

Effectiveness of the Lumi Application in Improving Reading Performance of the Learners

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Abstract

The study aimed to examine the effectiveness of Lumi Application as a digitized interactive material in improving Reading performance of the multigrade learners at Dangla Elementary School, transitioning from paper-based reading. Specifically, it sought to determine the reading levels of the learners before and after the intervention and identify its significant difference between two stages. The research employed quasi-experimental one-group design. The study was conducted at Dangla Elementary School, a multigrade school in Kabugao District 2, Schools Division of Apayao. The intervention took place during the entire fourth quarter of the School Year 2025-2026, consisting of 12-week reading session from January to March 2026. The study involved 17 multigrade learners from Grades IV to VI. Standardized tools from the Philippine Informal Reading Inventory (Phil-IRI) were used to measure reading fluency and comprehension through pretests and post-tests. Following a paper-based pretest, learners participated in daily 30-minute remedial sessions using the Lumi Application, which provided offline interactive content on laptops, tablets, and mobile phones. Data was analyzed using mean, standard deviation, and paired-samples t-tests to determine significant differences. Pretest findings revealed a critical reading gap with 0% independent level learners and a high concentration at the frustration level, particularly in Grade VI (100%). Post-test results showed the emergence of independent readers in Grade IV (28.57%) and Grade V (14.29%), and a decrease in frustration levels to 42.86% in Grade IV, 28.57% in Grade V, and 66.67% in Grade VI. Despite these observable improvements, t-test results (Grade IV $P=0.078$, Grade V $P=0.172$, Grade VI $P=0.423$) revealed no statistically significant differences, leading to the acceptance of the null hypothesis. However, Cohen's d showed a large effect for Grade IV ($d \approx 0.80$) and moderate effects for Grades V and VI ($d \approx 0.58-0.59$), indicating a meaningful practical impact. The use of the Lumi application led to observable improvements in learners' reading performance. However, the t-test results revealed no statistically significant differences across grade levels, suggesting that the improvement was not strong enough to be considered statistically significant. Overall, while the Lumi application shows potential as a supportive tool in enhancing reading skills, further implementation with a larger sample size or longer duration may be necessary to establish its significant impact.

Keywords: Lumi Application; Reading Performance; Phil-IRI; Digitized Interactive Materials; Multigrade; SAMR

1. Introduction

Reading is widely recognized as a fundamental macro skill that underpins learning across all disciplines and supports lifelong personal development. It enables learners to access, interpret, and engage with information, making it essential for academic success and informed participation in society. In the context of rapidly evolving educational environments, strengthening reading proficiency remains a critical priority for both educators and institutions.

Reading is a macro skill that serves as the foundation for learning and personal development (Stefanova, 2025). Reading is one of the most crucial core skills that learners should learn because, without it, it is difficult to become proficient in other subject areas. If reading competence is not well-founded, the teaching and learning process will be challenging for

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both teachers and pupils. Reading skill impacts academic performance of the students (Adao et al., 2023). The ability to read and comprehend are essential skills for students to survive and understand how society works because most information is presented through text (Suson et al., 2020).

However, the latest Programme for International Student Assessment (PISA) 2022 data shows that Philippines ranked in the bottom four in the creative thinking test and placed 76th in Mathematics, 77th in Reading, and 79th in Science among 81 countries, with scores far below the baseline proficiency (Anoba, 2025). Literacy remains significant challenge in the Philippines (Castor and Buenviaje, 2025).

At the national level, the Philippine Informal Reading Inventory (Phil-IRI) Result for Elementary Grades 4 to 6 in the Beginning of School Year (BoSY) 2025-2026 shows that there are 32.93% learners who fall under the Frustration, 39.3% for Instructional and 27.77% are under Independent Levels in Reading English (Department of Education, 2025).

To address these issues, the Department of Education (DepEd) has initiated curriculum reform like the MATATAG Curriculum or Revised K-12 Curriculum through DepEd Memorandum No. 054, s. 2023 (DepEd 2023), to improve the quality of basic education. In addition to this, the DepEd Memorandum No. 064, s. 2025 or also known as the Academic Recovery and Accessible Learning Program (ARAL) for Reading and The Early Literacy and Numeracy Program under DepEd Order No. 12 s. 2015 aims to provide timely and effective support to learners below expected proficiency levels in reading.

To bridge the gap, there is a necessary adaptation to the integration of Information and Communication Technology (ICT) in teaching to equip learners, to acquire and develop 21st-century skills, particularly Digital Literacy and Information, Media, and Technology Skills because individuals live in a digital world overwhelmed by technology where screen-based reading replaces paper-based reading (DepEd 2023).

The Integration of ICT is now essential for equipping learners with 21st -century skills. This adaptation is evident in the DepEd-Cordillera Administrative Region (CAR), where the Regional Achievement Test (RAT) for Grade 6 and Grade 10 was administered March 9-13, 2026, using CAR-Learning Management System. RAT is an online assessment program that requires internet connectivity, laptop, mobile phone or tablet for each learner to properly administer the test. It is a competency-based test that assesses the 21st Century Skills using the field of English, Filipino, Araling Panlipunan, Mathematics and Science (DepEd, 2020).

Adapting ICT is essential for teachers in teaching and learning process in a way that helps learners to understand and comprehend. Central to this adaptation is the use of LUMI Application as an interactive tool that offers over 60 types of interactive content and facilitates the sharing of interactive multimedia as accessible online or offline HTML files, H5P packages (Oksavional et al., 2023). Integrating LUMI Application into reading and learning process serves as a primary tool for an interactive digital learning and immediate feedback to learners using an instant scoring-system, fostering a learner-centered atmosphere. It is also a tool that functions as a real-time data-collection for the teacher.

The practical application of LUMI has been observed in various educational settings. For instance, Lambayong National High School utilized SIMULE to improve student performance, noting that the interactive nature of the tool helped bridge procedural gaps (Balazo, 2024).

Several studies have examined the use of digital and interactive tools in enhancing reading skills among elementary pupils. A study among Grade 6 pupils at San Andres Elementary School during the 2024–2025 academic year revealed that interactive multimedia strategies improved reading comprehension. The study concluded that interactive storytelling is an effective method for enhancing literacy through multimedia engagement and recommended its integration into regular teaching practices to strengthen comprehension skills (Azores and Velasco, 2025).

Furthermore, an investigation of the READTECH 1.0 reading application among struggling elementary readers in the Philippines revealed that technology-based reading applications improved reading literacy levels of elementary pupils, with higher post test scores compared to pretest results. This highlights the positive potential of educational apps in reading interventions (Quimsing and Otega-Dela Cruz, 2024).

Moreover, a quantitative study compared classes taught with Lumi Interactive media versus traditional PowerPoint instruction and found that students taught with Lumi performed significantly better in reading comprehension. The study suggests the effectiveness of interactive digital platforms in improving reading performance (Ginting and Tarigan, 2024; Driggs and Doran, 2024). Researchers also indicated in their study that learning media like LUMI positively

impacts language learning, learners' engagement or motivation and comprehension (Yulia et al., 2025; Fajardo and Apellido, 2025).

To succeed in effective ICT Integration, the students must be guided to engage with the features of the technology and instruction must be adapted to teaching activities (Kesson, 2020). There should be intensive teacher training on effectively integrating technology for teachers to have more experience in the use of digital tools and to select and develop appropriate materials because these crucial alternative ways are more on information based (Aryfien et al., 2025; Aşıkcan, 2023). Furthermore, adequate school facilities, such supporting gadgets, are necessary for successful implementation.

Despite potential of such tools to cater diverse learning needs, research on the effectiveness of Lumi Application in education is only limited in Kabugao District 2, Schools Division of Apayao. Given these probable causes, the teacher-researcher was motivated to conduct this educational research to improve the reading skills of Dangla Elementary School Learners using Digitized Interactive Materials specifically Lumi Application. The study seeks to employ a mobile-offline and friendly technological tool mentioned above as a practical substitute for traditional reading practices of the school. Dangla Elementary School is a last mile-school and a multigrade school with internet connectivity using Starlink and continuously cope and embrace trends in teaching while utilizing school facilities such as television and other devices for educational purposes.

This study aimed to determine the effectiveness of the Lumi application as a digitized interactive material in improving the reading performance of pupils at Dangla Elementary School. Specifically, it sought to determine the level of reading performance before and after the implementation of the Lumi application and identify its significant difference between the learners' reading performance before and after the use of the Lumi application.

2. Methodology

2.1. Research Design

This study made use of a quasi-experimental using a one-group research design. It focused on the use of Lumi Application as a digitized interactive material in improving the reading performance of the learners at Dangla Elementary School for S.Y. 2025-2026.

2.2. Locale of the Study

The study was conducted at Dangla Elementary School. The school is a last-mile school in Kabugao District 2 and a multigrade elementary school that is located in Dangla, Kumao, Kabugao, Apayao. According to the Municipal Record, the distance is 17 kilometers starting from the Municipal Town Hall, Poblacion, Kabugao, Apayao.

2.3. Respondents of the Study

The respondents of the study are the multigrade learners from Grades IV to VI enrolled at Dangla Elementary School for the school year, 2025–2026; they represent the actual demographic reality of the school. Specifically, there were seven learners from Grade IV, seven from Grade V, and three from Grade VI, making a total of 17 respondents.

2.4. Research Instrument

The researcher made use of the standardized test based on the Philippine Reading Inventory (Phil-IRI) utilizing reading passages for Grade IV, Grade V and Grade VI. It covered the pretest and posttest reading fluency and comprehension questions per grade level. For the pretest, Grade IV students were given the passages Get Up, Jacky! and Waiting for the Peddler, each with six items totaling twelve points. Grade V students read Frog's Lunch and The Cow and the Carabao, each with seven items totaling fourteen points, while Grade VI students were assessed using Yawning and Laughter, each with eight items totaling sixteen points. In the posttest, Grade IV students were assigned The Tricycle Man and Cat and Mouse with the same structure of six items and twelve points each. Grade V students read The Snail With the Biggest House and The Great Runner, both with seven items and fourteen points, and Grade VI students completed Rocks from Outer Space and Beetles, each with eight items and sixteen points. These instruments ensured consistency in evaluating reading performance across grade levels.

2.5. Statistical Analysis

Mean, and standard deviation was computed on the performance of the pupils in the Pre-Test and Post-Test using the scoring sheet from Phil -IRI. Reading levels were interpreted according to Phil-IRI standards: Independent (97–100%

word reading, 80–100% comprehension), Instructional (90–96% word reading, 59–79% comprehension), and Frustration (below 89% word reading, below 58% comprehension). These computations provided a comprehensive evaluation of learners' reading accuracy, comprehension, and fluency. T-test was employed in the significant difference of performance in reading before and after the reading intervention.

3. Results and Discussion

Table 1 Reading Performance of the Grade IV pupils in Dangle Elementary School before the implementation of the Lumi Application

Learner	Oral			Silent			Reading Level (Oral+ Silent)
	Score	Miscues	Reading Level	Score	Time (seconds)	Reading Level	
1	4	3	INS	5	66	INS	INSTRUCTIONAL
2	2	20	F	2	375	F	FRUSTRATION
3	4	4	INS	5	64	INS	INSTRUCTIONAL
4	2	17	F	4	339	F	FRUSTRATION
5	3	10	F	5	54	INS	FRUSTRATION
6	1	21	F	2	345	F	FRUSTRATION
7	4	3	INS	5	41	INS	INSTRUCTIONAL

As shown in Table 1, a striking pattern across the pre-test tables is that no learner from Grades IV–VI reached the independent level, and a large proportion, especially in Grade VI (100%), remained at the frustration level.

This trend suggests a systemic reading gap rather than an isolated classroom issue. Learners appear to have progressed through grade levels without mastering foundational literacy skills. According to UNESCO (2022) such patterns reflect “learning poverty,” where learners can read text but cannot comprehend meaning appropriate for their grade level. This is particularly evident in your Grade VI data, where learners struggle with both fluency and comprehension despite being in upper elementary.

From a developmental perspective, Linnea Ehri (2020) explains that failure to achieve automatic word recognition in early grades results in cumulative deficits, making higher-level reading tasks significantly more difficult.

Table 2 Reading Performance of the Grade V pupils in Dangla Elementary School before the implementation of the Lumi Application

Learner	Oral			Silent			Reading Level (Oral+ Silent)
	Score	Miscues	Reading Level	Score	Time (seconds)	Reading Level	
1	5	6	INS	6	58	INS	INSTRUCTIONAL
2	5	19	F	5	140	F	FRUSTRATION
3	5	5	INS	6	41	INS	INSTRUCTIONAL
4	2	20	F	2	179	F	FRUSTRATION
5	5	6	INS	6	49	INS	INSTRUCTIONAL
6	5	9	F	6	60	INS	FRUSTRATION
7	5	5	INS	6	40	INS	INSTRUCTIONAL

As shown in Table 2, the pre-test reading performance of Grade V pupils shows that most of the learners (57.14%) are at the instructional level, while a substantial proportion (42.86%) remain at the frustration level, with no learners reaching the independent level, as indicated in. This distribution suggests that although some learners demonstrate emerging reading competence, they still require teacher guidance to comprehend grade-level texts effectively. Learners

at the instructional level are generally capable of decoding and understanding text with support, yet their skills are not sufficiently developed for independent reading.

The presence of a considerable percentage of learners at the frustration level further indicates that a significant group of pupils' experience difficulty in both decoding and comprehension.

Moreover, the absence of learners at the independent level indicates that none of the Grade V pupils have achieved the expected level of reading proficiency for their grade. Independent readers are characterized by their ability to read accurately, fluently, and with full comprehension without assistance. The lack of such readers suggests that reading instruction prior to the intervention may not have sufficiently developed learners' automaticity and comprehension skills. According to Hattie (2023), variability in student performance often reflects differences in instructional effectiveness and learner readiness, highlighting the need for targeted and differentiated teaching approaches.

The result indicated that Grade V pupils are at a transitional stage of reading development, where some learners are progressing toward proficiency while others continue to struggle with foundational skills. The findings underscore the need for structured and sustained reading interventions that address both decoding and comprehension to move learners from instructional to independent reading levels.

Table 3 Reading Performance of the Grade VI pupils in Dangla Elementary School before the implementation of the Lumi Application

Learner	Oral			Silent			Reading Level (Oral+Silent)
	Score	Miscues	Reading Level	Score	Time (seconds)	Reading Level	
1	4	16	F	5	201	F	FRUSTRATION
2	5	10	INS	5	90	F	FRUSTRATION
3	3	20	F	2	303	F	FRUSTRATION

As can be gleaned from Table 3, the pre-test reading performance of Grade VI pupils, showing that all learners (100%) are classified under the frustration level, with none reaching the instructional or independent levels. This finding indicates a critical level of reading deficiency, particularly alarming given that learners at this stage are expected to demonstrate independent reading proficiency. The absence of learners at higher proficiency levels suggests that they are unable to decode text accurately, read fluently, and comprehend meaning effectively.

From a Philippine context, this finding strongly aligns with the results of the Department of Education (2018) through its Philippine Informal Reading Inventory (Phil-IRI), which consistently reports that a significant number of learners in upper elementary levels fall under the frustration level, indicating inability to read grade-level texts independently. This national assessment confirms that reading difficulties observed in Grade VI pupils are not isolated but reflect a broader systemic issue in literacy development.

Furthermore, learners who remain at the frustration level in upper grades are at high risk of academic failure, as reading becomes the primary medium for learning across all subject areas.

The results highlight the urgent need for intensive, structured, and sustained reading interventions tailored to older learners. The integration of both international and Philippine data underscores that the observed reading difficulties are part of a wider literacy challenge, requiring systematic and evidence-based instructional responses.

Table 4 Mean Reading Performance of the pupils in Dangla Elementary School before the implementation of the Lumi Application

GRADE LEVEL	f	P	READING LEVEL
IV	0	0	INDEPENDENT
	3	42.86	INSTRUCTIONAL
	4	57.14	FRUSTRATION

V	0	0	INDEPENDENT
	4	57.14	INSTRUCTIONAL
	3	42.86	FRUSTRATION
VI	0	0	INDEPENDENT
	0	0	INSTRUCTIONAL
	3	100	FRUSTRATION

As shown in table 4, the summary of pre-test results reveals a complete absence of independent readers across all grade levels, with most learners concentrated in the frustration and instructional levels. This indicates that learners, regardless of grade level, have not yet achieved the expected level of reading autonomy

This pattern reflects a system-wide literacy gap, where reading difficulties are not isolated but cumulative. The fact that even Grade VI learners are entirely at the frustration level suggests that foundational reading deficits were not remediated in earlier grades, leading to compounded difficulties over time. According to the OECD (2021), learners below baseline proficiency struggle with even basic comprehension tasks, such as identifying main ideas or making simple connections within a text.

Furthermore, the findings support the concept of learning poverty, as defined by the World Bank (2022), where learners are unable to read and understand age-appropriate texts. This suggests that without intervention, these learners are likely to face continued academic challenges across all subject areas. In the local setting, this condition is often associated with “struggling readers” identified through DepEd assessments, who require immediate and targeted interventions to prevent further learning loss.

Table 5 Reading Performance of the Grade IV pupils in Dangla Elementary School after the implementation of the Lumi Application

Learner	Oral			Silent			Reading Level (Oral+ Silent)
	Score	Miscues	Reading Level	Score	Time (seconds)	Reading Level	
1	6	3	IND	5	66	INS	INSTRUCTIONAL
2	3	12	F	2	210	F	FRUSTRATION
3	6	4	IND	6	61	IND	INDEPENDENT
4	4	10	F	2	201	F	FRUSTRATION
5	5	6	IND	5	53	IND	INSTRUCTIONAL
6	2	16	F	2	232	INS	FRUSTRATION
7	6	3	IND	6	42	IND	INDEPENDENT

The post-test reading performance of Grade IV pupils showing a noticeable improvement compared to the pre-test results, as evidenced by the emergence of learners in the independent level and an increase in those classified under the instructional level, as reflected in Table 5. Several learners who were previously at the frustration level progressed to higher reading categories, indicating gains in decoding accuracy, fluency, and comprehension. This improvement suggests that the intervention contributed to the development of foundational reading skills, particularly in word recognition and basic understanding of text. A study indicates that the acquisition of proper decoding and fluency skills enables learners to better grasp the meaning of the text and participate more effectively in reading activities (Goodwin et al., 2020).

Despite these gains, a portion of learners remains at the frustration level, indicating that the intervention did not uniformly benefit all pupils. This variation in progress reflects differences in learners' initial abilities and responsiveness to instruction.

Furthermore, although the increase in instructional-level learners indicates progress, many pupils may still be below expected proficiency levels. The results demonstrate that the intervention had a positive yet partial effect on learners' reading performance. While movement from frustration to instructional and independent levels indicates meaningful progress, the persistence of struggling readers highlights the need for continuous, differentiated, and sustained reading instruction to ensure that all learners achieve independent reading proficiency.

Table 6 Reading Performance of the Grade V pupils in Dangla Elementary School after the implementation of the Lumi Application

Learner	Oral			Silent			Reading Level (Oral+ Silent)
	Score	Miscues	Reading Level	Score	Time (seconds)	Reading Level	
1	5	9	INS	6	57	INS	INSTRUCTIONAL
2	5	15	INS	7	138	INS	INSTRUCTIONAL
3	6	2	IND	6	40	INS	INSTRUCTIONAL
4	4	20	F	5	180	F	FRUSTRATION
5	5	4	INS	6	48	INS	INSTRUCTIONAL
6	5	24	F	6	58	INS	FRUSTRATION
7	7	4	IND	7	39	IND	INDEPENDENT

As shown in Table 6, the post-test reading performance of Grade V pupils, showing a general improvement compared to the pre-test results, as evidenced by the emergence of learners in the independent level, an increase in those classified under the instructional level, and a reduction in the number of learners at the frustration level, as reflected in . This shift indicates that the intervention contributed to enhancing learners' reading abilities, particularly in terms of decoding accuracy, fluency, and comprehension. Learners who progressed to instructional and independent levels demonstrate improved ability to read with greater accuracy and understanding, suggesting that foundational reading skills have begun to stabilize. Research shows that as learners develop stronger decoding and fluency skills; they are better able to comprehend texts and engage in meaningful reading activities (Catts, 2021).

The increase in instructional-level learners indicates that more pupils are now capable of reading with guidance, reflecting a transition toward independent reading. However, the presence of some learners who remain at the frustration level suggests that the improvement was not uniform among all participants. This variation highlights the influence of individual differences in reading ability, prior knowledge, and responsiveness to instruction. According to Douglas Fuchs and Fuchs (2021), learners with persistent reading difficulties often require more intensive and individualized interventions to achieve significant progress, as standard instructional approaches may not sufficiently address their needs.

Furthermore, although the reduction in frustration-level learners indicates progress, many pupils may still be in the transitional stage of reading development and have not yet fully achieved independent reading proficiency. This implies that improvement is evident but not yet complete, as learners continue to develop higher-level comprehension skills.

The results imply that the intervention was moderately effective in improving the reading performance of Grade V pupils. While movement from frustration to instructional and independent levels demonstrates meaningful progress, the persistence of some struggling learners highlights the need for continuous, differentiated, and sustained instructional support to ensure that all pupils achieve independent reading competence.

Table 7 Reading Performance of the Grade VI pupils in Dangla Elementary School after the implementation of the Lumi Application

Learner	Oral			Silent			Reading Level (Oral+Silent)
	Score	Miscues	Reading Level	Score	Time (seconds)	Reading Level	
1	6	15	F	7	201	INS	FRUSTRATION
2	6	8	INS	6	114	INS	INSTRUCTIONAL
3	4	19	F	5	215	F	FRUSTRATION

The post-test reading performance of Grade VI pupils, showing slight improvement compared to the pre-test results, as evidenced by the movement of some learners from the frustration level to the instructional level, while the majority remain at the frustration level, as reflected in Table 7. This indicates that although the intervention contributed to some progress in decoding and comprehension, the overall reading performance of learners remains low. The limited improvement suggests that learners continue to experience difficulty in achieving reading automaticity and independent comprehension, particularly when dealing with more complex and content-based texts expected at this grade level.

The persistence of frustration-level readers indicates that the intervention was not sufficient to address the deeper and more entrenched reading difficulties of Grade VI pupils. Learners at this stage often require more intensive and individualized instruction, as their reading challenges are cumulative and have developed over time due to gaps in earlier literacy learning. Studies show that older struggling readers benefit from structured interventions that explicitly target comprehension, vocabulary, and background knowledge, as these are critical for understanding complex texts. Reading proficiency at this stage depends on the integration of linguistic comprehension and word recognition skills, and learners who have deficits in either area tend to exhibit persistent reading difficulties (Snowling and Hulme 2021).

Moreover, the reading result in the post test suggests that while some learners demonstrated progress, the majority remain at the frustration level, highlighting the need for more intensive, sustained, and differentiated instructional strategies. These findings emphasize that late-stage reading intervention is more challenging and requires stronger instructional support to help learners achieve independent reading proficiency.

Table 8 Mean Reading Performance of the pupils in Dangla Elementary School after the implementation of the Lumi Application

GRADE LEVEL	f	P	READING LEVEL
IV	2	28.57	INDEPENDENT
	2	28.57	INSTRUCTIONAL
	3	42.86	FRUSTRATION
V	1	14.29	INDEPENDENT
	4	57.14	INSTRUCTIONAL
	2	28.57	FRUSTRATION
VI	0	0	INDEPENDENT
	1	33.33	INSTRUCTIONAL
	2	66.67	FRUSTRATION

As shown in table 8, the summary of the post test result reveals a diverse distribution of reading levels across Grades IV, V, and VI. In Grade IV, majority of the pupils (48.86%) are classified at a Frustration level, while the remaining pupils are evenly distributed between Instructional and Independent levels at 28.57 each. Grade V shows a stronger shift towards Independent which accounts 14.29, and Instructional level with 57.14 of the group. Though a significant 28.57 remains at the Frustration level. Conversely, Grade VI exhibits the higher critical need with 66.66 falling into the Frustration level and 33.33 achieving Instructional status.

According to Hezam TA et. al (2022), several difficulties faced by the students in comprehending English reading texts were found. There were some problems of difficulties faced by the students such as Difficulties in Reading Text and Translating the English Meaning, Learners not interested in English reading practice, Lack of School Facility and House Environment.

Moreover, the reading result in the post test suggests that the application provides growth and a significant portion of learners across all grade levels but requires further intensive implementation of intervention to reach independent level.

Table 9 Test significant difference in the reading performance of the pupils in Dangla Elementary School before and after the implementation of Lumi Application

Indicator	N	Std. Dev.	Computed t	df	P-Value	Decision
Grade IV	7	0.53	-2.12	6	0.078	Accept H ₀
Grade V	7	0.49	-1.55	6	0.172	Accept H ₀
Grade VI	3	0.58	-1.00	2	0.423	Accept H ₀

The results of the paired-samples t-test indicate that there is no statistically significant difference between the pre-test and post-test reading performance of learners across all grade levels, as all computed P-values (Grade IV = 0.078, Grade V = 0.172, and Grade VI = 0.423) are greater than the 0.05 level of significance, as reflected in table 14. Consequently, the null hypothesis is accepted, suggesting that the observed improvements in reading performance cannot be considered statistically significant. This implies that, based on inferential analysis alone, the intervention did not produce a statistically measurable change in learners' reading performance.

However, when the magnitude of change is examined using effect size (Cohen's d), a different pattern emerges. The computed effect sizes show a large effect for Grade IV ($d \approx 0.80$) and moderate effects for Grade V ($d \approx 0.59$) and Grade VI ($d \approx 0.58$), indicating that the intervention had meaningful practical impact on learners' reading performance. This suggests that learners experienced noticeable improvements in decoding, fluency, and comprehension, even if these changes were not statistically significant. In educational research, it is important to consider both statistical significance and effect size, as p-values alone may not fully capture the real-world impact of an intervention, particularly in studies with small sample sizes and high variability among participants (Cohen J., 2013).

The discrepancy between non-significant p-values and moderate-to-large effect sizes may be attributed to the limited sample size and short duration of the intervention, which reduce the statistical power of the test. With only 7 learners in Grades IV and V and 3 learners in Grade VI, the ability to detect statistically significant differences is constrained. Additionally, reading development is a gradual and cumulative process that requires sustained instructional exposure over time, particularly for struggling readers.

4. Conclusion

The use of the Lumi application led to observable improvements in learners' reading performance. However, the t-test results revealed no statistically significant differences across grade levels, suggesting that the improvement was not strong enough to be considered statistically significant. Overall, while the Lumi application shows potential as a supportive tool in enhancing reading skills, further implementation with a larger sample size or longer duration may be necessary to establish its significant impact.

Compliance with ethical standards

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I acknowledge that I have not used ChatGPT or Copilot for refining some of the sections in the document.

Disclosure of conflict of interest

Authors have declared that they have no known competing financial interest OR non-financial interest OR personal relationship that could have appeared to influence the work reported in this paper.

Statement of ethical approval

The study was conducted with approval and in accordance with the standards of the college. No ethical approval was required, as the research followed all applicable ethical guidelines, ensuring respect for the respondent's privacy and confidentiality.

Statement of informed consent

I affirm that the respondents voluntarily agreed to participate after being fully informed about the purpose, nature and potential implications of the study. Their responses have been collected with utmost respect for their privacy and confidentiality in accordance with ethical research guidelines.

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