UTILIZATION OF DIGITAL STORIES IN IMPROVING THE READING COMPREHENSION OF LEARNERS WITH AUTISM SPECTRUM DISORDER

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ABSTRACT

This study aimed to determine and evaluate the use of digital stories to augment the level of reading comprehension of learners with Autism Spectrum Disorder (ASD). The study utilized a pretest-posttest experimental design that measured the level of comprehension of the participants before and after the intervention phase using criteria for reading comprehension, which exhibited a significant difference in the performance of learners with ASD before and after the employment of digital stories. Improvements in the observed routine in terms of their enriched vocabulary, enhanced memory, and retained focus on attention span were also noted. The results and findings generalized that the implementation of digital stories to the learners with ASD showcased improvement in the elements of comprehension displayed by enriched vocabulary, enhanced memory, and retained focus with minimal problems in attention span. The study also indicated that the application of digital stories had a high potential in improving the reading comprehension of learners with autism.

Keywords: Memory skills, vocabulary, attention span, technology-enhanced learning, computer-based instructions, multimedia, reading intervention, retaining focus

INTRODUCTION

Reading is a foundational macro-skill for literacy, essential from a young age, even for children with special learning needs (Nguyen, Leytham, Schaefer Whitby, & Gelfer, 2015). It is a pathway to knowledge, vocabulary expansion, and reading fluency. The reading process begins with symbol and letter recognition, phonemic awareness, and word decoding, but it is ultimately a multifaceted skill that requires practice. Crucially, reading is not just about fluency; its ultimate goal is comprehension—understanding the author's message and utilizing the information (Ricketts, 2011). Successful reading involves both the ability to decode and to comprehend (Carnahan, Williamson, & Christman, 2011). Comprehension is a complex process involving cognitive processes, language skills, and significant background knowledge (El Zein, Solis, Vaughn, and McCulley, 2014).

Reading comprehension involves macro-skills allowing the reader to understand the text's gist and integrate information (O' Connor & Klein, 2004). Teachers consistently face the challenge of enabling learners to read with comprehension. For children with Autism Spectrum Disorder (ASD), comprehension is dependent on their unique cognitive profile, yet improved word recognition does not guarantee advanced reading comprehension. This phenomenon, known as hyperlexia—high-level reading ability with difficulty

in language comprehension—is often manifested in children with ASD (Nation, Clarke, Wright, & Williams, 2006; Ricketts, Jones, Happé, & Charman, 2013; O'Connor & Klein, 2004). Nation et al. (2006) found that 65% of their 41 ASD participants showed poor reading comprehension despite having normal-range reading accuracy, indicating that superior word reading ability does not ensure satisfactory comprehension. Difficulties in comprehension are also linked to impairment in word recognition (Ricketts et al., 2013), and students with ASD may struggle to form meaningful connections across a text, necessitating intervention (Carnahan & Williamson, 2013). Reading comprehension levels are influenced by textual factors (e.g., word and sentence length) and reader factors (the reader's interaction with the text) (Williamson, Carnahan, and Jacobs, 2012).

ASD is characterized by impairments in social interactions, communication skills, and the presence of repetitive and stereotyped behaviors (American Psychiatric Association, 2000). There is a continuous increase in the number of children with ASD who possess word recognition skills but struggle with comprehension (Carnahan & Williamson, 2013). The associated communication, behavioral, and social characteristics of ASD—including deficiencies in language and social cognition (Gately, 2008)—often mean individuals exert great effort just to achieve even basic-level text comprehension (Nguyen et al., 2015).

With the prevalence of ASD rising in the Philippines (Lucero, 2017), local schools and teachers must be equipped with the necessary expertise to teach reading comprehension to these children. While various reading interventions have been implemented locally, few related local studies exist (Magno, 2010). Existing interventions in the Philippines often focus on decoding, fluency, and word recognition, such as Round Robin Reading (RRR) and the Marungko Approach.

To address comprehension difficulties, various studies emphasize using technology and multimedia to improve language acquisition and reading comprehension for children with ASD (El Zein, Solis, Vaughn, & McCulley, 2014). Technology has revolutionized teaching by increasing attention, making children more active and participative (Akin, 2016). Digital stories, which are three-to-five-minute visual narratives combining images, video, audio, and music (Parsons, Guldberg, Porayska-Pomsta, & Lee, 2015; Dreon, Kerper, & Landis, 2011), have shown effectiveness in developing comprehension and literacy. They are believed to enhance understanding because they are interactive, reiterative, and help children focus on visuals, which is particularly appealing to those with ASD (Abidin, Pour-Mohammadi, Souriyavongsa, Tiang, & Kim, 2011; Xin, 2014). Studies, such as Salkhord, Gorjian, and Pazhakh (2013), have shown that digital story instruction can significantly augment reading comprehension in young learners.

Multimedia—the simultaneous presentation of information through multiple channels like auditory and visual (Palmer, Lanquette, & Jeste, 2012; Akin, 2016)—is known to improve students' language and memory (Mulholland et al., 2008). Up-to-date research indicates that computer-based instructions, like digital stories, are an efficient way to encourage language development in children with autism (Mulholland, Pete, and Popeson, 2008). Technology can support students with reading problems by providing access to text and helping them learn to read with understanding (Ertem, 2010).

Given that the majority of research on reading comprehension in ASD has focused on describing difficulties rather than assessing interventions (El Zein, Solis, Vaughn, & McCulley, 2014), this context justifies the need for studies—like the one the researcher conducted—to assess the effectiveness of digital stories, particularly those using narrative text, in improving reading comprehension for pupils with ASD. Narrative texts are particularly useful as they provide clear story elements that aid in structuring comprehension (Williamson et al., 2012). While technology and multimedia have proven effective for typical learners, this study is grounded in the potential for digital stories to effectively improve reading comprehension in learners with ASD.

OBJECTIVES OF THE STUDY

In line with this gap, the study aimed to determine and evaluate the use of digital stories to augment the level of reading comprehension of learners with ASD. Specifically, this study aims to:

1. Determine the level of reading comprehension of children with Autism Spectrum Disorder before and after the employment of digital stories.
2. Establish the significant difference in the reading performance of learners with ASD before and after the employment of digital stories.
   2. Test the hypothesis that a significant difference exists in the reading performance of learners with ASD before and after the employment of digital stories.
3. Identify the observed effects of digital stories on the respondents' reading performance.

The primary outcome of this research is to provide teachers with practical insights into the effective use of technology-enhanced or internet-based technology, specifically digital stories, to improve reading comprehension in children with Autism Spectrum Disorder (ASD).

METHODOLOGY

This quantitative study utilized a pretest-posttest experimental design to statistically determine the participants' reading comprehension level before and after the intervention.

Observation (Zulueta, 2010) was employed throughout the intervention phase to gather verifiable data on participant behavior, strengths, and weaknesses within the specific environment. Observed performances were systematically recorded, analyzed, and interpreted (Akin, 2016). This provided reliable data to establish the study's worth concerning the reading and comprehension skills of students with Autism Spectrum Disorder (ASD).

The study involved four boys (mean age= 10 years) diagnosed with Autism Spectrum Disorder (ASD) by specialists. All participants were from a single special education class at Antonio G. Llamas Elementary School (AGLES) and were matched on chronological age, gender, IQ, and reading comprehension level. Parents provided consent for participation.

ALM (9 years old): Diagnosed via the Griffiths Mental Developmental Scale. Exhibited coordinated fine-motor skills, long attention span, and self-help skills. Showed emerging interest in identifying letters, sounds, and syllables. Required maximum assistance for sentence analysis, idea expression, and task completion, despite promising interest in verb usage.

MAB (11 years old): Diagnosed via the Dong-In Tulay Center (DITC) assessment. Demonstrated good coordination, fine motor skills, steadiness, self-help skills, and notable focus. Could produce alphabet sounds and recognize initial sounds (d, h, p, n), and read familiar words. Required maximum assistance for task completion, often needing constant repetition and paraphrasing of questions.

KT (10 years old): Diagnosed with ASD and ADHD via DITC. Exhibited self-help skills, long attention span, and fine motor skills. Reading skills were at an emerging interest level (B-), including identifying letters, sounds, and consonant blends. Displayed development in expressing feelings and ideas from stories.

LGM (10 years old): Diagnosed with ASD via DITC. Demonstrated fine motor skills, focus, and high reading interest (A-), showing engagement in identifying letters, sounds, and blends. Needed maximum assistance for the correct usage of interrogative words (what, when, where, who, and how).
The data gathering procedure was centered on conducting pre- and post-assessments of reading comprehension using passages adopted from the Philippine Informal Reading Inventory (PHIL-IRI).

The PHIL-IRI Oral Test Package, mandated by DepEd for the "Every Child A Reader Program," was used to identify reading/comprehension levels. This classroom-based tool measures performance in oral reading,

silent reading, and listening comprehension across English and Filipino, assessing word identification, vocabulary, and comprehension. It uses graded passages followed by 5–7 questions categorized into four critical dimensions: Literal, Interpretive, Critical, and Applied (schema-based), ensuring a thorough gauge of individual understanding.

The table below shows the Phil-IRI Oral Test Criteria that are used in classifying the reading levels of the students.

Table 1
Phil-IRI Oral Test Criteria

Level	Word Recognition	Comprehension
Independent	97-100%	80-100%
Instructional	90-96%	59-79%
Frustration	89% below	58% below

The given set of criteria shown in Table 1 was used in the study to identify the reading and comprehension skills of the participants. Through these criteria, non-readers were also identified.

The Phil-IRI package comprises: 1) a manual of administration, 2) a teacher's copy, and 3) a student's copy. The manual provides program background and administration instructions. The teacher's copy includes Phil-IRI Form 1 (Grade Level Passage Rating Sheet), Phil-IRI Form 2 (Individual Summary Record), and Phil-IRI Form 3 (Class Reading Profile) for rating and summarizing performance. The student's copy contains the oral reading passages (Grades I-VI). The oral reading test was conducted systematically, and data were treated confidentially, adhering to ethical considerations outlined in Belmont's Report.

The researcher administered Grade Level Passage I ("Flower") for both pre-test and post-test to establish the baseline reading ability and comprehension for participants with ASD. The assessment evaluated oral reading (decoding, word recognition, fluency, and comprehension), silent reading (speed and comprehension), and listening comprehension. Results were interpreted using the PHIL-IRI Manual's criteria.

To remedy skill deficiencies, a 12-week intervention used digital stories (e.g., ABC Zoo, Eric the Engine) sourced from Learning English Kids by the British Council. These engaging digital storytelling activities were employed to overcome the participants' short attention span, motivate them, and reinforce reading and comprehension skills in ASD students. The standardized PHIL-IRI test provided the necessary baseline data prior to the intervention.

Before the intervention, the standardized PHIL-IRI test was administered to the four respondents to establish the baseline data, with results interpreted using the criteria and formula specified in the PHIL-IRI Manual.

$$\text{Comprehension} = \frac{\text{no. of correct answers}}{\text{no. of questions}} \times 100$$

$$\text{Reading Speed} = \frac{\text{no. of words in passage}}{\text{Reading time in seconds}} \times 60$$

Objectivity was maintained throughout the study, adhering to Belmont's Principle of Justice, which requires fair subject selection. Four reading students (out of thirteen diagnosed with ASD) were chosen based on matching criteria: chronological age, gender, full IQ Scale, and Reading Comprehension Level, while the remaining nine were emerging readers. Intervention procedures and empirical data recording were cautiously executed to ensure unbiased evidence and outputs.

On the other hand, the reading level interpretation used was as follows:

Table 2
PHIL-IRI Silent Reading, Speed, and Comprehension Reading Level

Reading Speed	Comprehension	Reading Level
Fast	Independent	Independent
Fast	Instructional	Instructional
Fast	Frustration	Frustration
Average	Independent	Independent
Average	Instructional	Instructional
Average	Frustration	Frustration
Slow	Independent	Independent
Slow	Instructional	Instructional
Slow	Frustration	Frustration

Table 2 showed the reading test criteria for reading speed and comprehension that measured the learner's comprehension level within the specific time-frame and was adopted for the interpretation of the gathered data during the administration of the Pre and Post Reading Comprehension Test. On the other hand, reading time was recorded by the teacher to serve as a basis for the identification of the reading speed of the participant.

Table 3
Phil-IRI Silent Reading Test Criteria

Reading Level/ Grade	Reading Speed	Comprehension
Independent	Fast	90-100%
I	Readers	correct
II	70 Above	answers
III	100 above	8 correct
IV	120 above	answers
V	140 above	
VI	170 above	
	190 above	
Instructional	Average	75%- 89%
I	31-69	correct
II	61-99	answers
III	91-119	7-6 correct
IV	111-139	items
V	141-169	
VI	161-189	
Frustration	Slow	And below 75%
I	Readers	correct
II	30 below	answers for 5
III	60 below	items and
IV	90 below	below
V	110 below	
VI	140 below	
	160 below	

As elucidated in the manual, reading levels are marked as frustration when the participant scored 74% and below in comprehension, classified as a slow reader in the reading speed prescribed per grade level. Frustration is considered the lowest reading level. On the other hand, instructional is the category of the participant who scored 75-89% in comprehension but is considered an average reader depending on the reading speed recommended per grade level. Moreover, independent participants who scored 90-100% in comprehension tests were further classified as fast readers depending on the reading speed prescribed per grade level.

Intervention data were recorded on the "Teachers' STAR Observation Form." Video recordings were reviewed using Windows Media Player, and the data were subsequently interpreted and analyzed using the observer's dedicated data analysis form.

The data gathering phase was rigorously initiated by obtaining necessary permissions from various educational offices (Division Superintendent, Public Schools District Supervisor, Principal, etc.) and securing a parent-consent form (see Appendix E). Following approval, an orientation was conducted for the teacher adviser and parents, where the study's main purpose was clarified, and questions were entertained. To gather initial information and build necessary rapport, the researcher prioritized meeting the participants, using a simple group game called "Ball of Greetings" to foster a conducive classroom atmosphere and observe behaviors. Subsequently, a short reading comprehension pre-test was administered by the researcher and the adviser, utilizing graded passages adopted from the Department of Education- PHIL-IRI Manual (see Appendix A) to identify the participants' baseline comprehension levels.

Following the identification of reading levels, a 12-week intervention phase commenced, with the researcher visiting participants three times weekly (Mulholland, Pete, & Popeson, 2008). The core strategy involved introducing lessons through digital stories sourced from the internet platform Learn English Kids by the British Council. This platform was chosen as it aligns with early literacy interventions (ELLN, DAP-ELLN) used in local public schools, leveraging visuals and stories to develop memory skills.

Participants watched and listened to the digital stories, followed by paper-based activity worksheets (see Appendix B) designed to challenge vocabulary and memory. This three-month intervention mirrored the 12-week study duration used by Salkhord, Gorjian, and Pazhakh (2013). Each academic session lasted

approximately 30–40 minutes (Ignatova, 2013), allowing for close monitoring, detailed recording of responses, and progress tracking.

Quantitative data from the pre- and post-assessments were analyzed using a Dependent T-Test (or paired-samples t-test) via IBM SPSS Statistics V. 22 (see Appendix O). This inferential statistical test was employed to compare the means of the two related groups (pre-test and post-test scores) to determine if the intervention resulted in a statistically significant difference in participants' reading comprehension.

The study strictly adhered to the ethical principles of the Belmont Report, recognized as the "ethical backbone for research" (Sims, 2010), given the involvement of students with Autism Spectrum Disorder (ASD). Where permission was secured from school administrators and parents/guardians, with a letter of assent confirming free participation. Anonymity was strictly maintained, ensuring individual learners were unidentifiable. The "Do No Harm Policy" (Adams, 2013) was upheld by fully informing participants and parents about procedures to prevent harm. Also, fairness in selection (Gelling, 2015) was applied by choosing four participants based on specific matching variables (age, gender, IQ, reading level), as they were the only classified readers among thirteen students with autism.

Furthermore, the researcher employed credibility was ensured credibility by using appropriate instructional materials, like multimedia instructions, which Akin (2016) suggests have positive effects. All data was managed with confidentiality and anonymity.

RESULTS AND DISCUSSION

Observations were conducted every session using digital stories. The final phase was the standardized **post-test**, which was compared to the initial pre-test to determine the intervention's effectiveness on participants' reading and comprehension skills.

1. Level of Reading Comprehension of Learners with ASD Before the Employment of Digital Stories

Table 4 shows pre-intervention reading speed, calculated using the PHIL-IRI formula, and comprehension scores. The combined results determined each respondent's overall reading comprehension level, interpreted according to the Phil-IRI tabulation (see Appendix F).

Table 4

Level of Reading Comprehension of Learners with ASD Before the Employment of Digital Stories

Name	No. of Words	Time	Reading Speed	Score	Level	Reading Speed	Comprehension Level	Reading Comprehension Level
ALM	55	57"	Average	4	Frustration	Average	Frustration	Frustration
MAB	55	98"	Average	2	Frustration	Average	Frustration	Frustration
KT	55	69"	Average	5	Instructional	Average	Instructional	Instructional
LGM	55	88"	Average	3	Frustration	Average	Frustration	Frustration

The pre-test results indicated that the majority of participants scored at the Frustration reading level (74%) comprehension; slow reader), consistent with Cabardo (2015). This lowest level (PHIL-IRI manual) determined the intervention rationale.

Specifically, ALM scored 57% (Frustration), achieving an Average reading speed (57 seconds for 55 words) but only correctly answering 4 out of 7 comprehension questions. Similarly, MAB scored 28% (Frustration), required teacher prompting, and took 98 seconds, resulting in an Average reading speed but a low comprehension score (2 out of 7), partly due to difficulty understanding English questions. LGM also scored 42% (Frustration) with an Average reading speed (88 seconds), needing prompts for unfamiliar words. In contrast, KT scored 71% (Instructional) with an Average reading speed (69 seconds), though he often referred back to the passage.

Despite Average reading speeds, low comprehension (Frustration level) mandated intervention. This profile—strong word recognition but poor comprehension—is characteristic of **hyperlexia**, correlated with **ASD** (Nation et al., 2006; Ricketts et al., 2013; O'Connor & Klein,

2004). Hyperlexia involves early reading but poor language and comprehension (Lamonica et al., 2013). The intervention used digital stories to reinforce vocabulary and memory. Storytelling aids understanding (Bruner, 1986, cited by Byrne et al., 2018). Post-tests followed.

2. Level of Reading Comprehension of Learners with ASD After the Employment of Digital Stories

The same 55-word grade-level passage ("Flower") was used for both pre- and post-tests, recording reading time (see Appendix I). Participants answered seven comprehension questions. Table 5 presents the post-test results.

Table 5
Level of Reading Comprehension of Learners with ASD After the Employment of Digital Stories

Name	No. of Words	Time	Reading Speed	Score	Level	Reading Speed	Comprehension Level	Reading Comprehension Level
ALM	55	61"	Average	6	Instructional	Average	Instructional	Instructional
MAB	55	90"	Average	5	Instructional	Average	Instructional	Instructional
KT	55	72"	Average	7	Independent	Average	Independent	Independent
LGM	55	80"	Average	5	Instructional	Average	Instructional	Instructional

Following the 12-week intervention, all participants showed remarkable development in reading comprehension, reinforcing findings by Hamdy (2017) on the significant impact of digital stories. While reading speeds remained Average, comprehension scores significantly increased. Individual results:

ALM: 86% comprehension (6/7 correct), achieving Instructional level (up from Frustration), reading independently in 61 seconds.

MAB: 71% comprehension (5/7 correct), achieving Instructional level, with significantly less prompting (90 seconds).

KT: 100% comprehension (7/7 correct), achieving Independent level (72 seconds), despite minor speech difficulties.

LGM: 71% comprehension (5/7 correct), achieving Instructional level (80 seconds), with faster time and fewer prompts.

This notable increase in comprehension across all four participants attests to the intervention's efficacy, aligning with Angeraini and Afifah (2017). This success is attributed to continuous reading instruction, vocabulary activities, and increased attention span, suggesting enhanced memory and retention (Salkhord et al., 2013). Robin (2011) supports that digital stories facilitate lessons, making difficult concepts more accessible.

3. Test for Significant Difference in the Performance of Learners with ASD Before and After the Employment of Digital Stories

Table 6 shows the pre-test and post-test scores of the four respondents in the standardized comprehension test.

Table 6
Test for Significant Difference in the Performance of Learners with ASD Before and After the Employment of Digital Stories

Respondents	Pre-test Score	Post-test Score
ALM	4	6
MAB	2	5
KT	5	7
LGM	3	5
Mean	3.5	5.75
Standard Deviation	1.29	0.95
Computed P-Value	**Interpretation**	**Decision**
0.003	Significant	Accept Ha

The Dependent T-Test showed that the pre-test results were significantly different from the post-test results after the intervention. The computed pre-test mean was 3.5 (SD=1.29), increasing to a post-test mean of 5.75 (SD=0.95), resulting in a mean gain of 2.25.

The computed p-value was 0.003 at a 0.05 level of significance and 95% confidence (see Appendix O). Since ($p < 0.05$), the research hypothesis was accepted, confirming a significant difference in the reading comprehension performance of learners with ASD before and after the use of digital stories.

The digital stories significantly affected comprehension, proving useful in increasing listening skills, story analysis, and overall comprehension. Their graphical, visual, interactive, and repetitive nature facilitated learning at the participants' own pace. The graphical and visual elements aided story visualization, while animation and sounds reinforced memory and conceptualization. The

interactivity—combining digital activities with pen-and-paper tasks—actively involved children in decoding and understanding the narrative.

4. Observed Effect of Digital Stories on the Respondents' Reading Performance

To measure the effectiveness of digital stories, vocabulary, working memory, and attention span were observed using video clips and the observation form. Scores from exercises and participants' responses to questions were noted throughout the sessions.

Enriched Vocabulary. Vocabulary is crucial for reading and comprehension; a limited vocabulary impairs text processing. The study monitored vocabulary development weekly through tasks like picture recognition and object naming based on digital stories (Figure 1).

Individual vocabulary performance (weighted mean scores, Appendix J):

ALM (Mean 11): Showed consistent interest and independence. Easily identified familiar pictures, indicating good retention skills and low difficulty with key concepts.

MAB (Mean 9): Required frequent translation into Filipino to decode words and understand questions, highlighting the importance of the medium of instruction. Though initially needing significant assistance, he showed improvement.

KT (Mean 10): Could read words despite unclear speech. Showed keen interest and quickly answered concrete questions ("what," "where") but struggled with unfamiliar objects.

LGM (Mean 9): Required assistance in reading word choices but gained enthusiasm for the stories despite initial oral identification difficulties.

The overall results confirmed that presenting new words through digital stories significantly increased vocabulary, reinforced by associating words with pictures from the narratives. Word translation proved vital for some (e.g., MAB). This supports Abdul-Ameer (2014), who found digital stories successful in foreign language teaching by aiding vocabulary recreation through "spontaneous, vigorous performance supported by involvement and interaction." Knowledge of vocabulary and reading comprehension are interdependent, with digital stories presenting linguistic forms, grammar, phrases, and vocabulary within a meaningful context that supports narrative comprehension (Ramírez & Alonso, 2007).

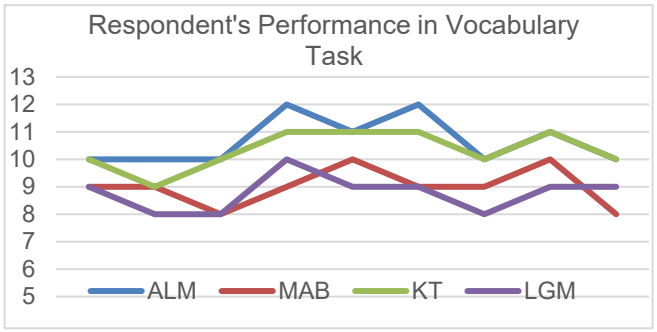

Figure 1. Respondent's Performance Vocabulary Task

Figure 1 displayed the scores of the participants in the given sets of activities administered by the researcher within the entire intervention period. Based on the plotted data, ALM got the highest scores compared with the three participants.

Enhanced Memory. Memory work, testing retention of the short digital stories, is a crucial indicator of comprehension—a complex process involving cognitive and language abilities (El Zein, Solis, Vaughn, and McCulley, 2014). Tasks included sequencing events, matching, and fill-in-the-blank.

ALM consistently maintained his scores in memory work (weighted mean score of 7). He required simultaneous video playback and teacher prompts, often needing long sentences to be paraphrased to grasp the meaning for sequencing.

MAB showed difficulty with sequencing events initially, requiring code-switching (English

to Filipino) to understand the content due to his home language preference. Although the time consumed was long during early sessions, he showed increasing correct responses through close supervision, achieving a weighted mean score of 5.22.

KT demonstrated the highest independence and consistently minimal errors, achieving a weighted mean score of 7.22. He could perform most memory tasks with minimal prompting.

LGM struggled with sequencing initially, but showed relative progress toward the end of the intervention, attaining a weighted mean score of 5.22.

The activities significantly enhanced memory skills. As Ramírez and Alonso (2007) stressed, stories effectively contextualize and introduce new language, making it meaningful and memorable. Continuous practice in sequencing and fill-in-the-blanks helped participants retain plot and key information, which is foundational to reading comprehension.

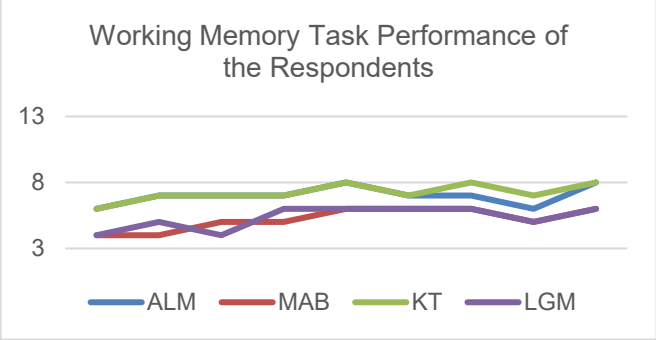

Figure 2. Memory task performance of the respondents

Figure 2 shows the memory task performance of the respondents. In the competencies such as sequencing events, matching type activities, and filling in the missing part, KT got the highest results as manifested by the plotted data in the line graph, as compared with the scores obtained by the three remaining participants. He registered a weighted computed mean of 7. 22.

Retained Focus. The intervention led to significant improvements in participants' focus and attention, contrasting with the typical short attention span in learners with ASD. This behavioral change was crucial for comprehension gains, supporting Xin (2014), who noted that digital stories' visual images help children with ASD focus. Individual observations include:

ALM showed stability, staying seated and returning to the task quickly after distraction.

MAB demonstrated a longer attention span, good coordination, and maintained focus, especially when motivated by visuals.

KT exhibited strong interest, readily engaging and independently manipulating the computer, showing longer focus and steadiness.

LGM displayed a greater attention span when interested, watching vividly until the end.

Crucially, both LGM and MAB intentionally repeated the video viewing to reinforce memory and vocabulary. Abdul-Ameer (2014) details that digital stories motivate concentration, and the ability to re-engage with content significantly aids vocabulary and understanding.

The outcome substantiated the effectiveness of digital stories in improving reading comprehension among learners with ASD. The intervention successfully enriched vocabulary, enhanced memory, and retained focus through visual animations and narration, despite varied individual needs (e.g., MAB's translation needs, KT's deferred speech). Continuous drills, memory exercises, and close supervision proved valuable.

5. Level of Reading Comprehension of Learners with ASD Before and After the Employment of Digital Stories

The participant learners demonstrated evident progress in reading comprehension from the pre-test to the post-test. Initially, all participants clustered at the Frustration level. After the intervention, three improved to the Instructional level, and one reached the Independent level. This marked improvement in graded passage scores is directly attributed to the intervention, which focused on enriching vocabulary, enhancing memory, and increasing attention/focus. These

exercises helped participants decode phrases and sentences, even if tasks required time.

This outcome supports the value of using digital media. Xin (2014) noted that computer-assisted instruction, like digital stories, with their digital images, serves as a visual cue to help students brainstorm and organize ideas. Furthermore, digital storytelling is cited as improving students' language performance (Burmark, 2004, cited by Alkhilili, 2018). The results strongly recommend the continued use of this intervention model for learners with ASD.

6. Observed Effect of Digital Stories on the Respondents' Reading Performance

The positive outcomes in reading comprehension are attributed to digital stories reinforcing essential cognitive skills. Vocabulary and working memory exercises (picture recognition, sequencing, matching, fill-in-the-blanks) were crucial prerequisites for comprehension, effectively enhanced by the visual and interactive digital content.

The pedagogical use of digital stories promoted concentration and focused attention on oral input. The ability for learners to repeat the stories guaranteed longer exposure, improving mastery and retention (Ramírez & Belmonte, 2007).

The rich audiovisual features (illustrations, moving pictures, narration) were key to improving focus. Integrating visual images with text accelerates comprehension and aids visual communication and meaning inference (Dreon et al., 2001). For ASD learners, visual cues help recognize event sequences and organize ideas (Parsons et al., 2015), improving memorization via picture association. These graphical and visual materials are highly effective for comprehension (Akin, 2016).

The study confirmed that digital stories were effective, evidenced by significant pre- and post-test score differences (Salkhord et al., 2013). This interactive, multi-sensory approach is highly beneficial for learners with ASD, improving success and attention (Akin, 2016; Xin, 2014).

CONCLUSION

The use of digital stories has demonstrated positive effects on improving reading comprehension among learners with ASD. The findings, substantiated by statistical analysis (T-test), confirm the effectiveness of this instructional method. The study concludes that

1. The incorporation of digital stories had a statistically significant impact on the learners' reading comprehension, as confirmed by the T-test analysis of pre-test and post-test data.

2. The digital stories enabled learners with ASD to increase their overall comprehension level by utilizing animated narration, which led to: Increased Vocabulary; Enhanced Memory; Improved Focus and Attention.

3. The integrated exercises (picture recognition, sequencing, filling-out missing words) are prerequisite skills for comprehension, and their use reinforced retention and higher-order thinking skills in the participants.

RECOMMENDATION

Following the affirmative results on using digital stories to improve reading comprehension in learners with ASD, the following recommendations are made for future research and practical application:

1. Future research should replicate the study using a significantly larger sample size to validate the positive findings.

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2. Since this study was in a specialized classroom, future studies should utilize inclusive classrooms to assess the intervention's applicability in more common educational settings for students with ASD.

3. Conduct similar studies with a variety of respondents, including learners who are intellectually challenged or at-risk in reading, to test the generalizability of the digital stories intervention.

4. Expand the study by administering the intervention to a larger sample of ASD learners from different schools offering special education curricula to broaden the findings on digital-based instructional materials.

5. Suggest utilizing other digital story platforms to validate the intervention's appropriateness and effectiveness across different technological resources.

6. Results should construct reading instructional innovations (e.g., SIM) for integration into the Bataan LRMDS.

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