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Increasing the Reading Levels of Grade 2 Learners through Assistive Technology Application Tools (ATAT)

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ABSTRACT: In today's digital world, reading skills are critical for learners, and the use of technology in education has become an important tool to enhance these skills. This study aimed to determine the effectiveness of Assistive Technology Application Tools (ATAT) in improving the reading skills of Grade 2 learners at Pilar Village Elementary School during the School Year 20222023. The study employed a total enumeration sampling method, with 67 participants, and used the Phil-IRI tools as pre-test and post-test measures. Data were analyzed using mean and standard deviation to assess reading skill levels, while a paired ttest was used to evaluate the significant differences before and after the intervention.

The findings revealed a substantial improvement in reading skills, with a mean difference of 17.83 in the post-test scores after the ATAT intervention. This indicates that the technology-assisted reading programs significantly enhanced both recognition and comprehension skills. These findings imply that the application of assistive technology has the potential not only to address immediate literacy challenges but also to foster long-term learning engagement. Moreover, this approach can bridge learning gaps by providing equitable access to interactive and tailored reading instruction, potentially levelling the playing field for learners with different abilities and learning paces. The results suggest that the early integration of technology in basic education could have broader implications for improving academic outcomes across other subjects as well.

In conclusion, the use of interactive tools like ATAT positively influenced the reading abilities of the learners. The study demonstrates that integrating digital technologies into early-grade reading programs can be an effective approach to developing literacy skills in young students.

KEYWORDS: assistive technology, reading literacy, technology tools

I. INTRODUCTION

Reading is a lifelong ability that can be employed in school and everyday life. It is a fundamental life skill, the foundation for a child's success in school and life. Reading is kind of a gateway to the development of academic skills across all disciplines. Despite its importance, reading is one of the most serious matters in the school system. Students must learn to read critically or analytically if they are to get the most out of the information presented to them. However, the growing demand for high levels of literacy in our technology world alongside different factors exacerbates the problem.

As Abidin, Pour-Mohammadi, & Jesmin (2011) stated, reading is an essential life skill as it not only "increases knowledge but also builds maturity and character, sharpens thinking, and widens awareness in social, economic, political, and environmental issues". A skilled reader has a strong comprehension of printed text (Anonat, 2011) owing to a strong vocabulary developed from earlier years of reading. In connection to this, Duke & Pearson (2015) cited those proficient readers can engage in active interaction with the material they are reading and are aware of the processes that contribute to their comprehension of the material. Thus, teaching students different approaches to reading can assist teachers enhance their students' overall comprehension.

According to American English for Educators (2020), reading skills are abilities that pertain to a person's capacity to read, comprehend, interpret and decode written language and texts. Exceptional reading skills can be highly beneficial to assimilating and responding to written communication like emails, messages, letters, and other written messages in various forms. Meanwhile, Sopris (2022) asserts that learning to read is a complex process made up of five key components, which means teaching reading essentials is also a complex task. The five essential reading components are phonemic awareness, phonics, fluency, vocabulary, and comprehension. Together, these components form the foundation for good reading skills and are essential for helping young

children become proficient readers. Struggling readers often have foundational gaps in one or more of these components (Givens, 2020).

Givens (2020) explains phonemic awareness as the capacity to identify and modify the individual sounds, or phonemes, in spoken words. Children must develop reading skills to comprehend that spoken words are composed of smaller sounds, or phonemes, that can be combined to make words. A lack of phonemic awareness can ultimately have a severe effect on a student's reading abilities, as well as their overall language development (Luis, 2005). On the other hand, Garforth (2020) refers to phonics as a method of teaching reading that focuses on the relationships between the sounds of spoken language and the letters that represent those sounds in written language. It involves teaching children to blend the sounds of individual letters which helps children understand the relationships between the sounds of spoken language and the letters that represent those sounds in written language. This process of decoding helps children develop their reading fluency and understand word meanings.

According to Nuttall (2005), it is difficult for a pupil to learn to read and spell words effectively if they do not establish a good understanding of phonics. Nonetheless, effective reading instruction will involve a strong focus on reading fluency, a reader's ability to read accurately, with sufficient speed and appropriate expression also referred to as prosody. Givens (2020) and Garforth (2020) claim that decoding abilities can have a variety of effects on reading comprehension. Children who read well can grasp literature easily and fast, which frees up their minds to concentrate on comprehending the text's meaning. Lack of reading fluency can make it challenging for students to read text automatically, and they might have trouble reading literature accurately, which can cause misinterpretations and make it hard to follow the narrative or information in the text. Moreover, Garforth (2020) refers to vocabulary development as the process of acquiring new words and gaining a deeper comprehension of their meanings. Children with a large vocabulary are better able to comprehend the text they are reading and make sense of unknown words. Thus, the cultivation of vocabulary is fundamental for both reading fluency and reading comprehension.

In the same case, the poorly developed reading skills of Filipino learners slowly became evident over the last couple of years as teachers, parents, employees and professionals were confronted with the pandemic crisis (Yang, 2021). The National Assessment of Educational Progress (2022) reports that the average fourth- and eighth-grade reading scores declined compared to 2019. This demonstrates the benefit of in-person instruction, which was inconsistent during the global pandemic. Nonetheless, even before the pandemic, PISA (Programme of International Student Assessment) and TIMSS (Trends in International Mathematics and Science Study) revealed that the Philippines scored the lowest in reading comprehension and the second-lowest in mathematics and science. In the same issue, DepEd acknowledged that initiatives implemented to develop the learners' reading skills are insufficient based on the results of the national assessments for learners. Thus, it pushed the urgency of addressing learning losses and took measures by launching the "Sulong EduKalidad" and the implementation of the Basic Education Learning Continuity Plan (BE-LCP) in 2020 in light of the global health emergency.

With previous national assessments revealing the need to improve literacy skills, DepEd launched Brigada Pagbasa (BP) as a form of Brigada Eskwela, an after-school reading program in response to Hamon: Bawat Bata Bumabasa or DepEd 3B Initiative issued under DM 173, s. 2019. This reading advocacy serves as an avenue for all stakeholders to contribute possible solutions to improve the country's education system, especially in equipping learners with 21st-century skills. All BE implementers are encouraged to conduct this partnership initiative for reading which serves as a platform to synergize education-related endeavors that immediately address literacy and numeracy learning gaps. This was anchored on Every Child A Reader Program (ECARP), a national program that supports the thrust of the DepEd to make every child a reader and writer at their grade level.

Grounded on these initiatives, DepEd implemented different development/enhancement of reading assessment designs/programs and tools. Despite the acknowledgement of the DepEd about the reading problem, the intake of students who struggle to read and write skyrockets setting back the failure and dropout rates. During post-pandemic education, following the implementation of modular distance learning, blended or hybrid learning, one of the priority areas reiterated by the DepEd is to focus on the core competencies of literacy numeracy and other skills. (Sunday Times, 2021).

Such the case, in a move to bridge literacy gaps among learners, the Schools Division of Las Pińas City is also intensifying its campaign on reading proficiency. Contingent on the concepts presented, the researcher can attest to the existence of reading gaps in the context of Pilar Village Elementary School. During the three-month transition period from August to October in a hybrid learning model, much has been experienced by language teachers in the delivery of learning along core subject areas due to reading problems as one of the emerging reasons. During a Learning Action Cell (LAC) session conducted, several teachers shared their struggles in terms of learners' competency gaps in comprehension, vocabulary, writing mechanics, and discourse abilities.

After the first quarter of the current school year, the reading assessment results revealed a large number of learners who needed full refresher on reading, meaning, exhibiting a lack of essential reading components. For Grade 1, out of 443 learners, 30 should undergo a full refresher and 25 for a moderate refresher. For Grade 2, the total number of enrollees is 403 with 15 full refreshers and 20 moderate refreshers for learning to recognize, decode, pronounce, and understand texts. It explains that due

to the reading gap, students are unable to speak fluently write well, and also comprehend the text. There is no interactive process that goes on between the reader and the text, resulting in low comprehension. These scoresheet results were made possible with the assistance of USAID through ABC+: Advancing Basic Education in the Philippines, an early grades education project of the DepEd in partnership with USAID and implemented by RTI International, The Asia Foundation, and Florida State University. Moreover, in the Philippine Informal Reading Inventory - Oral Reading Test in English, the results showed that there are 67 non-readers out of 407 assessed Grade 2 learners. It means that these are the learners who manifest reading disability, and demonstrate difficulties in reading skills that are unexpected to age, cognitive ability, quantity and quality instruction, and intervention. As a result, the overall mean percentage scores and proficiency levels of these young learners may also be imputed to the competency gap in reading. This year, the first quarter MPS of Grade 2 in English is 48.74 which is "low mastery" whereas the level of proficiency that was based on the numerical grades earned by the students in the first quarter showed "low proficiency" with a total average of 79%. Learners cannot advance since reading is a foundational skill in education that acts as a prerequisite for so many additional skills.

A student's ability to read has a vast impact on their life that goes far beyond the classroom setting. Teachers are an important factor in student success, and equipping teachers with general methods and strategy instruction is also important for institutions to remember when considering professional development opportunities. However, many educationalists still doubt the benefits of technology in fostering literacy skills and accordingly, the lack of literacy skills and technological skills poses a higher risk for learners and students who enter the educational system of not achieving educational goals (Weikle and Hadadian, 2003). In this regard, research has shown that assistive technology serves to improve certain skills deficits in reading ability and comprehension (Higgins and Raskind, 2017). Whereas, Lee (2021) asserted that assistive technology can help people of all ages work around their reading challenges. For people who struggle to read text, technology can be a lifeline. These tools for reading are inexpensive and easy to find and exist on computers, smartphones, and other devices.

Hence, this study utilized technology-assisted application tools with the assumption that using these tools eliminates learning difficulties and helps learners reach their full potential. Generally, the current study aimed to describe the level of reading skills of Grade 2 learners and further, it looked into the effectiveness of the Assistive Technology Application Tools (ATAT) in increasing the reading proficiency level of the target learners after its application. This study can help other language teachers find solutions to similar problems arising in their classrooms or can adapt the innovation proposed in this study to improve learner outcomes. Also, the school can underpin professional learning of knowledge, skills and understanding that connect them with sources of information and networks of professional support.

II. METHODOLOGY

This study utilized a pretest-posttest design to evaluate the effectiveness of Assistive Technology Application Tools (ATAT) in improving the reading skills of 67 non-readers in Grade 2 at Pilar Village Elementary School. The participants, comprising 32 females and 35 males, were assessed through the Philippine Informal Reading Inventory (Phil-IRI) and a Reading Assessment Tool (RAT). These learners, identified as non-readers based on official school records, were included in the study using total enumeration. Only learners assessed as non-readers were eligible, excluding those with higher reading skills.

The data collection process involved administering the Revised Phil-IRI, a standardized DepEd tool for assessing Grade 2 reading proficiency. Learners were given 10-item multiple-choice tests, designed to measure oral reading fluency and comprehension, before and after the intervention. Phil-IRI Graded Passages (Sets A & B) were used to track miscues, reading speed, and comprehension. Learners' reading skills were classified into frustration, instructional, and independent levels, consistent with DepEd's guidelines. Given that the Phil-IRI and RAT are already validated and reliable instruments, no additional testing for content validity or reliability was necessary.

The research was carried out in three phases. In Phase 1, the researcher sought approval from the school principal and the research committee and obtained informed consent from parents and assent from the learners. The researcher also developed learning materials and selected appropriate technology tools for the intervention. Phase 2 involved administering the pre-test to assess learners' reading proficiency before the intervention. The ATAT intervention, conducted over two months, employed various computer programs targeting different components of reading. Afterward, a post-test was administered to measure any changes in reading proficiency. Finally, in Phase 3, the collected data were analyzed using statistical tools such as mean percentage scores and paired t-tests to determine the impact of the intervention on the learners' reading performance.

The study sought to answer two key research questions: (1) What is the level of reading proficiency of learners before and after the application of ATAT? and (2) Is there a significant difference in learners' reading proficiency before and after the intervention? The results were analyzed to determine the effectiveness of ATAT as an instructional strategy for improving reading skills among non-readers.

III. RESULTS AND DISCUSSION

Research Question 1: What is the level of reading proficiency of learners before and after the application of ATAT?

Table 1. Level of reading proficiency of the learners before and after the application of the technology-assisted application tools as a strategy in teaching reading

Scores	Mean	SD	Descriptive Rating
Before	51.45	16.19	Frustration
After	69.28	29.05	Instructional

Legend: Test Criteria for Word Recognition and Reading Comprehension

Description Oral Reading Level	Statistical Limit (Word Recognition)	Statistical Limit (Comprehension)
Independent	97-100%	80-100%
Instructional	90-96%	59-79%
Frustration	89% and below	58 and below

Word Recognition (RC)	Reading Comprehension		Reading Profile Per Passage
Independent	Independent	=	Independent
Independent	Instructional	=	Instructional
Instructional	Independent	=	Instructional
Instructional	Frustration	=	Frustration
Frustration	Instructional	=	Frustration
Frustration	Frustration	=	Frustration

Table 1 presents the pretest and post-test scores of Grade 2 learners before and after the implementation of Assistive Technology Application Tools (ATAT) in teaching reading. Prior to the intervention, the mean score was $x^{-}=51.45\bar{x} = 51.45x^{-}=51.45$ with a standard deviation of 16.19, indicating a "frustration" level of reading proficiency. Following the ATAT intervention, the mean score increased to $x^{-}=77.28\bar{x} = 77.28x^{-}=77.28$ with a standard deviation of 29.05, reflecting an "Instructional" level. This shift from a frustration level to an instructional level demonstrates a significant improvement in the learners' reading skills.

Before the intervention, the learners' reading abilities and comprehension were inadequate, with most exhibiting frustrationlevel performance. This suggests significant gaps in reading skills, particularly in phonics and phonemic awareness. The inability to comprehend and accurately answer questions about the text indicates that the learners struggled with basic reading components, leading to limited reading and writing skills.

The National Reading Panel (2000) identified phonemic awareness, phonics, fluency, vocabulary, and comprehension as critical factors for early reading success. The study's findings align with this, as phonics instruction was notably lacking in the pretest results. Macaruso, Hook, & McCabe (2006) emphasize that success in early reading is crucial for later reading proficiency, while Mohseni, Seifoori & Ahangari (2020) highlight those various factors, including vocabulary and critical thinking skills, affect reading comprehension. Torgerson et al. (2006) also stress that poor reading skills early on often lead to persistent difficulties.

Post-test results showed a significant improvement, with learners transitioning from frustration to instructional levels. This improvement suggests that the ATAT intervention was effective in enhancing reading proficiency. The technology's ability to adjust to learners' levels and increase engagement was evident, as students demonstrated a greater enthusiasm for reading and began seeking additional material independently.

The findings are supported by the National Assessment of Educational Progress (NAEP, 2007), which highlights the importance of effective early reading programs for all students. Despite some studies reporting limited impacts of phonics on reading comprehension (Gamse et al., 2018; Moss et al., 2018; Serafini, 2014), the use of ATAT proved beneficial. Lynch, Fawcett, & Nicolson (2000) found that interactive multimedia effectively supports reading instruction by enhancing accuracy, fluency, and comprehension.

Sutarti (2017) similarly observed that technology-assisted learning increased student engagement and attention, leading to significant improvements in reading levels. The study concludes that computer-based reading programs are a valuable tool for addressing reading difficulties and recommends incorporating such technology in educational settings to foster a love of reading and improve literacy outcomes.

Table 2. Difference between the level of reading proficiency of the learners before and after the application of the Assistive Technology Application Tools (ATAT) as a strategy for teaching reading

	N	Mean	SD	t-stat	t-critical	Decision
Pretest	67	51.45	16.19	11.4	2.03	reject the null
Posttest	67	77.28	29.05			

Table 2 summarizes the differences in reading levels of Grade 2 learners before and after the implementation of Assistive Technology Application Tools (ATAT). The pretest mean score was $x^-=51.45\bar{x} = 51.45x^-=51.45$ with a standard deviation of 16.19, while the posttest mean score increased to $x^-=77.28\bar{x} = 77.28x^-=77.28$ with a standard deviation of 29.05. The t-test yielded a t-statistic of 11.4, which exceeds the t-critical value of 2.03, indicating a statistically significant improvement in reading proficiency due to the ATAT intervention.

Despite the increase in reading proficiency, learners advanced only one level from frustration to instructional, without reaching the independent reader level. This suggests that while ATAT significantly enhanced reading skills, further support may be needed as students progress to more complex texts. As students advance through grades, they may require ongoing assistance to meet higher standards set by educational frameworks. Interactive multimedia, tailored to the cognitive levels of younger students, could further support their development.

The integration of technology in education is becoming increasingly prevalent. Ahmad & Yamat (2020) highlight that the current generation's reliance on technology-based devices, software, and social media reflects a broader trend in education. The use of information and communication technologies provides innovative support to teachers and learners, enhancing engagement and learning outcomes.

Dedo & Hashim (2019) affirm that digital learning tools can boost reading performance, engagement, and personalized learning. Abdul & Aziz (2020) emphasize the benefits of technology-rich reading environments for students, especially in content-area texts with unfamiliar vocabulary. Wang & Li (2019) note that multimedia learning can enhance the creation of mental images from text, improving comprehension.

Lee (2021) supports these findings, demonstrating that assistive technologies like text-to-speech and audiobooks can help learners with reading difficulties. Texas A&M International University (2021) corroborates those assistive technologies are crucial for developing reading comprehension in digitally enriched environments, aiding diverse learners, and enhancing digital literacy skills. Bhatt (2021) highlights that assistive technologies can be transformative for struggling readers and those with disabilities, emphasizing that these tools can create a more inclusive learning environment. The study concludes that ATAT can be rehabilitative and compensative, offering alternative methods for reading and writing and reinforcing foundational skills. Educators should carefully select appropriate assistive devices to maximize the effectiveness of reading instruction.

IV. CONCLUSIONS

Based on the study's findings, the following conclusions were drawn:

1. Pre- and Post-Intervention Reading Levels: Prior to the use of Assistive Technology Application Tools (ATAT), learners' reading levels were categorized as "frustration." However, following the implementation of ATAT and associated instructional strategies, there was a notable progression in reading proficiency, with learners advancing to the "instructional" level. This indicates that the ATAT effectively facilitated an improvement in reading skills.
2. Significant Improvement in Reading Proficiency: The study demonstrated a significant difference in the reading proficiency of Grade 2 learners before and after the application of ATAT. The data revealed a marked enhancement in reading skills, underscoring the effectiveness of ATAT as a strategic intervention in teaching reading.

V. RECOMMENDATIONS

Based on the findings and conclusions, the following recommendations are proposed:

1. Incorporation of Assistive Technologies: Assistive technologies play a crucial role in developing students' digital literacy skills alongside traditional reading abilities, equipping them for the digital age. A range of technologies is available to support diverse learners. Therefore, integrating Assistive Technology Application Tools (ATAT) into reading instruction within educational programs could enhance learning outcomes. As technology becomes as fundamental as pen and paper, it is beneficial for it to be present in every classroom and accessible to all students and teachers.

2. Development of Computer Laboratories: Schools may consider establishing computer laboratories equipped with the necessary tools for reading instruction. This approach could leverage the advantages of technology-assisted learning and further support the integration of innovative educational practices.

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