothesis (H_a) which states that there is a significant difference in scientific literacy ability between students who follow the Discovery Learning model and students who follow the conventional learning model, is accepted. So it can be concluded that there is a significant difference in scientific literacy ability between students who follow the Discovery Learning model and students who follow the conventional learning model.

2. Second Hypothesis Test

Table 10. Summary of Interaction Results between Learning Models and *Self Regulation Learning*

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Interaction Statistical Value	**Interaction of Learning Models with Students ' *Self-Regulatory Learning***	
	F count	**F table**
F value	27.058	3.97
db dal	1:72	

Based on table 10, it can be seen in Self Regulation Learning that the mean score of scientific literacy ability of students who follow the Discovery Learning model is higher than scientific literacy ability of students who follow the conventional learning model. While self regulation learning is low, the mean score of scientific literacy ability of students who follow the conventional learning model is higher than scientific literacy ability of students who follow the Discovery Learning model. The results of second hypothesis test show that there are different simple effects in two different groups.

3. Third Hypothesis Test

Table 11. Summary of *t-Scheffe test* for students who have high *self-regulation learning* based on learning model

Group		***mean***	**N**	**RJK dal**	**t hit**	**t tab 5% (db 72)**	**Note:**
t A1B1 – A2B1	**A 1 B 1**	17,20	20	4,917	5.29	1.99	Significant
	A 2 B 1	13,39	18				

Based on the analysis results, the null hypothesis (H_0) states that there is no significant difference in scientific literacy ability between students who follow the Discovery Learning model and students who follow the conventional learning model in students who have high Self Regulation Learning, rejected. In contrast, the alternative hypothesis (H_a) states that there is a significant difference in scientific literacy ability between students who follow the Discovery Learning model and students who follow the conventional learning model in

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students who have high Self Regulation Learning, accepted. So it can be concluded that scientific literacy ability of students who follow the Discovery Learning model is higher than scientific literacy ability of students who follow the conventional learning model in students who have high Self Regulation Learning.

4. Fourth Hypothesis Test

Table 12. Summary of *t-Scheffe test* for students who have low *self-regulation learning* based on the learning model

Group		*mean*	N	RJK dal	t hit	t tab 5% (db 72)	Note:
$t_{A1B2-A2B2}$	A_1B_2	11.40	20	4,917	2.07	1.99	Significant
	A_2B_2	12,89	18				

Based on the analysis results, the null hypothesis (H_0) states that there is no significant difference in scientific literacy ability between students who follow the Discovery Learning model and students who follow the conventional learning model in students who have low Self Regulation Learning, rejected. In contrast, the alternative hypothesis ($H_{a)}$ which states that there is a significant difference in scientific literacy ability between students who follow the Discovery Learning model and students who follow the conventional learning model in students who have low Self Regulation Learning, is accepted. Based on research conducted by Utami et al (2019) namely a study on Discovery Learning conducted on students, the results showed that the discovery learning model had a significant effect on scientific literacy skills. In addition, one of the studies conducted by Kulsum (2020) on the Discovery Learning model gave the result that there was an influence of the discovery learning model on scientific literacy and student learning outcomes. Based on some of these research results, it appears that Discovery Learning has a positive impact on students' scientific literacy skills.

So it can be concluded that the scientific literacy ability of students who follow the Discovery Learning model is lower than the scientific literacy abil-

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ity of students who follow the conventional learning model of students who have low Self Regulation Learning.

CONCLUSION

Based on the discussion, research findings and hypothesis testing, the following conclusions are obtained. There is a significant difference in scientific literacy ability between students who follow the Discovery Learning model and students who follow the conventional learning model, there is a significant interaction effect between the learning model and Self Regulation Learning on scientific literacy skills, there is a significant difference in scientific literacy ability between students who follow the Discovery Learning model with students who follow the conventional learning model for students who have high Self Regulation Learning. This study found that the scientific literacy ability of the group of students who followed the Discovery Learning model was higher than the group of students who followed the conventional learning model, the students who had high Self Regulation Learning, and finally, there were differences in scientific literacy ability of students who followed the Discovery learning model with students who follow the conventional learning model on students who have low Self Regulation Learning.

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