Do Hebrew electronic books differ from Dutch electronic books? A replication of a Dutch content analysis

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Abstract

This replication study of Hebrew versus Dutch electronic books for young children was based on De Jong & Bus's content analysis, which explored whether e-books are appropriate supports for young children's literacy development. Our criteria for analysing 43 Hebrew e-books for young children included book processing, multimedia in pictures, multimedia connected to printed or spoken text, interactivity of pictures, interactive legibility, printed text quality, and congruence to story content. Like Dutch e-books, currently available, Hebrew e-books have no uniform components design and are unsatisfactory supports for children's literacy. Although most Hebrew e-books did not include hidden hot-spots that could be activated, when included, their congruence with the storyline was good. Recommendations for CD e-storybook designers and practical implications for educators are discussed.

Keywords   e-books, literacy development, young children

This study replicates de Jong and Bus's (2003) investigation that asked 'Are Dutch electronic books for young children appropriate to support literacy development?' We investigated whether Hebrew electronic books, which young children explore or read differ from Dutch electronic books. This question is important since it could inform us about whether e-books in different countries have a general similar design, and how similar or different they are in their potential to support children's story understanding as well as other early literacy aspects. The results of this investigation might provide a strong base of recommendations for future designers of e-books across countries and languages.

Poised as we are at the beginning of the 21st century and in the midst of a major technology revolution, the definition of literacy has necessarily been extended to include multiple literacy. The concept of multiple literacies refers to different ways of knowing, including the use of oral traditions, stories, music, mathematics, and visual images. Today, it is more widely accepted that there is no one path to literacy and that the written language is not the only way of knowing (Kantor *et al.* 1992; Crawford *et al.* 1995). As researchers who focus on young children's written literacy development (defined as school literacy as well), we adapt the idea that multiple literacies in the postmodern society should include both the traditional print literacy of the written language as well as literacies that involve the new technologies, including that of the computer (Kellener 1998).

One of the well-known avenues for young children for language and literacy development is the shared book reading event (Scarborough & Dobrich 1994; Bus *et al.* 1995; DeTemple & Snow 1996; Bus 2001). Parents and teachers have traditionally read picture

storybooks to young children and, sometimes, talked with the children about the written text and the pictures in the book in order to support the children's attempts to construct the meaning of the story. New insights into what constitutes literacy, the concept of 'multiple literacies' described above, influences people in different age groups, including young children before school age who, nowadays, can have their own, independent reading of picture book event by using the e-book.

E-books for young children, which generally replicate well-known storybooks, employ the integration of different types of expression. They are a form of interactive digital narratives, which include multimedia effects such as written text, oral reading, oral discourse, music, sound effects, and animations. Sometimes e-books include hidden hot spots relating to illustrations or text that are meant to be activated by the performer or the reader. This interactivity can provide the performers/readers insights into the nature of the written text, by allowing them to carefully follow the written words, phrases, or passages that are orally pronounced by the storybook narrator. It has also been assumed that these multimedia effects can be useful in supporting young children's literacy development in terms of book orientation, print knowledge, and storyline understanding (Labbo & Kuhn 2000; De Jong & Bus 2003).

Research on the educational contributions of e-books to children's literacy development is in its first stages, and the results of the few available studies are not consistent. Encouraging results were reported by several studies. For example, children's story comprehension was found to be higher for children who used the electronic version than for those who used the traditional hard copy print versions of the same story (Reinking 1988; Matthew 1996). Other studies reported that motivation to read was higher after children had some experience with e-books (Adam & Wild 1997; Glasgow 1996–1997). Kindergarteners' verbal ability was reportedly raised following exposure to CD-ROM storybooks (Johnson 1995), and e-books were found to be a good source of support for the emergent literacy curriculum of Head Start classes (Talley 1994).Yet, several researches reported that the same interactive nature of the e-book that creates the potential to support young children's literacy can sometimes serve as a distraction from the storyline

(Okolo & Hayes 1996; Underwood & Underwood 1996; De Jong & Bus 2002). For example, observing 4–5-year-old children exploring e-books that included games and other activities, De Jong and Bus (2002) found that the children's understanding of the content of the story was less well supported by the electronic version compared to the regular book format read to them by an adult. They concluded that 'the many attractive options of e-books seem to divert children's attention from text, and number of readings of the text in favor of iconic and pictorial explorations' (p. 154). Along the same lines, Okolo and Hayes (1996) believed that the low comprehension levels of poor readers from the second grade using CD-ROM storybooks resulted from inconsistencies between the animations and the storyline in the e-books. Additionally, Labbo and Kuhn (2000) found that the incongruence between features in the e-book and the storyline affected the targeted children's passive behaviour and did not support their story understanding.

These inconsistent findings about the educational values of e-books point to the importance of ongoing evaluation of CD-ROM storybooks as a potential source to support children's literacy development. Few studies have systematically evaluated e-books and literacy development. Two studies used a qualitative design (Burrell & Trushell 1997; Labbo & Kuhn 2000) with only one or two e-books; only one study has investigated a collection of e-books using a quantitative approach (De Jong & Bus 2003). De Jong and Bus were mainly interested in studying whether Dutch e-books are suitable for supporting young children's literacy development. Their evaluation included 55 Dutch and five well-known English CD-ROM storybooks recommended for young children (ages 3–7), which were available in Holland during the period 1995–2002. They developed a system for content analysis to answer the primary question they had posed. Their evaluation was based on the following coding categories: book processing, book orientation, multimedia additions, interactivity of pictures, interactive legibility, printed text quality, and congruence with story content (for more details, see De Jong & Bus 2003). Their results regarding the options of multimedia additions with and without interactivity were disappointing. For example, extra music and filming effect additions appeared only in less than half (41.8%) of the researched e-books. Hot

spots in the text were available in only about a quarter (25.5%) of the CDs. And, although hot spots in illustrations were available in more of them (56.4%), one of the most important findings was that these hidden hot spots in illustrations rarely offered any extra cues that could aid in the process of story understanding. Overall, only 9.4% of the e-books had congruence between the storyline and the hidden spots.

De Jong and Bus (2003) assumed that the collection of Dutch children's e-books that they investigated was probably not different from similar collections in other countries (pp. 147–148). Our research was an attempt to investigate this claim. Replicating their research, we used their content analysis with Hebrew CDs or e-books for young children to determine to what extent commercially available Hebrew e-books were similar to or differed from their Dutch counterparts. We were interested in determining whether there is a pattern in the design of e-books for young children across countries, and to what extent this design has the potential to support children's literacy development.

Method

E-books

We investigated 43 Hebrew CD-ROM storybooks that were available in the Israeli market (book stores, toy stores, and computers stores) between 1995 and 2002 (see Appendix A for the entire list). Most of the CDs are electronic versions of well-known traditional books recommended for young children. Almost half of the books (46%) were originally written in Hebrew (e.g., *Itamar Takes a Stroll on the Wall*, *The Lice Nehama*, *A Tale of Five Balloons*); the rest were translated from English to Hebrew (e,g., *Just Grandma and Me*, *The Nutcracker*, *The Prince and the Frog*). As in De Jong and Bus's (2003) research, e-books that presented a story consisting of dialogue between the characters and which had no narrator telling the story from beginning to end were not included.

Coding

We used De Jong and Bus's (2003) content analysis system (see Table 1) to examine the Hebrew e-books

and their similarity to Dutch e-books. Five main categories were used: book processing, multimedia in pictures, multimedia connected to printed or spoken text, interactivity, and interactive legibility. Each of these categories had several sub-categories. Each sub-category was rated by the coder in terms of whether the option was available in the e-book or not: Yes = 1, No = 0.

The quality of the printed text and congruence between the hot spots and the content of the story were coded as well. Quality of printed text is believed to be an important source of support for children's print knowledge, and congruence between the hidden hot spots and the written text can affect children's story-line understanding. Quality of printed text was rated on a 5-point Likert-type scale, ranging from 5 = very high to 1 = very low quality, for the following items: size of font, spacing between words, font colour, and text's background. Quality of hidden hot spots as a support for children's story understanding was rated on a 3-point Likert-type scale and five random screens from each CD-ROM ($n = 43$) were included in this study. All hot spots that appeared on these five screens were evaluated using this scale. For example, in *Imo, the King and the Prince*, a messenger comes to the house of the main character, Imo, and says that he has a message from the king. Clicking on Imo, the children hear Imo saying: 'Wow, a message from the king, this is going to be a very important thing'. This statement, which is not written in the story's text of the e-book, rates a 3 because it might support and enhance the children's understanding of the importance of this event. A rating of 2 on quality of hot spots indicates indirect support for the contents of the story. For example, in the e-book *Raspberry Juice*, the straw in a drink emerges from the roof of the main character's house when the giraffe and the lion come to visit him. The straw maybe a hint for the next scene where the giraffe and the lion discover that the rabbit drinks his raspberry juice with this straw. Because it is not clear how much this cue supports the general storyline, it rates only a 2. Some of the hot spots do not support the story at all and rate a 1, as in *Itamar Takes a Stroll on the Wall*, e.g., where, in the picture in which the little lion who has lost his way wants to go home, clouds in the sky become elephants.

In addition to the content analysis coding categories used by De Jong and Bus (2003), we also coded extra

Table 1. The De Jong and Bus (2003) coding system for a content analysis of e-books.

Coding variable	Analysis criteria
Book processing	1. Introduction screen: option are explained
	2. A forward and back button to load the next or previous screen
	3. Overview screen shows all screens in small format
Multimedia in pictures	4. Dynamic visuals to dramatize the story
	5. What is dramatized: details, fragments or complete story scenes?
	6. Extra music and filming effects
	7. Availability of an oral reading
Multimedia connected to printed or spoken text	8. Print that changes while it is being narrated by highlighting, colouring and the like
	9. Availability of games and songs: (i)as a separate track; (ii) integrated in the story
	10. Hotspots: (i)availability; (ii) integrated in the story
	11. Interactivity of illustrations accompanying the story:
Interactivity of the story	(i) no interactivity;
	(ii) realized by the availability of games and/ or songs and hotspots;
	(iii) realized by the availability of games and/or songs;
	(iv) realized by the availability of hotspots
Interactive legibility	12. Option to start, restart and interrupt the oral reading
	13. Availability of print
	14. Hotspot in the text to activate pronunciation of phrases or separate words
	15. A dictionary to explain words in the story text

print support option (see Table 2), which included the following options: screen titles (e.g., 'Nehama decides to see the word' *in Lice Nehama*), written signs on illustrations (e.g., on the front of an ice cream stand appears a sign which says: 'Ice Cream' in *Just grandma and Me*), printing text on paper, and diacritical marks. Diacritical marks (in Hebrew 'nikud') is a system of marking vowels composed of dots and dashes inserted under, above, or between letters. The diacritics represent the vowels fully, and usually appear in books addressed to children up to the fourth grade. This system of diacritical marks usually supports young children in their beginning reading.

To establish rating reliability, 10 electronic books were evaluated by two independent coders (one of the authors of this paper and an advanced graduate student) using the method described above. In the first stage, three CDs were evaluated, disagreements were discussed, and the manual was improved accordingly. Intercoder reliabilities were computed using Kappa or Pearson product–moment correlation tests which revealed generally satisfactory results ($P < .001$) (see Tables 2 and 3). Kappa was calculated when coders had to decide on the presence of a certain characteristic (e.g., whether the CD has or does not have an introduction screen); a Pearson product-moment

correlation was applied when the coders had to rate an item on a scale (e.g., if the font of the text is big enough or if the hot spots are congruent with the story text).

Results

The characteristics of the Hebrew e-books, based on De Jong and Bus's (2003) coding system are presented in Table 2.

As many as three-fourths of the e-books (72%) included an introductory screen where a narrator or one of the characters in the book explains to the children the different options available for the activation of the story (e.g., see *Zehava, Bears and other Things*). In addition, a vast majority of the e-books included forward (93%) and backward (95.3%) buttons and showed the printed text (93%). Yet, only about one-fourth included an overview screen (25.6%) (e.g., see *The Little Samorai*).

Most of the CDs (82.0%) included dynamic visuals. In just over half of these CDs (41.1%), dynamic visuals appeared in both details (e.g., the wings of a little butterfly in the background are moving) of the screen and in complete story scenes (e.g., A child who is the main hero in the story runs away from the monster) in

Table 2. Characteristics of Hebrew e-books based on the De Jong and Bus (2003) content analysis system.

Characteristics			% of e-Books (N = 43)
Book processing	Introductory screen	(k = 1.00)	72.0
	Forward button	(k = 1.00)	93.0
	Backward button	(k = 1.00)	95.3
	Overview screen	(k = 1.00)	25.6
Multimedia in pictures	Dynamic visuals available	(k = 0.80)	82.0
	Detail		2.5
	Fragments		4.8
	Complete story scenes		22.0
	Details and Complete story scenes		41.4
	Other combinations		12.0
	Extra music and filming effects	(k = 1.00)	100.0
Multimedia connected to printed or spoken text	Text that changes while it is being narrated	(k = 1.00)	28.0
	Oral reading available	(k = 1.00)	100.0
Interactivity	Games and songs available	A separate track (k = 0.80)	51.1
		Integrated in story (k = 0.75)	28.0
	Hotspots available integrated in the story	(k = 0.80)	28.0
	Interactivity of illustrations going with the story	No interactivity (k = 0.80)	24.3
		Games and/or songs and/or hotspots (k = 0.80)	31.7
		Games and/or songs (k = 0.80)	36.5
		Hotspots (k = 0.80)	7.3
Interactive legibility	Read–hear options	(re-) Start (k = 0.70)	16.3
		Interruption (k = 0.75)	28.0
	Printed text	Availability (k = 1.00)	93.0
		Hotspots in text to read text parts (k = 1.00)	13.9
	Dictionary	(k = 1.00)	4.3
Extra print support	Screen title	(k = 0.75)	9.3
	Print option	With text (k = 1.00)	18.6
		Without text (k = 0.80)	65.1
	Written signs	(k = 0.70)	37.2
	Diacritical marks*	(k = 1.00)	32.6

*The diacritical marks (in Hebrew 'nikud') is a system of marking vowels composed of dots and dashes inserted under, above, or between letters. The diacritics represent the vowels fully and usually appears in books addressed to children up to the fourth grade.

the same CD. In only about one-quarter of the CDs (22%), dynamic visuals appeared in the complete story scene alone. Very few (2.5%) CDs applied the dynamic visual in details alone (e.g., see *Just Grandma and Me*) or fragment (4.8%) (e.g. *Bible Stories: The tales of our father Abraham*). All the Hebrew CDs that we analysed used extra music and filmic effects and all of them had oral reading of the text. Yet, the option to see changes in the text while it is being narrated – indicated by the use of different coloured of highlighted text (e.g., see *Itamar Takes a Stroll on the Wall*) – appeared in less than one-third of the e-books

(28%). Most of the Hebrew CDs (72%) included games and songs. In a majority of them (51.1%), the games and songs were on a separate track; in about one-quarter of the CDs (28.0%), they were integrated in the story. Analysis of the interactivity of illustrations revealed that about one-quarter (24.3%) of the CDs that had hot spots available had no interactivity option, about one-third (31.7%) had games and/or songs and hot spots, and slightly more than a third (36.5%) had games or songs. Only 7.3% of the CDs had hot spots alone, without any games or songs.

In terms of interactive legibility, less than a third of the CDs (28.0%) had the option of interrupting the text while reading (e.g., see *Father Does Troubles*), and even fewer (16.3%) have the option to (re)start hearing the e-book (e.g., see *Imo, the King and the Little Prince*). Only a small percentage (13.9%) allow children to read text parts separately (for example, sentences or words) (e.g., see *Just Grandma and Me*).

Hebrew CDs provide very little extra print support to the e-book reading. In only a few CDs, it appears in screen titles (9.3%) (e.g., see *The Little Samorai*), but in over a third of the CDs, it appears in written signs (37.2%). For example, in *Just Grandma and Me*, there is a school bus sign on the bus and a sign for ice cream on the shop. Although the option to print the story text is limited (18.6%) (e.g., see *Rosh Hashan*), over two-thirds of the Hebrew CDs (65.1%) included the option to print the pages which had drawings only without any written text (e.g., see *Itamar Takes a Stroll on the Wall*).

Hidden hot spots in e-books, usually regarded as amusing and potentially enriching the content of the story, were used in less than a third of the Hebrew CDs (28%) (e.g., *Itamar the Dream Hunter*). Yet, in the Hebrew e-books that had hot spots, an examination of 55 screens for congruence between hot spots and story content revealed that, on the 3-point rating scale (where 3 = clearly supports the story content and 1 = does not support the story content), hot spots that appeared with talk ($M = 2.57$, SD = 0.52) and with songs ($M = 2.40$, SD = 0.70) were congruent with the story content (see Table 3, the lower part).

An example of a CD-ROM that included hot spots with talk that supported text understanding is *Just Grandma and Me*. When the child dives into the water, his grandma asks: 'What do you see there in the water?' Another example is from '*The Little Samurai*'. In the beginning of the story, when the hero Taro, the little child, is presented in the context of his home, the mask on the wall says: 'Maybe he is small, but he is going to do great things'. An example of hot spots integrated with songs that support the storyline is from *Imo, the King and the Little Prince*, where, when Imo is on his way to the king's palace, a group of young girls praises him for his bravery and sings: 'This boy is the greatest'.

Less congruity between storyline and hot spots was found in those that appeared *without* talk ($M = 1.98$, SD = 0.57). For example, in *Raspberry Juice*, when the giraffe and the lion hide in the forest, an elephant, which is not part of the story, moves in the background and makes very high sounds. Another example is from *The Little Samurai*, where a dragon, which is not part of the storyline, comes out of the wall and swallows two birds.

The results of the quality of the printed text on screen analysis in the Hebrew CDs are presented in the upper part of Table 3. The data indicate that the printed text in the Hebrew e-books – font size, space between words, text's background, and text's colour – is of good quality (range of means = 3.95–4.16 on a scale of 1–5).

Examples of literacy non-supporting and supporting e-books: '*The Nutcracker*' and '*Itamar the Dream's Hunter*'

In order to more fully illustrate the features of the Hebrew storybook CDs, we present here two examples of e-books; one which we consider as giving little literacy support, and the other as a supporting one.

Table 3. Quality of printed text and hotspots in Hebrew e-books.

		n	*M*	SD
Quality of printed text (range: 1–5)	Font size (*k* = 0.68)	43	3.95	1.47
	Space between words (*r* = 1.00)	43	4.16	1.27
	Text's background (*r* = 0.68)	43	4.00	1.36
	Text's colour (*r* = 0.70)	43	4.05	1.37
Hotspots' content support (range: 1–3)	Without talk (*r* = 0.95)	50	1.98	0.49
	With talk (*r* = 0.99)	37	2.57	0.51
	Songs (*r* = 1.00)	12	2.40	0.61

Note. r, intercoder reliability; *n* for quality of printed text relates to CDs and *M* for hotspots relates to the number of analysed screens.

Unfortunately, the first type, the non-literacy supporting one, is the more prevalent type.

'The Nutcracker': *example of a literacy non-supporting e-book*

This CD storybook was published in 1999. It is based on a classical fable with Tchaikovsky's 'The Nutcracker' providing the background music. This book is not available in hardcopy and the name of the author does not appear on the CD. It is the story of a young girl who got as a present a soldier doll, which is also a nutcracker, which relates the adventures that the girl and the toy share one magical night. In terms of book processing, CD has no introductory screen to explain to the children how to use the different options on screen. At the first screen, the narrator is heard telling the children the background of the story but does not appear on screen. In terms of book orientation, the children can go forward and backward between the screens; yet, there is no option to see all screens together in order to choose the one that they want to focus on or to start with. The only multimedia addition in pictures that this CD includes is the extra music and filming effects (e.g., Tchaikovsky's Nutcracker music and other dramatizations); however, no dynamic visuals are used to dramatize the story in details, in fragments, or at the level of complete story scenes. This means that the pictures on the screen appear almost as they would in a hardcopy version. The printed text, as well, appears as in the traditional storybook format and does not change while it is being narrated by means of highlighting, for example.

The only track available in the CD is 'reading with games'. No separate reading track and reading with hot spots are available. This means that, beginning with the first time that the children 'read' the story, they can, simultaneously, play the different games that appear on the screens (e.g., puzzles, colouring pictures, and building new words from letters). As was noted in previous research, this option might be a source of distraction for the children from the storyline (Okolo & Hayes 1996; Underwood & Underwood 1996; De Jong & Bus 2002). The e-book does not include a dictionary to support the children's story understanding even though the text uses words and idioms for which young children need explanations. Additionally, the e-book does not give the children the option to read the text by themselves by using hot spots of reading. The written text appears with no diacritical marks, which are usually used in children's books in Hebrew in order to facilitate children's reading, and no written language signs appear on the screens to present print in context. The children can print only those screens that have drawings, but not those with the printed text. Yet, the printed text in the e-book, in terms of font size, space between words, text background, and text colour is very satisfactory.

'Itamar the Dream Hunter': *Example of a literacy supporting e-book*

This e-book was published in 1998. It is based on a well-known Hebrew children's storybook by David Grosman and is available in hardcopy. It tells about a young boy who has frightening dreams and who is afraid to sleep alone in his bed at night. His father helps him to overcome his fear by becoming the 'dream hunter'. In terms of book processing, this CD has an introductory screen in which the main character of the story, the child Itamar, welcomes the children and presents the options of the different tracks. In terms of book processing, after listening to/reading the story the first time, the children can move forward and backward between the screens, and they have the option to see all the screens together in order to chose the one they wish to focus on or to start with. The CD employs many multimedia additions, with extra music and filming effects which appear automatically on the screen and which are usually adapted to the content of the story (e.g., when the story tells about Itamar's sadness, we hear the child crying quietly). The many dynamic visuals and the dramatizations are used in the CD at the complete story scenes level and not in fragments or small details. For example, when the narrator relates about Itamar's fears of the ghost, Itamar's image runs on the beach while a scary shadow chases him and does scary voices, or, before Itamar goes to sleep, his father gives him a lantern and says, 'Take the lantern, it will help you to put light on the ghost'. This does not appear in the written text of the story.

While it is being narrated, the printed text changes by means of highlighting at the phrase level. This means that the children can follow the reading of the narrator if they decide to do so. The children may chose between three different tracks: the 'read only', the 'reading with hot spots', and the 'reading with

games'. It is important to note that the 'reading with games' track is available only after reading the story in the 'read only' track. We believe that it was programmed in this manner so as to prevent children from being distracted from the storyline. This e-book does not include a dictionary, and does not facilitate children's reading by themselves by following the text. The written text appears with diacritical marks, as is usually the case in Hebrew children's books, but no written language signs appear on the screens, and the screens have no written titles. The print option of the screens is available only for the drawings with no text. The printed text in on screens in terms of font size, space between words, text background, and text colour is at a high level.

One of the important features of this CD is hot spots, which are integrated in the story and are mostly congruent with the general storyline. For example, in the first screen, after Itamar expresses his fear of ghosts at night, a Teddy Bear toy in Itamar's room turns into a scary creature. Additionally, coloured smoke starts to emanate from Itamar's bed and turns into a hand, which holds Itamar's head; and one of the pictures in his room turns into a scary face. In another screen, when the father teaches the child how to catch the monster in his dreams, he says: 'Don't forget to pull the string'. This appears additionally to the original text in the book and it brings to life the idea of how the father encourages the child to overcome his fear.

Discussion

This research was designed to investigate the quality of whether Hebrew e-books for young children and whether they are similar or different from Dutch e-books. Replicating De Jong and Bus's (2003) study and using their content analysis with Hebrew CDs, our investigation indicates several important findings. First, there appears to be a general pattern of e-book design for young children across countries, namely the Netherlands and Israel. Second, this general design can be rated as unsatisfactory in terms of multimedia additions and interactive options. Third, in both the Dutch and the Hebrew collections, hidden hot spots appeared less often than was expected; yet, hot spots in the Hebrew e-books showed a higher level of

congruency with the storyline than did those in the Dutch e-books.

The Hebrew and the Dutch e-books share a general pattern of components. All categories defined in the Dutch content analysis appeared in the Hebrew CDs as well. More than 70% of the CDs in both collections have an introduction screen, forward and backward buttons, and printed text that is available for the explorer. Additionally, less than 25.5% of the CDs in both collections have a dictionary and hot spots in the text that would enable the children to read the text part.

Generally, neither the Hebrew nor the Dutch CDs have a clear advantage over the other in terms of multimedia additions or interactive options. Multimedia additions, such as an overview screen, dynamic visuals in details or in fragments, a separate game track, game songs integrated into the story, and hidden hot spots, appeared in less than 60% of the e-books in both collections. This implies that when children, teachers, or parents intend to read an e-book, they cannot predict with any certainty what type of activation they might be engaged with.

Yet, some variations were found in the two collections. Compared to the Hebrew CDs, more Dutch CDs have the option to follow the text, such that the text changes while the narrator reads the story; more Dutch CDs have reading and playing modes, and more Dutch CDs allow the reader to restart or to interrupt the text reading by the narrator.

Another variation was found concerning dynamic visuals, which dramatize and elaborate on the story either at the level of the complete story, details, or fragments of the story. At the complete story level, dynamic visuals usually elaborate on the main hero or key issues of the storyline. Dynamic visuals at the complete story level appeared in about a third of the Dutch CDs (34.5%), but in two-thirds (63.4%) of the Hebrew CDs. Whereas in the Dutch CDs the same pattern of dynamic visuals appeared in every screen (i.e., either in details alone, or in fragments alone, or in the complete story scene alone), in the Hebrew CDs, they usually appeared in combination. Thus, rarely did dynamic visuals appear only in details or in fragments in the Hebrew CDs. Most frequently (41.4%), they appeared in both the details and complete story scenes in the screens we examined. Less often, in about one-fifth of the Hebrew CDs, they appeared in the complete story scene alone.

One of the most disappointing findings was that hidden hot spots in pictures, which are assumed to be an important component of interactivity with the story content, appeared much less often than was expected. It is important to note that hidden hot spots in Dutch CDs appeared twice as often as in Hebrew CDs (60% vs. 28%, respectively). Yet, the good news regarding the Hebrew CDs is that when hot spots were included, they usually were congruent with the story content and seemed to constitute a good source of support for the children's understanding of the storyline. This was especially found to be true with the hot spots that included speech in them (talking or singing). However, when animations were included without any speech, the support for the storyline was weaker or not as clear. Another unsatisfactory finding in both the Dutch and the Hebrew CDs was that most of the e-books do not include a dictionary. This is disappointing because we assume that rich opportunities that might expand the children's vocabulary in attractive ways could exist in computer programs (Johnson 1995).

In terms of interactive legibility, only a few of the Hebrew CDs have the option of interrupting the text while reading. This means that while following the narrator reading the story, if the children want to stop it for a little while for different reasons, as often occurs when reading a hardcopy book (e.g., to go to the bathroom or some other type of interruption), it is almost impossible for them to do so when reading an e-book. In such cases, all readers, especially the young ones, might lose the storyline or the reading track totally. As mentioned before, this option was present at a higher level in the Dutch CDs. Additionally, hot spots in the text that could be read at the word level were seldom found in the Hebrew CDs (13.6%) and only slightly more often in the Dutch CDs (25.5%). This option could help children follow the written text by themselves at their own rate and could constitute a kind of support for their initial steps in their metalinguistic awareness and in their independent reading.

Yet, it is quite encouraging that the printed text on the screens in the Hebrew e-books, including font size, space between words, text background, and text colour, is of good quality. Similar results, although to a lower extent, were reported regarding the Dutch CDs. In addition to the categories used in the Dutch analysis, we examined how much support Hebrew e-books include for exposure to the written language. Our results show that Hebrew CDs provide only little extra support of this type. Print exposure, such as screen title, written signs, Hebrew diacritic marks to assist young children reading, and print options with text, are available only in a small number of the Hebrew CDs.

Based on these analyses of Hebrew and the Dutch e-books, one might conclude that most of the e-books available in the market can be regarded more as amusing programs and less as a good source of support for young children's literacy development. Although it was assumed that e-books can serve as yet another avenue to support young children's literacy, in addition to the well-known opportunity provided by adults reading to children (Labbo & Kuhn 2000; Smith 2001; De Jong & Bus 2003), it seems that many e-books currently available in the market for young children can hardly fulfil these expectations.

Based on findings from our research and that of De Jong and Bus (2003), we propose that e-book designers should put more emphasis on developing storybook CDs that are not only amusing and motivating but also a good source of support for children's story understanding and literacy development. More hot spots that can activated by the children are needed in the CDs; yet, it is very important that these hot spots be designed to be supportive of children's story understanding rather than distracting or aimed solely for the children's amusement. The hot spots should expand children's knowledge and understanding of the story background, the plot, the characters in the story, and the main problems raised, among other factors.

Another type of hot spot that can be valuable to include in e-books are those that help children to read the text either by themselves or together with the narrator. This type of activity can support children's metalinguistic awareness of the written language components (letters, words, phrases) and can enable them to become aware of the relationship between the oral and the written language – an important linguistic activity at this age (Clay 1989; Sulzby 1991). We encourage designers to include, as well, an animated dictionary in the storybook CDs in order to extend young children's vocabulary. The dictionary could include short explanations, with an emphasis on the print of the new word. Designers of e-books should also take into consideration the children's age and level of verbal knowledge, similar to what adults do while reading a story to young children.

Written language support (print exposure) is another issue that we strongly feel e-book designers should include so as to enrich children's e-book exploration experiences. This print exposure can include screen title, written signs that might appear in the visual context of the story, and print options that include printing the story text, not story animations alone. These activities can address children's emergent or beginning reading and writing abilities. We suggest that written language should appear not only in the story text but also in the general context of the drawings that appear on the screen (e.g., putting the words 'School Bus' on the Bus). This type of exposure to print might be very valuable in helping further the children's understanding of the story.

Given De Jong and Bus's (2002) findings that games integrated into the CD might distract the children from the storyline, the fact that the Hebrew and the Dutch CD collections analysed include the read and play option in the same mode seems problematic. Thus, we recommend creating e-books, which have games on a separate track rather than integrated into the story plot. We also propose that activation of the play mode be subject to reading, namely, that children should have to read or hear the entire story before being able to activate the play modes. In our supplemental analysis of the Hebrew CDs (not reported in detail in this paper), we found that in only 58% of the CDs with read and play options was the play option subjected to reading. This means that children could play without doing any reading at all in almost half of the e-books. Additionally, we suggest including more games designed to expand children's oral and written language as well as their story comprehension, rather than those designed only to develop motor and visual skills. Although most e-books analysed in the Hebrew and the Dutch collections were not satisfactory in terms of literacy support, we found several CDs that met most of these criteria (e.g. *Itamar the Dream Hunter*). Parents and schoolteachers who expect e-books to be a literacy support for young children should be aware of the qualities of these unusually good e-books. The list offered above for designers to follow can also serve as a guideline for educators in choosing e-books for young children. As researchers who focus on young children's literacy development and who adopt the idea of multiple literacies using traditional and the new technologies (Kellener 1998),

we conclude that more needs to be done in order for e-books to meet the requirements generated by this perspective. More effort is needed in choosing and creating e-books which, on the one hand, use the specialty of the electronic and the interactive media and, on the other hand, support children's understanding of the story and their exploration of the written language.

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Appendix A. List of e-books

A Midsummer Night's Dream [Chalom Lail-Ka'its] [CD-ROM] (1999). QMS, Hadera, Israel.

A Tale of Five Balloons [Maa'se Behamisha Baloneem] [CD-ROM] (1995). : Hed Arzi, Or-Yehuda, Israel.

Bible Stories: Adam and Eve [Sipuray Tanach: Adam Ve'Chava] [CD-ROM] (1999). QMS, Hadera, Israel.

Bible Stories: Cain and Abel [Sipuray Tanach: Cain Ve'-Hevel] [CD-ROM] (1999). QMS, Hadera, Israel.

Bible Stories: Genesis [Sipuray Tanach: Bereshit] [CD-ROM] (1999). QMS, Hadera, Israel.

Bible Stories: The Tales of Our Father Abraham [Sipuray Tanach: Korotav shel Avraham Avinoo] [CD-ROM] (1999). QMS, Hadera, Israel.

Bible Stories: Sodom and Gomorrah [Sipuray Tanach: Sdom e'Amorah] [CD-ROM] (1999). QMS, Hadera, Israel.

Cover for the Suka [Schah Lasuka] [CD-ROM] (1999). Hed Arzi, Or-Yehuda, Israel.

Eran the Queries Boy [Eran Hasakran] [CD-ROM] (1995). Class CD: Gama Vision, Tel-Aviv, Israel.

Father is Embarrasing [Aba Osse Boushot] [CD-ROM] (1998). Bug Multisystem, Ben-Shemen, Israel.

Grandpa Tuvia Tells [Saba Tuvia Mesaper] [CD-ROM] (1996). Hed Arzi, Or-Yehuda, Israel.

Hot Corn [Tiras Cham] [CD-ROM] (1998). Hed Arzi. Or-Yehuda, Israel.

Imo and the King [Hanasich HaKatan] [CD-ROM] (1995). Next Multimedia, Tel-Aviv, Israel.

Itamar the Dream-Hunter [Itamar Tzayad HaHalomot] [CD-ROM] (1996). Compedia, Ramat-Gan, Israel.

Itamar Takes a Stroll on the Wall [Itamar Metayel al Kirot] [CD-ROM] (1995). Compedia, Ramat-Gan, Israel.

Just Grandma and Me [Rak Safta Ve'Anee] [CD-ROM] (1994). Next Multimedia, Tel-Aviv, Israel:.

Legends: Pinocchio and the Ugly Duckling [Sipuray Agadot: Pinokio Ve'HaBarvzaon HaMechoar] [CD-ROM] (1996). Nes Multimedia, Tel-Aviv, Israel.

Lulu: The Magic Journey [Lulu: Ha'Masa Ha'Kassoom] [CD-ROM] (1995). Hed Arzi, Or-Yehuda, Israel.

Peter and the Wolf [Peter Ve'Haze'ev] [CD-ROM] (1999). QMS, Hadera, Israel.

Pictures in the Exhibition [Tmunot Ba'Tarucha] [CD-ROM] (1999). QMS, Hadera, Israel.

Raspberry Juice [Mitz Petel] [CD-ROM] (1996). Bug Multisystem, Ben-Shemen, Israel.

Rosh Hashana [Rosh Hashana] [CD-ROM] (1997). QMS, Hadera, Israel.

Spot and His Friends [Pinooki Ve'Haverav] [CD-ROM] (2000). Bug Multisystem, Ben-Shemen, Israel.

Spot in a Day of Fun [Pinooki BeYom shel Kef] [CD-ROM] (2000). Bug Multisystem, Ben-Shemen, Israel.

The Animal Carnival [Karnaval Ha'Chayot] [CD-ROM] (1999). QMS, Hadera, Israel.

The Emperor's New Clothes [Bigday Ha'Melech Ha'Chadasheem] [CD-ROM] (1995). Stimatski, Bne-Brak, Israel.

The Fox and the Stork [Hashu'al Ve'Hahasida] [CD-ROM] (1999). QMS, Hadera, Israel.

The Fox and the Vineyard [Hashu'al Ve'Ha'Kerem] [CD-ROM] (1999). QMS, Hadera, Israel.

The Fox and the Cat [Hashoual VeHachatul] [CD-ROM] (1998). QMS, Hadera, Israel.

The House of Yael [Habait shel Yael] [CD-ROM] (2000). Orient Vision, Tel-Aviv, Israel.

The Lice Nehama [Hakina Nehama] [CD-ROM] (2000). Bug Multisystem, Ben-Shemen, Israel.

The Lion and the Mouse [Ha'Aryeh Ve'Ha'Achbar] [CD-ROM] (1999). QMS, Hadera, Israel.

The Little Samurai [HaSamoraee HaKatan] [CD-ROM] (1998). Davidson, Tel Aviv, Israel.

The Magician's Apprentice [Shuliyat Ha'Kosem] [CD-ROM] (1999). QMS, Hadera, Israel.

The Mice and the Cat [Ha'Achbarim Ve' Ha'Chatula] [CD-ROM] (1999). QMS, Hadera, Israel.

The Nutcracker [Mefatzeach Ha'Egozeem] [CD-ROM] (1998). QMS, Hadera, Israel.

The Peacock and the Nightingale [Ha'Tavas VeHazamir] [CD-ROM] (1999). QMS, Hadera, Israel.

The Prince and the Frog [Hanaseeh Vehazfardea] [CD-ROM] (1994). Stimatski, Bne-Brak, Israel.

The Scorpio and the Frog [A'akrav Vhakarpada] [CD-ROM] (1999). Hadera, Israel: QMS, Bne-Brak, Israel.

The Soul Bird [Zipor Ha'Nefesh] [CD-ROM] (1996). Impact Plus, Tel-Aviv, Israel.

The Tortoise and the Hare [Ha'Tzav Ve Ha'Arnav] [CD-ROM] (1999). QMS, Hadera, Israel.

Two Goats on the Bridge [Shnay Tyasheem Al Gesher] [CD-ROM] (1999). QMS, Hadera, Israel.

Where is Pluto [Ayeh Pluto] [CD-ROM] (1997). Hed Arzi, Or-Yehuda, Israel.

Zehava, Bears and Other Things [Zehava, Doobim VeDvareem A'hereem] [CD-ROM] (1997). Scopes, Mahshevet.