Implementation of Reading to Learn and Discovery Learning Models in Science Education Learning: Teaching Learning Process and Students' Response

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Abstract. In this research, 29 junior high school students of 8th grade were exposed to two different learning models in their learning activity in excretory system topic. First, Students were introduced to Reading to Learn (R2L) model (1st and 4th meeting). R2L model was considered effective to improve students' skills in note making and join a text construction that important to support their literacy by understanding a text. Another learning model, discovery learning, also applied simultaneously with R2L (2nd and 3rd meeting). This study aimed to record the teaching learning processes and students' response on this implementation. The results shown that students were able to construct new text by following the R2L syntax., the percentage of learning implementation from 1st and 4th meetings obtained an average value of 82.5%, which fall in a good category. As for the 2nd and 4th meetings, the percentage was 89.58%, which shows learning is carried out in a very good category. Students responded positively to the implementation of both models. They thought that by learning how to summarize a text using R2L can trained to compose sentences using their own style (81.9%) and help them to understand the topic easier (77.6%). Furthermore, discovery learning could help students to be more active and enthusiastic in learning the topic (81.9%) and make them more curious about the topic (80.2%). This study shown the importance of learning how to summarize a scientific text correctly so it can help students to build their understanding of a particular topic.

Keywords: discovery learning models · reading to learn models · teaching learning processes · students' response · excretory system

1 Introduction

Indonesian educational institutions still facing problems in achieving a sufficient level of scientific literacy. Indonesia's scientific literacy score at PISA 2018 was 396, while the average score of all participants was, Indonesia is ranked 71st out of 78 PISA 2018 participants. At the ASEAN level, Indonesia is below Singapore (550), Malaysia (438),

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Brunei Darussalam (431), and Thailand (425), meanwhile, Indonesia is only superior to the Philippines (357) [1]. Meanwhile, scientific literacy is very important so that every citizen understands science and science-based technology to gain enlightenment when making decisions that affect the environment such as social situations and natural conditions [2].

The ability to read and critically understand reading has a positive predictive effect on scientific literacy skills [3]. However, in the classroom, including the science class, the ability to read critically and understand reading does not seem to be trained enough despite the important of the critical reading ability. In fact, to train students' ability to understand reading, including science reading, students need time to examine arguments in texts related to logical, theoretical, historical, ethical, social, and personal aspects, because critical reading involves a thinking process that questions the results and accuracy of the text [3]. The result was students became lacking critical reading skills. The condition of scientific literacy of junior high school students in Indonesia is still at an unsatisfactory level. In the last 10 years, various studies have reported the low scientific literacy of junior high school students [4–7].

Reading to Learn (R2L) is an alternative model that can be used in the classroom to train students to understand a text critically in the classroom. The R2L model has been widely used by various researchers mostly in the field of linguistics [8–10]. The R2L model has inspired learning practices in Indonesia, especially in learning English [9]. The syntax of the R2L model consists of prepare – note making – join construction/elaboration [9]. In the 'prepare' syntax, the teacher prepares a text for students, then students detailly read to find the keywords; next syntax is 'note making', students mark the considered keywords, then students write down it; the last syntax is 'join construction', students make sentences with the keywords that has been found by paraphrasing, meaning that it produces a new sentence that is different from the previous one but still has the same meaning. The end of this activity will produce a new text [11]. In this study, researchers tried to apply the R2L model to science learning.

Another learning model that are considered effective to train students scientific literacy is the discovery learning model, because it involves students actively discovering and investigating themselves so as to strengthen their memory of the material being studied [12]. This statement is supported by Jgunkola & Ogunkola [13], which stated that one of the strategies in improving students' scientific literacy is by involving students to be active in learning activities. The Syntaxes of the discovery learning learning model including: 1) stimulation; 2) problem statements; 3) data collection; 4) data processing; 5) verification; 6) generalization [14].

This study aimed to describe the learning process of students by implementing two learning models, R2L and discovery learning. The study was also aimed to record students' response on the implementation of both models. The understanding of the learning process and response of the students might help science education researchers to provide best practice to increase students' scientific literacy ability.

2 Methods

In this study, 29 students of 8th grade from a Private Islamic Junior High School in Malang City, East Java, were exposed into two different learning models, R2L and discovery learning, in excretory system topic. The study was conducted in May 2022. The implementation of the models was held in four meetings. In the 1st and 4th meeting, the R2L model was implemented in classroom. In the 2nd and 3rd meeting, teacher implemented discovery learning model. In the R2L model implementation, students were asked to do individual activity, while in the implementation of discovery learning, students worked in group. The R2L was implemented in 1st and 4th meeting to allow students to understand the steps of R2L from note making to joint construction by themself. The discovery learning was implemented in 2nd and 3rd meeting, because students had group activity in those two meetings. The implementation steps were shown in Fig. 1.

In the R2L implementation, students were asked to paraphrase a text using R2L steps. A scoring rubric was developed to assess the students' assignment (Table 1). The scoring rubric of R2L was also used as indicators to determine the percentage of learning implementation using R2L.

In the discovery learning implementation, students were asked to form 5 groups. The teacher then distributed a worksheet to each group. The worksheet contained a problem in the form of an image accompanied by a short text to stimulate students' initial thoughts (first stage in discovery learning). In the second stage (the problem statement), students were encouraged to understand the problems that have been presented then with the guidance of the teacher then students formulated problems. The third stage was data collection. Students collected information through literature studies from videos or texts. 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 fifth and sixth stages were verification and generalization. At this stage there were activities from the scientific approach, called associating activities. These two stages trained students in drawing appropriate conclusions based on the data that has been obtained in the previous stages.

Furthermore, the percentage of learning implementation using R2L and discovery learning models then determined using the formula:

the percentage of learning implementation (%) =

$$\frac{number\ of\ observed\ indicators}{number\ of\ indicators} \times 100$$

The criteria of the learning implementation were shown in Table 2.

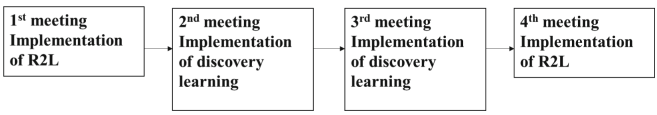

Fig. 1. The implementation steps of R2L and Discovery Learning models in this study

Table 1. Assessed aspects of R2L model

Assessed aspect	***Score***
Purpose (the purpose of the text was clearly stated)	*0–3*
Staging (Systematic of the text)	*0–3*
Phases (from general to specific)	*0–3*
Field (mastering the topic)	*0–3*
Keyword were written appropriately	3: wrote more than 90% keywords provided 2: wrote up to 60% keywords provided 1: wrote up to 10% keywords provided 0: wrote less than 10% keywords provided
Formation of new sentence	3: wrote entirely new text with all new sentences and included all keywords. 2: wrote more than 5 new sentences and included all keywords. 1: wrote more than 3 new sentences. 0: all sentences were identic with provided text.

Table 2. Percentage of learning implementation [15]

Percentage (%)	**Criteria**
85–100	Very good
80–84	good
75–79	enough
70–74	Less than enough
0–69	Failed

Furthermore, students were given attitude scale questionnaire [16]. The questionnaire was consisted of 10 questions. Students were asked about their experience in implementation of the models, their feeling, involvement in discussion, their attitudes toward the models, their preferred learning and teaching environments, their feeling about their literacy improvement, and other related questions and statements. The scale used was 4 scale Likert type without midpoint to improve clarity [17]. Numerical weights were assigned to the categories of response in attitude scale using the successive integers from 0 to 3, the highest weight being consistently assigned to the category which would indicate the most favorable attitude [18].

3 Results and Discussion

3.1 Description of the Implementation of R2L and *Discovery Learning Models*

Based on the learning activities at 1st and 4th meetings, students already understood how to do the given task with this R2L model. The results of R2L model implementation were shown in Table 2. Most of students were understand the R2L steps, this was indicated by the score of the assessed aspects: purpose, staging, phases and field (Table 3). Students were able to write down key words from the given text although the students' score were slightly decrease in 4th meeting compared with the 1st meeting (Table 3). However, the ability to create the new sentence was relatively low on both meetings, although there was improvement in 4th meeting (Table 3). For the result of the students' summary, in the 1st meeting there were many of identic sentences with the original text. While at 4th meeting, students were able to write their own sentences that were different from the original text, but still in accordance with the topics discussed. For example, the sentence that initially written: "*About 60% of an adult's body is filled with water*." The modified 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 text [19]. Various studies have shown that students who are faced with rewriting/paraphrasing situations tend to have a better understanding of sentence ideas and the ability to remember texts better [20. Therefore, students who are good at paraphrasing sentences in scientific discourse can be said to have high literacy on these scientific concepts. The percentage of learning implementation at 1st and 4th meetings was calculated from the results of the student summary. Based on the results of the percentage of learning implementation, an average value of 82.5% was obtained, which showed that learning was carried out in a good category [15].

In the 2nd and 3rd meetings, the discovery learning model was implemented. The discovery learning model consists of 6 stages [14]. Learning begins with dividing the group into 5 heterogeneous groups. Group activities aim to facilitate the learning process in class, can motivate the spirit of learning between one friend and another, optimize

Table 3. The comparison of the implementation of the R2L model in 1st and 4th meeting

Assessed aspect	1st meeting		4th meeting	
	Mean	± SD	Mean	± SD
Purpose	2.83	0.38	2.93	0.25
Staging	2.79	0.41	2.97	0.18
Phases	2.59	0.49	2.90	0.30
Field	2.41	0.56	2.66	0.60
Keywords were written appropriately	2.72	0.45	2.55	0.56
Formation of new sentence	1.07	0.25	1.24	0.57

students' thinking skills, build reciprocal communication through discussion activities. Then the teacher distributes LKPD to each group and gives stimulation to stimulate students' initial thoughts by presenting a problem on the LKPD, a problem in the form of an image accompanied by a short text. This stage is the initial stage of the syntax of the discovery learning learning model. Through this stage will bring up the scientific attitude of students to find solutions to existing problems [21].

The second stage of the problem statement, students were encouraged to understand the problems that have been presented then with the help of the teacher's guidance, later students formulate problems. Students were also trained to grow their scientific literacy skills by applying appropriate knowledge. By practicing the ability to recall and apply appropriate knowledge to students, they will be able to briefly explain the problems presented in the LKPD, so that they can formulate the problem correctly [21]. After formulating the problem, 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 is only a temporary answer, the answer made must of course be logical [21]. Through a literature study, students required to proof their temporary answer (hypothesis). Several groups had been correct in making temporary answers that were in accordance with the formulated problem.

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 processed data based on data that had 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 were investigated scientifically, the questions in the form of problem formulations made before at the problem statement stage. The fifth and sixth stages were verification and then generalization. These two stages trained students in drawing appropriate conclusions based on data that had been obtained in the previous stage. The percentage of learning implementation in 2nd and 3rd meetings was calculated from observation during learning activities and obtained an average value of 89.58%, which shown that learning was carried out in a very good category [15]. The advantages of discovery learning activities have been observed. The first advantage was that it made students directed 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 there was still guidance from the teacher. The second advantage was fostering student curiosity, 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.

3.2 *Students'* Response Toward *Implementation* of R2L and Discovery Learning Model

The students' personal attitude towards the implementation on both R2L and Discovery Learning models were displayed in Table 4. The first 5 statements were about the implementation of R2L. Most of students agreed that the given text could help them in

Table 4. Students' response in the implementation of R2L and Discovery Learning

Statement	Mean Score	Result
I feel the text given in this lesson helps me in learning the excretory system	2.1	Agree
I enjoy learning excretory system topic by summarizing a text	2.1	Agree
Learning to summarize can train me to compose sentences using my own language style	2.3	Agree
I feel that the topic is easier to understand after participating in learning activities	2.1	Agree
I find it easy to do the questions given after participating in the learning activities	2.2	Agree
Learning activities make me active and enthusiastic in participating in learning	2.3	Agree
Learning activities make it easier for me to understand the excretory system topic	2.3	Agree
Learning activities make my curiosity about the excretory system topic is getting bigger	2.2	Agree
Group activities make it easier for me to find ideas	2.5	Agree
By making a hypothesis at the beginning of lesson makes me understand the topic better	2.0	Agree

learning the topic (Table 4). They agreed that by learning to summarize a text might help them to train to compose sentences using their own language style and made the topic became easier to understand Table 4). The next 5 statements in Table 4 were about the implementation of Discovery Learning model. Group activities through discovery learning is useful to improve students learning performance [22]. In this study, students found that group activity helped them easier to found ideas (Table 4). They also became more active, enthusiastic and curious. Based on the students' response, it could be concluded that the implementation of both models could became an alternative for teacher to provide meaningful lesson to train students scientific literacy.

4 Conclusion

This study recorded the implementation of two models, R2L and Discovery Learning and describe its learning processes. It could be concluded that the implementation of R2L could helped the students to develop their scientific literacy ability by learnt how to summarize a factual text. The percentage of learning implementation obtained an average value of 82.5%, which shown that learning was carried out in a good category.

As for the implementation of Discovery Learning model, three advantages were identified: (1) it made students directed 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 there was still guidance from the teacher. (2) the model

was foster student curiosity; students were able to make the right problem formulation from the given stimulus. (3) It was encouraged active students' 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.

Students responded positively to the implementation of both models. They found both models could made them easier to understand the lesson's topic. Based on the study, it could be concluded that the implementation of both models could became an alternative for teacher to provide meaningful lesson to train students scientific literacy.

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