The effectiveness of problem-based learning on reading comprehension of eleventh-grade science students at SMAN 1 Sambit

Intan Muhsyanura[1]*, dan Dhinuk Puspita Kirana[1]

[1] Institut Agama Islam Negeri Ponorogo, Indonesia

*Surel Penulis Koresponden: intanmuhsya.n01@gmail.com

Article History:		
Submitted: June 04, 2024	Revised: August 01, 2024	Accepted: December 20, 2024

Abstract

Reading is one of the most important basic skills in learning English for students to learn. Reading is understanding written text which is a complex activity involving perception and thinking which consists of two processes related to word recognition and understanding. Comprehension is the process of understanding interconnected words, sentences and texts. Therefore, reading cannot be separated from understanding. The purpose of this research is to find out whether there is a significant difference between students who are taught using problem-based learning and have better reading comprehension than students who are not taught using problem-based learning. Researchers applied a quantitative research approach with quasi-experimental design. This research used two classes. The population in this study were all XI Science students at SMAN 1 Sambit, totaling 87 students. The sample in this study was an experimental class with 29 students and a control class with 29 students. Researchers used pre-test and post-test in data collection. Data were analyzed using a t-test formula such as the Independent Sample T-Test. The results showed that the mean post-test for experimental class was 89.82 and the mean post-test for control class was 80.93. This shows that there is a difference in mean scores between the two classes. The T-Test results show a significance value of 0.00 which is smaller than 0.05. Based on these data, it can be concluded that there is a significant difference between reading comprehension of students who are taught using problem-based learning than students who are not taught using problem-based learning.

Keywords: *problem-based learning, reading comprehension, quantitative research.*

A. INTRODUCTION

Language is an important aspect of life. English is a foreign language that is often used for language learning because English is the determinant of all language skills (Abdurrokhman et al., 2023). There are four basic skills in learning English, include: Listening, speaking, reading, and writing (Ardini, 2021). One of the demands faced by students in school education today is the ability to use English as a language of communication in spoken and written

contexts. Teachers today still use the old way of teaching because the old way gives better results. Teachers have an important role in improving the learning process. In the learning process, the teacher does not only have to deliver the material but also has to make various efforts so that the learning process can run well, be fun, and be able to motivate students to improve their English language skills, especially in students' comprehension. Reading comprehension is the ability to extract information from written text and then apply that knowledge or demonstrate understanding of the information obtained (Creswell, 2008, 2015). In reading, students don't just read sentences, they also have to understand the content contained in the text (Brassell & Rasinski, 2008). According to Septia et al. (2022), what usually happens to students when learning reading comprehension is difficulty understanding the text.

Based on research conducted in class XI Science at SMAN 1 Sambit, many students in class XI Science experienced various obstacles or difficulties when comprehending English texts. Teachers need to use various learning models in accordance with the demands of the basic competencies of curriculum content standards. Apart from that, teachers also need to plan learning that can build students' potential to use their thinking skills to solve problems (Hasibuan & Ain, 2024). One of these learning models is Problem-Based Learning (Mislinawati & Nurmasyitah, 2018). Problem-Based Learning is a type of learning model that can provide active learning conditions for students (Humairoh, 2021). Problem-based learning in reading can help teachers develop the desired learning models so that they can improve critical thinking skills, foster students' curiosity in working, foster inner motivation when studying, and foster interpersonal relationships when working in groups (Wani et al., 2019). In teaching English, teachers must focus on developing students' comprehension and knowledge. The material provided must be clearly understood by students (Prameswara, 2023). Students should not be taught using conventional models at the high school level. Because students can ignore the ability to give opinions to others, in cases like this teachers need to use learning models. Researchers use the problem-based learning model, where the problem-based learning is a learning model in English class XI Science at SMAN 1 Sambit. Teaching using problem-based learning makes students more challenged to actively learn, be independent and collaborate with fellow students (Pratiwi, 2021). The benefit for teachers when teaching using problem-based learning models is that teachers can be better prepared in preparing Learning Implementation Plans (RPP). RPP is a good first step when teachers prepare learning before learning takes place (Sharma & Puri, 2021). Through the stages contained in the Learning Implementation Plan,

teachers participate in preparing learning plans by guiding, directing students, and providing solutions when solving a problem faced by students during learning. In the experimental group (XI Science 1), the researcher used the problem-based learning model in the class that was given treatment. Meanwhile, for class XI Science 2 (control class), the researchers did not use the problem-based learning model (Sugiyono, 2010).

Based on the explanation above, researchers are interested in conducting research entitled "The Effectiveness of Problem-Based Learning on Reading Comprehension of Eleventh-Grade Science at SMAN 1 Sambit". The researcher proposed a problem formulation when carrying out this research, namely: "Do students who are taught by using Problem-Based Learning have better reading comprehension that those who are not taught by using Problem-Based Learning?" The purpose of this research is that researchers try to find out whether there is a significant difference between students who are taught using problem-based learning who have better reading comprehension than students who are taught using problem-based learning who have better reading comprehension than students who are not taught using problem-based learning in class XI Science at SMAN 1 Sambit. The following are some of the benefits of the importance of research: 1). It is hoped that the findings of this research can become a reference for other researchers, improving previous research related to students' reading comprehension. 2). When implementing learning in the classroom, it is hoped that the findings of this research can provide participation or a supportive role for teachers related to English language learning activities, especially in reading comprehension for students. Apart from that, it is also hoped that these findings can encourage teachers to further develop other models or approaches when teaching reading in the classroom.

B. RESEARCH METHOD

Researchers use a quantitative approach. Researchers use statistical calculations, namely SPSS 22 as data analysis. In addition, researchers use experimental research methods. In this experimental research, researchers used one of the research designs, namely the quasi-experimental design. In this design, there is an experimental group and a control group; however, the control group does not fully function to control external variables that may affect the implementation of the experiment. In quasi-experimental designs, the data validation used is inferential statistics.

The experimental group and the control group underwent pre-test and post-test. The experimental group receives treatment. In this study, researchers used Non-Probability Sampling as a sampling technique. The type

of non-probability sampling technique used by researchers is purposive sampling. Researchers chose 58 samples from all classes. The researcher used class XI Science 1 (experimental class) consisting of 29 students and class XI Science 2 consisting of 29 students (control group). The use of purposive random sampling technique in this study is based on learning in class XI Science where researchers need two classes where students in both classes have balanced abilities (homogeneous) to represent the characteristics of the population. The researcher used research instruments to measure the variables. The instruments in this study consisted of specific questions such as using a written test. The written test instruments used in this study were pre-test and post-test which amounted to 10 items in the form of short-answer tests. Researchers use validity to measure the level of accuracy of the measuring instrument in relation to the actual content to be assessed. In this context, it is important to distinguish between valid and reliable research results and valid and reliable instruments. Researchers used pre-test and post-test to test the validity, which pre-test and post-test can help researchers to collect research data. The research contained in this validity is measuring the extent of students' reading comprehension skills based on instruments that have been validated by teachers and lecturers. The following are the results of the pre-test validity calculation:

Table 1. Validity of Pre-Test

Number of Items	r_{value}	r_{table}	Criteria
1	0.4892	0,3673	Valid
2	0.6092	0,3673	Valid
3	0.4673	0,3673	Valid
4	0.5515	0,3673	Valid
5	0.3799	0,3673	Valid
6	0.3818	0,3673	Valid
7	0.3795	0,3673	Valid
8	0.379	0,3673	Valid
9	0.3778	0,3673	Valid
10	0.4957	0,3673	Valid

The pre-test correlation calculation table shows that all item numbers used in this study have met the validity criteria. With 29 respondents and a significance level of 5% (0.05), the critical value (r table) is 0.3673. If r count > r table then the item is considered valid; if r count < r table then the item is

considered invalid. In this study, the 10 question items are all valid. Therefore, it can be concluded that all items included in this study have good quality and can be used as a reference in assessing students' abilities. Researchers also calculated the validity of the post-test using IBM SPSS Statistic 22. The following are the results of the post-test validation calculation:

Table 2. Validity of Post-Test

Number of Items	r_{value}	r_{table}	Criteria
1	0.4582	0,3673	Valid
2	0.4108	0,3673	Valid
3	0.5258	0,3673	Valid
4	0.4983	0,3673	Valid
5	0.4340	0,3673	Valid
6	0.4383	0,3673	Valid
7	0.4367	0,3673	Valid
8	0.4994	0,3673	Valid
9	0.3794	0,3673	Valid
10	0.4441	0,3673	Valid

From the post-test correlation calculation table above, it shows that all item numbers used in this study have met the validity criteria. Because with the number of respondents 29 people at a significance level of 5% or 0.05 with df = n-2, namely 29-2 = 27, the r table is 0.3673 so that if r count > r table then the item is declared valid, while if r count < r table, then the item is declared invalid. Based on the table above, all valid item numbers in the table above with a value of r count > r table totaled 10 items (all valid). After knowing the validity, the researcher conducted a reliability test. The following is the reliability calculation:

Table 3. Reliability Statistic Result

Test	Cronbach's Alpha	N of Items	Level of Significance	Criteria
Pre-Test	0,688	11	0,05	Reliable
Post-Test	0,686	11	0,05	Reliable

The reliability results on the pre-test were 0.688 and the post-test was 0.686. Both test instruments show that the instrument reliability coefficient at the Cronbach's Alpha significance level > 0.05.

C. RESULT AND DISCUSSION

The data analysis technique in this study uses statistics as a result of hypothesis testing. The type of statistical application used is IBM SPSS Statistic 22. Researchers used a quasi-experimental design where the variables used in this study had no other influence that was not related to the treatment given. The following are the stages of quantitative data analysis techniques:

1. Pre-Test of Reading Comprehension

Descriptive statistics refer to methods used to analyze and summarize data by providing a clear picture of the information collected. The following is a table of descriptive statistical data on the pre-test results of the experimental and control classes:

Table 4. Descriptive Statistic of Pre-Test

Descriptive Statistic	Experimental Class	Control Class
Mean	66.96551724	66.13793103
Minimum	60	60
Maximum	75	75

The results showed that the mean pre-test score of the experimental class was 66.96, while the control class had a mean score of 66.13. Based on the pre-test score, it can be concluded that there is no significant difference in reading comprehension skills between students in the experimental and control classes.

2. Post-Test of Reading Comprehension

Researchers used a post-test to determine the extent of the students' ability level at the end of learning. The following is a table of descriptive statistical data results in the form of pre-test data on students' reading comprehension skills:

Table 5. Descriptive Statistic of Post-Test

Descriptive Statistic	Experimental Class	Control Class
Mean	89.82758621	80.93103448

Continued Table 5. Descriptive Statistic of Post-Test

Descriptive Statistic	Experimental Class	Control Class
Minimum	81	75
Maximum	98	87

The table above displays the data collected from the post-test regarding students' reading comprehension skills. The results showed that the mean post-test score of the experimental class was 89.82, while the control class had a mean post-test score of 80.93.

3. N-Gain of Reading Comprehension

The Normalized Gain test, often referred to as the N-Gain test, is designed to evaluate the effectiveness of a particular treatment in one group using a pre-test and post-test design, or in studies involving a control group. This test calculates the difference between pre-test and post-test scores. By assessing these scores (Gain score), researchers can find out whether the application of problem-based learning models has brought improvements. The following are the various analyses used in the N-Gain test to evaluate the improvement of students' reading comprehension skills:

a) Descriptive Statistic

The following is a statistical description of the N-Gain data obtained from the pre-test and post-test results of students' reading comprehension skills in the experimental and control classes:

Table 6. Descriptive Statistic of N-Gain

Descriptive Statistic N-Gain		N-Gain of Experimental Class	N-Gain of Control Class
N	Valid	29	29
Mean		0.685833726	0.426566833
Minimum		0.4	0.166666667
Maximum		0.95	0.666666667

Based on the table above, the experimental class has a mean N-Gain score of 0.685, while the control class has a mean N-Gain score

of 0.426. This N-Gain mean indicates a significant difference in reading comprehension between students in the experimental class and students in the control class.

b) Inferential Statistic

The following 3 tests are contained in the inferential statistics of the N-Gain test and their explanations:

1) Normality Test

The normality test was conducted to determine whether the dependent variable and the independent variable in the N-Gain data were normally distributed or not. The following is a data table of the normality test results of the N-Gain score of students' reading comprehension skills:

Table 7. Result of Normality Test of N-Gain (Tests of Normality)

	Class	Shapiro-Wilk		
		Statistic	**df**	**Sig.**
n-gain score	Experiment Class	.969	29	.527
	Control Class	.972	29	.617

*. This is a lower bound of the true significance. a. Lilliefors Significance Correction

The result from the significaced table of the N-Gain data for both the experimental and control classes indicated that the data in both classes was normality distributed.

2) Homogeneity Test

The homogeneity test included in the N-Gain assessment is designed to determine if the two sets of data are equivalent. This test compares two values namely pre-test and post-test. The purpose of the Levene Test is to see how much variance there is between two different data. From the results of data testing, researchers can see whether the existing data has a homogeneous indication or not.

Table 8. Result of Homogeneity Test of N-Gain (Test of Homogeneity of Variance)

		Levene Statistic	df1	df2	Sig.
n-gain score	Based on Mean	.578	1	56	.450
	Based on Median	.629	1	56	.431
	Based on Median and with adjusted df	.629	1	55.970	.431
	Based on trimmed mean	.595	1	56	.444

Based on the results of the Levene Test on the homogeneity test, the significance value (p-value) of the N-Gain data obtained a result of 0.578 > 0.05, indicating that H0 = Accepted and H1 = Rejected. From this it can be concluded that the N-Gain data in both classes are homogeneous (normally distributed). If there are indications that the data is does not meet the normality requirements, then researchers can use non-parametric statistical analysis, namely by conducting the Mann-Whitney test. If the data is normally distributed then the researcher does not need to do the Mann-Whitney test. So in this study researchers did not need to test the normality of the data using the Mann-Whitney U-Test.

3) T-Test

The homogeneity test was conducted as a prerequisite for the t-test. Its purpose is to assess whether the variances of two distributions are equal. This test helps ensure that observed differences are due to variation between groups, not within groups. Because the results contained in the homogeneity test show that the data have homogeneous groups, the similarity test on the two means uses the Independent Sample T-Test. The following table shows the results of the mean difference test for the two classes as follows:

Table 9. Result of T-Test of N-Gain (Independent Samples Test)

		t-test for Equality of Means		
		T	**Df**	**Sig. (2-tailed)**
Result of Pre-Test	Equal variances assumed	7.067	56	.000
	Equal variances not assumed	7.067	55.275	.000

The T-test results contained in the N-Gain test show a significance value of 0.00 < 0.05 which indicates that there is a significant difference between the improvement of reading comprehension of students taught using problem-based learning models and students taught not using problem-based learning models.

4. Discussion

The researcher investigated "The Effectiveness of Problem-Based Learning on Reading Comprehension of Eleventh-Grade Science at SMAN 1 Sambit in the academic year 2023/2024". The purpose of this study is to determine whether there is a significant difference in reading comprehension between students who are taught using problem-based learning and those who are not taught using problem-based learning models. The N-Gain score aims to determine the effectiveness of using a model or treatment into pre-test and post-test research on experiments and controls. By calculating the difference in pre-test and post-test values or N-Gain, researchers can find out whether the use of problem-based learning models can be said to be effective or not. Researchers used the SPSS 22 application to test N-Gain. The T-Test results obtained differences in reading comprehension improvement between students who were taught using problem-based learning models and students who were not taught using problem-based learning models. The meaning of the statement, it can be said that there is a significant difference between students who are taught using problem-based learning have better reading comprehension than students who are not taught using problem-based learning in class XI Science SMAN 1 Sambit. The use of problem-based learning model in class XI Science can make students' reading

comprehension increase. This happens because this model provides learning opportunities to students by involving students effectively in the learning process. It can be said that the alternative hypothesis (H_1) is accepted, and the null hypothesis (H_0) is rejected. The use of problem-based learning model shows a significant difference, this can be seen from the data of control class and experimental class. Therefore, it can be concluded that the problem-based learning model is effective in improving the reading comprehension of students of class XI Science at SMAN 1 Sambit. In other words, students who were taught using problem-based learning showed better reading comprehension than students who were not taught using this model.

D. CONCLUSION

Researchers used two classes as research. Researchers use a quantitative approach, namely quasi-experimental design. Researchers use pre-test and post-test to test the validity. In data analysis, researchers use 3 forms of statistical tests to get a clearer measurement result. The mean pre-test score in experimental class was 66.965 and the mean post-test score in experimental class increased to 89.827. The mean pre-test value in control class was 66.137 and the mean post-test value in control class increased to 80.931. From these two values, the experiment class and control class experienced an increase in reading comprehension. The T-Test results contained in the N-Gain test show that the significance value is $0.00 < 0.05$ which indicates that there is a significant difference between the improvement of reading comprehension of students taught using problem-based learning model and students taught not using problem-based learning model. The researcher concludes that H_0 is accepted, which means that students who are taught using problem-based learning model have better reading comprehension than students who are not taught using problem-based learning model.

D. REFERENCE

Abdurrokhman, D., Hamimudin, D., & Rostikawati, Y. (2023). The Use of Genially Assisted Problem Based Learning (PBL) Methods in Class VIII Students' Learning to Write Explanation Texts. *JLER (Journal of Language Education Research)*, *6*(1), 41–63.

Ardini, N. (2021). EFEKTIVITAS METODE EXPLORE ASK READ TELL HARVEST (EARTH) UNTUK MENINGKATKAN KEMAMPUAN MEMBACA PEMAHAMAN BAGI SISWA

BERKESULITAN BELAJAR KELAS IV (CLASSROOM ACTION RESEARCH DI SDN 024/XI KEL. DUSUN BARU). *Inspiratif Pendidikan*, *10*(1), 173–179.

Brassell, D., & Rasinski, T. (2008). *Comprehension that works: Taking students beyond ordinary understanding to deep comprehension*. Teacher Created Materials.

Creswell, J. W. (2008). *Research Desing: Qualitative, Quantitative and Mixed Method Research*. Sage Publications.

Creswell, J. W. (2015). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. pearson.

Hasibuan, F. D., & Ain, S. Q. (2024). Strategi Guru dalam Menumbuhkan Minat Baca pada Siswa Kelas IV di SDN 10 Kecamatan Kandis. *Didaktika: Jurnal Kependidikan*, *13*(2), 1469–1478.

Humairoh, S. A. (2021). *Exploring Students' Difficulties in Writing (A Case Study at the Department of English Education UIN Syarif Hidayatullah Jakarta)*. Jakarta: FITK UIN Syarif Hidayatullah Jakarta.

Mislinawati, M., & Nurmasyitah, N. (2018). KENDALA GURU DALAM MENERAPKAN MODEL-MODEL PEMBELAJARAN BERDASARKAN KURIKULUM 2013 PADA SD NEGERI 62 BANDA ACEH. *Pesona Dasar: Jurnal Pendidikan Dasar Dan Humaniora*, *6*(2).

Prameswara, A. Y. (2023). Upaya Meningkatkan Keaktifan dan hasil Belajar Siswa Kelas 4 SDK Wignya Mandala Melalui Pembelajaran Kooperatif: Indonesia. *Sapa: Jurnal Kateketik Dan Pastoral*, *8*(1), 1–9.

Pratiwi, A. (2021). Communication and international language: An overview on the importance of english international language (EIL) in global communication and broadcasting. *Journal of Islamic Communication & Broadcasting*, *1*(1).

Septia, N. W., Indrawati, I., Juriana, J., & Rudini, R. (2022). An analysis of students' difficulties in reading comprehension. *EEdJ: English Education Journal*, *2*(1), 11–22.

Sharma, C., & Puri, S. R. (2021). The importance of four basic skills in learning English. *The Genesis*, *7*(4), 33–36.

Sugiyono, S. (2010). *Metode penelitian kuantitatif dan kualitatif dan R&D*. Alfabeta Bandung.

Wani, O., Abdul, N. B., & Prabawati, E. (2019). THE USE OF MIND MAPPING TECHNIQUE TO DEVELOP THE STUDENTS SPEAKING ABILITY. *Jurnal Keguruan Dan Ilmu Pendidikan (JKIP)*, *6*(2), 114–133.