# The Effect of Interactive Media on Elementary School Childrens' Story Memory

Christine Joyce T. Daluz
*Campvelle's Learning Center, Therapy Works Inc., Philippines*

Mark Joel DJ. Mapoy
*De La Salle University, Manila*

## Abstract

*An experimental study examined the influence of interactive media on primary graders memory. A sample of 40 first graders from an Elementary School in the Philippines were randomly assigned to experience a computer-based story in 1 of 4 presentation modes (audio narration of the story, similar to radio; audiovisual presentation, similar to television; interactive viewing, and interactive observation). They were asked to listen, watch, interactively participate or observe during a storytelling activity and were asked later to answer a (a) narration-based questions; (b) visually-dependent questions; and (c) inference questions. The results showed that among students who had the storytelling activity, the ones under the condition of audio only remembered the story poorly, including the story facts and ability to make inferences. However, the effect of interactive media for this present study was identified to be non-contributing factor of facilitation of memory retrieval. Participants in the Audio-visual condition (M= 2.65, SD=.03) performed better than those in the Audio condition (M=2.02, SD=.15); t(9) = -3.720, p=.005. Likewise, participants in the Audio-visual condition (M= 2.65, SD=.03) performed better than those in the interactive (M= 2.19, SD=.11); t (9) = 3.743, p=.005. Lastly, Audio-visual participants performed better than those in the interactive observer (M= 2.04, SD=.11); t(9) =4.788, p=.001.*

*Keywords:* interactivity, media, memory retrieval, comprehension, children

## Introduction

Learning process is no longer confine with the traditional banking system of education, wherein pupils are seen as mere participants. Advancement in technology provides children the opportunity to explore and learn through different media. In particular, children's access to computer is becoming increasingly important, both at home and in the school settings (Ricci, 2002). These media includes devices such as audio components, digital video cameras, television and computer-based programs and games). These gadgets aid both the pupils and the teachers in actively achieving the learning objectives in a classroom setting. The introduction of such media encourages active learning and participation of pupils in the learning process. Active learning approach gives people control over their own learning (Bell & Kozlowski, 2008). Simply stated, active learning let pupils make crucial learning decisions such as selecting, judging and appreciating learning

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materials. In comparison with passive learning wherein pupils are mere expectators of what the teachers will present in the learning process.

Integrating computers into classroom is widely observed in schools and other educational institutions. There are different computer-based activities and software gear towards individual pleasure and leisure and for others; educational purposes. This is evident in the incorporation of computer-based literacy programs in word analysis, text comprehension, and fluency, alongside shared stories (Savage, Abrami, Hipps, & Deault, 2009). Computers inside the classroom are incrementally utilized in many schools such as the traditional, progressive and eclectic educational institutions. As the utilization of computers in the classroom increases since the start of the decade, its potential impact on children's information remembering and comprehension is vastly unexplored.

The history of utilization of interactive media in education has unclear beginnings. But as early as 1960's, there were already efforts of integrating this type of media in educational system. The following had their contributions: Frank Rosenblatt invented the "perceptron" in 1957 at the Cornell Aeronautical Laboratory in an attempt to understand human memory and cognition (Rosenblatt, 1958). A Physics professor at U.C. Berkely produced 163 high school physics lessons at Pittsburgh's PBS station WQED that were broadcast into public schools in the area. Each 30 minute lesson was filmed to be distributed in public television stations. Equally important during the early 1960's, Rath, Anderson and Brainerd reported a project using an IBM 650 to teach binary arithmetic in the University of Chicago which later did a series of courses delivered through the television. On the mid-1960's, Douglas Engelbart, a professor from the Stanford Research Institute published his seminal paper entitled "Augmenting Human Intellect: a conceptual framework (Engelbart, 1960). In this paper, he proposed using computers to augment training. And by the way, Engelbart is also the inventor of the computer mouse and a prototype is constructed by Bill English. And in 1965, the IBM via its subsidiary Science Research Associates, Inc., introduces Coursewriter for the IBM 1500, an online interactive CAI system in the 1960's. Standford University participated in the research and development that predated the IBM 1500s release (Silver et al, 1966). On the other parts of the globe, particularly in France, in one of the universities in Paris research in the field of computer assisted instruction began. Additionally, the Havering Computer Managed Learning System was developed in London, England (Broderick et. al, 1980). By 1980, it became popularly used by over 10,000 students and 100 teachers in applications that include mathematics, career guidance and industrial training. Another significant research study entitled "Examination of Obstacles to the Development of Computer Assisted Instruction" was created. Dr. Bernard Luskin, proponent of the mentioned study, directed a two year project funded

by the District of California, which aims to determine the potential needs of distance education in the future.

Not from the distant past, the K-12 learning management system named Sucessmaker is a software that emphasizes reading, spelling and numeracy (Zinn, 1980).

Nowadays, most computer-based programs allow active learning by allowing pupils to interact with the presented information. The interactivity involved in computer-based programs differentiates it greatly from other forms of media, such as audio components and television. This current study aims to investigate the possible impact of interactivity in pupils' information remembering and comprehension.

Previous researches conducted to examine the impact of interactivity in information remembering and comprehension revealed that when video, sounds, music, and oral text are combined in the multimedia storybook, children at risk seem to profit more from such repeated story experiences as is indicated by the more complete retellings (Verhallen, Bus, & de Jong, 2006). Support for the said finding can be found using Neuman's (2006) theory of synergy in multimedia wherein extra nonverbal features including video, music, and sounds seem to function additively when children are making inferences about a story's structure and when abstracting the story line.

Another hypothesis is that zoom shots and other visual and auditory effects help focus attention on significant visual details (Calvert et al., 1982; Gibbons et al., 1986). Short stories, accompanied by a helpful video framework, supported 6-year-old children's story recall and interpretation more than stories accompanied by mainly static images (Sharp et al., 1995). In examining third graders' recall and inferential abilities, Neuman (1989) found that the students who watched a multimedia story recalled more story elements than students exposed to only one medium.

Theoretically it is possible that live-action video and other formal features of multimedia books may impede the development of narrative comprehension, because they divert attention from the story line and the language, resulting in lower story comprehension and language skills (Hayes, Chemelski, & Birnbaum, 1981). According to this hypothesis the richness of multimedia symbols in multimedia presentations may elicit most attention from young children at the expense of verbal information processing (Hayes & Birnbaum, 1980; Hayes et al., 1981).

Development such as the introduction of computer-based programs provides convenience without sacrificing the objectives of the learning. It serves as an additional tool in order to deliver lessons in accordance with the learning objectives being implemented in school. In particular, use of computer, both through games and programs by children in school settings is being utilized (Annetta, 2010; Lee, 2006). In our modern time, the use of computers necessitates faster and efficient way of transferring information thus resulting in a more effective medium of learning.

Latest Department of Education (DepED) estimates place computer penetration at one computer for every 25,000 elementary pupils (1:25,000), one for every 111 secondary school students (1:111), one for every 728 elementary teachers (1:728), and one for every three secondary school teachers (1:3) ("National Framework," n.d.). The figures indicate the scarcity of computer in our current public educational system. The distribution of the available of computers depends on the support of their respective local government units and officials. Aside from this, computers also lack hardware peripherals (such as scanners, digital imaging devices and projectors) that would expand the functionality of computers, networking, and Internet access.

One big obstacle in the use of computer-based programs is the absence of specific curricular standards and guidelines for integrating computers into the subject areas is another important reason for the limited use of ICTs in classroom instruction ("National Framework," n.d.). Budgetary considerations hinder the national government from implementing a nationwide use of ICTs to make learning more interactive, interdisciplinary, collaborative and authentic. Presently, DepED is seriously taking into consideration the advancements in information-communication technology in delivering quality education in the future. Specifically, introduction of digital texts and audio visual programs will be prioritized from other forms of presentation.

The current research aims to find out whether children's learning is shaped by the type of media through which the information is presented. In the past, researchers compared audio with audio visual presentations. A number of studies have reported that visual presentation tends to dominate over other modalities in memory tasks (Posner, Nissen, & Klein, 1976). Support for this finding was found when children were assigned to watch a videotaped segment of *Sesame Street* followed by a comprehension test and a recognition test. The result revealed that the video material simply appears to be more salient and more memorable than the audio material.

## Method

### Participants

A convenient and purposive sample of 40 Grade I pupils participated in the study. There were 10 students randomly assigned to the four conditions. ($M_{age}$ = 81 months, $SD_{age}$ = 5.51 months). Parental permission was obtained for each child through consultation with parents before the experiment. All the participants came from Guyong Elementary School, a public elementary institution located in the District of Santa Maria, Division of Bulacan. The site was chosen because of its location proximity to one of the researchers. In addition, the researchers conducted the experiment in a rural location since

past studies were done in urbanized areas. No child in the study had seen *The Scaredy Crow* interactive book before.

## Location of the Study

The study was conducted at Guyong Elementary School, a public elementary school belonging to the District of Santa Maria in the National Capital Region of the Philippines. As of School Year 2010-2011, the school has a total student population of 1,317. Barangay Guyong has a total land area of 361.91 hectares, whose sources of income include agricultural products, livestock and industries. Rapid growth of the population is observed due to migration of workers relocated from nearby barangays.

## Experimental Design

Children were randomly assigned to one of four story presentation conditions: audio only (N= 10), audiovisual (N=10), interactive participant (N =10) and interactive observer (N =10).

## Procedure

Children were randomly assigned in the four conditions of the experiment: audio, audio visual, interactive and interactive observer. They were accompanied by the experimenter to the conference room of the school. The experimenter obtained permission from the school principal to use the said school facility as venue of the experiment. Laptop was utilized to present the four conditions of the experiment. The device was set up on the end of the table. A section of the conference room was used as holding area of the participants. The pupils were told to observe silence before, during and after the experiment.

At the beginning of each conditions, the researcher asked the name and age of each participants.Before the start of the interview, children were asked for verbal consent to participate in the experiment. Likewise, general instructions intended for the condition were given at the start of each experimental condition. All the participants were not familiar with *The Scaredy Crow.* The researchers are sure that the children are not familiar with the story since the material presented is not widely published in storybooks. Since none of the student were familiar with the story, the experimenter asked the children to tell what they thought the story might convey. Follow up questions regarding possible characters, locations and plot of the story was given before the actual experiment. The researcher asked the children to listen carefully to the story as a follow up interview would be given after the presentation.

Participants in the audio only condition were seated in front of the laptop. Headphones were assigned to them to avoid distractions from the outside environment. The participants listened carefully to the audio narration of the story. Laptop monitor was turn off so that the participant can concentrate on the assigned audio material. Children assigned in the audio visual condition also wore headphones but this time they were asked to watched the images displayed in the laptop monitor. *The Scaredy Crow* was played in the laptop as if the participants were just watching a television program. These conditions lasted around 12 minutes.

Children in the interactive condition were seated in front of the laptop. Children were encouraged to use the mouse while playing games from the laptop. This will ensure that the participants were at ease in using the mouse. The children then watched the story and were asked to click the next button displayed in every page of the electronic story book once they are ready to view the next part of the story. Meanwhile, the interactive observer participants were assigned in a separate portion of the experiment room to view the interaction of the participants assigned in the interactive condition. The interactive observer participants were not able to control the interaction. These sessions lasted for 15 to 20 minutes.

After the sessions, children were asked to respond to 20 specific questions about the story. The set of questions included 13 fact questions and 7 inference questions. Questions like where did the story take place? and what color were the birds? are example of narration-based fact questions. On the other hand, questions like why did Spike get scared? and what happened when the wind stop are examples of inference questions. The specific questions are included in the Appendix.

The experiment concluded by asking the child to name a favorite book, computer program and television show. Vague answers were clarified to specifically classify whether the information given was intended as a show, book or computer program. The said procedure was done since some children's stories had a book, television show and computer-based program versions. Only the first answers to the specific categories were considered in cases that the participants mentioned related or similar information. The said task aims to ensure that the child will finish the experiment with a positive feelings.

## Results

Children's total correct-response scores were collated and analyzed. The means and standard deviation were computed. The scores in response to the specific memory questions (scores ranged from 0-60 ).

**Table 1**
*Mean Number of Four Story Presentation Conditions*

| Condition | *M* | *SD* |
|---|---|---|
| Audio | 2.01 | .48 |
| Audio-visual | 2.64 | .09 |
| Interactive P | 2.18 | .33 |
| Interactive O | 2.04 | .33 |

T- test for significant differences between groups was used for the four conditions namely: audio, audio-visual, interactive and interactive-observer. Participants in the Audio-visual condition (*M*= 2.65, *SD*=.03) performed better than those in the Audio condition (*M*= 2.02, *SD*=.15); t (9) = -3.720, *p*= .005. Likewise, participants in the Audio-visual condition (*M*= 2.65, *SD*=.03) performed better than those in the interactive (*M*= 2.19, *SD*=.11); t (9) = 3.743, *p*=.005. Lastly, Audio-visual participants performed better than those in the interactive observer (*M*= 2.04, *SD*=.11); t (9) =4.788, *p*=.001.

A second media condition by gender ANOVA (two-way ANOVA) was conducted on children's summed correct questions that could answer narration facts questions. There was a main effect of media condition *F*(3,32) = 3.86, *p*<.02. Participants in the audio-only (*M*=13.30, *SD*=2.71) scores lower than the rest of the participant in the audio-visual (*M*=17.90, *SD*=2.33), interactive participant (*M*=14.40, *SD*=3.66) and interactive observer (*M*=12.80, *SD*=1.75) conditions.

**Table 2**
*Mean number of Correct Responses to Narrated Fact and Inference Questions*

| Condition | Narrated fact questions | | Inference questions | |
|---|---|---|---|---|
| Audio | 13.30 | (2.71) | 13.30 | (5.12) |
| Audio-visual | 17.90 | (2.33) | 19.40 | (1.57) |
| Interactive P | 14.40 | (3.65) | 14.50 | (1.75) |
| Interactive O | 12.80 | (3.63) | 15.60 | (3.77) |

Scores ranged from 0-21 for each question type (narrated fact and inference). These scores were analyzed in a gender (boy and girl), media condition (audio only, audio-visual, interactive participant, interactive observer) using two-way ANOVA, the main effect was on media condition *F*(6,62) =2.55, *p*<.03.

Participants in the audio only (Facts: *M*=13.30, *SD*=2.71 Inference: *M*=13.30 *SD*=5.12) scored lower (FACTS and INFERENCE) among other conditions such as the audio-visual (Facts: *M*=17.90, *SD*=2.33 Inference: *M*=19.40, *SD*=1.57), interactive participant (Facts: *M*=14.40, *SD*=3.65 Inference: *M*=14.50, *SD*=1.75) and interactive observer (Facts: *M*=12.80, *SD*=3.63 Inference: *M*=15.60, *SD*=3.77).

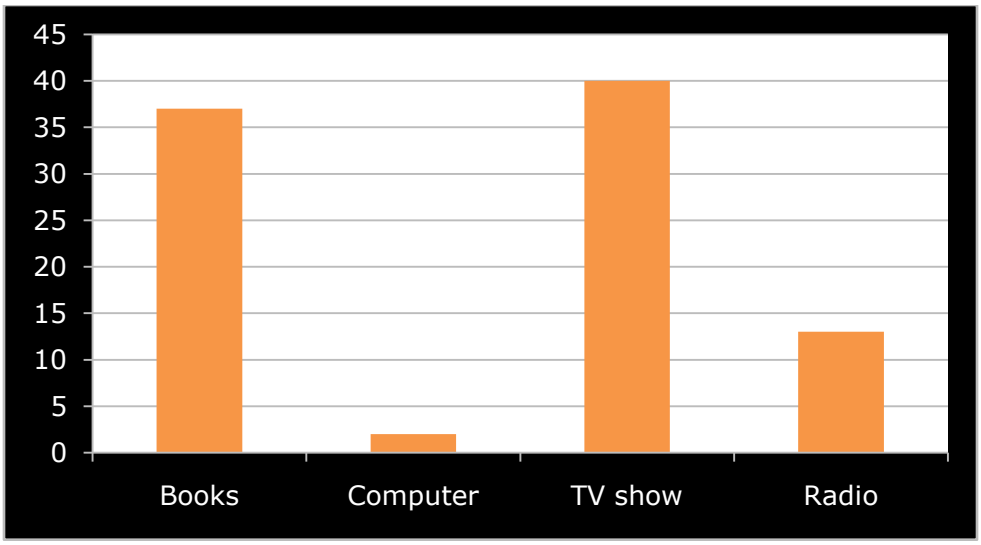


*Figure 1.* Participant's response to their favorite book, television show, radio and computer program

There are 40 responses for television shows, 37 responses for favorite books, 13 for radio programs and 2 for computer programs. Based on the results, it can be said that most participants were more exposed in TV shows followed by books, redio and computer. This may be due to the fact that participants can access television readily as compared to the other materials.

The results suggest that Filipino is the most favorite book (45.95%) followed by Matapat (24.32%) and English (13.51%). All the books mentioned were textbooks that the participants were using in their classrooms. On the other hand, Ben 10 emerged as the most favorite television shows of the participants (35%) followed by Dora (20%), SpongeBob Square pants (10%) and Bantatay (10%). All except Bantatay are cartoon shows considered as the participants' favorite television shows. It can be noted that the television shows considered by the participants are all within the range of television programs classified as fit for children viewing.

## Discussion

The current study replicated earlier findings that audio only children participants remembered a story poorly, including the story facts and ability to make inferences. There is a need to replicate similar studies in our Philippine setting. There are instances that the results and findings conducted abroad may not yield similar result when compared with the conditions present in our current settings. The researchers felt that it will be of best interest if the research be replicated using participants from our country. The study supported the hypothesis that visual stimuli tend to

dominate over other modalities in both perceptual and memory tasks (Posner, Nissen, & Klein, 1976). In addition, video comprehension was significantly higher in the A/V match condition than in either the A/V mismatch or video-only conditions, which did not differ from each other (Pezdek, & Stevens, 1984). The results clearly indicates that children tend to remember and comprehend visual or audio visual materials rather than audio materials.

Contrary to the expectations, interactive observer participants performed as well as the other participants assigned in other conditions. This may be linked to the personal motivation of the child in any given condition. It is probable that if the child is not properly motivated, the ability to remember facts in a story may not be enhanced. Motivation factor is important to investigate in future research. In fact, children in the present study were observed to be highly motivated with the task involved in the current study.

The effect of interactive media seems not evident in the experiment conducted. Instead of facilitating memory retrieval, it hindered the participant to retrieve story facts and in making inferences. The interactive book format offers many potential detours and distractions away from the main story than other forms of media (Ricci, & Beal, 2002). Since interactive condition requires longer time with the material, it is expected that it will yielded higher memory retrieval. Contrary to expectations, longer time allotted with material did not lead to better memory of the story.

It was apparent in the study that participants in the study had higher exposure to television based media. This may provide evidence for the significant higher memory retrieval in audio visual condition than the other three conditions. The similarity between television programs and the audio visual presentation of *The Scaredy Crow* facilitated better memory of the story among the participants in audio visual condition.

The results of the study may be totally different with a more difficult and elaborated story or with other types of interactive media, let's say computer games. Future researchers may study possible effect of story type, story difficulty and motivation of students. Future researchers might also be interested in possible effect of other socio economic status variables such as age, grade level and location.

The effect of interactivity is similar with audio visual presentation in terms of memory retrieval. This finding should be noted by the different children's program being produced in the country. Producers of these shows must utilized interactivity to harness the memory retrieval of their children audience. Shows like Batibot and Art angel are currently employing interactivity by asking their audience to respond to questions related to the show's theme and story.

The use of interactivity using computer-based programs could play a vital role at each stage in the process of information comprehension and

remembering. In addition to the competency of the teacher, technological instruments specifically computer-based programs can be utilized to convey story content and ensure that the required competencies at a given grade level are achieved by all pupils. In order to facilitate the introduction of computer-based programs in schools, administrators and teachers need to be oriented to what extent they will utilize such medium. A workshop must be convened in order to address the specific guidelines and processes needed to be accomplished before the formal integration of computer-based programs in the learning process. Likewise, resource speakers may be invited in workshops to explain the possible advantages and disadvantages of the said learning media. This kind of activities prior to the implementation may prove worthwhile since all stakeholders are well informed and part of the decision making.

If stakeholders decided to implement a computer- based learning may it be in specific or all the subjects, the computer-based programs to be used must be compatible with the learning objectives of a specific lesson per subject. For many lesson objectives, computer-based programs could be the ideal medium for initial explanation. But in succeeding class sessions, computer-based programs can be supplemented by other audio visual or learning methods and strategies. Well-designed computer-based programs can present compelling images, graphics, skits, demonstrations that will reinforce the learning process. Such application of learning media can actively motivate pupils to exert additional effort in order to achieve expected learning goals.

Teaching using different learning media must be done cautiously to avoid diverting the attention away from the learning objectives. The use of audio-visual devices greatly depend not only to its content but also on how the teacher uses the media to make the learning process understandable, memorable, and motivating.

The task of a teacher does not end with the presentation of a computer-based program. A careful review of key ideas and a series of questions to pupils are necessary to facilitate learning.

Innovations such as showing questions pre-loaded on the computer can catch the attention of pupils rather than simply calling pupils randomly. Based on the answers of the pupils, the teacher easily detects whether there is a need to reteach a difficult idea or to skip forward if the content appears too basic.

Innovation such as the use of computer-based learning materials provides an alternative from the traditional and passive learning process. Its application will depend on the content of each lesson and to the expected learning competencies of pupils under a specified grade level. Furthermore, its integration can be done on selected topics and lessons or to the whole subject. The length of the lessons using computer-based materials also may be quite different, depending on whether the content lends itself to many short lessons or few lengthy lessons.

Lastly, there are unlimited ways by which a teacher can integrate computer-based programs and other technology to meet the desired learning objectives and to meet the competencies expected from pupils. However, the point is that to achieve information comprehension and retrieval in the learning process, one must not solely rely on the possible effect of interactivity. The success of any learning process appears to be best achieved using an integrated collaboration between the teacher, learning media and the unlimited ways and methods a teacher may utilize to teach a lesson.

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