Using Animated E-Storybooks to Develop Filipino Vocabulary and Story Comprehension Among Preschool Children

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Abstract: A mixed methods concurrent triangulation design was employed to determine whether storyreading would be more effective in developing Filipino receptive vocabulary and story comprehension among four-year old children when animated e-storybooks were used instead of the usual print storybooks. Twenty children from a private preschool with limited Filipino language proficiency were randomly assigned to either the treatment (animated e-storybooks) or control conditions (print storybooks). Original stories in Filipino were written and illustrated by the researchers for both the electronic and print books. Pictorial Receptive Vocabulary Test (PRVT) was used to measure receptive vocabulary before the experiment, immediately after each storyreading, and two weeks after the last storyreading session. Story comprehension, on the other hand, was measured by means of story retelling and oral comprehension tests. The children were also observed during storyreading sessions and interviewed to obtain feedback on their experiences. Findings show that the receptive vocabulary of both the treatment and control groups improved significantly. Receptive vocabulary assessed immediately after each storyreading was significantly higher among the children who were exposed to animated e-books in two out of the three stories. Participants from the treatment group outperformed the control group in story comprehension tests but the difference was not statistically significant. Children from the treatment group also revealed that animations in the e-books helped them remember and understand the stories better, and most preferred e-books to print storybooks. This research shows that classroom teachers can develop and use their own animated e-books as a teaching strategy to enhance vocabulary acquisition and story comprehension of their pupils.

Key Words: animated e-storybooks; storyreading; receptive vocabulary; story comprehension; Filipino language

1. INTRODUCTION

In this age of fast-paced technological advancements, early childhood education professionals and parents alike are caught in the midst of debates regarding children's exposure to technology. Research findings on the effects of technology use on children have varied from being harmful to being beneficial, so much so that the National Association for the Education of Young Children (NAEYC) and the Fred Rogers Center for Early Learning and Children's Media in their joint statement in 2012 called on professionals in the field to continue to implement quality research and obtain evidence to settle these differences. This study was undertaken as a response to this call with the view of using the limited technological resources available in an early childhood classroom to enhance teaching

strategies for promoting early literacy skills, specifically in developing receptive vocabulary and story comprehension among children.

1.1 Background of the Study

This research was conducted in a small preschool in an urban area where the researchers had spent their student-teaching practicum. A routine practiced by the teachers in this school was to read English language stories to children every day, except for Fridays which were allotted for Filipino storyreading sessions. After a period of observation, it was clear to the researchers that there were children who did not fully understand the stories that were written in Filipino. During the Filipino storybook read-aloud, some children frequently asked what certain Filipino words and statements in the story meant. They needed English translations and more prompts (as compared to when an English story was read) to be able to answer questions posed by the teacher during storyreading. The researchers also discovered that despite being Filipino nationals, English was the primary language the children spoke at home. The observed difficulty that the children had with regards the Filipino language during storytelling prompted the researchers to focus their study on the acquisition of receptive vocabulary and story comprehension.

The purpose of the study was to determine whether children acquired Filipino receptive vocabulary and story comprehension better when using animated e-books contained in a common technology tool–the laptop–than when the same stories were read using print books. Effectiveness of e-books was determined by comparing data obtained from the treatment and control groups.

Previous research on using electronic books to develop literacy skills have focused mostly on the English language. Korat (2010) and Smeets & Bus (2015) concluded that e-books aid in developing vocabulary and comprehension of children. However, Chiong, Ree, Takeuchi, and Erickson (2012) found that children who used e-books remembered significantly fewer details than children who read the printed version of the same book. They believed that it was because the children's attention was focused more on non-content features of the e-book than on the story details. Similarly, Davis (2012) also found that the multimedia features of e-book were distracting the readers, leading to reduced comprehension and recall of the story. Studies specifically on whether certain elements of e-books can be beneficial to literacy and learning have yielded varied results. For instance, O'Day (2007) found that animations aid long-term memory

acquisition better than static images. However, other studies concluded that low quality e-books may have distracting features that are detrimental rather than supportive of learning (Zucker, Moody, & McKenna, 2009). Chau (2008) also concluded that animations and sound effects can distract children and interfere with comprehension. In order for e-books to successfully provide richer learning experiences to the readers, experts have agreed that multimedia features should be critically crafted based on appropriate standards and theories (Wouters, Paas, & Merrienboer, 2008; Korat, 2010; Moody, 2010; Smeets & Bus, 2015). The researchers identified several of these theories and principles to guide the development of their animated e-books as explained below.

1.2 Theoretical Bases and Design of E-book

Scaffolding, the cognitive load theory, the personalization effect, and the voice principle served as theoretical bases for the design of the e-books.

Scaffolding. According to Wood, Bruner, and Ross (1976), scaffolding is the process that allows the child to accomplish a task he cannot do on his own through the help of an adult who takes control of the parts of the task beyond the learner's capabilities. This same concept could also be applied in e-storybooks when digital features are purposefully designed to provide support to children's learning (Moody, 2010). For instance, second language learners who may not have sufficient vocabulary to comprehend a story in the second language could benefit from the non-verbal cues in e-storybooks. Hence, for this study, the researchers made use of a digital feature (i.e. animations) that would concretize the meaning of difficult words in the stories.

Cognitive Load Theory. According to John Sweller's Cognitive Load Theory, instruction should aim to minimize working memory load for schema acquisition to happen (Culatta, 2015). This idea is built on George Miller's information processing theory which explains that the working memory can contain only a limited number of elements simultaneously (1956). Wouters et al. (2008) laid out strategies on circumventing the limits of working memory: Multimedia Principle, using visual and auditory presentation modalities to increase working memory capacity, and Signaling or Cueing, thus freeing up working memory load by presenting cues to limit visual search. Applying these in the current study, the researchers minimized the students' cognitive burden of decoding unfamiliar Filipino words and putting them together to form a complete thought by splitting the burden between the visual and auditory channels. The meaning of the word could be shown through animation rather than

having the teacher define the word verbally. The researchers also minimized extraneous cognitive load by directing the attention of the children to the key concepts or words (e.g. through zooming, highlighting) in order to remove the need for visually searching the entire page for information.

Personalization Effect and Voice Principle.

According to the personalization effect perspective, teaching is more effective when narrations are conversational rather than pedantic. In addition, the voice principle conveys that a friendly human voice is more effective in teaching than a robotic or machine-like voice (Sorden, 2012). These principles were the basis of the decision not to include pre-recorded narrations in the e-storybooks. The stories in the e-books were thus read aloud by researchers to the children. Electronic books greatly vary in terms of their digital features like animations, sound effects, narrations, and interactive features like games and hotspots. However, considering the aforementioned theories and principles, the researchers decided to limit the digital feature of the e-storybooks to animations. For this study, the term electronic storybook would refer to the softcopy of a storybook presented in a laptop, with animations as its only digital feature setting it apart from its print counterpart.

2. METHODOLOGY

Participants of the study were selected from three classes of level 3 kindergarten in a small progressive preschool in Makati City, Philippines. Children were excluded from the study if any one of the following criteria was present: (1) special needs, (2) proficiency in the Filipino language before intervention, or (3) absence of written consent from the parents. Out of the total population of 32 children, 20 four-year-old children qualified for the study.

A randomized complete block design was used for this research. According to Yale University's Department of Statistics (1998), randomized complete block design is a type of experimental design wherein a significant variable which may affect the results is contained first before randomly assigning the participants to experimental groups. Meaning, the participants are first divided into homogenous groups according to the variable to be controlled. Then, the members of the homogenous groups are randomly divided into experimental groups, ensuring that each treatment level is present in each homogenous group. Since the differences across the three participant classes (e.g. teacher

factor, time of the day, in-class learning activities) may affect the results, the researchers decided to control for this by using the original class assignments (i.e. Class A, Class B, and Class C) as the homogenous grouping of participants. Afterwards, the participants from each of the classes were stratified according to gender then randomly assigned to either control or treatment groups.

2.1 Preparation Stage

The researchers started by writing three stories (*Si Bong Pagong, Nawawala si Nanay*, and *Mang Mateo*) reflecting the curricular themes of the school. The researchers crafted the illustrations and animations for the print and electronic versions of the storybooks. Colored paper cut outs were arranged on a blank piece of paper to form the illustration for the pages. The pages were manually animated by the alternating process of scanning, moving or replacing the cut out part to be animated, then scanning the page again. Insertion of texts and combination of the scanned frames to form sets of moving pictures (i.e. GIF) were done using Adobe Photoshop. The animated pages in each story were then combined in a single Microsoft Powerpoint presentation to finish the process of creating the e-storybooks. On the other hand, the print storybook versions were made by printing one frame from every animated page of the e-storybook and binding the printed pages together to look like a book. Finished storybooks were then sent to a Filipino children's storybook author for content appropriateness and validity check.

The researchers also constructed the instruments for the study. The Pictorial Receptive Vocabulary Test (PRVT) which measured receptive vocabulary acquisition consisted of 15 words from the three Filipino stories. A Story-Retelling Rubric and a Comprehension Test were used to measure story comprehension. An interview protocol consisting of six questions to inquire into the children's reactions and experience with e-books was also constructed. The instruments were validated by a content expert in children's literature. In addition, the Cohen's kappa coefficients were computed for inter-rater reliability for the six components of the Story Retelling rubric. The coefficients ranged from 0.70 to 1.00 indicating that inter-rater reliability was satisfactory.

2.2 Implementation Stage

A pre-test for receptive vocabulary was administered to both groups of children at the start of the experiment. Then, each of the three stories was read aloud by the researchers two days a week, one story per week for three weeks. The same stories

were read to both groups, one using the animated e-books and the other, print storybooks. Vocabulary and comprehension tests for each story were administered after the second exposure to the story. A final post test for the vocabulary was conducted two weeks after the last story to check for vocabulary retention. The treatment group was also interviewed regarding their experience with e-storybooks. Content analysis was used to analyze their responses. Observation notes taken during the storyreading sessions provided further information.

3. RESULTS AND DISCUSSION

3.1 Receptive Vocabulary

The pre-test and post-test scores for the receptive vocabulary for treatment and control groups were analyzed through paired sample t-tests (see Table 1). Significant improvements in the receptive vocabulary after exposure to the stories were found in both the treatment $t(9)=-3.42$, $p=.009$ and control groups, $t(9)=-2.95$, $p=.018$.

Table 1. Within-groups comparison of PRVT scores of each group

	N	Mean (SD)	t	df	p	d
Treatment Group						
Pre-Test	9	7.33 (3.94)	-3.42	8	.009	-.67
Post-Test	9	9.89 (3.92)				
Control Group						
Pre-Test	9	5.22 (3.03)	-2.95	8	.018	-.77
Post-Test	9	7.33 (2.40)				

To check for difference between groups, post-test scores of the treatment and control groups were compared using ANCOVA (see Table 2). Results showed no significant differential effects in receptive vocabulary acquisition between the control and treatment groups, $F(1, 15)=.99$, $p=.34$. Post-test data collected two weeks after the storyreadings revealed that memory retention of vocabulary words did not differ between the groups. Unlike the studies of Smeets and Bus (2015) and Korat (2010), the current study was not able to establish significantly different effects. The researchers attribute this to the limited exposure of children to both print and electronic storybooks. Previous studies involved four to five exposures to a story in contrast to the two exposures in this study. Furthermore, there were more than

100 participants in both Smeets and Bus' (2015) and Korat's (2010) studies while the current research involved 20 participants only. The small sample size may have hindered the magnification of effects in the study. Another contributory factor may be the ceiling effect. There were three participants who knew 11 to 12 words out of the 15 words even before the intervention. Hence, these participants would have had less room for improvement since they only had 3 to 4 words left to learn. They happened to be part of the treatment group, and this may have minimized the effect of the intervention for the said group.

Table 2. ANCOVA for PRVT post-test scores as a function of treatment, using PRVT pre-test scores as a covariate

Source	df	Mean Square	F	p	Partial η^2
Pre-Test	1	105.94	25.24	.00	.63
Treatment	1	4.16	.99	.34	.06
Error	15	4.97			

Further analysis, however, showed significant differences between the control and treatment groups when the PRVT scores were analyzed per story, in favour of the treatment group. (see Table 3). Independent t-tests showed significant differences between the two groups for the stories *Nawawala si Nanay*, $t(18)=-3.07$, $p=.008$, and *Mang Mateo*, $t(16)=-2.22$, $p=.041$. The effect sizes for the analyses ($d=-1.37$ and $d=-1.04$, respectively) exceeded Cohen's (1988) standards for a large effect ($d=0.8$). On the other hand, receptive vocabulary scores of the control and treatment groups for the story *Si Bong Pagong* were statistically similar based on their p-values, revealing a medium to large difference ($d=.77$). It could be inferred that the animations for *Si Bong Pagong* were thus less effective compared to the other two stories in terms of developing receptive vocabulary. Animations in *Nawawala si Nanay* and *Mang Mateo* were used to explicitly lead the attention of the readers to the target vocabulary words even when it meant that the realism of the actions portrayed might be compromised. For instance, in the scene that mentioned the target Filipino vocabulary word "*plato*" in *Nawawala si Nanay*, the plates were only part of the background

and were not the focus of the story in that scene. The researchers, during the development of the e-storybook, had decided to make the plates shake a little in order to direct the attention of the children to the target vocabulary, despite the fact that plates cannot move on their own in real life. In the print version, the plates in the scene blended into the background which ultimately resulted in failure to learn the word. Nine children from the treatment group were able to learn the word "*plato*" while only four children from the control group acquired the word. This result illustrates the application of the Signaling or Cueing strategy for maximizing the capacity of working memory. Since the animations directed the attention of the children to the target vocabulary word, establishing the relationship between the visual representation and the word itself was easier.

Table 3. Between-groups comparison of PRVT scores for each story

	N	Mean (SD)	t	df	*p*	*d*
Si Bong Pagong						
Control	10	3.00 (1.33)	-1.71	18	.104	-.76
Treatment	10	3.90 (.99)				
Nawawala si Nanay						
Control	10	2.20 (1.69)	-3.07	18	.008	-1.37
Treatment	10	4.10 (.99)				
Mang Mateo						
Control	9	2.67 (1.22)	-2.22	16	.041	-1.04
Treatment	9	4.00 (1.32)				

3.2 Story Comprehension

No significant differences between the story retelling scores of control and treatment groups across the three stories were found in the independent t-tests. The effect sizes for each story ranged from small to medium (d=-.51, d=-.20, d=-.52, respectively). Actual retelling scores for the stories ranged from 3 to 5.56 which was relatively low considering that the highest possible score was 12. This seems to indicate that the children found the task of retelling rather difficult, corroborating a statement made by the Iowa Department of Education (2013) that "retelling a story is not easy for children even though they have heard countless stories" (p. 15).

Independent t-tests were also used to compare the participants' story comprehension scores (see Table 4). In contrast to the result for retelling, the treatment group's scores from the comprehension questions were significantly higher than the control group's scores for the story *Si Bong Pagong*, t(18)=-2.21, p=.040; d=-.99. No significant difference between control and treatment groups was established for both *Mang Mateo*, t(16)=-1.35, p=.196, d=-.64) and for *Nawawala si Nanay*, t(18)=-.25, p=.806, d=-.11. In addition, the average scores for *Nawawala si Nanay* for both groups were very high. The mean scores were 7.3 and 7.4, respectively, out of the perfect score of 8. The children may have found the story too easy—due to its repetitive texts and simple plot—such that the story could be understood even without the help of animations.

Table 4. Between-groups analysis of comprehension question test scores for each story

	N	Mean (SD)	t	df	*p*	*d*
Si Bong Pagong						
Control	10	3.20 (1.32)	-2.21	18	.040	-.99
Treatment	10	4.80 (1.87)				
Nawawala si Nanay						
Control	10	7.30 (.95)	-.25	18	.806	-.11
Treatment	10	7.40 (.84)				
Mang Mateo						
Control	9	4.00 (1.50)	-1.35	16	.196	-.64
Treatment	9	5.11 (1.96)				

Results show that the e-book for *Si Bong Pagong* was effective for developing story comprehension. Animations used in the story appeared more realistic and natural (e.g. characters walking, fish swimming, blazing movement of fire). These features that demonstrated the crucial actions or events happening in the story effectively aided in the story comprehension of the children. In keeping with the theory of Scaffolding, the visual scaffold provided by the animations provided a contextual support that helped the children comprehend the story.

3.3 Children's Reactions to E-Storybooks

Observation notes revealed that the children who were shown the e-storybooks were more focused on the stories than the other group. Their eyes were

directed at the e-storybooks from the start of the read aloud until the end. On the other hand, the attention of the children from the control group tended to wander, sometimes playing or talking with their classmates.

Interviews revealed additional reactions to the e-storybooks. Eight out of ten children felt "happy" while the stories were being read while the remaining two children reacted differently to specific scenes in the stories. One responded that she felt frightened when *Mang Mateo* was being read aloud while another child shared that she felt sad for *Bong Pagong*. The reactions indicate that the children were able to relate emotionally to the stories, facilitated by the animations in the e-books. All of the children liked the animations, describing them as "*nice*", except for the one who was scared of *Mang Mateo*. Some even shared that they liked the e-books because the experience was similar to watching a TV program. All participants from the treatment group attested to the usefulness of animations in helping them understand the story. One child said, *"Yes, I know it was a story and I remember it."* Lastly, six out of 10 children categorically stated that they generally preferred the use of animated e-storybooks to print storybooks. Of the four who expressed preference for print books, one child explained that *"I still like story books because I don't like iPad. Mama says no."*

4. CONCLUSION

Findings of this study show that e-storybooks, when used in storyreading, promote increased vocabulary acquisition and help the children comprehend the story better compared to its print counterpart. Moreover, certain types of animations are more useful for focusing aid for either receptive vocabulary or story comprehension development. Realistic animations which illustrate the actions or events happening in the story foster children's comprehension of the stories. On the other hand, the "attention-getting" animations which do not necessarily need to be realistic appear to be more effective in building vocabulary. The use of animated e-storybooks holds promise as a teaching tool for teachers to enhance receptive vocabulary acquisition and story comprehension in Filipino among kindergarten children. These findings however should be viewed in the context of the study's research limitations. Future studies can

be designed with a larger sample, increase the number of exposures of children to the storybooks, and further explore children's reactions to the various features of the e-books.

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