JISIP (Jurnal Ilmu Sosial dan Pendidikan)
Vol. 9 No. 4 November 2025
e-ISSN : 2656-6753, p-ISSN: 2598-9944
DOI: *10.36312/jisip.v9i4.9515/http://ejournal.mandalanursa.org/index.php/JISIP/index*

The Effectiveness of the Role of Lead Teachers in Implementing Independent Curriculum-Based Learning to Improve Students' Learning Outcomes and Scientific Literacy Understanding Skills

Ewisahrani[1], Eva Nursa'ban[2] , Anita[3]
[1,3] Pendidikan IPA, STKIP Harapan Bima
[2] Pendidikan Guru Sekolah Dasar, STKIP Harapan Bima

Article Info
Article history:
Received: 1 October 2025
Publish: 1 November 2025

Keywords:
Mobilization Teacher;
Independent Curriculum;
Learning Outcomes;
Understanding;
Scientific Literacy.

Abstract
This study investigates the effectiveness of the Guru Penggerak program in implementing the Independent Curriculum to improve students' learning outcomes and scientific literacy. Conducted at SMPN 1 Wera, Bima Regency, the research applied pre-test, post-test, and N-gain analysis, supported by simple linear regression. The findings indicate that the experimental class achieved a higher average score (82.05%) compared to the control class (61%), with an average N-gain of 0.514 (medium category). Regression analysis showed no significant effect of pre-test on post-test (p = 0.176), suggesting that improvements were mainly driven by the role of Guru Penggerak through innovative teaching strategies. In conclusion, the Guru Penggerak effectively enhanced students' learning outcomes and scientific literacy under the Independent Curriculum.

Corresponding Author:
Ewisahrani
STKIP Harapan Bima
Email: ewisahrani88@gmail.com

1. INTRODUCTION

Indonesian education has continued to experience very rapid development from 1947-2020[1]. These developments are related to materials, learning media, use of technology, and information.[2],[3]In response to the rapid development of education, the Indonesian government continues to strive to create policies by creating a curriculum that is in accordance with the needs and developments of the times, namely by launching the Independent Curriculum.[4].

The Independent Curriculum emphasizes and strives to improve students' talents and interests because students have different abilities.[5]. In the implementation of the Independent Curriculum, teachers are essentially those who accompany students in developing their skills without any limitations and provide teaching by prioritizing the needs of students according to the Pancasila profile.[6].

To maximize the Independent Curriculum, the government launched the Leading Teacher Education (PGP) program. The PGP program aims to improve competency in leading student-centered learning processes. PGP is believed to encourage teachers to develop competencies linked to Pancasila values.[7]. The Moving Teacher is also believed to be an exemplary agent and a beacon of change in Indonesian education. This beacon of change is certainly headed in a positive direction, considering the results.The 2018 PISA test showed that Indonesian students' scientific literacy was low, ranking 70th with an average score of 396, and the 2022 PISA results dropped to 359. The PISA results explain

that current learning is less effective in improving students' learning outcomes and understanding of scientific literacy.[8].

The results of various current studies show that the role of the driving teacher has an impact on Indonesian education. Driving teachers are able to increase students' learning motivation.[1] and become *role* model for other teachers in carrying out the learning process inside and outside the classroom[3]However, there have been no significant results in improving students' learning outcomes and understanding of scientific literacy. Based on this, a more in-depth review of the role of leading teachers in improving students' learning outcomes and understanding of scientific literacy is necessary, as there are concerns that their learning outcomes and understanding of scientific literacy will continue to decline. This also serves as an effort to provide information to the government in recruiting leading teachers to be more selective. If this is ignored, it will certainly affect PISA scores in the next two years.

The presence of a leading teacher at SMPN 1 Wera, Bima Regency, has brought a new dimension to science learning. While this impact has had various implications, further study of its role in improving students' learning outcomes and understanding of scientific literacy is warranted. This is because learning outcomes in scientific literacy are influenced by various factors. These learning outcomes can be influenced by students' activeness and motivation.[9], learning experiences, and learning methods[10]This means that the science learning process will yield positive results if students are actively engaged in meaningful learning activities, creating meaningful learning experiences, and teachers are able to apply effective methods coupled with technology.

Scientific literacy is a person's ability to apply their knowledge to identify questions, construct new knowledge, provide scientific explanations, draw conclusions based on scientific evidence, and the ability to develop reflective thinking patterns so that they are able to participate in addressing issues and ideas related to science.[11][12]Scientific literacy is now a requirement that must be mastered by every individual in the world of work.[13] [14] [15] [16] [17].

The formulation of the research problem is: 1) what factors influence the effectiveness ofThe role of driving teachers in implementing Independent Curriculum-based learning to improve learning outcomes and students' scientific literacy understanding abilities of SMPN 1 Wera Regency?; 2) How is the effectiveness? The role of driving teachers in implementing Independent Curriculum-based learning to improve learning outcomes and students' scientific literacy understanding abilities of SMPN 1 Wera, Bima Regency?

2. RESEARCH METHODS

This research is quantitative. The method used in this study is qualitative-descriptive analysis. This qualitative-descriptive analysis method is used to comprehensively explain the quantitative data and examine in more depth the factors influencing and the effectiveness of the role of the driving teacher in improving student learning outcomes and understanding of scientific literacy.

The population in this study was 5 leading teachers and 230 students in grades VII, VIII, and IX of SMPN 1 Wera, Bima Regency. The sample used was 17 students and 1 leading teacher. The sample determination for this study used the technique random *sampling*.

The data collection instruments in this study used observation, questionnaires, interviews, documentation, and tests. Observations were conducted at the beginning of this study to review the presence of the driving teacher at SMPN 1 Wera and examine the role of the driving teacher in improving students' learning outcomes and understanding of scientific literacy. After the observation stage, interviews, questionnaires, and

documentation were carried out. These activities were carried out to collect data from the driving teacher during teaching in grade VIII of SMPN 1 Wera in improving students' learning outcomes and understanding of scientific literacy. After that, it was continued with tests. Tests were used to measure students' scientific literacy understanding abilities and further test students' science learning outcomes. To ensure that data related to the role of the driving teacher is valid and effective, this research instrument was validated by experts before use to ensure the instrument was valid.[22].

The data analysis technique in this study used simple linear regression analysis. Simple linear regression is a statistical method for analyzing the linear relationship between one independent variable and one dependent variable. Simple linear regression analysis is used to determine the direction and extent of influence of the independent variable on the dependent variable.[23]The purpose of the linear regression test is to determine the relationship between the independent and dependent variables. The independent variable in this study is the role of the driving teacher, and the dependent variable is the learning outcomes and understanding of student science literacy. This means that the use of simple linear regression analysis techniques to determine the effectiveness of the driving teacher's role in improving learning outcomes and understanding of student science literacy.

In addition to simple linear regression analysis, this study also employed N-Gain analysis. This technique was used to comprehensively explain the quantitative data, examine the influencing factors in more depth, and examine the effectiveness of the teacher's role in improving students' learning outcomes and understanding of scientific literacy.

3. RESEARCH RESULTS AND DISCUSSION

This study aims to determine to find out effectiveness the role of driving teachers in implementing Independent Curriculum-based learning to improve learning outcomes and students' scientific literacy understanding abilities. Improving and achieving the role of the driving teacher can be seen from the scores of students' learning outcomes and scientific literacy tests at the beginning and end of learning. The questionnaire on the effectiveness of the role of the driving teacher is also given at the beginning and end of learning, but the results are only seen in terms of achievements because this research was conducted in a relatively short time. not long. The data generated from this study are pretest and posttest data on the ability learning outcomes and science literacy, normalized gain (N-gain) data on students' learning outcomes and science literacy abilities, and data from the driving teacher questionnaire.

3.1.Research result

1.Learning Outcomes and Understanding of Scientific Literacy

The results of the pretest and posttest of students' learning outcomes and scientific literacy comprehension abilities were obtained from the total scores of students. on each test item given to students. Next, the N-gain can be determined fromlearning outcomes andscientific literacy skills. The following is a summary of descriptive statistics from the pretest data, post-test, and N-gain of students' learning outcomes and scientific literacy.

1. Table of Control Class Student Scores (Pre-test) According to Grades and Predicates

Value Range	Predicate	F	∑F	%	∑%

0-49	Very Low Value	3	3	17,64%	17,64%
50-69	Low Value	9	12	52,94%	70,58%
70-79	Medium Value	4	16	23,52%	94,11%
80-100	The highest score	1	17	6%	100%

Information:
F : Number of Students
∑**F**: Cumulative Number of Students
%: Percentage of Number of Students
∑**%**: Cumulative Percentage of Number of Students

Based on the table above, it can be seen that the scientific literacy scores and learning outcomes of students at SMPN 1 Wera, Bima Regency, were 1 student with the highest score, representing 6%. Four students with the average score, representing 1.23,52%. Students who got low marks were 9 with a percentage of52,94%. Students who got very low marks were 3 with a percentage of17,64%. The average value of all students is 61%. This means that the control class is the class*pre-test*still not sufficient to be declared successful in improving scientific literacy and student learning outcomes.

2. Experimental Class Student Score Table (Post-test) According to Grades and Predicates

Value Range	Predicate	F	∑F	%	∑%
0-49	Very Low Value	0	0	0,00%	0,00%
50-69	Low Value	0	0	0,00%	0,00%
70-79	Medium Value	3	3	17,64%	17,64%
80-100	The highest score	14	17	82,35%	100%

Information:
F : Number of Students
∑**F**: Cumulative Number of Students
%: Percentage of Number of Students
∑**%**: Cumulative Percentage of Number of Students

Based on the table above, it can be seen that the scientific literacy scores and learning outcomes of students at SMPN 1 Wera, Bima Regency. The students who received the highest scores were 14 students with a percentage of 82.35%. The students who received medium scores were 3 with a percentage of 17.64%. The students who received low scores were 0 with a percentage of 0.00%. The students who received very low scores were 0 with a percentage of 0.00%. The average score for all students was 82.05%. This means that in the experimental class as a class of *post-test* has met the requirements to be declared successful in improving scientific literacy and student learning outcomes.

3. Mark Pre-Test, Post-Test, dan N-Gain

No	Student Name	Pre-Test	Post-Test	N-Gain (Categories)

1	Muhammad al fatahillah	65	90	0.714 (High)
2	naufah magfiratunnisa	70	80	0.333 (Medium)
3	nur iray putri	45	80	0.636 (Medium)
4	rahmat hidayah	50	75	0.500 (Medium)
5	ikbal	65	80	0.429 (Medium)
6	m jinjul q	70	85	0.500 (Medium)
7	ratu permatasari	55	90	0.778 (High)
8	nina zahirah	75	85	0.400 (Medium)
9	nuradhillah sakinah	80	80	0.000 (Low)
10	siti laras	70	90	0.667 (Medium)
11	filova salwa azadira	45	80	0.636 (Medium)
12	nuratul azhilah	45	75	0.545 (Medium)
13	nurlao la	60	80	0.500 (Medium)
14	siti aliyah s	55	85	0.667 (Medium)
15	miranti	65	80	0.429 (Medium)
16	putri nafiah	60	75	0.375 (Medium)
17	sayfa fadiah	60	85	0.625 (Medium)

Based on the table above, the significant values obtained from the pre-test and post-test valuesThe average N-Gain was 0.514. This indicates that the ability of learning outcomes and scientific literacy is in the Medium category. This means that overall the increase in students' learning outcomes and scientific literacy is quite significant, although it has not yet reached the high category. From the distribution of the N-gain category, it was found that the High Category had 2 students with a percentage of 11.8%, and the Medium Category had 15 students with a percentage of 88.2%. This indicates that the learning intervention was quite effective in improving student understanding.

2. Simple Linear Regression Test

A simple linear regression test is used to predict or test the effect of one independent variable on a dependent variable. A simple linear regression test is used to determine the effectiveness of the driving teacher's role on students' learning outcomes and scientific literacy.

4. Simple Linear Regression Analysis Results

Parameter	Coefficient (B)	Std. Error	t-count	p-value	95% CI
constant	72.1753	7.06	10.224	0.0	[57.128 ; 87.223]
Pre-Test	0.1623	0.114	1.42	0.176	[-0.081 ; 0.406]

Based on Table 4, the following simple linear regression equation is obtained:

$$Y=72.1753+0.1623X$$

The constant is 72,1753shows that if the Pre-Test value is zero, then the Post-Test value is predicted to be 72.18. The Pre-Test regression coefficient is**0,1623**indicates a positive relationship, meaning that every one-point increase in the Pre-Test tends to

increase the Post-Test score by 0.1623 points. However, the results of the significance test show that the Pre-Test regression coefficient is not significant (p = 0.176 > 0.05), with a 95% confidence interval [-0.081; 0.406] that includes zero. The coefficient of determination (R^2) value is0,118shows that only 11.8% of the variation in Post-Test scores can be explained by Pre-Test scores, while the remaining 88.2% is influenced by other factors outside the effectiveness of the driving teacher. Adjusted R^2 is0,060further confirms the low predictive ability of the driving teacher. In addition, the simultaneous test (F-statistic) produced p = 0.176 (> 0.05) so that the overall regression model was not significant.

1. Scatter Plot Image With Regression Line

Based on the scatter plot in Figure 1, there is a positive trend in the regression line, indicating that the higher the pre-test score, the higher the post-test score. This is reinforced by the pre-test regression coefficient value of **0,1623**, which means that every one point increase in the Pre-Test is predicted to increase the Post-Test score by 0.16 points.

However, the significance test results showed that the relationship was not statistically significant (p = 0.176 > 0.05). This means that although there was a positive trend in the direction of the relationship between the pre-test and post-test, the relationship was not significant. In other words, the post-test score was not completely influenced by the pre-test score.

These findings indicate that other factors contribute to determining post-test achievement (scientific literacy and student learning outcomes), such as student motivation and the learning strategies used by the leading teacher. This aligns with constructivist learning theory, which emphasizes that learning experiences and classroom interactions play a greater role in shaping learning outcomes than initial abilities alone.

3.2.Discussion

The results of the study showed a clear difference between the pre-test (control class) and post-test (experimental class) results. In the control class (pre-test), the majority of students were in the low (52.94%) and very low (17.64%) score categories, with an average of only 61%. This indicates that students' initial scientific literacy skills and learning outcomes are still insufficient to be considered successful.

In contrast, in the experimental class (post-test) after implementing the Independent Curriculum-based learning with the role of the Leading Teacher, there was a significant improvement. A total of 82.35% of students scored in the highest score category (80–100), with an average of 82.05%. No students scored in the low or very low categories. This indicates that the implementation of learning by the Leading Teacher has proven effective in improving student learning outcomes.

The N-gain calculation also supports these findings. The average N-gain obtained was 0.514, which is considered moderate. The N-gain distribution shows that 88.2% of students fall into the moderate category and 11.8% into the high category. This means that the learning provided has significantly improved students' scientific literacy understanding and learning outcomes, although it has not yet reached the high category overall.

A simple linear regression analysis shows that the Pre-Test regression coefficient of 0.1623 has a positive direction, meaning that every one-point increase in the Pre-Test tends to increase the Post-Test by 0.16 points. However, the results of the significance test show that this effect is not significant ($p = 0.176 > 0.05$), and the low R^2 value (0.118) indicates that the predictive ability of the Pre-Test to the Post-Test is very limited. In other words, the improvement in students' learning outcomes and scientific literacy is more influenced by factors other than initial scores, especially by the learning interventions carried out by the Teacher Leader..

These results align with constructivist theory, which states that learning is an active and dynamic process, where student learning outcomes are influenced not only by initial abilities but also by the quality of the learning experiences they undergo. The role of the Leading Teacher in the context of the Independent Curriculum is to ensure that learning takes place according to the principles of differentiation, contextualization, and student-centeredness. Teachers function as facilitators, motivators, and innovators in creating meaningful learning experiences, thereby encouraging students to improve their scientific literacy and learning outcomes.

Thus, the findings of this study confirm that the role of the Leading Teacher contributes more than just the pre-test results. Leading Teachers who implement innovative learning strategies are able to create significant changes in student learning outcomes, particularly in improving scientific literacy.

4. CONCLUSION

Based on the research results and analysis, it can be concluded that the results of the study indicate that students' initial abilities as measured by the pre-test did not significantly influence the post-test results ($p = 0.176$). This confirms that other factors, such as innovative learning strategies, learning interventions, student motivation, and the role of the Leading Teacher in implementing the Independent Curriculum approach, are more dominant in improving students' learning outcomes and understanding of scientific literacy. In addition, the role of the Leading Teacher has proven effective in improving student achievement. The increase in the average score from 61% in the control class to 82.05% in the experimental class, as well as the N-Gain value shows that 88.2% of students are in the medium category and 11.8% in the high category,showed significant improvement. This finding confirms that the implementation of Independent Curriculum-based learning by the Leading Teachers contributed positively to the learning outcomes and scientific literacy skills of students at SMPN 1 Wera, Bima Regency.

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5. ACKNOWLEDGEMENT

Thank you to the Directorate of Research and Community Service (DPPM), Ministry of Higher Education, Science, and Technology (Kemendiktisaintek) for providing funding so that this research can be carried out well and smoothly, and can contribute to the improvement of science. The researcher would like to thank all the teachers and the Principal of SMP N 1 Wera, Bima Regency, who have been willing to allow the research to be carried out and accompany the researcher to support the research process. Thank you to STKIP Harapan Bima for supporting the smooth running of the research process. The researcher would also like to express his gratitude to fellow researchers and students who contributed during the research process.

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