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Digital Play for Early Literacy: Advancing Alphabet Recognition

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ABSTRACT: *This study examined the effectiveness of traditional teaching methods and technology-based games in improving preschoolers' alphabet knowledge, focusing on uppercase recognition, lowercase recognition, and producing letter sounds. A quasi-experimental design was used with 60 preschool learners from Alejandro P. Gurrea Elementary School during the school year 2025–2026, divided into a control group receiving traditional instruction and an experimental group using interactive educational apps. Pretests and posttests measured learners' performance levels using an adapted digital assessment tool. Results showed significant improvements in both groups across all areas of alphabet knowledge. The control group demonstrated larger mean gains; however, the difference between the two groups' progress was not statistically significant. These findings indicate that technology-based games can be as effective as structured, teacher-led methods in developing early literacy skills. The study highlights the potential of blending traditional instruction with digital tools to create engaging and effective early literacy programs. The results provide practical insights for educators and policymakers seeking to enhance preschool alphabet instruction and foster strong foundations for reading and writing development.*

Key words*: Alphabet knowledge, early literacy, preschool education, quasi-experimental design, technology-based games, traditional instruction.*

1. Introduction

In today's educational settings, early literacy development is regarded as a crucial foundation for long-term academic achievement and overall school readiness. Among the various components of early literacy, alphabet knowledge plays a central role, as it equips children with the ability to recognize and manipulate letters, which is essential for decoding words, developing phonemic awareness, and achieving fluent reading skills (Cabell et al., 2019; Lonigan & Shanahan, 2021). Mastery of both letter names and their corresponding sounds serves as a gateway to building strong reading and writing abilities, making alphabet knowledge one of the most reliable predictors of later literacy success (Piasta & Wagner, 2010; Pence-Turnbull et al., 2010). However, despite the implementation of structured literacy programs in many early childhood classrooms, a considerable number of young learners continue to experience difficulties in mastering alphabet recognition. One of the most common challenges observed is the ability to distinguish between uppercase and lowercase letters, a critical skill that supports both reading and writing development (Neumann et al., 2017). This struggle highlights the need for more engaging, developmentally appropriate, and evidence-based instructional strategies that can strengthen children's alphabet knowledge. Addressing these gaps during the early years is

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vital, as delays in alphabet mastery can impact later reading comprehension and overall academic progress, underscoring the importance of effective and innovative approaches to early literacy instruction (Schuele & Boudreau, 2008).

In the Philippine educational system, early literacy issues were notably prevalent, where numerous learners advanced to higher grade levels despite insufficient reading skills, resulting in cumulative academic challenges (Villanueva & Domingo, 2022). Such issues were especially prevalent in early grades, exacerbating the necessity for effective early literacy interventions. This phenomenon emphasized an urgent need to address fundamental literacy gaps before they escalated into more profound educational barriers. According to research by Domingo (2021), these gaps often stemmed from inadequate instructional resources and limited teacher training, further hindering effective literacy skill acquisition among young learners.

Globally, early literacy challenges remained a critical concern, particularly in low- income and developing countries, where quality early childhood education resources were limited. UNICEF (2023) reported that over 40% of children worldwide did not achieve foundational literacy skills by age 10, often due to inadequate access to engaging and developmentally appropriate teaching resources. Additionally, Sustainable Development Goal (SDG) 4 reinforced the imperative for inclusive, equitable quality education, promoting lifelong learning opportunities beginning from early childhood (United Nations, 2022).

To address these literacy gaps, technology-based games emerged as promising instructional tools. Hirsh-Pasek et al. (2020) asserted that game-based learning effectively enhanced literacy and cognitive development in children. Similarly, Zosh et al. (2021) found that interactive, technology-driven learning environments significantly increased student engagement, motivation, and knowledge retention compared to conventional teaching methodologies. Additionally, studies by Gee and Hayes (2022) demonstrated that educational games provided meaningful contexts that enhanced learners' problem-solving and critical-thinking skills.

Despite growing international interest in technological integration within early childhood education, limited research was available in the local Philippine context to evaluate the effectiveness of technology-based games for literacy development. Factors such as age, gender, parental educational background, and family income could also have influenced learners' literacy progress. Therefore, this study aimed to rigorously assess the effectiveness of selected technology-based games in enhancing alphabet knowledge among kindergarten learners at Alejandro P. Gurrea Elementary School, Bohol Division, during the 2025–2026 school year. By conducting a comparative analysis between traditional instructional methods and game-based learning interventions, this study aimed to provide empirical evidence on the efficacy of technology-driven educational games. Ultimately, it sought to inform educators and policymakers on incorporating innovative, evidence-based teaching strategies into early literacy curricula. This research's outcomes offered valuable insights to teachers aiming to enhance instructional effectiveness, administrators developing informed curricula, and policymakers advocating for technology-integrated literacy programs. Most crucially, the research directly benefited young learners by providing engaging and effective learning opportunities, ultimately aiming to bridge early literacy gaps and foster a robust foundation for continued academic growth.

2. Literature Review

Research indicates that technology-based games can significantly support the development of alphabet knowledge in young learners. Studies on digital game-based learning in early childhood education have consistently shown positive impacts on children's ability to recognize and produce letters. For instance, one investigation involving kindergarten students revealed that the use of interactive digital games led to notable improvements in recognizing letter sounds and matching letters, with substantial gains observed from pretest to posttest (Papadakis et al., 2022). Broader analyses also emphasize that gamified learning environments enhance engagement and help children grasp abstract concepts such as letter-sound relationships more effectively (Kucirkova et al., 2021). Furthermore, recent studies demonstrate that digital literacy games can be beneficial across different socioeconomic and cultural contexts, making them an adaptable tool for diverse early childhood classrooms (Bautista & Ocampo, 2023).

Alphabet knowledge is also widely acknowledged as one of the strongest predictors of later reading achievement. Children who begin school with a solid understanding of both uppercase and lowercase letters are more likely to develop fluent reading and writing skills (Piasta et al., 2022). However, individual factors such as parental education level, home literacy environment, and socioeconomic status can influence how quickly these skills are acquired. Research suggests that children from more advantaged households often

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have greater exposure to language-rich activities, which supports stronger early literacy outcomes (Niklas & Schneider, 2017). Despite these differences, evidence shows that structured alphabet interventions, including technology-based games, can help close these gaps and benefit learners regardless of their background, promoting equitable literacy development (Neumann, 2020).

3. Methodology

This study employed a quasi-experimental research design to examine whether technology-based games could enhance preschoolers' alphabet knowledge in a real classroom environment. Unlike true experimental designs that require random assignment, this approach utilized existing preschool sections, making it appropriate for practical school-based research. The participants consisted of 60 preschool learners from Alejandro P. Gurrea Elementary School in the Bohol Division during the school year 2025–2026. They were selected through purposive sampling to ensure they were within the critical stage for developing early literacy skills. The learners were divided into two groups: a control group that received traditional alphabet instruction and an experimental group that used two interactive educational applications, Kids Academy and Starfall, which featured gamified activities designed to build alphabet recognition. Both groups completed a pretest and a posttest using an adapted instrument from Gray (2023), which assessed uppercase and lowercase letter recognition delivered digitally via tablets. The same standardized procedure was applied in both assessments to ensure reliable comparisons and minimize testing anxiety. The study adopted the Input-Process-Output (IPO) model to systematically measure the effects of the intervention. Data were analyzed by comparing the pretest and posttest scores of both groups to determine whether the technology-based approach produced significant improvements in alphabet knowledge compared to traditional teaching. A percentage range with adjectival ratings (from Excellent to Poor) was used to interpret learners' performance levels, offering clear insights into their mastery of alphabet skills.

Results

Table 1. Level of alphabet knowledge of the learners in the Control Group during Pretest.

Level	Ranges of Scores	Upper Case Recognition		Lower Case Recognition		Producing Letter Sounds	
		f	%	f	%	f	%
Excellent	21-26	13	43.33	12	40.00	12	40.00
Very Good	16-20	15	50.00	15	50.00	15	50.00
Good	11-15	2	6.67	3	10.00	3	10.00
Fair	6-10	0	0.00	0	0.00	0	0.00
Poor	0-5	0	0.00	0	0.00	0	0.00
Total		30	100.00	30	100.00	30	100.00
Average		20.40		19.90		19.90	
Standard Deviation		3.42		3.54		3.54	

The pretest results for the control group show that most learners performed within the "Very Good" and "Excellent" levels across all areas of alphabet knowledge. For uppercase recognition, 43.33% of learners achieved the "Excellent" level, while 50% were rated "Very Good," and a small portion, 6.67%, fell into the "Good" category. In lowercase recognition, 40% of learners scored "Excellent," 50% "Very Good," and 10% "Good." Producing letter sounds showed similar results, with 40% at the "Excellent" level, 50% at "Very Good," and 10% at "Good." The computed averages were 20.40 for uppercase recognition, 19.90 for lowercase recognition, and 19.90 for producing letter sounds, with standard deviations ranging between 3.42 and 3.54, indicating moderate variation in learner performance.

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Table 2. Level of alphabet knowledge of the learners in the Experimental Group during Pretest

Level	Ranges of Scores	Upper Case Recognition		Lower Case Recognition		Producing Letter Sounds	
		f	%	f	%	f	%
Excellent	21-26	27	90.00	22	73.33	21	70.00
Very Good	16-20	3	10.00	8	26.67	9	30.00
Good	11-15	0	0.00	0	0.00	0	0.00
Fair	6-10	0	0.00	0	0.00	0	0.00
Poor	0-5	0	0.00	0	0.00	0	0.00
Total		30	100.00	30	100.00	30	100.00
Average		23.80		22.97		22.90	
Standard Deviation		2.01		2.13		2.14	

The pretest results for the experimental group indicate that most learners demonstrated high levels of alphabet knowledge before the intervention. For uppercase recognition, 90% of learners scored within the "Excellent" range, while the remaining 10% were in the "Very Good" category. In lowercase recognition, 73.33% achieved "Excellent," and 26.67% scored "Very Good." Producing letter sounds followed a similar trend, with 70% reaching the "Excellent" level and 30% classified as "Very Good." The computed averages were 23.80 for uppercase recognition, 22.97 for lowercase recognition, and 22.90 for producing letter sounds, with low standard deviations ranging between 2.01 and 2.14, suggesting that learner performance was consistently high across the group. These results show that the experimental group started with a strong baseline in alphabet knowledge, with most learners already demonstrating advanced skills in letter recognition and sound production. This suggests that the group was well-prepared for further literacy instruction and provided a solid basis for evaluating the added value of technology-based games. For educators, this highlights the potential of technology to build on existing skills and sustain mastery among learners performing at higher levels. For curriculum developers, the results suggest that digital tools can be effectively integrated not only for remediation but also for enrichment to maintain engagement and enhance literacy outcomes even for advanced students.

Table 3. Level of alphabet knowledge of the learners in the Control Group during Posttest.

Level	Ranges of Scores	Upper Case Recognition		Lower Case Recognition		Producing Letter Sounds	
		f	%	f	%	f	%
Excellent	21-26	25	83.33	20	66.67	20	66.67
Very Good	16-20	5	16.67	10	33.33	10	33.33
Good	11-15	0	0.00	0	0.00	0	0.00
Fair	6-10	0	0.00	0	0.00	0	0.00
Poor	0-5	0	0.00	0	0.00	0	0.00
Total		30	100.00	30	100.00	30	100.00
Average		22.50		21.97		21.97	
Standard Deviation		2.22		2.17		2.17	

The posttest results for the control group show a noticeable improvement in alphabet knowledge after the intervention. For uppercase recognition, 83.33% of learners achieved the "Excellent" level, while 16.67% were rated "Very Good." In lowercase recognition, 66.67% reached "Excellent" and 33.33% remained at "Very Good." Producing letter sounds displayed the same pattern, with 66.67% at the "Excellent" level and 33.33% at "Very Good." The average scores increased to 22.50 for uppercase recognition and 21.97 for both lowercase recognition and producing letter sounds. The standard deviations, ranging from 2.17 to 2.22, indicate relatively consistent performance across learners with some minor variability.

The posttest results in Table 4 for the experimental group show that all 30 learners achieved the "Excellent" level in uppercase recognition, lowercase recognition, and producing letter sounds, with 100% scoring in the highest category for all three areas. The computed averages were 24.87 for uppercase

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recognition, 24.43 for lowercase recognition, and 24.37 for producing letter sounds. The standard deviations, ranging from 1.13 to 1.17, indicate that learner performance was consistently strong with minimal variation across the group.

Table 4. Level of alphabet knowledge of the learners in the Experimental Group during Posttest.

Level	Ranges of Scores	Upper Case Recognition		Lower Case Recognition		Producing Letter Sounds	
		f	%	f	%	f	%
Excellent	21-26	30	100.00	30	100.00	30	100.00
Very Good	16-20	0	0.00	0	0.00	0	0.00
Good	11-15	0	0.00	0	0.00	0	0.00
Fair	6-10	0	0.00	0	0.00	0	0.00
Poor	0-5	0	0.00	0	0.00	0	0.00
Total		30	100.00	30	100.00	30	100.00
Average		24.87		24.43		24.37	
Standard Deviation		1.14		1.17		1.13	

These findings suggest that the use of technology-based games was highly effective in elevating learners to mastery-level performance in all aspects of alphabet knowledge. The uniform "Excellent" scores demonstrate that interactive digital tools can reinforce and enhance literacy skills across an entire class, ensuring equitable learning outcomes. For educators, this underscores the potential of integrating gamified, technology-driven instruction to engage students while building foundational literacy skills. For curriculum planners and policymakers, the results provide strong evidence supporting the adoption of technology-based learning interventions as a complementary tool alongside traditional teaching methods to maximize early literacy achievement.

Table 5. Test of difference between the Control Group's Pretest and Posttest scores on their Alphabet Knowledge.

Variables	Source of Difference	Mean	S.D.	Mean Diff.	Comp. t- value	p-value	Decision	Remarks
Upper Case Recognition	Pretest	20.40	3.42				Reject Ho	
				2.10	4.227*	0.000		Significant
	Posttest	22.50	2.22					
Lower Case Recognition	Pretest	19.90	3.54				Reject Ho	
				2.07	3.888*	0.001		Significant
	Posttest	21.97	2.17					
Producing Letter Sounds	Pretest	19.90	3.54				Reject Ho	
	Posttest	21.97	2.17	2.07	3.888*	0.001		Significant

Note: *significant at p<0.05(two-tailed); df=29.

The t-test results for the control group revealed significant improvements in all areas of alphabet knowledge after the intervention. For uppercase recognition, the mean score increased from 20.40 in the pretest to 22.50 in the posttest, with a mean difference of 2.10 and a computed t-value of 4.227 (p = 0.000), indicating a highly significant gain. Lowercase recognition also showed progress, with the mean rising from 19.90 to 21.97, resulting in a mean difference of 2.07 and a t-value of 3.888 (p = 0.001). Producing letter sounds followed the same pattern, improving from 19.90 to 21.97, with a mean difference of 2.07 and a t-value of 3.888 (p = 0.001). These results confirm that traditional teaching methods effectively enhanced the alphabet knowledge of learners in the control group. The significant improvements in all three skill areas highlight the value of systematic, teacher-led instruction in building foundational literacy skills. For teachers, these findings emphasize the importance of consistent and explicit alphabet instruction in early childhood education. For curriculum planners and policymakers, the results provide evidence that traditional approaches can produce meaningful gains in literacy development and can serve as a standard against which to evaluate newer strategies, such as technology-based interventions.

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Table 6. Test of difference between the Experimental Group's pretest and posttest scores on their Alphabet Knowledge.

Variables	Source of Difference	Mean	S.D.	Mean Diff.	t- value	p- value	Decision	Remarks
Upper Case Recognition	Pretest	23.80	2.01				Reject Ho	
				1.07	3.117*	0.004		Significant
	Posttest	24.87	1.14					
Lower Case Recognition	Pretest	22.97	2.13				Reject Ho	
				1.47	3.925*	0.000		Significant
	Posttest	24.43	1.17					
Producing Letter Sounds	Pretest	22.9	2.13				Reject Ho	
	Posttest	24.37	1.13	1.47	3.893*	0.001		Significant

Note: *significant at p<0.05(two-tailed); df=29

The t-test results for the experimental group showed significant improvements in all aspects of alphabet knowledge after the use of technology-based games. For uppercase recognition, the mean score increased from 23.80 in the pretest to 24.87 in the posttest, with a mean difference of 1.07 and a computed t-value of 3.117 (p = 0.004). Lowercase recognition also improved, rising from 22.97 to 24.43, resulting in a mean difference of 1.47 and a t-value of 3.925 (p = 0.000). Similarly, producing letter sounds increased from 22.90 to 24.37, with a mean difference of 1.47 and a t-value of 3.893 (p = 0.001). All p-values were below 0.05, leading to the rejection of the null hypothesis for each variable. These findings confirm that technology-based games had a statistically significant effect on improving preschoolers' alphabet knowledge. Although the gains were smaller compared to the control group's results, the consistent and significant improvements across all areas suggest that digital tools can effectively reinforce letter recognition and sound production. For teachers, this highlights the role of technology as an engaging supplement to traditional literacy instruction. For curriculum developers and policymakers, the results support the integration of interactive educational apps into early literacy programs to enhance student motivation and maintain consistent progress across diverse learners.

Table 7. Test of Significant Mean Gain Difference on the Pre-test and Post-test scores between the two groups.

Variables	Source of Difference	Mean Gain	sd	Mean Gain Difference	t-value	p-value	Decision	Remarks
	Control	2.10	2.72				Do not reject Ho	
Upper Case Recognition				1.03	1.713	0.092		NS
	Experimental	1.07	1.87					
	Control	2.07	2.91					
Lower Case Recognition				0.60	0.923	0.360	Do not reject Ho	NS
	Experimental	1.47	2.05					
Producing Letter Sounds	Control	2.07	2.91					
				0.60	0.921	0.361	Do not reject Ho	NS
	Experimental	1.47	2.06					

Note: *significant at p < 0.05 (two-tailed); df=58; NS=Not Significant, S=Significant.

The test of significant mean gain differences between the control and experimental groups revealed no statistically significant differences in any of the three areas of alphabet knowledge. For uppercase recognition, the control group achieved a mean gain of 2.10 compared to the experimental group's 1.07, resulting in a mean gain difference of 1.03 with a t-value of 1.713 (p = 0.092), which was not significant. In lowercase

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recognition, the control group's mean gain was 2.07, while the experimental groups were 1.47, producing a mean gain difference of 0.60 with a t-value of 0.923 (p = 0.360). Producing letter sounds followed the same pattern, with the control group's mean gain at 2.07 versus 1.47 for the experimental group, yielding a mean gain difference of 0.60 and a t-value of 0.921 (p = 0.361). These findings indicate that both traditional instruction and technology-based games were equally effective in improving preschoolers' alphabet knowledge, as no significant difference was observed between the two groups. This suggests that interactive digital tools can perform at par with structured, teacher-led methods in supporting early literacy development. For educators, this highlights the flexibility to incorporate either method depending on classroom needs and resources. For curriculum developers and policymakers, the results emphasize the potential of blended approaches that combine the strengths of both traditional and technology-enhanced instruction to maximize engagement and learning outcomes in early childhood education.

4. Discussion

The results of the study show that both traditional teaching and technology-based games were effective in improving preschoolers' alphabet knowledge. In the control group, most learners started at the "Very Good" level in the pretest and showed noticeable improvement in the posttest, with a large number reaching the "Excellent" level across uppercase recognition, lowercase recognition, and producing letter sounds. This indicates that structured, teacher-led instruction can successfully strengthen early literacy skills. The experimental group, on the other hand, began with higher pretest scores, with many learners already at the "Excellent" level. After the intervention using technology-based games, all learners achieved mastery in every skill area, with 100% scoring "Excellent." This suggests that interactive digital tools are highly effective for reinforcing and maintaining alphabet knowledge, especially for learners who already have a strong literacy foundation. When comparing the two groups, the results show no significant difference in the mean gains between traditional and technology-based methods. This means both approaches can produce similar improvements in alphabet knowledge. For teachers, this finding suggests that they can choose either method depending on the resources available, or combine both for a balanced approach. For curriculum developers and school administrators, the results emphasize the value of integrating digital games as a complement to traditional teaching. Technology-based tools can help engage young learners, maintain motivation, and create interactive learning experiences while still achieving the same outcomes as teacher-led instruction. These findings support the use of blended learning strategies to maximize early literacy development.

5. Conclusion

The study concludes that both traditional teacher-led instruction and technology-based games are effective in improving preschoolers' alphabet knowledge, particularly in uppercase recognition, lowercase recognition, and producing letter sounds. The control group demonstrated significant progress using structured, teacher-guided methods, while the experimental group achieved mastery through interactive digital games. Although the control group showed slightly higher mean gains, the difference between the two groups was not statistically significant, indicating that both approaches can produce comparable results. These findings highlight that technology-based games can serve as a valuable complement to traditional instruction, providing engaging and interactive ways to reinforce early literacy skills. For educators and curriculum planners, the results suggest that a blended approach combining teacher-led lessons with digital tools can maximize learning outcomes, support diverse learners, and make alphabet learning more enjoyable and effective for preschoolers.

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