Utilization of Locally-Based Reading Resources in Improving Science Concept Comprehension among Grade 9 Learners

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ABSTRACT

The study aimed to assess the effectiveness of locally-based reading resources (LBRR) on the comprehension of science concepts among ninth-grade learners at Odiongan National High School. A quasi-experimental design was employed to achieve this, wherein two groups were tested using a non-equivalent pre- and post-test setup. The sample comprised ninth-grade learners from Odiongan National High School, selected through purposive sampling. Two sections were chosen, with 31 students in each group. The samples were selected due to their similar average grades in Science during the second quarter of the school year 2023-2024. Data collection utilized a teacher-made test, validated and reliability-tested administered to the treatment group (exposed to LBRR) and the control group (exposed to DepEd Learning Material). Statistical analysis involved using mean and standard deviation, with a one-way analysis of covariance (ANCOVA) employed to assess the effect of LBRR as an intervention. The findings indicated that post-test results demonstrated a notable difference, with the treatment group showing a higher mean score. The effect size was found to be medium, further supporting the significance of the results. The study concluded that LBRR effectively enhances science concept comprehension among ninth-grade learners at Odiongan National High School based on these outcomes. This conclusion was drawn from the observed improvement in post-test scores following the implementation of LBRR.

Keywords: *literacy in science, scientific literacy, locally-based reading resources (LBRR), Deped learning material, science concept comprehension, pre-and post-test*

INTRODUCTION

Reading comprehension and scientific literacy are crucial to academic success, particularly in subjects like Science. Enhancing learners' literacy in Science facilitates the development of their scientific comprehension and inquiry abilities (State Government of Victoria, Australia, 2019).

The Department of Education (DepEd) remains committed to the continuous efforts of improving learners' academic achievements, addressing the challenges of low reading proficiency levels as identified in both national and international large-scale assessments.

A study by Calleja et al. (2023) used machine learning to identify 15 factors predicting poor science literacy among Filipino students in PISA 2018, including metacognitive reading strategies, classroom experiences, motivation, and family background, highlighting the need for targeted interventions.

The Department of Education emphasizes enhancing reading proficiency and comprehension through the DepEd Memorandum No. 173 of 2019 while Republic Act 10533 promotes a flexible, locally-adapted curriculum and the use of locally produced teaching materials.

The researchers acknowledge the necessity of implementing interventions particularly in strengthening literacy skills including utilizing locally-based reading resources (LBRR) to improve science concept comprehension among ninth-grade learners at Odiongan National High School.

Integrating literature and storytelling in science education has been shown to captivate students' interest, provide context for the material, and demonstrate the genuine application of storytelling in science, making

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the subject matter more relevant (MacNeil et al., 2017; Schwartzbach-Kang & Kang, 2018). Additionally, research indicates that embedding scientific content in a narrative format can enhance comprehension, retention, and personal connections to the content (Arya & Maul, 2012, as cited in MacNeil et al., 2017).

The effectiveness of localized reading materials in improving comprehension has been highlighted in various studies. Gallano (2019) found that using reading materials tailored to local contexts ignited students' enthusiasm for reading and facilitated better comprehension. Similarly, Angeles et al. (2022) reported that localized reading resources significantly improved students' reading skills, supporting their use for both beginning and struggling readers.

Schema theory explains that readers use their prior knowledge to comprehend and derive meaning from text (Rumelhart, 1980; An, 2013). This theory emphasizes the importance of readers' background knowledge and experiences in engaging with and understanding the text, forming the theoretical foundation for the development of LBRR in this study.

The study aims to determine the effectiveness of LBRR in improving science concept comprehension among grade 9 learners at Odiongan National High School. Specifically, the objectives are:

1. To determine the pre-test mean scores in Science of grade 9 learners exposed to LBRR and DepEd Learners Material (control).
2. To determine the post-test mean scores in Science of grade 9 learners exposed to LBRR and DepEd Learners Material (control).
3. To determine the significant difference between the post-test mean scores of grade 9 learners exposed to LBRR and the control group, using pre-test scores as covariates.

The study's conceptual framework follows the Input-Process-Output (IPO) paradigm, where LBRR is developed (Input) based on schema theory principles, incorporating local contexts and familiar elements. The implementation phase (Process) involves using LBRR for the treatment group and DepEd Learning Materials for the control group, with pre- and post-tests administered. Statistical analysis (Output) is then employed to evaluate the intervention's effectiveness by comparing the groups' post-test scores.

METHODOLOGY

The study employed a quasi-experimental design to assess the effectiveness of locally-based reading materials on students' science comprehension. Here is a summary of the methodology:

The methodology involved two groups:

1. Treatment group: This group was exposed to locally-based reading materials that integrate science concepts into the context of students' experiences.
2. Control group: This group followed the standard curriculum without tailored reading materials.

To test the effectiveness of the locally-based reading materials, the researchers looked at the differences between the two groups' performances, controlling for prior knowledge through the analysis of covariance.

The analysis of covariance allows the researchers to examine the relationship between the reading materials and comprehension while accounting for students' prior knowledge. This ensures that any difference in comprehension between the two groups is due to the reading materials rather than the students' prior knowledge.

By utilizing the analysis of covariance, the researchers can determine if tailoring the content to students' experiences does improve comprehension. Analyzing the differences between the two groups, while controlling for prior knowledge, allows researchers to assess the true impact of tailoring reading materials to students' experiences.

FINDINGS AND DISCUSSION

The pre-test results provide insights into the learners' baseline knowledge and understanding of the science concepts related to projectile motion, impulse, and momentum before the intervention. As presented in Table 1, the descriptive statistics of the pre-test mean scores for the LBRR and control groups are shown.

The pre-test results indicate that learners in both groups had limited prior knowledge of these science concepts, which is common in ninth-grade students who have yet to be exposed to these topics in depth. The low mean pre-test score of 7.51 (SD = 2.39) across both groups suggests that the learners needed a stronger foundation in these concepts before the intervention.

The more significant standard deviation in the control group's pre-test scores (SD = 2.78) compared to the LBRR group (SD = 1.98) implies more significant variability in prior knowledge levels within the control group. This variability could stem from differences in individual learning experiences, exposure to related concepts, or varying levels of engagement with science subjects.

After the intervention, the post-test results revealed a notable difference in mean scores between the LBRR group and the control group, as shown in
The significant difference in mean post-test scores between the LBRR group (M = 14.57, SD = 4.60) and the control group (M = 12.17, SD = 3.70) suggests that the locally-based reading resources played a crucial role in enhancing learners' comprehension of science

Table 1. Descriptive Statistics of Pre-test Mean Scores of Grade 9 Learners Exposed to LBRR and DepEd Learning Material in Science (Control)

Group	Mean	SD	N
LBRR	7.400	1.9758	30
Control	7.6207	2.7828	29
Total	7.5085	2.3880	59

Table 2. Descriptive Statistics of Post-test Mean Scores of Grade 9 Learners Exposed to LBRR and DepEd Learning Material in Science (Control)

Group	Mean	SD	N
LBRR	14.567	4.600	30
Control	12.172	3.704	29
Total	13.390	4.319	59

concepts. The higher mean post-test score for the LBRR group indicates that incorporating locally based reading resources can significantly enhance students' understanding of complex science concepts. This finding underscores the importance of developing and using localized educational materials that resonate with students' backgrounds and experiences.

However, the more significant standard deviation in the LBRR group's post-test scores suggests that while the intervention was effective for many learners, others may require additional support or alternative instructional strategies to achieve similar improvements. The variability in post-test scores could be attributed to factors such as individual learning styles, engagement levels, and the effectiveness of LBRR in addressing the diverse needs of different types of learners.

Significance and Effect Size To determine the statistical significance of the difference between the post-test mean scores of the LBRR group and the control group while controlling for pre-test scores as covariates, an analysis of covariance (ANCOVA) was conducted. The results of the ANCOVA are presented in Table 3.

The ANCOVA results reveal a statistically significant difference between the post-test mean scores of the LBRR group and the control group ($F_{(1, 56)}$ = 5.173, p = 0.027), even after controlling for pre-test scores as covariates. This finding provides strong evidence for the effectiveness of the LBRR intervention in improving learners' comprehension of science

concepts related to projectile motion, impulse, and momentum.

Furthermore, the partial eta squared value of 0.085 indicates a medium effect size, suggesting that the LBRR practically impacted learners' comprehension. After accounting for pre-test scores, approximately 8.5% of the variance in post-test scores can be attributed to the difference between the LBRR and control groups. This effect size supports the practical significance of the LBRR intervention in enhancing learners' performance in science.

Theoretical Framework Integration

The study's results align with and support schema theory by demonstrating that students' comprehension improves when new information is connected to their existing knowledge and experiences, facilitated by the localized context of the LBRR. By incorporating familiar elements and local contexts, the LBRR provided a scaffold for learners to build upon their prior knowledge, enhancing their ability to comprehend and engage with the scientific concepts presented.

The pre-test results indicate that learners initially had limited prior knowledge of the science concepts, as evidenced by the low mean scores. However, the post-test results suggest that the LBRR effectively tapped into learners' existing schema by presenting the scientific concepts within a familiar, local context. This connection facilitated the integration of new information with learners' prior knowledge, leading to improved comprehension and higher post-test scores in the LBRR group compared to the control group.

Practical Implications

The study's findings have practical implications for educators and policymakers in enhancing science education and promoting scientific literacy among learners.

For educators, the results underscore the importance of integrating localized reading materials into their curriculum, particularly in subjects that involve abstract or complex concepts. By leveraging learners' prior knowledge and experiences through locally relevant contexts, educators can create more engaging and relatable learning experiences, potentially

Table 3. ANCOVA Results for Post-test Scores with Pre-test Scores as Covariates

Source	SS	df	MS	F	p	Partial η^2
Corrected Model	116.114[a]	2	58.057	3.366	.042	.107
Intercept	649.497	1	649.497	37.655	<.001	.402
Pretest	31.584	1	89.225	1.831	.181	.032
Posttest	89.225	1	17.249	5.173	.027	.085
Error	965.920	56				
Total	11660.000	59				
Corrected Total	1082.034	58				

Note. R^2 = .107 (Adjusted R^2 = .075)

improving learners' comprehension and academic performance.

Educators should consider developing or adapting reading materials that incorporate familiar settings, characters, and situations that resonate with their learners' backgrounds. This localization can be achieved through collaborative efforts with subject matter experts, writers, and local community members.

For policymakers, the study's findings highlight the need to support developing and implementing localized educational materials. Policymakers could allocate funding and resources for creating such materials and provide professional development opportunities for educators to integrate localized resources into their instructional practices effectively.

Additionally, policymakers might consider establishing guidelines or frameworks that encourage the integration of local contexts and culturally relevant elements into educational materials, promoting inclusive and equitable learning experiences for learners from diverse backgrounds.

CONCLUSION AND RECOMMENDATIONS

The study demonstrates the potential of locally-based reading resources in enhancing science concept comprehension among ninth-grade learners at Odiongan National High School. By leveraging learners' prior knowledge and experiences through localized contexts, the LBRR intervention facilitated an improved understanding of complex scientific concepts related to projectile motion, impulse, and momentum.

The statistically significant difference in post-test scores between the LBRR and the control group, even after controlling for pre-test scores, provides quantitative solid evidence for the effectiveness of the intervention. The medium effect size further supports the practical significance of the LBRR in enhancing learners' performance in science highlighting the potential of localized materials to foster engagement and comprehension by connecting abstract concepts to learners' lived experiences and prior knowledge. This alignment with schema theory underscores the theoretical foundation of the LBRR approach.

While the study demonstrates the effectiveness of LBRR, the variability in post-test scores within the LBRR group suggests that a multi-faceted approach combining localized materials with other instructional strategies may be necessary to cater effectively to diverse learning needs.

The study's findings have practical implications for educators and policymakers, emphasizing the importance of integrating localized reading materials into curricula and supporting the development and implementation of such resources.

Future research could further validate and expand upon the findings by examining the effectiveness of LBRR across different educational settings and subject areas and in combination with other interventions. Additionally, longitudinal studies and larger sample sizes could enhance the generalizability and understanding of LBRR's long-term impact.

The study's findings underscore the impact of locally-based reading resources (LBRR) on enhancing science concept comprehension among ninth-grade learners. Given the promising results, it is imperative to implement practical and actionable recommendations to maximize the benefits of LBRR. These recommendations are designed to support educators, policymakers, and researchers in their efforts to improve science education through the integration of localized and culturally relevant materials. By focusing on the development, implementation, and continuous assessment of LBRR, we can ensure that students receive engaging, relatable, and practical instruction that bridges the gap between abstract scientific concepts and their lived experiences. The following matrix outlines targeted actions and quantifiable outcomes for each stakeholder group aimed at fostering a more inclusive and effective educational environment.

AUTHORS' CONTRIBUTIONS

I declare that I am responsible for conceptualizing the research, designing the methodology, conducting the experiments, analyzing the data, and writing the manuscript.

Co-author, Dr. John Philip I. Ramos, provided all the technical assistance all throughout the thesis writing.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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