Chapter 6
What Can Better Support Low SES Children's Emergent Reading? Reading e-Books and Printed Books with and Without Adult Mediation

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One of the computer programs introduced for children in recent years is electronic books (e-books). These are most often interactive books which are used as a version of children's books that were originally published in a printed format. Although there has been a sharp increase in the publishing of electronic books, there is to date little research on the quality of these books, the way they are used or their advantages (for details see Chera and Wood 2003; Lankshear and Knobel 2003). There exists primary evidence that electronic books promote young children's literacy in different aspects. Activity with e-books was found to improve children's phonological awareness (Chera and Wood 2003; Korat and Shamir 2008), their ability to recognize written words (Gong and Levy 2009; Lewin 2000; Shamir and Korat 2007), and their ability to read accurately and fluently (Medwell 1998; Oakley 2003). Activity with an e-book also improved children's ability to retell a story (de Jong and Bus 2004; Trushell et al. 2003) as well as their concepts about print (Shamir et al. 2008).

But also, some studies have shown that the electronic book makes little or no contribution to young children's literacy (Burrel and Trushell 1997; Underwood and Underwood 1996). These studies include one that compared the contribution to children's literacy of an independent activity with an e-book with the contribution of reading a printed book. Some studies reported a similar contribution of both contexts (de Jong and Bus 2004; Korat and Shamir 2007), whereas others showed a greater contribution of the adult reading (de Jong and Bus 2002; Segers et al. 2004). To date, only one study has investigated the contribution of reading an e-book with an adult compared to reading a printed book with an adult (Caplovitz 2005). This study found no differences in the emergent reading of children who read an e-book with an adult compared to children who read the same book in a printed format with an adult.

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One of the explanations for the e-book's limited contribution to children's literacy is that adult mediation is needed in addition to the e-book reading in order to more effectively promote children's literacy (Trushell and Maitland 2005; Underwood 2007). Many studies indicated the contribution of adult mediation when reading a printed book to a child (Sénéchal and LeFevre 2002) and during an activity of a child with a computer (Nir-Gal and Klein 2004).

Another explanation is that many commercially available e-books emphasize multimedia, sounds, colors, and graphics, but are not necessarily adapted to promoting children's language and literacy (de Jong and Bus 2003; Korat and Shamir 2004). Two comprehensive reviews on the e-books found in the commercial market have been carried out, one in the Netherlands (de Jong and Bus 2003) and the other in Israel (Korat and Shamir 2004). It was found that many commercial e-books do not have the option of a text that is highlighted congruently with the narrator's reading. This option is important, since it can help children track the text, and may promote their concept about print and reading ability. Furthermore, many commercial e-books do not include the option of seeing or hearing how words from the text can be divided into syllables or sounds, an option that may support children's phonological awareness.

The current study focused on children from a low socioeconomic status (LSES). It has been well established in the literature that LSES children have a lower level of emergent reading than children from a high SES (HSES) (Hecht et al. 2000; Lonigan et al. 1998). In Israel, the gap between the literacy levels of LSES and HSES children is, according to the international literacy test PISA (2002), the largest among the participating countries (Hablin et al. 2004). Studies carried out in Israel showed that this gap has already begun in kindergarten (Korat et al. 2003).

It was also found that Israeli LSES children have a lower home literacy level in terms of materials (e.g., newspapers, books, literacy games) as well as parental mediation during book reading (Korat et al. 2007). Verhallen et al. (2006) claimed that multimedia features, such as those found in e-books, may have a greater potential for promoting emergent reading than printed books with static pictures. They further claimed that this is especially true for children at risk for having difficulties in learning to read. Verhallen et al. (2006) reported that LSES kindergarteners who read e-books with dynamic multimedia features (e.g., active animations and sounds) independently increased their vocabulary and story comprehension to a greater extent than LSES kindergarteners who read e-books with static multimedia features (e.g., static animations and no sounds) independently.

Mixed results were obtained in studies that focused on the effect of e-book reading by LSES kindergarteners on their emergent reading skills. Some studies reported that among LSES kindergarteners, an independent activity with an e-book promoted word reading, phonological awareness, and CAP (Korat and Shamir 2008; Shamir et al. 2008). Others found that this activity only promoted children who had an initial high emergent reading level (Korat and Shamir 2007; Verhallen et al. 2006). It is therefore interesting to examine whether reading an e-book with adult mediation could have a different effect on the emergent reading of LSES children than an independent activity with the e-book as well as compared with reading the same version of the printed book with adult mediation.

The present study is unique because it is the first to compare the interventions of an independent activity with an e-book without adult mediation, reading the e-book with adult mediation and reading a printed book with adult mediation, and the effects of these mediations on promoting children's emergent literacy. A central issue in the present study is whether the reading and mediation of an electronic book by an adult makes a unique contribution to kindergarten children's emergent reading compared to reading a printed book with adult mediation and compared to the children's independent activity with the e-book.

Method

Participants

The sample consisted of 128 children from 12 kindergarten classes. The mean age of the children was 69.65 months ($SD = 4.14$). A nearly equal number of boys and girls were included in each group. All children attended kindergartens located in LSES neighborhoods. Neighborhood SES levels were determined according to the Israeli municipalities' statistical report (Central Bureau of Statistics 2005), which includes data such as the parents' education level, income level, housing density, PC ownership, etc. All kindergartens that participated in the research had the same educational program.

Procedure

Children in each of the kindergarten classes were randomly assigned to four different groups. Each group participated in four book-reading sessions. One intervention group (EB) read the e-book independently without adult mediation. Another group (EBM) read the e-book with adult mediation during and after the sessions. The third group (PBM) read the printed book with adult mediation during and after the sessions. The fourth group, which served as the control group, received the regular kindergarten program.

The children's activity with the computer or the printed book took place in their kindergarten classes. The children worked in pairs in a separate room. Working in pairs was found to promote young children's emergent literacy when engaging with e-books (Shamir 2009; Shamir and Korat 2007; Shamir et al. 2008). Sessions in all three experimental groups lasted 20–30 min. The sessions with the adult after the readings in the EBM and PBM groups lasted 20–30 min. In the EB and EBM groups, the children were given technical support as needed, and some were encouraged to finish their session. The mediation in the EBM and PBM groups occurred during and after the sessions and emphasized the promotion of emergent reading based on studies that indicate that discussion of print concepts and emergent literacy aspects

in shared book readings promotes children's literacy skills (Justice et al. 2008; Korat et al. 2007). The activities with the adult after reading the books were conducted with reference to the books that were read before and the mediation given by the adult during the reading. For example, during the sessions with the e-book, the adult focused the children's attention on the option of hearing and seeing how words from the text can be divided into syllables and sub-syllables. In the PBM group, the adult stopped at those words which were divided in the e-book and divided them into syllables and sub-syllables. In both the EBM and PBM groups, this activity took place repeatedly with the adult and the child after the sessions by clapping hands.

The Printed and Educational Electronic Books

Two books, each in a printed and an electronic version, were used. Half of the children in the intervention groups read one book and half read the second book. The e-books were electronic versions of *Yuval Hamebulbal* (*Confused Yuval*) by Miriam Rot (2000) and *Hatractor Beargaz Hachol* (*The Tractor in the Sandbox*) by Meir Shalev (1995). These e-books were designed by the authors to capture general educational principles and those found especially beneficial for developing literacy, while avoiding drawbacks identified in standard e-books (de Jong and Bus 2003; Korat and Shamir 2004). The story's protagonist in *Confused Yuval* is Yuval, a young boy who tends to be confused and forgetful until his grandmother makes a special hat for him to help him remember. The *Tractor in the Sandbox* tells the story of an old farmer (Uncle Aaron) and his special relationship with an old tractor. A large colored drawing covering more than half of the page appears on each of the two books' pages, as do three to five written sentences totaling approximately 40 words. We scanned the pages from the printed books for the e-books in order to maintain similarity between the versions. An animated figure explained the different options for activating the story in the electronic version.

The children were offered two modes or options: (1) read story only and (2) read story and play (in the first session, they were told to read the "read story only" mode, and in the other three sessions, they were told to read the "read story and play" mode). Each activation mode included an oral reading of the printed text by an actor. The e-books also contained automatic dynamic visuals that dramatized story details, events, and the complete story plot, as well as music and film effects that were intended to "bring the story content to life." The e-books had a forward button (a colored arrow that points to the right) and a backward button (an arrow that points to the left) on each screen in order to stimulate the children's reading orientation and involvement, thus enabling the children to return to previous screens or continue to the next one. A function that allowed the children to reread/re-listen to the text was also available. The highlighting of written phrases as the text was rendered aloud was intended to focus the children's attention on the relationship between the text and the oral reading, thus perhaps supporting their exposure to the written text and word recognition (de Jong and Bus 2002).

The "read story only" mode included an oral reading of the printed text as well as automatic dynamic visuals that dramatized story scenes, extra music, and film effects. The "read story and play" mode was designed to enhance the children's story understanding and phonological awareness. Its interactive functions allowed the children to activate the story by clicking on hidden hotspots as they appear on (a) characters or objects and (b) words appearing in the text. However, since we did not want the hotspots to distract the children from listening to or reading the story, they were programmed so that the children could activate them only after reading/ listening to the text on each page. Activation of characters or objects was designed to enrich story comprehension by means such as a discourse between the main characters as well as voice and sound effects. The inclusion of hotspots of words also aimed at promoting the children's phonological awareness of syllabic and sub-syllabic levels. For example, when the word "Yuval" in *Confused Yuval* is shown, it is divided into its syllables and sub-syllables, which the narrator reads out loud.

Preliminary studies that tested the effectiveness of these two e-books showed that activity with them improved kindergarten children's phonological awareness and their ability to recognize written words (Korat 2009; Korat and Shamir 2008; Shamir and Korat 2007), vocabulary (Korat and Shamir 2007, 2008), story comprehension (Korat 2009; Korat and Shamir 2007), and writing ability (Korat and Shamir 2007).

Children's Emergent Reading Level (EL)

The children's EL was assessed before and after the activity with the e-book/printed book. The measures used for assessing EL were recognition of letter names, letter-sound connection, phonological awareness (opening and closing phoneme and division into syllables and sub-syllables), word reading, and concept about print (CAP). A general emergent reading level grade was built from all the measures. The alpha score for this grade was .82.

We also investigated whether the children's progress in EL was influenced by their initial EL. For this purpose, the participants were divided into two groups: high and low initial EL. The children's level was determined according to the general EL test score prior to the intervention. The 40% of children in each group with the lowest scores were defined as having a low EL. The 40% of children in each group with the highest scores were defined as having a high EL. The division of 40% was carried out in order to insure a sufficient number of children in each level for performing the statistical analyses.

Results

Preliminary analyses of the overall pre-intervention early reading scores were performed using univariate analysis of variance by groups (EB, EBM, PBM, control). Significant differences were found between the groups before the intervention in

Table 6.1 Children's emergent literacy degree of improvement scores (means and standard deviations) by treatment group

	Control	EB	EBM	PBM
Letter names recognition	−1.25	3.75	11.25	2.81
	(20.44)	(15.81)	(16.21)	(14.64)
Letter-sound connection	10.31	8.91	6.25	1.56
	(14.97)	(16.15)	(16.01)	(25.35)
Phonological awareness – opening sound	8.51	11.46	3.13	5.21
	(20.16)	(17.18)	(15.84)	(20.11)
Phonological awareness – closing sound	18.13	23.54	31.04	8.33
	(30.69)	(30.51)	(33.43)	(32.06)
Phonological awareness – division into syllables	3.39	−.78	2.34	.26
	(17.56)	(14.26)	(7.40)	(12.79)
Phonological awareness – division into sub-syllables	2.02	8.07	7.29	14.39
	(13.70)	(16.14)	(8.81)	(22.93)
Emergent word reading	.52	1.91	60.76	4.95
	(11.52)	(14.24)	(17.72)	(15.82)
CAP	.20	8.20	24.61	11.91
	(12.14)	(14.84)	(11.70)	(15.66)
General reading level	5.18	8.13	18.31	6.18
	(8.19)	(7.64)	(6.70)	(7.53)

two measures: phonological awareness ($F[3,120]=5.05$, $p<.01$, $\eta_p^2=.11$) and CAP ($F[3,120]=13.08$, $p<.001$, $\eta_p^2=.25$). Differences in phonological awareness were found between the EBM and the PBM group in favor of the former. Differences in CAP were found between the PBM and the other three groups. CAP achievements for the PBM group were lower than the achievement level in the other three groups.

A univariate one-way analysis of variance with Bonferoni corrections was then performed in order to determine improvements in the children's early literacy measures as a function of the intervention group (EB, EBM, PBM, control) and EL (low and high). The analyses were carried out for each EL measure separately as well as for the overall general EL score. The analyses were controlled for differences found between the groups in the pretests. Means and standard deviations of improvement in the children's EL scores in each treatment group and by initial EL are presented in Tables 6.1 and 6.2.

The achievement in the EBM group was significantly higher than the other three groups (PBM, EB, and the control) in recognition of letter names [$F(3,119)=3.98$, $p<.05$, $\eta_p^2=.09$], word reading [$F(3,119)=142.47$, $p<.001$, $\eta_p^2=.78$], concept about print (CAP) [$F(3,129)=29.71$, $p<.001$, $\eta_p^2=.43$], and general reading level [$F(3,119)=23.54$, $p<.001$, $\eta_p^2=.37$]. Furthermore, achievement in the EBM group was significantly higher than that of the PBM group in phonological awareness – closing phoneme [$F(3,119)=5.51$, $p<.01$, $\eta_p^2=.12$]. The EBM group scored significantly higher than the EB group and the control group in phonological awareness – sub-syllables [$F(3,119)=4.83$, $p<.01$, $\eta_p^2=.11$]. The EB group was significantly higher than the PBM group in phonological awareness – opening phoneme [$F(3,119)=2.70$, $p<.05$, $\eta_p^2=.06$].

Table 6.2 Children's emergent literacy degree of improvement scores (means and standard deviations) by treatment group and by beginning of EL

	Control		EB		EBM		PBM	
	Low	High	Low	High	Low	High	Low	High
Letter names recognition	6.15	−5.38	10.00	−1.54	15.38	3.85	4.62	1.54
	(25.99)	(12.66)	(19.51)	(12.81)	(20.25)	(10.44)	(20.25)	(9.87)
Letter-sound connection	8.85	12.69	13.08	6.15	10.00	−5.38	.38	3.85
	(13.56)	(18.44)	(20.77)	(14.02)	(10.08)	(14.06)	(16.26)	(37.03)
Phonological awareness – opening sound	10.26	4.62	8.72	12.82	9.49	−3.59	6.41	.51
	(16.24)	(21.54)	(15.55)	(19.00)	(20.13)	(11.58)	(21.54)	(16.71)
Phonological awareness – closing sound	28.96	13.08	20.51	24.36	16.67	43.85	.51	20.77
	(36.03)	(34.71)	(27.21)	(35.18)	(30.00)	(35.32)	(3.29)	(47.98)
Phonological awareness – division into syllables	10.90	−.64	−3.85	1.92	.00	2.56	.00	−.64
	(25.55)	(5.34)	(21.95)	(3.65)	(.00)	(7.12)	(18.94)	(6.33)
Phonological awareness – division into sub-syllables	4.33	−1.28	12.82	4.17	5.61	9.46	18.75	10.10
	(19.37)	(7.09)	(22.08)	(10.24)	(9.86)	(7.64)	(25.73)	(23.74)
Emergent word reading	2.99	−3.42	5.13	−2.14	58.76	61.32	−2.14	12.18
	(10.30)	(12.01)	(9.13)	(18.60)	(17.45)	(16.84)	(8.72)	(18.48)
CAP	0.48	−1.92	6.25	7.21	22.60	24.04	11.54	8.65
	(12.62)	(13.83)	(12.76)	(18.55)	(10.38)	(12.46)	(17.65)	(13.63)
General reading level	7.13	3.15	9.56	5.66	20.71	12.88	5.01	7.12
	(9.01)	(5.68)	(8.37)	(5.55)	(8.78)	(4.18)	(8.24)	(9.75)

Table 6.3 Promoters of hierarchical regression analysis for variables predicting children's EL according to difference scores

Variable	B	SE	β	t	R²	Δ R²
Step 1					.11	.01
Gender	−.03	.07	−.04	−.42		
Age	−.01	.01	−.06	−.64		
Mother's education	−.01	.03	−.03	−.25		
Father's education	.02	.02	.09	.78		
Step 2					.33**	.10**
Gender	−.03	.07	−.04	−.41		
Age	−.01	.01	−.05	−56		
Mother's education	.00	.02	.016	.13		
Father's education	.03	.02	.15	1.42		
Initial EL	−.20	.06	−.33**	−3.34**		
Step 3					.65***	.31***
Gender	−01	.06	−.01	−.14		
Age	−.00	.01	−.03	−.34		
Mother's education	−.01	.02	−.03	−.29		
Father's education	.01	.02	.04	.45		
Initial EL	−.25	.05	−.42***	−5.00***		
EB compared to control group compared	.09	.09	.11	1.09		
EBM compared to control group	.47	.08	.61***	5.79***		
PBM compared to control group	.00	.08	.00	.03		

*$p<.05$; **$p<.01$; ***$p<.001$

Reading the e-book with adult mediation was found to be the only reading that significantly raised scores for the children from both the low initial EL and the high initial EL in phonological awareness [$F(3,95)=4.62$, $p<.05$, $\eta_p^2=.13$] and word reading [$F(3,95)=3.73$, $p<.05$, $\eta_p^2=.11$]. Children who began with a low EL were advanced promoted in phonological awareness and word reading, and those who began with a high EL were advanced promoted in word reading. Reading the printed book with an adult was associated with enhanced word reading of children with an initial high EL.

A hierarchical regression analysis was carried out in order to explore the possible contribution of the study's variables to the children's general EL score. Demographic variables (child's age, gender, mother's education and father's education) were entered as the first predictor, the initial EL (low or high) as the second, and intervention groups (EB, EBM, or PBM) as the third. The intervention groups were entered as dummy variables with the control group as a reference group. Results of these analyses are presented in Table 6.3, which also presents the additional contribution of each predictor as well as the cumulative variance explained by the combination of several predictors to children's EL.

The initial EL accounted significantly for 10% of the variance in the children's reading, and the activity of reading the e-book with adult mediation accounted

significantly for 31% of the variance in the children's reading. Demographic variables did not explain variance in the children's EL.

Discussion

The findings of the current study might indicate that educational computer programs which their features are pedagogically adapted to kindergarten children's abilities (e.g., animations, sounds, colors, and graphics) are not sufficient for greatly promoting their emergent literacy. The findings show that an independent activity with a computer program, such as an e-book, even though one adapted for young children, may not be sufficient for achieving good progress in emergent reading. The present study indicates that the interactive features of the e-book (e.g., the option of a text that is highlighted congruently with the narrator's reading or the option of seeing or hearing how words from the text can be divided into syllables or sounds) that researchers claim may be used as mediators for promoting literacy (Bus et al. 2006; Caplovitz 2005) are not enough for a high level of emergent reading. The findings show that young children might need augmentation by adult mediation in order to gain better results in emergent reading skills (see also Trushell and Maitland 2005; Underwood 2007).

The present study revealed that adult mediation makes a unique contribution to kindergarten children's emergent reading, compared to an adult's mediation when reading a printed book and compared to children's independent activity with the e-book. The combination of the support of the educational e-book with adult mediation focused on promoting emergent reading led to the most improvement in children's emergent reading. The findings indicate that use of new computer programs, such as e-books, together with supportive and suitable adult mediation, can promote young children's emergent reading and their achievements in the written language. This promotion might be effective among kindergarten children, in general, and among children from a low SES and children with a low emergent reading level in particular.

These results are important for children from low SES communities, where there are large differences in children's homes with reference to literacy tools (books, computers, literacy software) and to joint literacy activities with others (DeBaryshe 1993; Korat et al. 2007). Our study demonstrates that an educational e-book with adult mediation may facilitate emergent literacy skills for such children.

One of the innovations of the present study is that reading an e-book with adult mediation advanced the emergent word reading of children with a low initial EL and children with a high initial EL compared to those who read the e-book independently. These results are important since the research literature focused on the effect of adult book reading to preschoolers usually showed only little effect on children's emergent literacy skills, including phonological awareness and emergent word reading. The present study indicates that adult mediation tuned not only to reading the story content but also to print may afford the children new knowledge related to later reading skill. Children with a high literacy level were able to read words better after reading printed books, whereas all children, with both low and high initial emergent literacy levels, were able to read the words after they were read by the

e-book software together with adult mediation. The synergism between multimedia features such as highlighting of the words as they are read by the narrator combined with an adult supporting the child during and after reading the e-book made a big difference for children of all levels.

In conclusion, it is recommended to develop e-books that emphasize the books' pedagogical quality and suitability for supporting young children's literacy. The contribution of e-book programs to children's literacy is in the existence of a significant and authentic context, the books and story world, compared to many computer programs that promote literacy only by training and practicing discrete (and often fairly low level) early reading language skills. We stress also the importance of developing guiding programs for kindergarten teachers, school teachers, and parents for promoting children's literacy combined with new technologies such as e-books. These programs should emphasize the suitable adult support and mediation.

It is recommended to compare the adult contribution in reading an e-book to other literacy skills such as the oral language in future studies. Some studies have shown that an independent activity with an e-book promotes the oral language of young children (Korat 2009; Korat and Shamir 2008; Lewin 2000; Segers et al. 2004; Segers and Verhoeven 2002, 2003; Shamir 2009; Shamir and Korat 2007; Shamir et al. 2008). However, it is possible that reading an e-book with adult mediation would contribute more to this domain, especially to children from a low SES and a low oral language level.

Appendix: Examples of the Unique Features of the E-Book

An Example of Promoting Phonological Awareness in The Tractor in the Sandbox

An Example of Promoting Phonological Awareness in Confused Yuval

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