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Student's Learning Outcomes and Scientific Literacy Improvement Through the Implementation of Reading to Learn and Discovery Learning Models

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Abstract: This study aimed to determine the effect of the implementation of two learning models, discovery learning and Reading to Learn on scientific literacy skills and student learning outcomes on the excretory system material. This research was conducted in a Junior High School in the city of Malang involving 29 students of 8th grade. This study used pre-experimental research design (one group pretest-posttest design). Data were collected through pretest, posttest, and worksheet questions. Data were analyzed using non-parametric statistical tests (Wilcoxon test), n-gain and d-effect size. The findings revealed that there was an increase in scientific literacy skills and student learning outcomes as indicated by the n gain of 0.58 (upper medium) and 0.77 (high). The use of discovery learning and Reading to Learn models has been shown to have a strong positive/effective impact on improving students' learning outcomes and scientific literacy skills, as shown by the d effect size values of 2.13 and 3.28, which fall into the large effect category.

Keywords: Discovery learning model; Reading to learn model; Scientific literacy skills; Students' learning outcomes

Introduction

One of the challenges that must be solved with education is how to produce high intellectuality and high quality of students (Rabiah et al., 2020). The high quality of students can be produced by carrying out contextual and meaningful science learning activities. To produce a meaningful learning, it necessary to create science learning that allows students to be able to apply the knowledge they have to solve problems in everyday life. In other words, in this learning, students become science literate or have scientific literacy skills (Utami & Sabri, 2014).

Scientific literacy is the ability to think scientifically to identify problems and draw conclusions from existing facts in order to understand natural phenomena so that they can make decisions to solve scientific/science problems at hand (OECD, 2013). The Program for International Student Assessment (PISA) is a literacy study conducted by the Organization for Economic Cooperation and Development (OECD). One of the purposes of this program is to analyze literacy skills in the field of science (scientific literacy) which is carried out regularly (Wulandari & Sholihin, 2012). Implicitly, the research conducted by PISA on students aims to state the importance of preparing quality human resources starting from elementary and junior high school (Erdani et al., 2020).

There are four aspects of scientific literacy according to the PISA framework, that is: the aspect of context scientific literacy examines important topics related to science and technology in everyday life; the aspect of competence refers to the psychological processes involved in responding to questions or solving problems (Toharudin et al., 2011). The aspect of knowledge includes content knowledge, procedural knowledge, and epistemic knowledge, the aspect of attitude to show an interest in science and an encouragement to act responsibly towards the environment and natural resources (OECD, 2019).

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From the aspect of competence, PISA's main assessment is focused on three indicators, these three indicators consist of several sub-indicators listed in table 1.

Tabel 1. Indicators of Competence Aspect

Indicator	Sub indicator
Explaining phenomena scientifically	a. Recalling and applying appropriate scientific knowledge b. Identifying, using and generating explanatory models and representation c. Making and justifying appropriate predictions d. Offering explanatory hypotheses e. Explaining the potential implications of scientific knowledge for society
Evaluating and designing scientific enquiry	a. Identifying the question explored in a given scientific study b. Distinguishing questions that are possible to investigate scientifically c. Proposing a way of exploring a given question scientifically d. Evaluating ways of exploring a given question scientifically e. Describing and evaluating a range of ways that scientists use to ensure the reliability of data and the objectivity
Interpreting data and evidence scientifically	a. Transforming data form one representation to another b. Analyzing and interpreting data and drawing appropriate conclusions c. Identifying the assumptions, evidence and reasoning in science-related texts d. Distinguishing between arguments that are based on scientific evidence and theory and those based on other considerations e. Evaluating scientific arguments and evidence from different

Indonesia is one of the countries that is consistent in participating in the PISA rankings, the scientific literacy rankings from 2012-2018 are as follows: in 2012, it was ranked 64th out of 65 countries that participated in the study, in 2015, the score was at ranked 62 out of 70 countries, in 2018, the score was ranked 70 out of 78 study participating countries (OECD, 2019). These results indicate that the level of scientific literacy of students in Indonesia is in the unsatisfactory category. In the last 10 years, various studies have mentioned the low scientific literacy of junior high school students (Sari & Nurwahyunani, 2017).

The results of a preliminary study conducted through interviews with an 8th grade science teacher at a private Islamic Junior High Schools in Malang City, shown that the learning activities carried out were still less directed to learning that helped the development of students' scientific literacy. The learning method that was often used was one-way and does not prioritize student-centeredness. The questions developed were still limited at levels C2 and C3 on Bloom Taxonomy, mostly multiple choice, and no specific measurement of students' scientific literacy indicators, so students are not used to working on discourse-based questions and experience difficulties with questions that lead to the assessment of scientific literacy. According to the 8th grade science teacher at the object school, students' scientific literacy and reading literacy during science learning were still relatively low. The low level of scientific literacy is also influenced by the low interest in reading students (Susiati et al., 2018).

The curriculum and education system, the quality of learning, as well as the selection of learning models are factors that affect the low ability of scientific literacy and learning outcomes (Rabiah et al., 2020). The majority of the learning outcomes related to the excretory system content that were revealed in the preliminary study conducted through interviews have not yet reached the Minimum Completeness Criteria (MCC). The discovery learning model, which incorporates students actively exploring and inquiring to help them retain the material being studied, is one of the learning methods that are deemed successful for fostering scientific literacy skills and learning objectives based on Indonesian curriculum. This statement is supported by research Jgunkola & Ogunkola (2013) which states that the strategy in improving students' scientific literacy is one of them by involving students to be active in learning activities. The steps of the discovery learning model include six syntaxes, including: stimulation; problem statements; data collection; data processing; verification; and generalization (Widiadnyana et al., 2014).

The benefits of using the discovery learning model in education including a) giving students control over their own learning activities; b) encouraging students' natural curiosity; and c) encouraging students' active participation because both students and teachers contribute to the generation of ideas (Astuti, 2015). This study was corroborated by research conducted by Yaumi et al. (2017) which shows that the use of discovery learning model tools increases the average achievement of students' scientific literacy, supported by the results of n-gain in the medium category. Learning that encourages and involves students to play an active role really supports the improvement of students' critical thinking skills. Increased critical thinking skills experienced by students will have an impact on how students' scientific literacy is formed by itself during learning activities (Aiman & Ahmad, 2020).

According to research by Jufrida et al. (2019) it was found that there was a strong relationship between scientific literacy skills and learning outcomes at a Public Junior High School in Jambi. The same results were obtained from research by Armas et al. (2019) that there is a positive relationship between scientific literacy and chemistry learning achievement of class XI high school students. High school students who excel in scientific literacy have a positive influence on motivation and learning styles, which directly affect the progress of their academic learning outcomes. For middle and high school students, the relationship between scientific literacy and learning outcomes is strong (Nugraha, 2022).

Scientific literacy skills also have a positive relationship with the ability to read and critically understand reading (Karademir & Ulucinar, 2016). Reading to Learn is an alternative model that can be used in the classroom to train critically understanding a discourse. The Reading to Learn model has been carried out by various researchers in various parts of the world (Becerra et al., 2020; Kartika-ningsih & Rose, 2020; Shum et al., 2018). The syntax of the Reading to Learn model is preparing–note making–join construction (Husein et al., 2021). The Reading to Learn model has inspired learning practices in Indonesia, especially in learning English (Kartika-ningsih & Rose, 2020). All this time, Reading to Learn model is more focused on language learning, especially related to the structure of a discourse.

Excretory system material was included in the 2018 PISA assessment on the aspect of content knowledge that is included in the living system material group on the topic of humans, so this material was suitable as a reference in measuring students' scientific literacy. Judging from the completeness of students based on the results of teacher interviews, in the excretory system material in the previous academic year, 25% of 30 students were already above the MCC and 75% were still below the MCC (the MCC for science subjects was 75). This was because students are still having difficulties in mastering complex material concepts. Complex material will be difficult if learning is carried out in one direction or teacher's explanation The topic of the excretory system explains the relationship between the structure and function of the excretory organs, abnormalities and prevention efforts that occur in the excretory system (Zubaidah et al., 2017)

Based on the background that has been described, the researchers were interested in conducting a study entitled "Students' Learning Outcomes and Scientific Literacy Improvement Through the Implementation of Reading to Learn and discovery learning models" with the aim of: a) described the implementation of Reading to Learn and discovery learning models; b) understood the effect of discovery learning and Reading to Learn on increasing students' scientific literacy skills; c) determined the effect of discovery learning and Reading to Learn on improving student learning outcomes.

Method

This research was using experimental method. The experimental method was one of the quantitative methods that aims to determine the effect of the treatment of the independent variable on the results of the dependent variable (Sugiyono, 2019). This study used a mixed method approach, resulting in 2 data. Qualitative data gathered in the form of teacher interviews, comments from validators regarding the instruments used, and answers to Student Worksheets (SW). As for the quantitative data in the form of pretest, posttest and percentage of learning implementation. The research was carried out on 19-24 May 2022 in the even semester of the 2021/2022 academic year at a private Islamic junior high school in Malang. The research sample was one class VIII, totaling 29 students.

This study used a mix method approach, where the quantitative approach was carried out by taking experimental data. The research design used was a pre-experimental design with the type of one-group pretest-posttest design. The effect of a treatment could be calculated by comparing the posttest and pretest scores (Sugiyono, 2019). If the posttest value was higher than the pretest value and produces a significant calculation, it means that the treatment had a positive effect. The research design was shown in table 2.

Tabel 2. Research Design

Pretest	Treatment	Postest
O_1	X	O_2

Information:
O_1: the value of scientific literacy skills and learning outcomes before applying the discovery learning and Reading to Learn models to the excretory system material
X: the application of discovery learning and Reading to Learn models to the excretory system material
O_2: the value of scientific literacy skills and learning outcomes after applying the discovery learning and Reading to Learn models to the excretory system material.

While the qualitative approach was done by collecting data through interviews and observations. The interview sheet was used to collect preliminary study data, while the observation sheet was used to collect learning implementation data. Before conducting the research, the instrument was validated first, which consisted of device validation and question validation by the validator using the Guttman scale. The Guttman scale used "yes" and "no" statements, the purpose of using this scale was to provide a clear and unequivocal answer to a particular problem in a text (Sugiyono, 2019), because the researcher does not want to get a neutral answer or did not measure a person's attitude about the object of research (Sugiyono, 2010). The assessment of "yes" was scored 1, while "no" was scored 0. The instrument eligibility criteria were shown in table 3.

Tabel 3. Instrument Eligibility Level Criteria

Eligibility (%)	Criteria
81-100	Very Eligible
61-80	Eligible
41-60	Fairly eligible
21-40	Less eligible
0-20	Not Eligible

Research instruments which include learning tools and pretest posttest questions were validated to an expert, science education lecturer. The validator was tasked with conducting both quantitative and qualitative assessments of learning tools and questions on the validation sheet. Based on the results of the assessment by the validator, the learning device got a percentage value of 85%, which means it was very feasible to use. For pretest and posttest questions, the percentage value of 100% means that it was very feasible to use. Furthermore, the validity of the pretest and posttest questions was tested with the Pearson product moment correlation test on 30 students from grade 9 who had passed the excretory system topic to determine the accuracy of a measuring instrument used. The validity criteria were determined by comparing the calculated Pearson coefficients and tables (*r count* and *r table*) (Purnomo, 2018). A sample of 30 resulted an *r table* score of 0.361. Of the 10 items to measure scientific literacy ability, 1 item was found to be invalid because the value of *r count* < 0.361 which is -0.005. the other 9 valid questions were then tested for reliability and obtained a value of 0.704 the question has high reliability (Arikunto 2010). All questions to measure learning outcomes were included in the valid category because *r count* > 0.361 (0.565; 0.597; 0.733; 0.597 respectively) and for the reliability test of the 4 questions obtained a value of 0.470, which means that the 4 questions were included in the category of moderate reliability (Arikunto 2010). The data, data sources, and data collection instruments in this study were shown in table 4.

Tabel 4. Data, Data Sources, Data Collection Instruments

Data	Data Source	Data Collection Instruments
Interview	Teacher	Interview sheet
Implementation of learning	Teacher and students	Observation sheet on the implementation of learning and student summary results
Science Literacy Ability	Students	Pretest and posttest questions that refer to scientific literacy competency indicators
Learning Outcomes	Students	The pretest and posttest questions that use the level of knowledge competence according to Bloom's Taxonomy are analysis (C4)

The follow-up of data collection was conducting data analysis. Quantitative data were shown in percentage of learning implementation, pretest and posttest results from the value of scientific literacy ability and learning outcomes.

Learning Implementation

Learning implementation was carried out in 4 meetings. Meetings 1 and 4 used the Reading to Learn model, while meetings 2 and 3 used discovery learning. For more details, it was shown in Figure 1.

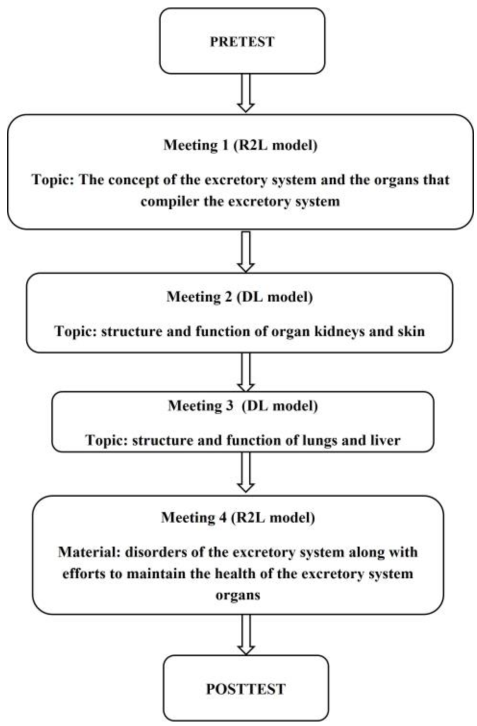

Figure 1. Implementation of Learning Models

The implementation of learning was assessed by an observer by filling out an observation sheet that used a

Likert scale for learning activities with the discovery learning model, while learning activities with the Reading to Learn models were obtained from the results of student summaries at meetings 1 and 4. Observation and technical analysis of data on the implementation of learning could be determined by perform a percentage calculation using the following formula:

$$\text{Percentage of learning implementation (\%)} = \frac{\textit{Number of indicators appear}}{\textit{Number of indicators}} \times 100 \quad (1)$$

The learning implementation criteria were shown in table 5.

Table 5. Learning Implementation Criteria

Learning Implementation (%)	Criteria
85-100	Very good
80-84	Well
75-79	Enough
70-74	Not enough
0-69	Fail

Scientific Literacy Improvement and Students' Learning Outcomes

The following was the procedure used to analyze the results of the pretest and posttest: Determining the normality of a data using Shapiro Wilk, because the sample is less than 30 (Aliman et al., 2019); After that, a different test was carried out to find out whether there was a difference in a sample after being given treatment. In this study, the Wilcoxon test was used instead of the difference test *(paired sample t test* (Khoiriah et al., 2020). The significance value is less than (<) 0.05, indicating a difference between a sample before and after being treated; To find out how strong the increase in the pretest and posttest scores was by using a normalized average gain. increase can be calculated using the Equation 2:

$$\text{N-gain} = \frac{Meanpost - Meanpre}{Score\ maximum - Meanpre} \quad (2)$$

The categories of N-gain values are listed in table 6. To determine the strength of the impact and effectiveness of the discovery learning and Reading to Learn models in learning, it could be calculated using d-effect size analysis with the following equation:

Table 6. Category N-gain Value (Sutopo & Waldrip, 2014)

N-gain	Criteria
$\langle g \rangle \leq 0.25$	Low
$0.25 \leq \langle g \rangle < 0.45$	Medium low
$0.45 \leq \langle g \rangle \leq 0.65$	Medium high
$\langle g \rangle \geq 0.65$	High

$$d = \frac{Meanpost - Meanpre}{Mean\ Standart\ Deviation} \quad (3)$$

$$d = \frac{Meanpost - Meanpre}{(SDpre + SDpost)/2} \quad (4)$$

The categories of d-effect size values are listed in Table 7.

Table 7. Category d-effect size Value (Cohen, 1992)

d-effect size value	Criteria
$d > 0.8$	large effect
$0.2 < d < 0.8$	medium effect
$0 < d < 0.2$	small effect

Result and Discussion

The data obtained in this study include: the results of SW answers, the results of observations during learning, and the results of the pretest posttest. These data were analyzed to determine the effect of the application of discovery learning and Reading to Learn models on scientific literacy skills and student learning outcomes.

Description of the Implementation of Reading to Learn and Discovery Learning Models

The learning activity lasted for 4 meetings. Meetings 1 and 4 used the Reading to Learn model, because at the first meeting the general description was discussed and at the 4th meeting, diseases and efforts related to the excretory system were discussed. For meetings 2 and 3 use the discovery learning model, because the sub-topics discussed in more detail were about the organs that play a role in the excretory system, so discussions, questions and answers and presentations through the discovery learning model were suitable for studying these sub-topics.

Based on the learning activities at meeting 1 and meeting 4, students already understood how to do the given task with this Reading to Learn model, it was seen that students were able to write down key words from the given discourse. The highlighted keywords would be listed in the summary results. For the summary results, it can be seen that the results of the summary of meeting 1 there are still many of the same sentences from the discourse presented, one of which was in the sentence "*the skin has sweat glands that excrete waste substances in the form of sweat*", the sentence was still the same as the original text. While at the meeting 4, students were able to compose their own sentences that were different from the discourse presented, but still in accordance with the topics discussed. One of them was from the sentence that initially reads "*about 60% of an adult's body is filled with water*" and then the resulting new sentence was "*In our bodies we need approximately 60% water of body weight*".

The necessity for students to rewrite in their own sentences/paraphrase will train their scientific literacy, because paraphrasing will make students more actively involved than just normal reading and train students in analyzing a given discourse (Schumaker et al., 1984). Scientific literacy that was trained is on interpreting indicators. Various studies had shown that students who were faced with rewriting/paraphrasing situations tended to have a better understanding of sentence ideas and the ability to remember texts better (Hagaman et al., 2012). Therefore, students who were good at paraphrasing sentences in scientific discourse can be said to have high literacy on these scientific concepts. The percentage of learning implementation at meetings 1 and 4 was calculated from the results of the student summary. Based on the results of the percentage of implementation of learning from meetings 1 and 4, an average value of 82.5% was obtained, which showed that learning was carried out in a good category (Sukardi, 2021).

Meetings 2 and 3 used the discovery learning model. The discovery learning model consists of 6 stages (Widiadnyana et al., 2014). Learning begun with dividing the group into 5 heterogeneous groups. Group activities aimed to facilitate the learning process in class, can motivate the spirit of learning between one friend and another, optimize students' thinking skills, build reciprocal communication through discussion activities. Then the teacher distributed SW to each group and gives stimulation to stimulate students' initial thoughts by presenting a problem on the SW, a problem in the form of an image accompanied by a short text. This stage was the initial stage of the syntax of the discovery learning model. This stage will bring up the scientific attitude of students to find solutions to existing problems (Nahdiah et al., 2017).

The second stage of the problem statement, students were encouraged to understand the problems that had been presented then with the help of the teacher's guidance, students formulate problems. Students were also trained to grow their scientific literacy skills by applying their appropriate knowledge. By practicing the ability to recall and apply appropriate knowledge to students, students will be able to briefly explain the problems presented in the worksheet, so that they can formulate the problem correctly [36]. After formulating the problem, the students then discussed to make a hypothesis from the problems that were written previously. The hypothesis was made in the form of a temporary answer. In making temporary answers, scientific literacy skills in making appropriate predictions were also trained. Although it was only a temporary answer, the answer made must of course be logical (Nahdiah et al., 2017). The temporary answer was then proven to be true or not through a study of reading literature. Several groups had been correct in making temporary answers that were in accordance with the formulation of the problem made.

The third stage was data collection. Collecting information through literature studies from videos or readings was included in the component of the scientific approach carried out. The fourth stage was data processing. At this stage students process data based on data that has been obtained previously. All information obtained was processed at a certain level of confidence. The third and fourth stages trained students' scientific literacy in the competence to identify questions that are investigated scientifically, questions in the form of problem formulations made at the problem statement stage. The fifth and sixth stages were verification and then generalization. At this stage there were activities from the scientific approach, namely associating activities. These two stages trained students in drawing appropriate conclusions based on data that has been obtained in the previous syntax. The percentage of implementation of learning at meetings 2 and 3 was calculated from observations during learning activities and obtained an average value of 89.58%, which shows that learning was carried out in a very good category (Sukardi, 2021). The advantages of discovery learning activities had been seen in the learning activities carried out. The first advantage was that it makes students direct their own learning activities, as evidenced by students who were able to discuss with groups well from formulating problems to making learning conclusions even though teacher guidance was still involved in it, the second advantage was fostering student curiosity as evidenced by activities students were able to make the right problem formulation from the given stimulus, the third advantage was to encourage active student participation as evidenced by students having the courage to present the results of their discussions in front of the class based on the results of group work.

Improvement Scientific Literacy Ability through the Implementation of Reading to Learn and Discovery Learning Models

Based on the normality test results from the pretest and posttest values of scientific literacy skills, the data obtained were not normally distributed with a significance value of 0.011 and 0.047, which means less than 0.05 (Hadi et al., 2020), because the data is not normally distributed, the different test uses a non-parametric statistical test with the Wilcoxon test (Khoiriah et al., 2020).

Table 8. Improvement Scientific Literacy Ability

Aspect	Mean pretest	Mean posttest	N-gain	d-effect size
Scientific Literacy Ability	37	68	0.59	2.12

Based on table 8, there was a significant increase in students' scientific literacy skills, as evidenced by the n-gain value of 0.59. This value is at the limit of 0.45 < N-gain < 0.65 which means it is included in the upper medium category (Sutopo & Waldrip, 2014). The increase in scientific literacy skills was experienced by 27 students out of a total of 29 students as indicated by the positive ranks (27[b]) from the Wilcoxon test results, the ties (2[c]) value means, as many as 2 students did not experience an increase or decrease in the value of pretest to posttest. These results indicate that learning with discovery learning and Reading to Learn models improves students' scientific literacy skills. For the value of n-gain for each scientific literacy indicator, the result is 0.62 for the indicator to explain the phenomenon scientifically; 0.70 for indicators of evaluating and designing scientific investigations; 0.41 for the indicator to interpret the evidence and data scientifically. The questions used to measure scientific literacy consist of 10 questions where numbers 1-4 referred to indicators explaining phenomena scientifically, numbers 5-7 referred to indicators of evaluating and designing scientific investigations, and numbers 8-10 referred to indicators of interpreting data and evidence, scientifically.

The magnitude of an effect/effectiveness level of the applied learning model was measured using the d-effect size, and the value was 2.12. Based on the d-effect size category, the value of d count was 0.08, included in the large effect category (Cohen, 1992). From these results, the application of discovery learning and Reading to Learn learning models to the excretory system material had a strong positive/effective impact on improving students' scientific literacy skills.

Based on the results of the calculation of the achievement of the scientific literacy ability indicator, the pretest score with the highest percentage was on the 1st scientific literacy ability indicator. Meanwhile, the pretest results with the lowest score were on the 2nd scientific literacy ability indicator. Of 37 students, including the category of scientific literacy level 3, while the posttest value of 68 was included in the category of scientific literacy level 4 (Hadi et al., 2020). Level 3 had a teaching principle that the teacher must be able to clearly explain the problem described by various facts, contexts, and phenomena so that students can apply various disciplinary theories to the problem. Level 4 had teaching principles that stipulate that teacher must be able to relate situations to problems involving phenomena, so that students can make conclusions based on the knowledge they have acquired (OECD 2019). The students' scientific literacy ability was getting better because of the increase in the level of their scientific literacy category.

Improvement student's learning outcome through the Implementation of Reading to Learn and Discovery Learning Models

Table 9. Improvement Student's Learning Outcome

Aspect	Mean pretest	Mean posttest	N-gain	d-effect size
Student's learning outcome	41	87	0.77	3.28

Based on the results of the normality test of the pretest and posttest learning outcomes, the data obtained were not normally distributed with a significance value of <0.001 (Amyani et al., 2018). Because the data were not normally distributed, the difference test used a non-parametric statistical test with the Wilcoxon test (Khoiriah et al., 2020).

Based on table 9, there was a significant increase in student learning outcomes, as evidenced by the n-gain value of 0.77. The value is greater than 0.65 which means it was included in the high category (Sutopo & Waldrip, 2014). The increase in student learning outcomes was experienced by 29 students as indicated by the positive ranks (29b) from the Wilcoxon test results. Based on these results, it could be interpreted that learning with discovery learning and Reading to Learn models improved student learning outcomes.

The magnitude of an effect/effectiveness level of the applied learning model was measured using the d-effect size, which results in 3.28. Based on the d-effect size category, the value of dcount > 0.08, the results were included in the large category (large effect) (Cohen, 1992). These results indicate that the application of discovery learning and Reading to Learn models had a strong positive/effective impact on improving student learning outcomes on the excretory system material. This is confirmed by research (Amyani et al., 2018) which found that the discovery learning model improved student learning outcomes in the excretory system material to meet the classical completeness criteria of 85%. Furthermore, the Reading to Learn model could be used in the classroom to train students to understand a discourse critically in the classroom. In line with the questions used to measure learning outcomes that are categorized as C4 (analysis), where in working on questions C4 (analysis) students' critical thinking skills are needed (Uki et al., 2017).

Conclusion

The application of Reading to Learn and discovery learning models to the excretory system material had a positive effect on students' scientific literacy skills as indicated by an increase in the pretest and posttest scores at the n gain value of 0.59 in the upper medium category, the strength of the impact and the effectiveness of the applied model was indicated by the d-effect size of 2.12 (large effect). The application of Reading to Learn and discovery learning models had a positive effect on learning outcomes, which was indicated by an increase in the pretest and posttest scores at the n gain value of 0.77 (high category). From the application of the Reading to Learn and discovery learning models, both had effects on scientific literacy skills and student learning outcomes. Indicators of scientific literacy skills that were trained through the application of discovery learning models include: remembering and applying appropriate scientific knowledge; make correct predictions; identify questions investigated in scientific studies; analyze, interpret data and draw appropriate conclusions. The Reading to Learn model facilitates students in analyzing a text. The ability to analyze was contained in the sub-indicators of scientific literacy and the ability to measure student learning outcomes.

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The authors declare no conflict of interest.

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