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The Influence of the R2L Learning Model on the Material of the Human Digestive System on Students' Scientific Literacy

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ABSTRACT

2018 PISA results show that Indonesia is ranked 71st out of 77 countries in the world. While Indonesia has been successful in increasing the access of 15-year-olds to the school system, greater efforts are still needed to educate them so that the percentage of low-achieving students is kept as low as possible. Based on the results of observations made, students' scientific literacy at SMP Negeri in Bukittinggi is still relatively low. This research was a quasi-experimental study with a non-equivalent control group design which aims to determine the scientific literacy profile of students using the Reading to Learn (R2L) model. The R2L model has a main focus on teaching students to read texts and then gain a deeper understanding of the contents of the reading and rewriting what they have learned (note-taking). Based on the results of statistical analysis, the data is normally distributed and homogeneous so that a parametric test (T-test) is carried out. The results of the calculation of the T-test obtain a value of 0.05, thus H_0 is rejected and H_1 is accepted. This shows that there is an influence of the Reading to Learn (R2L) model on the digestive system material on the scientific literacy skills of junior high school students.

Keywords: PISA, Reading to learn (R2L), Human digestive, Scientific literacy

INTRODUCTION

The 21st century requires quality in every effort and human product so quality human resources are needed. Professionally managed institutions need to produce superior products to meet these new demands. Therefore, breakthroughs in thinking, concepts, and actions are needed to face new challenges, and a new paradigm is needed (Wijaya et al., 2016). The 21st century was marked by the emergence of the industrial revolution 4.0, which made it a century of openness or a century of globalization. Indonesia is currently experiencing the era of the industrial revolution 4.0, which is believed to open up many job opportunities and wider employment opportunities, as well as speed up and facilitate human work processes with more satisfying results. Therefore, human life in the 21st century is experiencing many changes and requires quality human resources in every effort and work output (Mardhiyah et al., 2021). In the 21st century, technological advances parallel the skills of innovation. This makes it easy for both educators and students to learn science. The rapid development of this technology also led to the development of media (Ashel & Riandi, 2022).

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The 21st century is also known as the knowledge age in which all the alternatives offered to meet life's needs in various contexts are based on knowledge. Not only teachers, but students also need to understand the skills needed in 21st-century learning. Human resource development must be improved every year and must keep abreast of existing developments to remain able to compete well. In 21st-century learning, there is the application of creative skills, critical thinking, cooperation, problem-solving, communication skills, social skills, and character skills (Mardhiyah et al., 2021; Asrizal et al., 2022). This will be a challenge for science teachers to design a learning process that can motivate students to improve their abilities in science and mathematics (Hermansyah, 2020). Science education currently aims to prepare students to be successful in life in the 21st century (Robbia & Fuadi, 2020). With science education, students can be involved in understanding the implications of science in everyday life and their role in society. By applying science concepts in learning, Indonesian students can overcome challenges in real life in the 21st century (Pratiwi et al., 2019). This planning activity is illustrated by the learning tools used by schools to organize the learning process in class, starting from the syllabus, lesson plans, teaching materials, learning media used, as well as the assessment instruments to be used. All aspects of this learning tool should be structured oriented towards the 21st century skill needs to be achieved (Sari et al., 2020). During the Industrial Revolution 4.0, teachers are expected to be smart, creative, continue to work and serve as educators. In addition, teachers must have quality and quantity. Teachers during the Industrial Revolution 4.0 must be able to use and manage technology well in order to achieve learning goals (Yogica & Hasanah, 2019).

In order to be able to follow the development of science and technology in the 21st century, students need to have adequate literacy skills. Literacy is defined as language skills which include the ability to listen, speak, read, and write, as well as the ability to think which is an important element in it (Azwar & Jahro, 2023). Reading literacy has an important role in improving scientific literacy skills. In addition, the environment and learning experience, academic achievement, and math skills can also affect scientific literacy skills (Shaffer et al., 2019). Scientific literacy has an important role in building quality education and creating high-quality Human Resources (HR) who can apply their abilities and knowledge to solve problems related to science (Wulandari & Jahro, 2023). This is important for students for life after graduating from school so they can compete in today's modern era (Ningrum & Rahmi, 2021). In learning science, science teachers need to develop student literacy in order to achieve success both in learning and in real life. Integrated learning will gain knowledge and skills and make learning more meaningful for students because it is connected to the real world context (Asrizal et al., 2018).

Scientific literacy skills include understanding science, communicating about science, and applying scientific literacy skills to solve problems (Yuliati, 2017). Scientists build scientific knowledge through creative stages systematically to satisfy human curiosity throughout life. Scientific knowledge includes facts, concepts, principles, theories, and laws that are interrelated and arranged in an orderly manner. Integrated science learning helps students build knowledge that is meaningful and relevant to the real world. Therefore, teaching science must be adapted to the situations and conditions of students so that they can significantly increase their scientific knowledge (Alfa et al., 2022). According to "Project 2061" organized by AAAS (American Association for the Advancement of Science), scientific literacy is defined as the ability to use scientific knowledge, identify relevant questions, and make conclusions based on evidence so that one can understand and contribute to making decisions. decisions about the natural world and human interaction with nature (Narut & Supardi, 2019).

Reading and understanding science includes the ability to think scientifically and critically and apply scientific knowledge to develop skills in making decisions. The definition of scientific literacy is the ability to utilize scientific knowledge, identify relevant questions,

and draw conclusions based on evidence to understand and make decisions related to natural phenomena and changes caused by human activities on nature (Wulandari & Jahro, 2023). Therefore, it is important to instill scientific literacy from an early age so that it can be applied effectively (Robbia & Fuadi, 2020). New literacy is business literacy for Gain knowledge and meet challenges age with aspects of data literacy competence, technology and humans. Aspects contained in new literacy in the form of data, technology, and people where humans must be good at utilizing and process the data, and apply it to the One of the technologies is scientific literacy in science learning (Firmonia et al., 2020).

Scientific literacy is a skill that enables a person to engage in issues related to science and scientific ideas as a critical-thinking citizen. As a result, individuals who have scientific literacy skills are ready to participate in scientific communication about science and technology and can demonstrate competence in scientifically explaining phenomena, evaluating and designing scientific investigations, and interpreting data and evidence scientifically (OCED, 2019). According to the National Science Education Standards (1996), the focus on scientific literacy is not only limited to understanding science concepts and processes, but also on how individuals can make decisions and be involved in the life of society, culture, and economic growth. However, what needs to be understood in scientific literacy in this century is that science and technology are not only used to understand the universe (Narut & Supardi, 2019). Because scientific literacy is very important in human progress and science education in schools, increasing students' scientific literacy must be one of the top priorities (Oktavia & Aulia, 2023).

However, the problem faced in Indonesia is the low level of scientific literacy in education. This is reflected in the results of the 2018 PISA (Program for International Student Assessment) scientific literacy assessment, where the level of scientific literacy of Indonesian students in reading and applying science only ranked 71 out of 77 countries measured, with an average score of 371 (Wulandari & Jahro, 2023). Seeing the results of the PISA score obtained by Indonesia, it is a challenge for Indonesia to improve the education system and the ability to increase student literacy so that they can become globally competitive human resources (Setiawan et al., 2022). In line with the survey results from PISA, based on the survey conducted by Trends in International Mathematics and Science Study (TIMSS) which is an international assessment study for students' mathematical and scientific knowledge which is conducted every four years in 2007, Indonesia is ranked 36th out of 49 countries and in 2011 Indonesia was ranked 39th out of 42 countries (NCES, 2012). These results indicate that the average score of Indonesian students' scientific literacy is below the international average score, namely with a score of 397 (Firmonia et al., 2020).

Based on the results of observations, it was found that the scientific literacy skills of students were still relatively low. This is because students have not been accustomed to or trained in learning that applies scientific literacy. Scientific literacy is a goal that must be achieved by science-centered subjects, one of which is biology. Lack of understanding in the field of science causes students to be unresponsive to things that happen around them, one of which is the digestive system material. The low achievement of learning carried out by students is the only thing that is of concern to power educators. Learning is done correctly, it will take place effectively. Models or even media can support facilitating the learning process. The Learning Model acts as a teaching method in the process of learning new things (Werimon et al., 2017).

In connection with this problem, a solution is needed to increase students' understanding in the field of science, one of which is by utilizing the right learning model. The importance of the learning model as a medium for training students' skills needs to be considered. Using learning models as a tool to improve student skills is very important and must be taken seriously. In the implementation of learning, the selection of the right model to

develop students' literacy and skills must be adjusted to the goals to be achieved. Science learning models and tools are designed to achieve student competence in the field of science and to develop good character or cultural values in learning that can be used by science teachers (Sadia, 2013). Among the various existing learning models, the Reading to Learn (R2L) model is often used to improve students' literacy skills (Muttaqiin et al., 2022).

The Reading to Learn (R2L) model has a main focus on teaching students to read texts and then gain a deeper understanding of the contents of the reading by writing what they have learned (Rose & Martin, 2012). The R2L model can be applied with a syntax that can express students' understanding through ideas or ideas they get from reading material (Husein, Sembiring, et al., 2022). There are four stages in implementing the R2L strategy, including (Husein, Siregar, et al., 2022):

1. Preparation before reading (Preparing for Reading), in which the teacher prepares students before reading the text to facilitate students' understanding.
2. Reading carefully (Detailed Reading), where the teacher guides students to read the text independently and look for important information.
3. Note-taking, where students mark or record important information they have read.
4. Making construction together (Joint construction), where the teacher guides the class to write new text using notes that have been made by students.

The R2L learning model contains four learning stages that are useful for students in overcoming problems related to reading and writing, taking into account relevant concepts and steps for solving them. It is hoped that the application of the four stages in this model which includes examples of teacher teaching, first and second guided practice, and joint construction, can improve students' scientific literacy skills as proven by the results of previous studies in several countries. Learning by using this model can be a solution to overcoming the problems that occur. This study aims to determine the effect of the Reading to Learn (R2L) model on the scientific literacy skills of Junior High School students in Bukittinggi.

METHODS

This type of research was quasi-experimental. This study used a quasi-type because the sample of this study used human samples so external factors from the sample cannot be controlled as a whole, non-equivalent group research design where there was no equal treatment in both classes. The design of this study used the application of a pretest and posttest in sample classes that have different treatments from the two classes (Sugiyono, 2017). It aimed to see the influence of treatment given to the object of research. The population of this research was students of SMPN in Bukittinggi. The research sample consisted of an experimental class and a control class. The research sample was taken using a purposive sampling technique. This technique was applied because this research required a sample with a specific purpose. This sample selection technique was seen by looking at the average value of students who were almost close to or the same, supporting teachers are also the same, and the number of learning hours is the same.

The data collection tool in this study used an instrument in the form of a test. The tests carried out in this study were in the form of posttest and pretest questions which were tested using item tests with scientific literacy questions based on PISA. The type of data used was primary data obtained by researchers based on test results taken directly by researchers. While secondary data was adapted based on existing data at the school, this data aimed to be a benchmark for sample selection. This research started with the selection of the sample. After obtaining the sample, the control class and experimental class samples were obtained. The next step was to give a test in the form of a pretest. Then proceed with the application of learning models. For the control class, it was necessary to provide learning following what

was normally carried out by schools, namely conventional learning. As for the experimental class, it needed to be provided in the form of applying the Reading to Learn (R2L) model. After implementing the application of the learning, a posttest was carried out. After the results of the test data were obtained, data analysis was then carried out to obtain conclusions from the research.

Data analysis in this study used descriptive statistical tests and inferential statistical tests. The descriptive statistical test in this study consisted of the maximum, minimum, mean and gain scores of the two sample classes. The instrument in the form of a test is validated before being used for the pretest. The content validation sheet contains the suitability of the contents of the instrument with the curriculum, the suitability of the science concept in the product, the clarity of the questions and the answer choices, and the suitability of the data/graphics/images presented. This validation sheet design contains statements or questions about the product being developed. Instruments in the form of questions were also tested on students and analyzed statistically and were ready to be used for the pretest. Before carrying out the Hypothesis Test, prerequisite tests are first carried out, namely normality and homogeneity (Sundayana, 2016). If the data is normal and homogeneous, then a parametric test is carried out and if it is not normal and homogeneous, then a non-parametric test is carried out. If testing the hypothesis is done with the independent t-test, then we use the help of the SPSS application.

RESULTS AND DISCUSSION

Results

Implementation of the Reading to Learn (R2L) model on digestive system material during the learning process has been carried out optimally and very well with a syntax implementation of 100%. Based on the results of the students' pretest and posttest scores which were analyzed with quantitative descriptive statistics, data were obtained in the form of average scores, maximum scores, and minimum scores from the control and experimental classes. Descriptive statistical analysis was carried out using SPSS Version 25. The results of this research analysis can be seen in Tables 1 and 2 below.

Table 1. Average Value (Mean)

Sample Class	The Number of Students	Average
Control Class (*Pretest*)	28	47,8
Experimental Class (*Pretest*)	28	42,8
Control Class (*Posttest*)	28	66,2
Experimental Class (*Posttest*)	28	72,6

Based on Table 1 above, it can be seen that the control class and the experimental class have an average pretest score that is almost the same or close. The control class pretest score was 47.8 and the experimental class was 42.8, meaning that there was a difference in value of 5 points. Meanwhile, the posttest score for the control class was 66.2 and for the experimental class was 72.6 with a difference of 6.4 points. Based on these data, it can be seen that there is an average score increase of 18.4 points for the control class and 29.8 points for the experimental class. This shows an increase in learning outcomes after being given treatment.

Based on statistical calculations, it can also be seen that the distribution of pretest and posttest scores is shown in Table 2 below.

Table 2. Maximum and Minimum Values

Value	Category	Class	
		Control	Experimental
(Pretest)	Minimum Value	30	20
	Maximum Value	70	75
(Posttest)	Minimum Value	45	45
	Maximum Value	85	85

In Table 2 above, it can be seen that the minimum pretest score for the control class is higher than the experimental class with a difference of 10 points. While the maximum value of the experimental class is 5 points higher than the control class. After the model is applied/treated, it can be seen that the minimum and maximum posttest values for the control class and the experimental class are the same. The minimum pretest score for the control class increased by 15 points and the minimum score for the experimental class increased by 25 points. The maximum score for the control class also increased by 15 points and for the experimental class by 10 points. There is an increase in the minimum score of the experimental class due to the rapid literacy technique applied in the Reading to Learn (R2L) model.

Furthermore, prerequisite tests were carried out, namely the normality test and homogeneity test. The normality test was carried out to determine whether the distribution of data was normally or not normally distributed in order to determine the statistical test that would be used to be able to see whether or not there was an influence in the research being conducted. The normality test was carried out on the two data obtained, namely pretest data and posttest data in two class groups, namely the control class and the experimental class. The results of the normality test in this study can be seen in Table 3 below.

Table 3. Normality Test

Class	Sig	α	Conclusion
Control	0,101	0,05	Normal
Experimental	0,200		Normal

Based on Table 3 above, it can be seen that the results of the normality test using the Liliefors Test obtained a significance value of > 0.05 for the control class and the experimental class so that the data for both classes were normally distributed and H_0 was accepted. Meanwhile, if the significance value is ≤ 0.05, it can be said that the data is not normally distributed. Furthermore, a Homogeneity Test is carried out to prove whether the basic data to be processed is homogeneous or not or whether the object under study has the same or different variants. Homogeneity data can be seen in Table 4 below.

Table 4. Homogeneity Test

Class	Sig	α	Conclusion
Control Experimental	0,214	0,05	Homogeneous

The results of the homogeneity test in Table 4 above obtained a significance value of 0.214 which means the data is homogeneous. This shows that the variance of the data is the same so H_0 is accepted. But if the significance is ≤ 0.05 then the data is not homogeneous. This will determine which statistical tests will be carried out after this. This homogeneity test is a requirement before carrying out other tests such as the T Test and ANOVA so that the measurement results are valid and accurate. Furthermore, a hypothesis test is carried out which aims to find out whether the hypothesis can be accepted or not. To test the hypothesis is divided into two, where if the data is normally distributed and homogeneous then a parametric test is carried out using the t-test. Meanwhile, if only one of the calculations is normal or homogeneous, then a non-parametric test is carried out, namely by using the Mann-Whitney test or U test. In this study, the data were normally distributed and homogeneous so the T-test was carried out as shown in Table 5 below.

Table 5. T-test

Class	Asymp Sig. 2-tailed	α	Conclusion
Experimental Control	0,05	0,05	H_0 Rejected There is a significant difference in the results of students' scientific literacy using the Reading to Learn (R2L) model

After the prerequisite test was carried out with the results of the data being normally distributed and homogeneous, the hypothesis test was carried out utilizing the t-test as shown in Table 5 above. If the significance value is > 0.05, it can be concluded that there is no difference in the pretest average of students' scientific literacy skills in the control and experimental groups. Meanwhile, if the results of the hypothesis test show a significance value of ≤ 0.05, it can be concluded that there is an influence of the Reading to Learn (R2L) learning model on students' scientific literacy skills in the control and experimental classes. Based on the tests carried out, a significance value of 0.05 was obtained, which meant that there was a significant difference in students' scientific literacy skills, and H_0 research was rejected and H_1 research was accepted. This shows a comparison of 2 samples to test the truth or not of a hypothesis (assumption testing) in the population.

Discussion

Research conducted at SMPN in Bukittinggi City by applying the Reading to Learn (R2L) model has been well implemented. This study aims to determine the effect of the Reading to Learn (R2L) model on students' scientific literacy skills in the material of the human digestive system. Based on the analysis of statistical tests, it can be described that the initial skill (pretest value) of students' scientific literacy in the control class and the experimental class has almost the same average value. The class with the lower pretest average score was used as the experimental class and the class with the higher pretest average score was used as the control class. The two sample classes were given pretest questions in the form of 20 scientific literacy questions referring to PISA. After that, treatment was given to both classes to see how the effect of the independent variable on the dependent variable and ended with a posttest. In the experimental class, in the learning process, the Reading to Learn (R2L) model was applied, while the control class applied the conventional model or the usual learning model used by

teachers at the school, namely lectures and discussions. The students involved in this study were 56 students with 28 students in each class.

Before conducting the research, the research instrument (questions) was first validated by an expert validator and the validated questions were tried out in other equivalent schools and the students had studied the material. From the results of the test item analysis, 20 valid questions were obtained to be used as pretest and posttest questions. After obtaining data on student learning outcomes from the results of the pretest and posttest, then data analysis was carried out. The prerequisite test is a test that is carried out first, namely the normality test and homogeneity test.

In the statistical test, it was found that the normality value based on Table 3 above obtained a significant value in the control class of 0.101 and the experimental class of 0.200. If the significance value is > 0.05, the data is stated to be normally distributed (Sundayana, 2016). From the results of this analysis, it can be stated that the data of the two classes are normally distributed. After carrying out the normality test, then proceed with the homogeneity test. Data is said to be homogeneous if it has a significance value > 0.05 (Widana & Muliani, 2020). Based on the homogeneity test that has been carried out, it is obtained based on a significance value of 0.214. This shows that the data is homogeneous. This data means that it has the same population with the same characters and there is no variance in one group with another.

Based on the results of the analysis of the normality test and homogeneity test, a hypothesis test was carried out using the parametric test. The parametric test in this study used the T-test. Based on the results of the T-test, a value of 0.05 was obtained. Based on decision-making, if the significance value is <0.05, then H_0 is rejected (Sujarweni, 2022). So it can be concluded that there is a significant difference in students' scientific literacy skills after being treated using the Reading to Learn (R2L) model. Three things can be explained regarding scientific literacy in the context of the PISA framework, namely the concept of scientific literacy itself, the application of the Reading to Learn (R2L) model to improve scientific literacy skills, and the method of assessing scientific literacy according to the PISA framework (Setiawan et al., 2022). The Reading to Learn (R2L) model in research can improve students' scientific literacy skills and is one of the right solutions for increasing students' literacy skills. This is supported by the purpose of the Reading to Learn (R2L) model which can help students get used to collecting important information from the text they read (Yulianeta et al., 2022). Learning about the digestive system material is very effective with this model because this material is a very complex concept, so the application of this model makes it easier for students to collect important information from the material as a whole and continuously.

The use of the Reading to Learn (R2L) model also helps improve students' understanding of the texts used in learning. By reading carefully, students can better understand the contents of the text. Studies have shown that students who have a better comprehension of texts have higher and more active learning participation and achievement. In addition, the use of the Reading to Learn (R2L) model also contributes to a prominent student character profile during learning, as part of efforts to increase scientific literacy skills (Muttaqiin et al., 2022). There are several factors that can improve students' skills in the Reading to Learn (R2L) model, one of which is the steps in the model which are easy to apply and follow by students. These steps help students to understand factual texts from the simplest to the most complex, so they can capture the meaning and scientific concepts contained in the text. In addition, topics that are interesting and close to everyday life are also other factors. In the Reading to Learn (R2L) model, students are not only asked to read the text but start with reading preparation so that they have an initial picture before reading the text. In this model, students also have to mark and rewrite what they have read (Oktavia & Aulia, 2023). To improve scientific literacy skills, a contextual approach can be used by giving students the

skills to associate subject matter with everyday life situations. Therefore, the Reading to Learn (R2L) model is the right solution to improve students' literacy skills (Merta et al., 2020)

CONCLUSION

Based on the research results, it can be concluded that there is an influence of the Reading to Learn (R2L) model on students' scientific literacy skills in the digestive system material at SMPN in Bukittinggi. Based on the results of the research that has been done, the researcher provides suggestions to other researchers so that they can continue this research on a wider sample with a more varied form of questions such as PISA questions. The researcher would like to thank profusely to various parties who have helped carry out this research.

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