Reading to Learn Models: A Strategy to Improve Student Science Literacy About Addictive, Additive, and Psychotropic Substances

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Abstract

Scientific literacy an individual's understanding of scientific concepts, phenomena and processes, and their ability to apply this knowledge to new and, at times, non-scientific situations. The science literacy of Indonesian students is still low as seen from the results of the PISA test as long as Indonesia participates in this program. One learning model that can improve students' scientific literacy is the implementation of Reading to Learn (R2L). R2L is a strategy that can be applied by teachers to train students' reading skills with the aim of increasing literacy.The purpose of this study was to determine the effect of the implementation of R2L on students' scientific literacy about addictive, additive and psychotropic substances. This type of research is a quasi-experimental carried out with a posttest only control group design. This study conducted in SMP N 29 Padang. The sample is 31 student in experiment class and 27 students in control class. Science literacy data of the subject was collected by multiple choice test that arranged based on scientific literacy indicators. Realiabity of the instrument was very high category. The results of hypothesis testing using the independent sample t test showed that significance value is smaller than alpha, 0.000 <0.05, so that R2L model had a positive effect on students' scientific literacy.

Keywords: R2L learning models, scientific literacy, science learning

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INTRODUCTION

The late 20th century and early 21st century saw unprecedented rapid economic development driven by information and communication technological advances and globalization. Never before has the country's economic development relied so heavily on scientific and technological progress to create demand for a skilled workforce and a scientifically educated population (Liu, 2009). Scientific knowledge has an important role in the progress of civilization and culture in order to create a quality life (Snow & Dibner, 2016). Knowledge of science then developed into the term scientific literacy which began to emerge around 1958. The phrase "science" and "literacy" was coined to express the disposition and knowledge necessary to engage in science. Both in the private life of e person and in context of civic issues raised both through the use of science and technology and the production of more knowledge. Scientific literacy is an individual's ability to understand science, communicate science, and apply scientific knowledge to solve problems so that they can develop high attitudes and sensitivity towards themselves and the environment when making decisions based on scientific considerations (Durasa et al., 2022).

According to Organization for Economic Co-operation and Development (OECD , 2015) understanding and participating in critical discussions of science literacy, including science and technology, requires three discipline-specific competencies. The first is the ability to explain natural phenomena, man-made objects and technologies and the impact on society. Such competence requires knowledge of the main explanatory ideas of science and of the issues that constitute scientific practice and goals. The second is the ability to use scientific research knowledge and understanding to identify questions that can be answered by scientific research. The third is the ability to scientifically interpret and evaluate data and evidence and judge whether the conclusions are correct. Interestingly, this definition differs from many others in that the knowledge required to perform these actions includes not only substantive knowledge from various sciences, but also how scientists It also includes knowledge about how to work or how science makes sense (Snow & Dibner, 2016).

Based on the importance of scientific literacy in the development of progress in human life, in learning science in schools, increasing the scientific literacy of students must be a prioritized aspect. Learning science literacy is learning that includes social issues require the components of scientific concepts in problem-solving decision-making, help students solve problems(Holbrook et al., 2009). Based on data released by the Organization for Economic Co-operation and Development (OECD), the performance of Indonesian students in international assessments by the Program for International Student Assessment (PISA) still needs improvement. There are many ways that teachers can do to improve students' scientific literacy, one of them is by reading activities (Muttaqiin & Sopandi, 2016) . To improve scientific literacy the teacher can apply the Reading to Learn (R2L) model ((Muttaqiin et al., 2022). R2L model is a set of strategies that teachers can cunduct by involving reading and writing activities to improve students` literacy, that consist of six steps: 1) selecting apopropriate texts; 2)preparation before reading; 3) paragraph by paragraph reading; 4) text marking; 5) detailed reading; and 6) sentence making, spelling, and sentence writing (Rose, 2015).

This article presents the findings of the effect of R2L model on scientific literacy that conducted at SMP 29 Padang. The student's scientific literacy in this research is focused on the topic of addictive, additive and psychotropic substances

METHOD

This study is a quasi-experimental research carried out with a posttest only control group design. In this design, the two groups were not get the pretest because: 1) the two sample groups had never received a treatment to develop their scientific literacy and 2) the two sample groups was assumed to have the same initial ability in scientific literacy. The experimental group was given treatment in the form of learning with the Reading to Learn (R2L) model, while the control group only followed conventional learning as is usually done by the teacher. After being given treatment, the two sample groups were given the same posttest questions, namely scientific literacy instruments on addictive, additive, and psychotropic substances. The research design can be seen in the table 1:

Tabel 1. Postest only Control Group Design

Group	Treatment	Post-test
EC	X	T
CC	-	T

Cresswell (2011)

This study was conducted on 15th November to 15th December 2022. The population in this study were students of 8th grade of SMP 29 Padang. Samples were taken with purposive sampling technique, namely sampling with criteria that were adjusted to the research objectives. The criteria for taking the experimental class and the control class in this study were 2 classes with same teacher and having the same average ability as seen from the results of daily assessments on the previous learning topic.

The instrument used to collect data in this study was a of scientific literacy test in the form of multiple choice tests. Instruments about scientific literacy are validated by experts to ensure content and construct validity. The instrument then tested to see the level of reliability. Instrument reliability was calculated using the Kuder Richardson 21 (KR-21) formula based on the results of the instrument trial. Instrument reliability was 0.87 with very high criteria (Arikunto, 2002).

RESULT AND DISCUSSION

Result

Based on the post-tests that were given to the two sample groups, data analysis was carried out to see an overview of students' scientific literacy achievements. The researcher used the Benchmark Reference Assessment (PAP) to present the data analysis. PAP type II is an assessment of the level of competence mastery, and is said to have succeeded in mastering competence if it achieves a minimum score of 56% (Prijowutanto, 2016: 185). Guidelines for type II PAP can be seen in Table 3.

Table 2. Category of PAP type II

Competency mastery level	Assesment category
81-100	Very high
66-80	High
56-65	Enough
46-55	Low
0-45	Very low

This researcher uses the PAP Type II reference where the calculation method is that the minimum score is 0 and the maximum score is 100. Based on the posttest data of the experimental class and control class, the results of students' scientific literacy achievement are described as in tabel 3:

Table 3. Data on students' scientific literacy posttest scores

No	Value range	Amount of students				Criteria
		EC	Percentage	CC	Persentage	
1	81-100	13	41,93 %	1	3,70%	Very high
2	66-80	18	58,07 %	24	88,89 %	High
3	56-65			3	11,11 %	Enough
4	46-55					Low
5	0-45					Very low
Total		31		27		

Table 3 shows a comparison of the posttest results of control class students with experimental class students based on the same instrument. About 41,93% ff the 31 students in the experimental class achieved very high criteria in scientific literacy, and the rest 58.07% achieved high criteria. This is quite different from the achievement of students in the control class. Most of the students from the control class were in the high criteria, namely 88.90% of the 24 students. Below that, 11.11% is in sufficient criteria. Only 1 person out of 24 people, which means 3.70% of control class students have scientific literacy achievement in the very high category. In general, it can be seen that the scientific literacy of the experimental class students who participate in science learning using the Learning to Learn model is better than the control class.

Next, a research hypothesis test was carried out to see whether R2L model had an effect on the science literacy of junior high school students regarding adictive, additive, and psychotropic substances. Preliminary tests in the form of normality and homogeneity tests were carried out to determine the type of hypothesis test used. The normality test was carried out to assess whether the data distribution was normally distributed or not. By using the Liliefors Test, it was found that the post-test data for the experimental class and control class were normally distributed with a significance value of

0.521. Homogeneity test was conducted to investigate whether the two sample groups come from populations that have the same (homogeneous) variance. Based on the homogeneity test using the F test, it was found that the variance of the data is homogeneous. Based on this preliminary test, the hypothesis test used is the independent sample t test. The results of hypothesis testing can be seen in Table 5.

Tabel 4. Independent Sampel t-test Results

Group	Mean	Sig.	Alpha	Interpretation
EC	78.67	0.000	0.05	Sig< Alpha
CC	71.00			

Table 4 shows the results of hypothesis testing using the independent sample t test and it can be seen that the significance value is smaller than alpha, 0.000 <0.05. The average posttest score of the experimental class is higher than the posttest value of the control class. From the results of this statistical test it was concluded that H0 was rejected and H1 was accepted in other words that there was a positive influence from the implementation of the R2L model on students' scientific literacy about addictive, additive and psychotropic substances.

Discussion

The implementation of the R2L model in this study proved to have a positive influence on students' scientific literacy about addictive, additive and psychotropic substances. Other research that investigated the effect of the R2L model with HOTS literacy learning on literacy also showed that this model had a positive influence on students' scientific attitudes (Fitria et al., 2022). In addition, R2L is also known to have a positive influence on increasing students' mathematical literacy (Tasman et al., 2022). The positive influence of implementing R2L is supported by several factors.

The first factor that supports the positive influence from the implementation of R2L is because the steps in the R2L model are easy to implement and follow by students. The learning steps in the R2L model consist of selecting appropriate texts, preparation before reading, paragraph by paragraph reading, text marking, detailed reading, and sentence making, spelling, and sentence writing (Rose, 2015). The steps in the R2L model help students to understand factual texts from the simplest steps so that they can capture the meaning and scientific concepts contained in the text.

The second factor that supports a positive influence on students' scientific literacy is the topic of addictive, additive and psychotropic substances that are interesting and close to everyday life. To create meaningful learning in understanding everyday life, adequate scientific literacy is needed (Sulistyowati, 2019). This means that science learning for addictive, additive, and psychotropic substances has the potential to increase students' scientific literacy. Besides that, factual reading about addictive, additive, and psychotropic substances is interesting reading because students can relate it to everyday life, such as the dangers of using MSG and drug abuse (Hübner et al., 2022). Uninteresting reading is one of the causes of students not having interest in reading. Therefore the selection of reading texts must be considered in the R2L model.

Reading texts related to daily activities can increase students' interest in reading(Hidi, 2001). In research that has been carried out the topics chosen in learning are factual texts with the title, "Is it true that MSG makes people stupid?", "The dangers of artificial dyes in food and drink, can cause cancer", "Jepara Police revealed 13 cases of drug abuse in the last 3 months", and "Drug addicts are prone to mental disorders". These four factual texts are then included in the student worksheet as a first step for learning activities with the R2L model.

The third factor that supports the positive influence of implementing R2L on scientific literacy is student involvement in the learning process. In this model students are not only asked to read but start from reading preparation so that students have an initial view before reading the text. In this model students are also required to give marks and rewrite things that have been read. In the learning process with R2L students do not take material for granted but participate to get concepts conveyed in factual texts (Muttaqiin & Sopandi, 2016; Tasman et al., 2022).

Based on the results of observations made during the application of the R2L model in learning, it was found that students were interested in this model. This can be seen from the high enthusiasm of students in reading the given factual text, conveying arguments and questions after reading, and following all the learning steps well. Interviews conducted with several students also provided information that students liked reading that was related to everyday life and easy to understand.

CONCLUSION

The implementation of the R2L model had a positive effect on students' scientific literacy, especially on the topic of addictive, additive and psychotropic substances, as seen from a significance value of less than 0.05 using an independent sample t-test.

Suggestions for further research are to conduct research on the application of the R2L model to students' scientific literacy for other science topics. In addition, this research can also be developed by examining the effect of the R2L model on other variables

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