



The Effect of Reading to Learn (R2L) Based Modules on Increasing Stedents HOTs-Literacy in Chemical Bonding Materials

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Abstract : The Effect of Reading to Learn (R2L) Based Modules on Increasing Stedents HOTs-Literacy In Chemical Bonding Materials. This study aims to identify whether the use of Reading to Learn (R2L) based modules can affect the improvement of students' HOTs-Science Literacy in chemical bonding material. The population in this study consisted of students of class XI MAN 1 MEDAN who were divided into six classes. The sample of the study was 30 students of class XI MIPA 1. The instrument used in this study was a test with 15 multiple-choice questions. Hypothesis testing was carried out using a regression model, with the results of the study showing a sig value of $0.01 < \alpha$ (0.05), which means H_a is accepted and H_0 is rejected. This shows that the use of R2L based modules has an effect on students' HOTs-Science Literacy abilities. Furthermore, in science literacy abilities, a sig value of $0.03 < \alpha$ (0.05) was obtained, which also shows that H_a is accepted and H_0 is rejected, indicating the influence of science literacy abilities on improving students' HOTs-Science Literacy in chemical bonding material. Finally, the influence of the R2L-based module on students' HOTs-Science Literacy abilities in solving HOTs-Literacy problems on chemical bonding material simultaneously shows a sig value of $0.00 < \alpha$ (0.05), which means that the R2L-based module has a significant influence on students' HOTs-Science Literacy abilities on the material.

Keywords: Reading To Learn (R2L) Based Module, HOTs-literacy, Chemical Bonds

Abstrak : Pengaruh Modul Berbasis Reading to Learn (R2L) Terhadap Peningkatan HOTs-Literacy Sains Siswa Pada Materi Ikatan Kimia. Penelitian ini bertujuan untuk mengidentifikasi apakah penggunaan modul berbasis Reading to Learn (R2L) dapat berpengaruh terhadap peningkatan HOTs-Literacy Sains siswa pada materi ikatan kimia. Populasi dalam penelitian ini terdiri dari siswa kelas XI MAN 1 MEDAN yang terbagi dalam enam kelas. Sampel penelitian adalah siswa kelas XI MIPA 1 yang berjumlah 30 orang. Instrumen yang digunakan dalam penelitian ini adalah tes dengan 15 butir soal berupa pilihan ganda. Uji hipotesis dilakukan menggunakan model regresi, dengan hasil penelitian menunjukkan nilai sig $0,01 < \alpha$ (0,05), yang berarti H_a diterima dan H_0 ditolak. Ini menunjukkan bahwa penggunaan modul berbasis R2L berpengaruh terhadap kemampuan HOTs-Literacy Sains siswa. Selanjutnya, pada kemampuan

literasi sains, diperoleh nilai $\text{sig } 0,03 < \alpha (0,05)$, yang juga menunjukkan bahwa H_a diterima dan H_0 ditolak, mengindikasikan adanya pengaruh kemampuan literasi sains terhadap peningkatan HOTS-Literacy siswa pada materi ikatan kimia. Terakhir, pengaruh modul berbasis R2L terhadap kemampuan HOTS-Literacy Sains siswa dalam menyelesaikan soal HOTS-Literacy pada materi ikatan kimia secara simultan menunjukkan nilai $\text{sig } 0,00 < \alpha (0,05)$, yang berarti modul berbasis R2L memberikan pengaruh signifikan terhadap kemampuan HOTS-Literacy Sains siswa pada materi tersebut.

Kata kunci: Modul Berbasis Reading To Learn (R2L), HOTS-literacy, Ikatan Kimia

■ INTRODUCTION

The era of globalization has an impact on various aspects of life, including education. the organization of education. In the field of education requires the preparation of a quality quality education to improve skills so that the nation's generation can face global challenges. face global challenges. Based on the PISA assessment results in 2018, the average scores of literacy, mathematical literacy, and scientific literacy of Indonesian students are 371, 379, and scientific literacy of Indonesian students are 371, 379, and 396, respectively. This puts Indonesia in 70th place out of 78 participating countries. From the results From these results, it can be said that the science literacy skills of Indonesian students are still below the average. average. Chemistry learning is included in the scope of science learning, so it also supports the achievement of science literacy skills. supports the achievement of students' science literacy skills. The main objective of learning chemistry in upper secondary education is the formation of a generation that has chemical literacy skills. have chemical literacy skills (Aryani et al., 2022).

Science literacy can be defined as a person's ability to understand science, communicate science and apply science knowledge to solve problems. knowledge to solve problems, so as to improve attitudes and sensitivity to the surrounding environment (Irsan, 2021). According to (Kurniyawan & Tanshzil, 2024) an individual who has reading/literacy skills will be able to find ways to solve problems and will analyze the problems so that a critical character/personality will be formed. Thus, the ability of science literacy (science literacy) is one of the main needs of students in the 21st century. 21st century. Science literacy is generally focused on four interconnected aspects aspects, namely knowledge, context, competence, and attitude (Fuadi et al., 2020).

Literacy levels in Indonesia are still very low. This is shown in the results of survey that placed Indonesia in 62nd place out of 70 countries. While the results of PISA (Program for International Student Assessment) 2018 show that the literacy skills of Indonesian students that the literacy skills of Indonesian students rank 6th from the bottom with an average score of 371. Through this data, it can be concluded that the level of literacy in Indonesia is still low (D et al., 2022).

Critical thinking skills are a type of high-level thinking skills in which individuals demonstrate their ability to scientifically and wisely interpret phenomena from different perspectives in different contexts to make effective final decisions (Manurung et al., 2023). High-level thinking skills can be interpreted as the ability of complex thinking processes that include analyzing, criticizing and creating solutions to problem solving (Saraswati & Agustika, 2020). High-Order Thinking Skills (HOTS) are abilities that

involve analyzing, rotating and creating. So in high-level thinking requires more complex abilities to obtain solutions in solving problems (Romlah, 2022).

High-level thinking skills or Higher Order Thinking Skills (HOTS) is a thinking process that is not just memorizing and re-conveying known information (Sutiani et al., 2020). But the ability to connect, manipulate, and transform knowledge and experience that is already owned to think critically and creatively in an effort to determine decisions and solve problems in new situations (Sianturi, 2021).

One of the materials in grade XI SMA/MA in the odd semester is chemical bonding. Chemical bonding is one of the chemistry materials taught at the high school level. Chemical bonds contain material about the process of bonding between atoms (Asri & Dwiningsih, 2022).

Madrasah Aliyah (MAN) 1 Medan is one of the educational institutions equivalent to high school in Medan City that aims to produce a generation of achievers. Scientific literacy, which includes the ability to read, understand, and analyze scientific information, has become an important aspect of learning in the modern era. However, in general, scientific literacy among Indonesian students is still relatively low, as shown by the results of national and international education evaluations. This phenomenon can have an impact on students' ability to face academic challenges, especially in subjects that require in-depth analysis such as chemistry.

At MAN 1 Medan, chemistry learning currently faces similar challenges. Based on the results of initial observations, students are required to carry out literacy activities before learning begins, but these activities are limited to reading texts without in-depth understanding. When asked to explain the contents of the reading, students often appear confused and need additional time to reread. In addition, interaction between teachers and students in chemistry learning tends to be minimal because the teaching method is still centered on the teacher, which only relies on textbooks and blackboards as the main media. As a result, students are less trained to analyze, evaluate, and interpret information from various sources, including graphs and symbols in chemistry materials.

One method that can overcome this problem is the Reading to Learn (R2L) approach, which is designed to improve literacy skills by integrating systematic reading-based learning. Although teachers at MAN 1 Medan already understand the R2L method, its implementation is still constrained, especially in preparing worksheets that are relevant to everyday life as a stimulus. This unpreparedness has an impact on students' low ability to understand scientific readings, reason texts, and analyze visual information such as graphs and tables.

Based on these problems, efforts need to be made to improve students' scientific literacy skills by utilizing R2L-based modules. The use of this module is expected to create more interactive learning, improve students' understanding of chemical materials, and help students develop critical and analytical thinking skills. Therefore, this study aims to implement and test the effectiveness of the R2L module in improving students' scientific literacy on chemical bonding materials.

Research conducted by (Priyasmika & Farida Yuliana, 2021) entitled The Effect of Guided Inquiry on High Order Thinking Skill review from Chemical Literacy shows that there is an influence of the Learning model on students' high-level abilities in the Equilibrium material³. Research conducted by (Fuadah et al., 2017) states that learning using the literacy method can improve students' analytical skills in chemical learning materials, namely heat transfer.

Based on this background, this study aims to determine the Effect of Reading to Learn (R2L) Based Modules on Improving Student Learning Outcomes in Solving HOTS (Higher Order Thinking Skills) Questions on Chemical Bonding Materials, as an effort made to improve literacy culture and high-level thinking skills, as well as an alternative that can be done when conducting chemistry learning in schools to choose effective and efficient methods in building HOTS-Literacy in the school environment.

▪ METHOD

This research was conducted at Madrasah Aliyah Negeri (MAN) 1 Medan located at Jalan William Iskandar No.7B, Bantan Tim, Medan Tembung, Medan City, North Sumatra. This research will be conducted in the odd semester of the 2024/2025 academic year. The population in this study were all students of class XI MIPA in the odd semester of the 2024/2025 academic year totaling 6 classes. The sampling technique used in this study was Purposive Sampling, namely directly selecting one class, namely XI MIPA 1 with a total of 30 students. The type of research used was a quasi-experiment. The data collection technique used was quantitative and qualitative data carried out by means of written tests by creating modules based on R2L, Pretests and posttests. Data collection was carried out by giving Pretest sheets to students before entering the chemical bonding material, then R2L-based modules were given to students at each meeting as a substitute for apperception. Posttests were given to students at the end of learning as a final test. The final test (posttest) is adjusted to the Hots-Literacy indicator which contains Hots-Literacy-based questions on chemical bonding material. Data analysis in this study used a regression model with a t-test (partial) and an f-test (simultaneous) using SPSS 26 for windows.

Research Design

The type of research used was a quasi experiment. The design chosen was Pretest-Posttest One Group Design.

Table 1. Research Design Pretest-Posttest One Group Design

Kelas	Pretest	Perlakuan 1	Perlakuan 2	Posttest
Eksperimen	A ₁	P ₁	P ₂	A ₂

(Case-Smith et al., 2012)

Research Instruments

The instrument is needed to collect data used to analyze the results obtained from the study. The instrument used is a test instrument in the form of a pretest and posttest of 15 multiple choice questions. The questions are designed to cover 9 (nine) HOTS-Literacy indicators, namely identifying information and data, using information and data, producing explanatory models, distinguishing questions that can be researched scientifically, formulating hypotheses, making predictions, analyzing data, interpreting data, and drawing or presenting conclusions. The analysis of the test instrument was carried out by an expert validator.

▪ RESULT AND DISCUSSION

To manage the research data, a requirement test analysis is carried out such as the normality, heteroscedasticity, and multicollinearity tests. The next step is to test Hypothesis test to determine the effect of Reading to Learn method on students' HOTS-Literacy on Chemical Bonding material.

1) Normality Test

The data normality test aims to determine whether the data used is normally distributed, assuming that the samples come from the same population. In multiple linear regression analysis, the normality test was performed using SPSS 26 for Windows with the Kolmogorov-Smirnov method at a significance level of 0.05(Widiari et al., 2023).

Table 1. Data Normality Test		
One-Sample Kolmogorov-Smirnov Test		
N	Asymp.Sig.(2-tailed)	Information
Unstandardized Residual	0,198	Normal Data

The data in Table 1 shows the Asymp. Sig. (2-tailed) value of 0.198, which is greater than the significance level α (0.05). Therefore, the data can be stated to be normally distributed.

2) Heteroscedasticity Test

The heteroscedasticity test is conducted to determine whether there is a difference or similarity in the residual variance in a regression model. A good regression model is a model that is free from heteroscedasticity. In multiple linear regression analysis, the heteroscedasticity test is conducted using SPSS 26 for Windows with a significance level of 0.05(Hakiki et al., 2022).

Table 2. R2L Heteroscedasticity Test			
Coefficients^a			
Model	t	sig	Information
Reading to Learn (R2L)	- 0.499	0.621	Free from Heteroscedasticity

The data in Table 3 shows the Asymp. Sig. (2-tailed) value of the R2L method of 0.621, which is greater than the significance level α (0.05). This indicates that the data is free from heteroscedasticity.

3) Multicollinearity Test

The multicollinearity test aims to determine whether there is a relationship or correlation between independent variables. In linear regression analysis, the model must be free from multicollinearity (Lestari et al., 2022). This test is performed using SPSS 26 for Windows.

Table 3. R2L Multicollinearity Test.

Coefficients			
	Model	Sig.	Collinearity Statistics
			<i>Tolerance</i> <i>VIF</i>
1	(Constant)	.175	
	Reading to Learn (R2L)	.001	.994 1.006

a. Dependent Variable: HOTS Literacy

Based on the data in the table, the VIF (Variance Inflation Factor) value is 1.006 and the tolerance value is 0.994. With this, the VIF value is below 10 and the tolerance value is above 0.1 so that it is known that there is no multicollinearity in R2L.

4) Hypothesis Test

Hypothesis testing was conducted to analyze the effect of R2L (Reading to Learn) based modules on increasing students' HOTS-Literacy in chemical bonding material. The analysis used multiple linear regression with the help of SPSS 26 for Windows at a significance level of α (0.05). If the sig value $< \alpha$ (0.05), then H_a is accepted and H_0 is rejected; however, if the sig value $\geq \alpha$ (0.05), then H_0 is accepted and H_a is rejected. (Tulle et al., 2024).

Table 4. Hypothesis Test Results

Hypothesis	Model	Sig	Information
I	Reading to Learn (R2L) Sheet	0.001	H_a accepted
II	Reading to Learn (R2L) Based Module	0.003	H_a accepted
III	Simultaneous Reading to Learn Based Module for scientific literacy skills	0.000	H_a accepted

Based on the results of the hypothesis test on the first hypothesis, the sig value $< \alpha$ (0.05) was obtained, so H_a was accepted and H_0 was rejected. This answers the third problem formulation, namely regarding the influence of scientific literacy skills on student learning outcomes in solving HOTS-Literacy questions on chemical bonding material. With a sig value of $0.001 < \alpha$ (0.05), it can be concluded that there is a significant influence between scientific literacy skills on student learning outcomes in solving HOTS-Literacy questions on chemical bonding material (Putri et al., 2020).

Based on observations from observers, another factor that influences the relationship between R2L-based modules and students' HOTS-Literacy is students' desire to read and understand the applicable chemical bonding material content, so that they are motivated to follow the learning. The influence of R2L-based modules on HOTS-Literacy abilities is also reflected in the average value obtained during the three meetings, which is compared with the average achievement of HOTS-Literacy ability values through the Posttest.

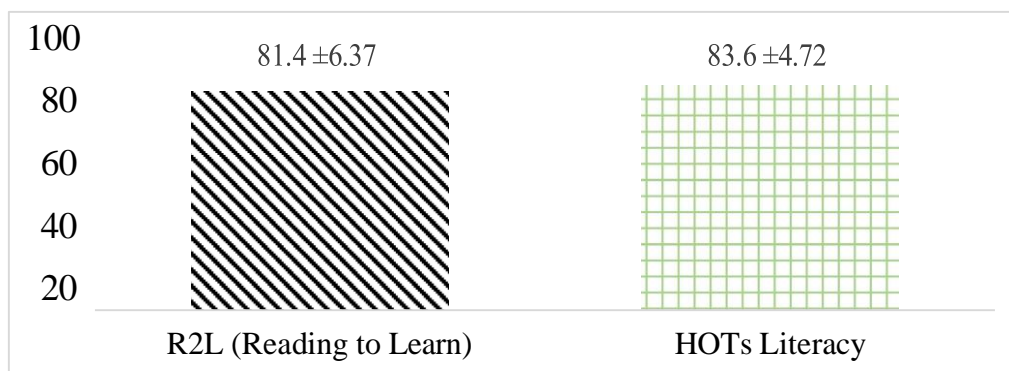


Figure 1. Mean R2L value and posttest mean

The obstacles faced in using R2L-based modules include managing students with low numeracy skills and students with kinesthetic learning styles. Researchers overcome these obstacles by making adjustments, such as combining various learning models that are appropriate to student characteristics. These findings have important practical implications in educational settings, especially to improve students' HOTS-Literacy. Reading to Learn (R2L)-based modules can be an effective learning tool to help students understand the material in depth through a structured, iterative approach that focuses on developing high-level thinking skills.

In practical application, teachers can use this module as a guide to create more focused learning, especially in teaching complex materials such as chemical bonds. With R2L-based strategies, teachers can guide students through systematic learning stages, starting from reading, understanding, to summarizing information, which ultimately helps students improve their analytical and problem-solving skills. In addition, by modifying the teaching method, this module can be adjusted to different student learning styles, such as providing practice-based activities for kinesthetic students or providing visual illustrations that support students with low numeracy skills.

At the institutional level, the results of this study can be used to formulate educational policies that encourage the use of literacy-based modules such as R2L. Curriculum development that includes this module can improve the quality of learning, not only in science materials but also in other subjects that require in-depth understanding and critical thinking skills. Furthermore, teacher training on the implementation of the R2L module can expand its application on a larger scale, thus providing a positive impact on improving student competency at various levels of education.

This study also provides a basis for further development in literacy-based learning strategies for various educational contexts. Thus, the findings of this study not only enrich literacy-based teaching methods, but also contribute to the achievement of educational goals to produce students who are able to think critically, creatively, and adaptively in facing future challenges (Muliani et al., 2021).

▪ CONCLUSION

This study explains the influence of R2L (Reading to Learn) based modules on students' HOTS-Literacy. Based on the results of the study, several conclusions can be drawn. First, students' initial HOTS-Literacy Science ability on chemical bonding material is in the range of 35 to 65, with the highest frequency in the "moderate" category of 7 students, namely in the range of 45 to 55. This shows that students' initial

HOTs-Literacy ability has not reached the completion score (KKM 75). Second, students' final HOTs-Literacy Science ability has increased, with a range of 77 to 91. A total of 11 students are in the "moderate" category with a range of 81 to 86. Based on these data, students' final abilities have passed the completion score (KKM 70). Third, there is a significant influence between scientific literacy skills on student learning outcomes in solving HOTs-Literacy problems on chemical bonding material, with a significance value of $0.001 < \alpha 0.05$, which indicates that the alternative hypothesis (H_a) is accepted. Fourth, the R2L-based module also has a significant influence on student learning outcomes, as evidenced by a significance value of $0.03 < \alpha 0.05$, which also supports the acceptance of the alternative hypothesis. Finally, the simultaneous influence between the R2L-based module and scientific literacy skills on student learning outcomes was also found to be significant, with a significance value of $0.00 < \alpha 0.05$. Thus, the R2L-based module and scientific literacy skills are proven to contribute to improving student learning outcomes on chemical bonding material.

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