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Living Books: The Incidental Bonus of Playing with Multimedia

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The story-telling multimedia, Living Book, is one of the most common edutainment genres, in which children hear and play with interactive and animated stories, in a highly-engaging multimedia environment. Living Books are designed so that that every word of the story is projected as text on the computer monitor simultaneously with its narration. This enables listeners to synchronize between the audio and textual representation of words and thus to learn their pronunciation and understand their meaning. This article presents results of a study which showed that young children who did not know how to speak or read the English language became proficient in pronunciation and gained a high level of understanding by playing with Living Books. Results show that the participants were able to correctly pronounce almost 70% of the words in the Living Book and could identify the meaning of about 70% of them. On the other hand, it was found that they were able to read words as orthographic units but not to identify individual letters (average of 6.25%). Our findings point to the potential for incidental learning in highly-interactive, engaging and playful multimedia environments, such as Living Books.

Introduction

During the last decade, rapid development in multimedia capabilities has led to the gradual fusion of education and entertainment, creating a genre of educational gaming multimedia environments (Fromme, 2003), collectively referred to as *edutainment* (Brown, 1995; Okan, 2003). Edutainment environments include a large variety of educational multimedia features that combine fun and engagement in serious learning. One of the most powerful and increasingly widespread expressions of edutainment is online storytelling, a genre that is becoming very popular in today's educational websites (see, for example, "Educational Uses of Digital Storytelling" - http://www.coe.uh.edu/digital-storytelling/ - which is dedicated to the exploration of the impact of digital storytelling on learning). Another form of storytelling, that usually appears on multimedia-rich CD ROMs, is the Living Book (e.g., http://www.livingbooks.com/, and http://www.classsource.com/livingbooks/index.html), as represented by stories such as *Just Grandma and Me* (http://www.kidsource.com/software/ just.grandma.html) and *Arthur's Reading Race* (http://www.kidsclick.com/descrip/ arthur_reading_race.htm).

In Living Books, children play with highly interactive and animated stories. As they listen to the story, the sentences are projected on the screen as text and each narrated word is highlighted. The simultaneous appearance in Living Books, of written sentences, highlighted words and their narration, allows the player to synchronize the visual and the audio representation of words and learn their meaning, pronunciation and spelling. Despite arguments regarding drawbacks of such digital reading (e.g., Saga, 1999), there is a growing amount of evidence that points to the value of digital reading in general and Living Books in particular, in improving reading and acquisition of vocabulary among young children (Amory, NaickerVincent & Adams., 1999; Healy, 2000; Subrahmanyam, Greenfield, Kraut & Gross, 2001; Healy & Dooley, 2002; Squire, 2005; Stanford & Williamson, 2005).

Today, Living Books are very popular among young children, and like the rest of the computer games culture, they have become a cult that involves millions of "Living Book freaks," who use them for hours every day, both in groups and alone (Beentjes, 2001; Fromme, 2003; Foreman, 2004).

In 2004, the authors came across a group of young children (1st and 2nd graders) from non-English speaking countries, who reached a high level of proficiency in understanding and pronouncing English words only by playing intensively with Living Books (mainly *Just Grandma and Me* and *Arthur's Reading Race*), despite the fact that they all came from a non-Eng-

lish speaking-reading background and were completely illiterate in English.

This phenomenon of acquiring a foreign-language vocabulary through Living Books has not yet been reported in the literature. This article presents empirical results of a pilot study that aimed to characterize the phenomenon of second language vocabulary acquisition through multimedia Living Books, and to shed light on its educational implications. The results were obtained from a series of tasks designed to check the nature and level of word understanding and reading comprehension of the participants. This research serves as the foundation for future studies, aimed to examine processes of second language acquisition in multimedia environments, as well as implicit learning processes in highly-engaging technology-rich environments.

METHODOLOGY

The Studied Program

In the present research, the Living Book, *Just Grandma and Me,* was used as a representative of a Living Book. *Just Grandma and Me* belongs to the Interactive Animated Stories Series of Broderbund, Inc.; it is considered one of the most popular Living Books among young children. The Living Book consists of a short story by Mercer Mayer, which describes a trip by a child and his grandmother to the beach. The story is animated and narrated, and includes rich sound effects and other multimedia elements. When using *Just Grandma and Me* users can be completely passive (just listen to the story and watch the animations), or interact with the program by controlling the story and flipping back and forth between the screens. Narration is available in different languages, including French, English and German. Participants in the present research used only the English option. Of special interest in the present research is the fact that the narration is fully synchronized with the text. This allows the user to hear the narrated words and view them simultaneously in text format. The story consists of 12 consecutive screens, with 5-6 lines of text in each screen. In addition, the Living Book provides a variety of highly engaging and fun elements such as playing virtual games in the sand. These elements acted as a major motivator for the repeated use of the program by children.

Participants

Participants were ten boys and ten girls in the 1st and 2nd grades, living in Jerusalem, Israel, who volunteered, with their parents' permission, to participate in the research. They belonged to a large community of new immigrants and foreign workers, who came to Israel from Spanish-speaking countries in South and Central America. The children spoke fluent Spanish but were not able to write or read Spanish. Except for one child, their parents spoke mainly Spanish and only very basic English, if at all. None of them were exposed to English at home, and with the exception of computer games, most were exposed to the Latin alphabet only through the Spanish-language stories they were told by their parents, and the Spanish newspapers their parents read. They were exposed to some English through English-speaking programs on the Israeli television, but since all foreign-language TV programs are subtitled in Israel, this exposure was very limited. According to all participants, they watched almost only Hebrew and Spanish-speaking TV programs. They did not have Internet connection at home and hardly used English computer software, such as computer games. Since English studies begin in later years in the Israeli education system, they had not been exposed to English in school. All participants were "Living Book freaks" who began to use them intensively about one year before the study. In 2005 they continued this intensive use. They all had a computer at home and functioned as a close community whose members kept in close contact and met to play together almost every day.

Tasks

To examine the nature of language acquisition from Living Books, a task-oriented research approach, in which participants were required to perform authentic tasks, was chosen (Wiggins, 1993). A set of eight tasks was designed and assigned to each participant. The tasks belonged to three major domains: (1) word pronunciation, (2) meaning recognition, and (3) letter pronunciation. All tasks were based on working with the Living Book, *Just Grandma and Me*, a multimedia interactive storytelling Living Book, used intensively by all participants. The study took place during 2004 and lasted for two months. It was conducted in one of the participants' houses. All instructions for performing the tasks were given in Hebrew, a language all participants understood well.

*Word pronunciation tasks***.** The purpose of the word pronunciation tasks was to explore the ability of the participants to identify words that appear in

the Living Book by pronouncing them properly. For each task, ten randomly-selected words that appeared in *Just Grandma and Me* were listed on a printed page, and the participants were asked to say them aloud. There were three different word pronunciation tasks:

- Task #1: Identify words exactly as they appear in *Just Grandma and Me*. Participants were given a printed screenshot and were asked to say aloud the ten words marked on the page. The words appeared exactly as they did in the Living Book.
- Task #2: Identify words that were typed on a page using a word processor, in the same font as in the Living Book: Participants were asked to say aloud, another group of ten words from the story *Just Grandma and Me* that were typed using a word processor, in the same font and size as in the Living Book.
- Task #3: Identify another group of ten words from the story *Just Grandma and Me* that were typed using a word processor, in the same size but using a different font than the Living Book.

Meaning recognition tasks. The purpose of these tasks was to investigate the ability of participants to understand the meaning of words that they encountered in *Just Grandma and Me*. For each task, words were read to the participants, and they were asked to mark them on a printed page showing a screen capture from *Just Grandma and Me*, that included the words. There were two meaning recognition tasks:

- Task #4: Listen to a word: Ten words were read to the participants. They had to mark the words on a printed screenshot, which consisted of sentences from *Just Grandma and Me*.
- Task #5: Listen to a word description**:** Participants received a screen capture that showed the text of part of the story told in *Just Grandma and Me*. They heard a description, in Hebrew, of a word that appeared on the page, and were asked to mark the described word. For example, they heard the description, "This is where we like to swim," and were supposed to mark the word "sea" on the page.

Letter pronunciation tasks. These tasks examined the ability of the participants to identify individual letters, not in a word context. For each task, the participants were shown ten cards. Each card showed a randomly-selected letter. Participants were asked to pronounce the letters in the same way they are pronounced in the Living Book. There were three letter pronunciation tasks:

- Task #6: Identify letters exactly as they appear in *Just Grandma and Me*: Participants were given ten cards, each showing a capture of a randomly-selected single letter from *Just Grandma and Me*, and were asked to pronounce the letter on each card.
- Task #7: Identify ten letters written using a word processor, in the same font as in *Just Grandma and Me*. Participants were asked to pronounce the letters that were written using a word processor, in the same font and size as in *Just Grandma and Me*. Each letter appeared on a separate card.
- Task #8: Identify and pronounce ten letters generated by a word processor, written in the same size but in a different font than in *Just Grandma and Me*. Each letter was printed on a separate card.

The order of all task categories (word pronunciation, meaning recognition and letter pronunciation) was counterbalanced.

RESULTS

The results (Tables 1 and 2) revealed that participants had high proficiency in the word pronunciation and meaning recognition tasks (tasks 1-3 and 4-5, respectively), whereas their performance on the letter recognition tasks (tasks 6-8) was very low. Results also indicate that the girls' scores were about 10% higher compared to boys in all tasks. In addition, in an interview that preceded the research it was found that of the 10 children that participated in the research, 9 said that they were "just playing a game" (and not "learning"), when asked about their reason for using *Just Grandma and Me*. None of them mentioned learning English words as the major outcome of using the program.

In the following sections, the research findings and major trends are analyzed and discussed.

Word Pronunciation

An overall analysis of variance (ANOVA) was carried out on word pronunciation performance. The results are summarized in Table 1. In general, all participants showed high proficiency in pronouncing words. The mean correct word pronunciation over all tasks was 6.85 words (68.5%). The

mean correct word pronunciation for Task #1 was 7.1; it was 6.75 for Task #2 and 6.7 for Task #3. Clearly the best performance was for pronunciation of words as they appear in the Living Book (Task #1), and it slightly deteriorated as the words differed from their original appearance. But the differences in performance between the three tasks was not significant [F(2, 19) = 298, .063]. Overall, the girls performed 12% better than the boys. Girls scored an average of 7.43 while boys scored an average of 6.26. This difference was found to be significant [F(1, 18) 2.82, .011]. No significant interaction was found between sex and tasks [F<1].

Table 1

Results for the Word Recognition Tasks

	Task 1 Word exactly as in game	**Task 2** Word in a word processor; same font & size	**Task 3** Word in a word processor; different font; same size	**Average**
Girls	7.7	7.3	7.3	7.43
Boys	6.5	6.2	6.1	6.26
Average	7.1	6.75	6.7	6.85

Note: Values show the number of correct words recognized out of ten.

Meaning Recognition

An overall analysis of variance (ANOVA) was carried out on meaning recognition performance. Results are summarized in Table 2. In the two tasks of meaning recognition, participants achieved high scores. The mean correct meaning recognition over all tasks was 6.3 words (63%). The mean correct meaning recognition in listening to a word (Task #4) was 6.65, and in listening to a word description (Task #5), was 5.95. This difference was found to be significant [F(1, 18) 29.4, .0001]. As in the word recognition task, girls performed better than boys, scoring 7.2 correct answers for the listening task (#4) and 6.4 for the "listen to a word description task" (#5), whereas boys scored 6.1 and 5.5, respectively. This difference was significant [F(1, 18) 5.56, .03]. No significant interaction was found between sex and tasks [F<1].

Table 2
Results for the Meaning Recognition Tasks

	Task #-4 Listen to a word	**Task #-5** Listen to a word description	**Average**
Girls	7.2	6.4	6.8
Boys	6.1	5.5	5.8
Average	6.65	5.95	6.3

Note: Values show the number of correct meaning recognition out of ten.

Letter Pronunciation

In contrast to the high performance on word pronunciation and meaning recognition, performance on letter pronunciation was very low over all tasks. Of the 20 participants, 9 did not pronounce any letter properly (3 girls and 6 boys). The other 11 participants scored between one and two correct pronunciations, a mean of one correct pronunciation over all three tasks. Here too, the girls performed better than the boys, scoring an average of 1.15 pronunciations, compared to .33 by the boys, but this difference was not significant [$F(1, 18) = 6.22, .022$]. No significant interaction was found between sex and tasks [$F<1$].

DISCUSSION AND CONCLUSIONS

The empirical findings of the present research illustrate the potential of incidental learning that takes place in playful multimedia environments, which were not originally designed for formal learning, but their highly-engaging nature promotes meaningful learning. This process involves the incidental transformation of irrelevant into relevant information, in which learning is the by-product of the interaction. As evident from the design of *Just Grandma and Me* and from the interviews with the research participants, the users' main purpose was playing in an enjoying multimedia environment, not formal learning. Despite this fact, the findings show that by interacting with the engaging elements of the environment, children incidentally gained meaningful learning of the spoken and written language.

The incidental nature of learning with multimedia environments in general and of foreign language acquisition in particular, is discussed in the Creative Construction approach (Krashen, 1981), that describes the cen-

tral role of incidental and implicit learning in foreign language acquisition. According to this approach, in many cases, especially when learners are in extensive dialogue with their working environment, they acquire a second language incidentally, without being aware of it, and without even practicing speaking or writing. This process of incidental learning by comprehensible input occurs to a large extent in *Just Grandma and Me*, where the users make sense of the input they receive from the program without being aware of the fact that they are actually learning a language. This process is similar to the implicit language learning process described by Pemberton, Fallahkhair and Masthoff (2004), who claimed that after learners hear and read many samples of words in interactive television, they are able to make sense of them and internalize the language. The Creative Construction approach puts special emphasis on engagement and motivation as major elements in achieving effective incidental learning, as also occurs in the engaging and motivating design of Living Books such as *Just Grandma and Me* and many other edutainment environments that combine incidental learning with play.

In Living Books and in other digital platforms such as interactive television, as they hear the story, users are required to synchronize effectively between simultaneous verbal (the narration) and visual (the written words) stimuli in order to recognize the words and understand their meaning (Mayer, 2001). The process of simultaneous text-narration synchronization in digital environments has been studied intensively in recent years (e.g., Snyder, 1997, 1999; Beavis, 1999; Williams, 1999; Healy & Dooley, 2002; Milton, 2002). Most studies (e.g., Koolstra, 1999; Fallahkhair, 2004; Pemberton et al., 2004) focused on the synchronization process in interactive television. A few studies (e.g., Williams, 1999; Healy, 2000; Henry, 2002) discussed multimedia storytelling environments as platforms for language acquisition. Williams (1999) described the value of pointing to or highlighting words simultaneously with the story-telling to children, and discussed the major role that synchronization between verbal and visual stimuli takes in this process. It is suggested that the learners' ability to synchronize these simultaneous stimuli effectively plays a major role in their ability to achieve the high degree of reading proficiency that was found in the present study.

Findings of the present research suggest that words are perceived by learners as orthographic units (as whole words) rather than as a combination of elements (letters). This is evident from the high scores of all participants on word pronunciation, and from the very low scores on letter recognition. On the other hand, the word recognition and understanding scores did not change significantly when the words or were typed using a word processor (in the same font and size), or when the font was changed. These findings

indicate that the knowledge acquired is not domain-specific and can be performed outside of the specific environment. Results of the meaning recognition tasks indicate that the participants not only recognized words from their appearance and structure, but also (and perhaps most importantly), understood their meaning from the context. In both meaning recognition tasks, the participants achieved high scores, and no significant difference was observed between listening to a word (Task #4) and understanding from its description (Task #5).

In recent years, a global spread of the digital games culture is being reported, which involves millions of people in the world, from almost every society and age group, who spend much of their free time playing multimedia games (Fromme, 2003). Most of these games were not originally designed for learning, and gamers don't usually think that they are learning when they play them (Fromme, 2003). Despite this fact, our findings illustrate the potential of many of today's multimedia games for incidental and unexpected learning, as a by-product of using the game, much in the way it occurred with *Just Grandma and Me*.

And finally, an interesting finding of our study is the consistent superiority of girls over boys on all tasks. This finding is in accordance with studies that suggested the general superiority of girls in learning from multimedia environments (e.g., Henderson, Klemes & Eshet, 2000), and reading acquisition using technology (e.g., Milton, 2002). But one should remember that most of the research performed in the field focused on explicit learning in which learners are attentively trying to acquire reading ability. In Living Books and other edutainment environments, the main goal of users is play, and the reading ability is acquired incidentally, with no direct intention (Marsick & Watkins, 1990). Is there a gender difference in implicit learning, or perhaps girls are more motivated to learn in edutainment environments settings? Such questions require further study.

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