Journal of Educational Psychology
2001, Vol. 93, No. 2, 288–298

0022-0663/01/$5.00 DOI: 10.1037//0022-0663.93.2.288

Learning to Read From Television: The Effects of Using Captions and Narration

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The author investigated caption use, sound, and the reading behavior of 76 children who had just completed 2nd grade. The present study indicated that beginning readers recognize more words when they view television that uses captions. The auditory element was important for comprehension tasks related to incidental elements and spontaneous use of target words, and the combination of captions and sound helped children identify the critical story elements in the video clips. Positive beliefs about one's competence in reading or watching television appeared to facilitate the recognition of words and, for boys, improve their oral reading rates. In sum, television captions, by evoking efforts to read, appeared to help a child focus on central story elements and away from distracting information, including sound effects and visual glitz. Implications are discussed.

Reading is an important skill that young children need to acquire early in their academic careers to be successful in both school and, later, in work. Finding practical, effective ways to enhance learning to read are essential and timely goals, given the higher demands on literacy in technologically advanced societies. Although television has often been criticized for displacing reading and compromising children's learning (e.g., Healy, 1990), there is little evidence to support these claims when examining television as a monolithic entity (Neuman, 1995). In a recent longitudinal study, no relationship was found between watching entertainment television during both the preschool and teen years and reading books during the teen years (Anderson, Huston, Schmitt, Linebarger, & Wright, in press). On the other hand, watching educational television during the preschool years did contribute positively to reading in high school. In short, television has the potential to enhance book use and reading (Linebarger, 2000; Neuman, 1995).

Neuman (1995) argued that an association evolves among print and television media in which interests in one medium tend to be reflected in the other medium. An appropriate combination of television and print produces opportunities for enhancing literacy experiences and outcomes. Therefore, print and television may be used to complement rather than compete with each other with obvious benefit (MacBeth, 1996). A particular example wherein regular viewing is combined with print occurs naturally with the use of captions on television.

Captions refer to subtitles or translations of the spoken word that were designed to permit those who are deaf or hearing impaired to read what they cannot hear or hear well. An electronic code embedded in the regular television signal is converted to on-screen text that a viewer can read. Captions use white text against a black background and are either strategically placed on the screen so that relevant parts of the picture are not obscured or scroll up from the bottom of the screen.

The number of programming hours captioned per year has increased from 832 hr in 1980 to more than 14,000 hr in 1996. To make this service even more accessible, the National Captioning Institute and ITT Corporation developed a caption-decoding microchip that could be installed in television receivers at the manufacturing stage. With the introduction of this technology, Congress passed the *Television Decoder Circuitry Act of 1990,* which mandated that by mid-1993 all new television sets with monitors of 13 in. or larger being manufactured in the United States must contain the caption-decoding microchip.

Although not originally intended for this purpose, on-screen print in the form of captions has the potential to evoke reading as a seemingly automatic accompaniment to TV viewing while giving children the opportunity to view and learn words in a meaningful and stimulating context. Using captions might obviate each of these obstacles children face when learning to read: (a) difficulty understanding and using the alphabetic principle, (b) failure to transfer the comprehension skills of spoken language to written language, and (c) absence or loss of motivation to read (National Research Council, 1998).

Obstacles to Learning to Read

Obstacle 1: Difficulty Understanding and Using the Alphabetic Principle

The ability to understand the correspondence between written and spoken words, or the alphabetic principle, is a critical skill for

This research was part of a dissertation presented to the University of Texas at Austin in partial fulfillment of the requirements for a doctorate degree. Portions of the research were presented at the biennial meeting of the Society for Research in Child Development, Albuquerque, New Mexico, April 1999.

I am indebted to John C. Wright and Aletha C. Huston for their contributions to this research and to Charles R. Greenwood, who provided feedback on drafts of this article. Thanks are also extended to the schools, families, and children from Smith Elementary School in Austin, Texas, and Hale Cook Elementary School in Kansas City, Missouri, who participated in this study.

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learning to read. Without this ability, word recognition can be inaccurate, labor intensive, and frustrating for children learning to read, resulting in a lack of motivation to continue. Television's combination of pictures, sounds, and captions may help children establish a connection between the spoken and the printed word by placing words in a familiar context using a familiar medium. Therefore, captions provide a context to master the idea that written words systematically represent spoken words.

Below-average readers enhance their vocabularies watching television programs with captions (Adler, 1985; Koskinen, Bowen, Gambrell, Jensema, & Kane, 1997; Koskinen, Wilson, Gambrell, & Jensema, 1986). With a small sample (i.e., $N = 36$), Adler (1985) found that third- and fourth-grade remedial readers were able to read an average of five words after viewing them in captions compared with no words by a similar group who received traditional instruction (i.e., reading words in context). In two other studies, Koskinen and colleagues examined vocabulary acquisition after viewing captioned materials at school or at home. Children between 9 and 13 years old who received captioned television with the sound turned on outperformed children who watched traditional television (i.e., no captions) or captions without sound (Koskinen et al., 1986, 1997). Moreover, the effects were moderate for the time invested (i.e., about one half of a standard deviation difference on a standardized test).

For children and adults learning English as a second language, vocabulary acquisition and decoding skills improve with captioning (Garza, 1991; Haugh, Wilson, & Koskinen, 1998; Neuman & Koskinen, 1992; Price, 1984). Neuman and Koskinen (1992) used captioned programs with Asian and Hispanic seventh and eighth graders learning English as a second language. Those children who viewed with captions performed better on tests of word recognition and word meaning than those who viewed traditional television, read along silently in a text while a teacher spoke, or received only print materials (i.e., a control group). However, the control group did not receive instruction in the same content/topic areas as did the other treatment groups, making comparisons with the control group difficult to interpret. Overall, these studies provide preliminary support for word learning from captions, especially with effect sizes of one half of a standard deviation, a medium effect (Cohen, 1982).

Obstacle 2: Failure to Transfer the Comprehension Skills of Spoken Language to Written Language

To help children transfer their comprehension skills, literacy instruction should build on the child's background knowledge, vocabulary, and comprehension strategies (i.e., summarizing the main idea, predicting events and outcomes of upcoming text, drawing inferences, and monitoring for coherence and misunderstandings; National Research Council, 1998). Viewing with captions provides children with opportunities to hear and see the connections between events, characters, and other related story information. In addition, children can easily gain background knowledge about various subjects, thus aiding in their ability to comprehend information presented.

For children, use of captions is related to higher comprehension scores (Goldman & Goldman, 1988; Koskinen et al., 1986, 1997). Goldman and Goldman (1988) found that students' performance on comprehension tests remained at 70% or higher. However, there were no statistical tests reported or control groups used from which to make comparisons. In both structured school environments and unstructured home environments, children between the ages of 9 and 13 improved in comprehension skills in the presence of captions with sound (Haugh et al., 1998; Koskinen et al., 1986, 1997; Neuman & Koskinen, 1992). As with word learning, comprehension skills for those in the captioned condition were improved by approximately one half of a standard deviation above those who viewed with no captions.

Obstacle 3: Absence or Loss of Motivation to Read or Failure to Develop Positive Attitudes About Reading

Motivation and a positive attitude are crucial components of learning to read. Without them, the effects of the other two obstacles previously described are magnified. Rickelman, Henk, and Layton (1991) proposed that the motivating aspects of television might provide a viable alternative for those students who are not particularly motivated to learn to read using conventional methods, especially considering that most children love to watch television and spend about 3 hr per day doing so (Huston & Wright, 1997). Motivation is linked to attitudes or beliefs about the usefulness of a particular source in learning information and children's competence in learning information from that particular source (Eccles, Roeser, Wigfield, & Freedman-Doan, 1999). When attitudes are positive, beliefs about one's competence may be higher, and subsequent performance will follow while poor beliefs or attitudes may lead to an aversion for reading and difficulties throughout life (National Research Council, 1998).

Researchers who have designed reading interventions using captions have reported that children find this method highly motivating (Gladdhart, Lebbin, & Layton, 1987; Koskinen, Wilson, Gambrell, & Jensema, 1991; Koskinen, Wilson, & Jensema, 1985; Parks, 1994; Spath, 1990), and Salomon (1984) reported that most children believe that they can process information from television effectively.

Although there are not many studies, in those that exist, using captions increased motivation to read. Improvement in other aspects of reading skill was less clear, however. In addition, there is limited research on the use of captions with children 6–8 years old who are just learning to read and no research on the differential effects of captions and sound for children in this age group. Finally, information on children's beliefs about their abilities to learn from print versus television and how this relates to what they actually learn waits to be addressed. Therefore, the purposes of this study were to examine what combination of captions and auditory cues contribute to children's reading skill, to determine whether these are sustainable effects, and to answer whether children's beliefs about their abilities and their attitudes toward reading and television affect their reading skills.

Method

Participants

The initial sample consisted of 80 children, 73 who had just completed the second grade and were attending a public school program in Austin, TX or in Kansas City, MO and 7 children who were beginning the third grade. The programs were held in schools receiving Title 1 benefits and were enrichment programs rather than remedial programs. All children whose

participation was approved by their parents were included in the study. One child's data were excluded from the study's results because the child had Down's syndrome, and three other children's data were excluded due to experimenter error (the experimenter deviated from standardized procedures). Thus, the final sample consisted of 76 children, 32 boys (M = 8.46 years, range = 7.78–9.23 years) and 44 girls (M = 8.40 years, range = 7.78–10.06 years). Fifty percent of the children were African American, 27% were European American, 16% were Hispanic, and 7% described themselves as Other. Children were reading at the second-grade level at an average rate of about 83 words per minute.

Apparatus

Captions and narration were presented by using a VCR, a separate 13-in. television monitor, and an audio tape recorder. The child was seated approximately 1–2 feet away from the monitor, and the experimenter sat to the left side of the child.

Stimuli

Five 4–6-min clips from the Nickelodeon series *Pinwheel* (aired during the early 1980s) were chosen. The clips contained both human and animal characters and had a story line but no verbal narration or dialog. Instead, sound effects, nonlinguistic vocalizations, and characters' actions were used to convey the story.

Text and narration. Scripts for each video were developed where the main text was written at a first-grade level ranging from early to late first grade as measured by the Fry readability formula (Fry, 1968). The text was written at this level so that the children would not struggle with the supporting text, freeing them to concentrate on the more difficult target words. Target words were selected from third-, fourth-, and fifth-grade word lists and arranged in the scripts (Mogilner, 1992). Each segment contained ten target words that were repeated four or five times. A woman read the text aloud to generate the narration for the stimuli. A sample script is available in the Appendix.

Captions. For those children that viewed captions, the captions were placed at the bottom of the screen in appropriate syntactic phrases and capital letters that corresponded verbatim to the narrator's voice. Other sounds (e.g., bells ringing, music, knocks on the door) were placed in lower-case letters and sometimes were surrounded by music notes to indicate other information (and not spoken words). The average rate of caption presentation for the five clips equaled 90 words per minute, slightly higher than the 60–80 words per minute reading rate of children this age (Neuman, 1995), but lower than the average 124 word per minute rate found in typical educational television programming (Jensema, McCann, & Ramsey, 1996). Rate of presentation was calculated as the number of words in the script divided by the total time of the video clip. A professional captioning organization, Caption Services of Kansas, arranged the captions to resemble the appearance of commercially available captions.

Measures

Theoretically related measures were collected over the course of the study, including demographic information, reading achievement, word recognition, oral reading rate, comprehension, and perceived utility/competence.

Demographic information. Information was collected from the parents regarding the child's gender, birth date, and race. Gender interactions and main effects were examined for all dependent variables and, where significant, are reported here.

Wide Range Achievement Test (WRAT)—Reading subtest. This standardized reading test was designed to measure a child's basic reading abilities, including recognizing and naming letters and pronouncing words out of context. All subjects were administered the blue form as a quick index of word recognition abilities. This instrument was chosen as a control variable because it provides a rapid measure of the child's reading ability.

Word recognition. I measured the child's ability to recognize and read aloud selected target words that were incorporated into the script of each video clip and into a passage that was unrelated to the video clips. Each video featured ten target words that were repeated throughout the clip four or five times. Paragraphs taken from the video scripts that contained all ten target words featured in a particular video clip were given to children to read. (See the Appendix for an example.)

Oral reading rate. Children were timed while reading the video scripts. To calculate an oral reading rate, the number of words the child read correctly was divided by the total time it took to read the paragraphs.

Comprehension. After viewing the video segment, children participated in a free recall and a cued recall question session, tapping their comprehension and memory of the TV program. Each child's responses were recorded on audiotape. The free recall instruction asked the child to "Pretend that I am someone who didn't see the program and tell me what you just saw." After the child responded, the experimenter prompted the child one time with "Is there anything else you can remember?"

Data from the audiotapes were transcribed, and children's responses to the free recall measure were coded into two categories: central story elements and incidental story elements. Central story elements were those considered critical to the story line and were agreed on by a panel of five judges who were familiar with each story. The number of central elements varied by each clip. Incidental story elements referred to extraneous auditory, visual, or print elements that did not constitute a part of the central story line. Responses across all sessions were then summed to form a total central recall variable and a total incidental recall variable. Two raters consensus coded 5 children's comprehension answers (5 children × 5 sessions = 25 individual sessions, or 7% of the sessions) while training to criterion levels. Forty individual sessions were then double coded to assess interrater reliability. Percentage agreement was calculated by taking the total number of agreements for central and incidental recall elements and dividing by the total number of agreements plus disagreements. Percentage agreement using this method was 89% for central recall elements and 81% for incidental recall elements. Low levels of agreement occurred most often with incidental recall elements because there were fewer of these elements to score.

After each free recall session, four cued recall questions were administered. The type of question was the same for each video segment: (a) The child was asked to choose a character and describe that character (character description); (b) the child was asked "When this happened, what happened next?" (the situation described was a critical element in the story; critical elements); (c) the child was asked to give the main idea of the story (main idea); and (d) the child was asked about some incidental content in the story (incidental elements; e.g., "What was behind the door in the Mole's house?"). A coding manual with point designations was assembled and agreed on by five judges familiar with the video segments. For the character descriptions, 1 point was awarded for identifying a character, and 1 point was awarded for each separate description; for example, the bunny (1 point); he had ears that spun around (1 point). For the remaining three questions, 5 points were given for a completely correct answer, 3 points were given for a partially correct answer, 1 point was given for any answer, and no points were given if the child did not answer or said "I don't know." Thus, this score could range from 0 to 20. Two raters consensus coded 5 children's cued comprehension answers (5 children × 5 sessions = 25 individual sessions, or 7% of the sessions) while training to criterion levels. Eighty-five individual sessions (22%) were then double coded to assess interrater reliability. The numbers of agreements and disagreements for each type of question were scored. Percentage agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements. Percentage agreement using this method was 83% for character descriptions, 84% for critical story event, 88% for main idea, and 93% for incidentals.

Spontaneous use of target words. While answering the comprehension questions, each instance that a child used one of the ten possible target words featured in the clip just viewed was recorded and summed to form a composite score.

Perceived utility and competence of television watching and reading. The children's beliefs about their own competence at information acquisition and whether they believed that learning information from reading or watching television was useful were measured.

Prior to viewing the Session 1 video, children were asked four questions regarding how useful they thought reading and television were for learning new information and how competent they felt at using each medium for information acquisition using a scale adapted from Eccles et al. (1999). The questions were read to them, and then each was given a 7-point Likert-type scale card. The children were asked to point to the number on the scale that best matched how they were or felt about that item.

Procedure

A 2 (captions; with vs. without) × 2 (narration; with vs. without) design was used to address the research questions. Children whose parents signed informed consents were randomly assigned to one of four conditions: captions with verbal narration (n = 18), no captions with verbal narration (n = 20), captions with no verbal narration (n = 19), and no captions with no verbal narration (n = 19). Each child participated in five individual sessions over an 8–15-day period (M = 9.1 days), depending on absences, field trips, or vacation days.

During the first session, the children were given a one-time-only assessment on the perceived utility/competence measure and a brief test of reading achievement (i.e., WRAT–3). During each video viewing session, children watched a video, after which they answered comprehension questions and read a portion of the script that contained all target words taken from the video they just viewed. From these measures, word recognition and oral reading rate data were taken. Beginning on Day 2 of the intervention, children also read the script from the previous day's session prior to viewing the next video. After Session 5, the final session, the children read a passage that contained all target words but was unrelated to the videos that they had previously seen. From this assessment, measures of word recognition and oral reading rate were taken.

Results

For the measures taken repeatedly over five sessions, the data were consolidated to form single scores that represented each child's performance immediately after viewing the video, during the next session, and during the last session. This within-subjects comparison of context provided a repeated measure of reading acquisition in the overall design. Because of intercorrelations between dependent variables (see Table 1) and preexisting group differences on initial reading ability, a multivariate approach was taken that included a multivariate analysis of covariance (MANCOVA). Two data reduction activities to increase statistical test validity, power, and clarity of results were performed: (a) computation of composite variables and (b) grouping similar, correlated dependent variables into a single MANCOVA (Cohen & Cohen, 1983). Repeated measures MANCOVAs were computed for word recognition and oral reading rate outcomes, and between-subjects MANCOVAs were computed for comprehension outcomes. To analyze perceived competence and utility, the two questions pertaining to reading and the two questions pertaining to television were summed separately and divided into equal high and low groups based on empirical analyses (i.e., low reading group = 1–10; high reading group = 11–14; low television group = 1–10; high television group = 11–14). Each set of outcome variables was then entered into a MANCOVA with reading competence/utility and television competence/utility as the between-subjects factors. To estimate the practical significance of the reading outcomes, effect sizes were also computed (Cohen, 1982).

As a check on random assignment, groups were compared across all measures administered at the pretest, including demographic characteristics and reading level (see Table 2). No significant pretest differences were noted among the four treatment groups. Therefore, treatment effects attributable to the experimental manipulations are warranted. There were no interaction or main effects for site in the pretest data; therefore, site was not included in further analyses. Results are presented for each obstacle: (a) difficulty understanding and using the alphabetic principle, (b) failure to transfer the comprehension skills of spoken language to written language, and (c) absence or loss of motivation to read or failure to develop positive attitudes about reading.

Obstacle 1: Difficulty Understanding and Using the Alphabetic Principle

I calculated a 2 (captions) × 2 (narration) × 2 (gender) × 3 (context) repeated measures MANCOVA with WRAT score as the covariate and repeated measures on the last variable. There was a

Table 1
Zero-Order Correlations Among Dependent Variables

Dependent variable	1	2	3	4	5	6	7	8	9	10	11	12
1. Immediately after word recognition	—	.99**	.97**	.78**	.84**	.71**	.19	.22	.43**	.26*	.38**	.11
2. Next session word recognition		—	.97**	.18	.23*	.84**	.18	.23*	.43**	.24*	.38**	.09
3. Final session word recognition			—	.13	.85**	.72**	.13	.20	.42**	.22	.38**	.07
4. Immediately after oral reading rate				—	.98**	.93**	.25*	.24*	.45**	.23	.40**	0
5. Next session oral reading rate					—	.93**	.23	.23	.45**	.25*	.38	.06
6. Final session oral reading rate						—	.20	.16	.45**	.15	.34**	0
7. Free recall central							—	.80**	.45**	.34**	.51**	.19
8. Free recall incidental								—	.39**	.38**	.50**	.14
9. Cued recall character descriptions									—	.19	.45**	.19
10. Cued recall critical elements										—	.32**	.15
11. Cued recall main idea											—	.19
12. Cued recall incidental elements												—

* $p < .05$. ** $p < .01$.

Table 2
Demographic Characteristics, Reading Ability, and Competence/Usefulness Scores Across All Children and Within Treatment Group

Variable	All	C + N	NC + N	C + NN	NC + NN	$F(1, 75)$
Race						
African American	37	10	10	7	10	
European American	20	3	6	7	4	
Hispanic	12	3	4	3	2	
Other	5	2	0	2	1	
Missing	2	0	0	0	2	
WRAT score	27.96	28.28	27.90	27.47	28.21	.137
Reading competence	4.64	4.28	5.10	4.42	4.72	.904
Reading usefulness	5.45	5.06	5.55	5.84	5.45	.607
Television competence	5.27	5.33	5.45	5.16	5.11	.164
Television usefulness	5.04	5.06	4.75	6.00	4.33	2.50

Note. $\chi^2(N = 24) = 5.23$. Chi-square tested whether groups differed in their composition of children's racial characteristic. All F tests were nonsignificant. Wide Range Achievement Test (WRAT) score range = 18–39. Competence and usefulness ranges = 1–7. C = captions present; NC = captions absent; N = narration present; NN = narration absent.

significant within-subjects interaction for context by WRAT score, $F(1, 63) = 37.04$, $p < .00$ (see Table 3). Children who had higher scores on the WRAT read more target words across different contexts. There was also a significant within-subjects main effect for context, $F(1, 63) = 11.44$, $p < .00$. Children were able to read more target words in context than out of context.

There were significant between-subjects main effects for WRAT score, $F(1, 63) = 203.86$, $p < .00$, and captions, $F(1, 63) = 6.15$, $p < .05$. Children who watched video clips with captions recognized more target words than did those children who watched video clips without captions. There were no interaction or main effects for narration or gender. The captions' effect size was .09, a moderate effect (Cohen, 1982).

Oral Reading Rate

A 2 (captions) × 2 (narration) × 2 (gender) × 3 (context) repeated measures MANCOVA with repeated measures on the last variable was computed. WRAT served as the covariate (see Table 4). There was a significant within-subjects interaction for context by WRAT score, $F(2, 59) = 13.68$, $p < .01$. Children who had higher scores on the WRAT read more quickly and accurately across different contexts than did children who had lower scores. There was also a significant within-subjects main effect for context, $F(2, 59) = 7.09$, $p < .01$. Children's reading rate increased from Context 1 to Context 2 and decreased from Context 2 to Context 3. There were significant main effects for WRAT score, $F(1, 60) = 123.54$, $p < .00$, and child's gender, $F(1, 60) = 10.61$, $p < .01$. Girls were able to read more quickly and accurately than boys read. The gender effect size was .15.

Obstacle 2: Failure to Transfer the Comprehension Skills of Spoken Language to Written Language

Free recall. A 2 (captions) × 2 (narration) × 2 (gender) MANCOVA with WRAT score as the covariate was computed with the free recall data (see Table 5 for descriptive statistics). There was a significant main effect for narration, $F(2, 63) = 3.24$, $p < .05$.

Differences existed only for the free recall incidental elements variable (see Table 6), with children in the narration groups scoring higher than did children in the non-narration groups, $F(1, 64) = 6.23$, $p < .05$, an effect size of .09. No differences emerged on the central elements variable, $F(1, 64) = 2.66$, $p < .11$, and no significant interactions or main effects emerged for gender.

Cued recall. The four cued recall variables were entered into a 2 (captions) × 2 (narration) × 2 (gender) MANCOVA with WRAT score as the covariate (see Table 7). There were two significant interaction effects—captions by narration, $F(4, 61) = 2.60$, $p < .05$, and captions by gender, $F(4, 61) = 3.15$, $p < .05$—and a significant main effect of WRAT score, $F(4, 61) = 8.06$, $p < .00$, and narration, $F(4, 61) = 3.90$, $p < .01$.

Table 3
Means, Standard Deviations, and Adjusted Means for Word Recognition Outcomes by Levels of Captions

	Captions present			Captions absent		
Outcome	*M*	*SD*	Adjusted *M*	*M*	*SD*	Adjusted *M*
Immediately after	34.37	14.42	34.67	30.08	15.90	30.12
Next session	28.83	12.18	29.01	25.03	13.13	25.06
Final session	21.97	9.96	22.11	18.84	10.42	18.85

Table 4
Means and Standard Deviations for Oral Reading Rate by Levels of Child's Gender

	Short-term (in context)			Midterm (in context)			Long-term (unrelated context)		
Gender	*M*	*SD*	Adjusted *M*	*M*	*SD*	Adjusted *M*	*M*	*SD*	Adjusted *M*
Boys	58.0	23.0	57.6	65.5	26.4	65.0	57.2	25.0	56.2
Girls	70.3	30.5	70.2	78.2	33.8	78.1	71.6	30.9	71.5

Table 5
Means and Standard Deviations for Free Recall Comprehension Outcomes by Levels of Narration

	Central elements			Incidental elements		
Narration level	*M*	*SD*	Adjusted *M*	*M*	*SD*	Adjusted *M*
Present	51.4	21.5	51.6	10.7	10.6	6.1
Absent	43.3	17.1	43.7	7.0	7.4	4.6

First, with regard to the caption by narration interaction, character descriptions, main ideas, and incidental elements scores were higher in the presence of narration without captions, and the critical story element scores were higher in the presence of both captions and narration.

For the gender by caption interaction, boys tended to score higher in the presence of captions, and girls scored higher in the absence of captions. There was also a significant main effect for WRAT score, $F(4, 61) = 8.06$, $p < .00$, and narration, $F(4, 61) = 3.90$, $p < .01$. Overall, children performed better in the presence of narration than in the absence of narration.

An analysis of univariate tests clarifies these results (see Table 8). For character descriptions, a caption by gender interaction existed; boys gave more-detailed descriptions of characters when captions were present; girls' descriptions were more detailed when captions were absent.

A three-way interaction between captions, narration, and gender and a main effect for narration was identified for critical story elements. Girls' scores were highest when captions were absent and narration was present and were lowest when captions were present and narration was absent. Scores were highest for boys when both captions and narration were present and were lowest when captions were present and narration was absent. Both boys and girls had higher scores when narration was present and lower scores when narration was absent.

A two-way interaction between captions and narration as well as a main effect for narration existed for identifying the main idea. Children who watched the clips with narration had higher scores than children who watched without narration had, and those who watched with narration and without captions had the highest scores.

Spontaneous use of target words during comprehension session. The number of target words that children used spontaneously while answering comprehension questions was entered into a 2 (captions) × 2 (narration) × 2 (gender) analysis of variance (ANCOVA) with WRAT score as the covariate (see Table 9 for descriptive statistics). There was a significant main effect for narration, $F(1, 64) = 28.15$, $p < .00$. Children used target words more often in the presence of narration than in the absence of narration, an effect size of .31.

Obstacle 3: Absence or Loss of Motivation to Read or Failure to Develop Positive Attitudes About Reading

Word recognition. I carried out a 2 (reading competence/utility) × 2 (television competence/utility) × 2 (gender) × 3 (context) repeated measures MANCOVA with WRAT score as the covariate and repeated measures on the last variable for the word recognition data. There was a significant within-subjects interaction for context by WRAT score, $F(2, 63) = 32.43$, $p < .00$ (see Table 10 for descriptive statistics). Children who had higher scores on the WRAT read more target words correctly across the different contexts. There was also a significant within-subjects main effect for context, $F(2, 62) = 10.51$, $p < .00$. Children were able to read more target words in the sessions immediately after and prior to the next session compared with the last session.

There was a significant between-subjects two-way interaction between reading competence/utility and child's gender, $F(1, 63) = 7.45$, $p < .01$ (see Table 10 for more details). On word recognition tasks, comparing children with high reading competence and utility scores, boys outperformed girls; comparing children with low reading competence and utility scores, girls outperformed boys. There was also a main effect of reading competence/utility, $F(1, 63) = 6.67$, $p < .012$. Those in the high reading competence/utility group read more words than did those in the low reading competence/utility group.

Oral reading rate. I carried out a 2 (reading competence/utility) × 2 (television competence/utility) × 2 (gender) × 3 (context) repeated measures MANCOVA with WRAT score as the covariate and repeated measures on the last variable for the oral reading rate data. There was a significant within-subjects interac-

Table 6
Summary Table of Univariate Between-Subjects Effects for Free Recall Comprehension

Source	SS	MS	*F*	γ^2
WRAT				
FRC	910.47	910.47	2.38	.04
FRI	102.02	102.02	3.35	.05
Captions (A)				
FRC	179.08	179.08	.47	.00
FRI	.65	.65	.02	.00
Narration (B)				
FRC	1018.79	1018.79	2.66	.04
FRI	190.00	190.00	6.23*	.09
Gender (C)				
FRC	70.41	70.41	.18	.00
FRI	6.28	6.28	.21	.00
A × B				
FRC	568.61	568.61	1.49	.02
FRI	18.74	18.74	.62	.01
A × C				
FRC	16.93	16.93	.04	.00
FRI	3.08	3.08	.10	.00
B × C				
FRC	467.37	467.37	1.22	.02
FRI	10.96	10.96	.36	.01
A × B × C				
FRC	18.89	18.89	.05	.00
FRI	9.81	9.81	.32	.01
Error[a]				
FRC	24498.77	382.79		
FRI	1950.54	30.48		

Note. Degrees of freedom = 1, unless noted otherwise. FRC = Free recall central elements; FRI = free recall incidental elements; SS = sum of squares; MS = mean square.
[a] $df = 64$.
* $p < .05$.

tion for context by WRAT score, $F(2, 59) = 15.41$, $p < .00$ (see Table 11 for descriptive statistics). Children who had higher scores on the WRAT read faster across the different contexts. There was also a significant within-subjects main effect for context, $F(2, 59) = 7.87$, $p < .001$. Children read fastest in the session prior to the next session while reading slower in the session immediately after and the last session.

Between-subjects effects for the interaction of television competence/utility by gender, $F(1, 60) = 3.99$, $p < .05$, and for the main effect of gender, $F(1, 60) = 12.01$, $p < .01$ were present. Boys who reported that television was useful for learning information and who believed that they were good at learning information from television had higher oral reading rates than those for boys who did not believe they were good at learning from television or that it was useful for learning information. In contrast, girls had higher oral reading rates when they believed that television was not useful for learning information and that they were not competent at learning from television and had lower oral reading rates if they believed the opposite.

Comprehension. Free recall comprehension scores did not differ by reading competence/utility, $F(2, 62) = .89$, $p < .41$, or by television competence/utility, $F(2, 62) = .93$, $p < .40$. Finally, cued recall comprehension scores did not vary by reading competence/utility, $F(4, 60) = 1.61$, $p < .18$, or by television competence/utility, $F(4, 60) = 1.39$, $p < .24$.

Discussion

The use of television captioning helped beginning readers in this study improve certain reading skills. In addition, beliefs about one's competence in using and learning from a particular medium (i.e., reading or television) influenced word recognition and oral reading rate outcomes.

Obstacle 1: Difficulty Understanding and Using the Alphabetic Principle

As predicted, captions produced greater gains than did the absence of captions for word recognition measured at three time points: immediately after viewing the clip, prior to viewing the next clip, and after viewing all clips. Television's combination of pictures, sound, and captions helped children establish a connection between the spoken word and the printed word by putting words in a familiar context using a familiar medium. Children learned to recognize words from print, in the form of captions, combined with television. Contrary to prediction, the combination of narration and captions did not produce greater word recognition scores compared with captions alone. Narration neither added nor detracted from the child's ability to learn words when captions were present.

Not only did children recognize words when reading a passage taken verbatim from the clip, they also transferred that learning to a passage unrelated to any of the video clips. Captions helped children learn to recognize and retain words. This finding has positive implications for using this technology to improve long-term gains, especially for children who might not have access to print. Exposure to a word four or five times over the course of 4–6 min was enough to help children retain that word when encountered up to 15 days later. Captions provide an additional opportunity for readers to learn to visually recognize words in print.

With regard to oral reading rate, no differences emerged for captions or narration. Most likely, five short sessions across a 2-week period is not enough time to significantly change or improve one's oral reading rate. There was improvement from the first reading to the second reading; however, these gains were not maintained. To realize long-term gains, exposure to captions would probably need to occur over a considerable length of time. Further research is needed to explore this possibility.

Obstacle 2: Failure to Transfer the Comprehension Skills of Spoken Language to Written Language

For the free recall question, comprehension was greater in the narration conditions, although significant differences occurred only for incidental story elements. That is, captions were as effective as narration was for helping children concentrate on the important, or central, story elements. When captions were not present, children remembered more of the incidental, or distracting, elements in the story (e.g., the Bunny had red-and-white ears). Therefore, captions appeared to have had a focusing effect on children, helping them concentrate on important elements in the story.

Table 7
Means, Standard Deviations, and Adjusted Means for Cued Recall Outcomes by Levels of Captions and Narration Split by Gender

	Captions present						Captions absent					
	Narration present			Narration absent			Narration present			Narration absent		
Gender and outcome	*M*	*SD*	Adjusted *M*	*M*	*SD*	Adjusted *M*	*M*	*SD*	Adjusted *M*	*M*	*SD*	Adjusted *M*
Boys												
Character descriptions	17.20	5.47	17.10	17.75	5.74	18.84	15.56	2.56	15.63	16.44	3.71	15.68
Critical elements	18.10	0.86	18.06	11.50	4.93	11.89	14.67	2.50	14.69	14.89	3.30	14.61
Main idea	8.80	4.24	8.72	8.25	2.50	9.09	11.33	5.27	11.39	6.56	4.53	5.97
Incidental elements	17.00	3.16	16.99	16.75	2.06	16.90	17.89	3.14	17.90	20.33	3.12	20.23
Girls												
Character descriptions	14.75	3.11	14.68	16.00	4.78	15.49	17.80	4.18	18.22	16.90	5.59	17.49
Critical elements	14.63	3.16	14.60	12.92	3.59	12.74	17.20	2.86	17.35	14.90	3.00	15.12
Main idea	7.25	5.04	7.19	7.23	4.36	6.84	11.10	6.05	11.42	7.30	3.89	7.76
Incidental elements	15.63	3.47	15.62	17.23	5.80	17.16	18.70	4.50	18.76	15.00	4.37	15.08

Table 8
Summary Table of Univariate Between-Subjects Effects for Cued Recall Comprehension

Source	SS	MS	*F*	γ^2
WRAT				
CD	377.89	377.89	25.93***	.29
CSE	49.76	49.76	5.83*	.08
MI	223.77	223.77	11.80**	.16
ISE	7.01	7.01	.41	.01
Captions (A)				
CD	.86	.86	.06	.00
CSE	20.58	20.58	2.41	.04
MI	22.62	22.62	1.19	.02
ISE	28.89	28.89	1.69	.03
Narration (B)				
CD	3.62	3.62	.25	.00
CSE	109.90	109.90	12.87**	.17
MI	84.59	84.59	4.46*	.07
ISE	.01	.01	.00	.00
Gender (C)				
CD	1.89	1.89	.13	.00
CSE	.30	.30	.04	.00
MI	3.90	3.90	.21	.00
ISE	29.90	29.90	1.75	.03
A × B				
CD	10.63	10.63	.73	.01
CSE	33.29	33.29	3.90	.06
MI	84.52	84.52	4.46*	.07
ISE	8.03	8.03	.47	.01
A × C				
CD	103.18	103.18	7.08**	.10
CSE	33.36	33.36	3.91	.06
MI	31.25	31.25	1.65	.03
ISE	10.10	10.10	.59	.01
B × C				
CD	2.97	2.97	.20	.00
CSE	4.76	4.76	.56	.01
MI	1.11	1.11	.06	.00
ISE	19.60	19.60	1.15	.02
A × B × C				
CD	.02	.02	.00	.00
CSE	42.11	42.11	4.93*	.07
MI	6.16	6.16	.33	.01
ISE	58.84	58.84	3.43	.05
Error[a]				
CD	932.90	14.58		
CSE	546.33	8.54		
MI	1213.61	18.96		
ISE	1094.91	17.11		

Note. Degrees of freedom = 1, unless noted otherwise. CD = character descriptions; CSE = critical story elements; MI = main idea; ISE = incidental story elements; SS = sum of squares; MS = mean square.
[a] $df = 64$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

For the cued recall questions, the presence of narration again contributed to higher comprehension scores than did the absence of narration. In this analysis, two interactions were present: gender × caption and caption × narration. In the presence of captions, boys outperformed girls on the outcome variables, whereas in the presence of narration, girls outperformed boys. A possible explanation for this finding is that boys have a greater affinity for television and are willing to invest more reading effort with a television stimulus than without one. Captions had an especially focusing effect for boys, helping them concentrate on the important aspects of the programs. In addition, the results from the perceived competence/utility analyses were consistent with this finding. Boys' oral reading rates were higher (and more similar to girls' rates, a six-word-per-minute difference) when they believed themselves to be competent at learning information from television, independent of their beliefs about their reading abilities. In prior research, more pronounced intervention effects related to increased academic achievement for boys were reported (Anderson et al., in press): The group more at risk academically benefited more from the intervention.

Table 9
Means and Standard Deviations for Spontaneous Use of Target Words by Levels of Narration

Narration level	*M*	*SD*	Adjusted *M*
Present	6.46	6.04	6.43
Absent	0.67	1.07	0.78

Narration also was important for increasing a child's comprehension. For the critical element question (i.e., when X happened, what happened next), the presence of captions seemed again to help the children focus, so they were able to identify the critical moment of the story. For the remaining cued recall questions, narration without captions produced higher scores. Scores for character description and incidental story elements, two lower level, more shallow processing questions, slightly favored narration without captions.

Identifying the main idea greatly favored narration without captions. This skill is extremely difficult for children to acquire and usually does not appear until the upper elementary grades (Baker & Brown, 1984; Ezell, Kohler, Jarzynka, & Strain, 1992; Flood & Lapp, 1991). To go beyond simple retention of character descriptions, incidental elements, and one obvious-but-crucial story element to identify the essential organizing features of the story, children need to be able to allocate extra time to distinguish, review and, in some cases, actively construct the organizing features (Baker & Brown, 1984). Because children were still struggling with the mechanics of reading, captions demanded and captured their attention, causing them to switch back and forth between the story line and the captioned text. Only one task can be done at a time; therefore, children may not have had sufficient cognitive resources available to process both the decoding of the words and the main idea. Because captions have the power to evoke reading, children spent more time on decoding the captioned text and less time on the story line, producing lower scores in the

Table 10
Means and Standard Deviations for Word Recognition Outcomes by Levels of Perceived Competence/ Utility for Reading

	Utility high		Utility low	
Outcome	*M*	*SD*	*M*	*SD*
Immediately after	34.54	1.38	29.93	1.29
Next session	28.97	1.14	24.82	1.06
Final session	21.93	0.90	18.91	0.84

Table 11
Means and Standard Deviations for Oral Reading Rates by Levels of Perceived Competence/Utility for Television and Child's Gender

	Utility high		Utility low	
Gender	*M*	*SD*	*M*	*SD*
Boys	62.14	3.83	56.72	4.68
Girls	68.05	3.76	78.71	3.76

presence of captions than would be expected for children who had achieved automatic decoding.

For those children in the narration group, the processing skills associated with television viewing were automatic. These children had processing capacity left over to focus on processing the information in the story more deeply. The same power to process more deeply could be expected from captions once the child has reached automated reading. As children become proficient readers, researchers have provided evidence that comprehension improves in the presence of closed captions (Griffin & Dumestre, 1993).

Spontaneous Use of Target Words

Contrary to prediction, children used the target words spontaneously in a recall session more frequently in the presence of narration than in the absence of narration. There were no differences in spontaneous use of target words for groups in the presence and absence of captions. Perhaps children need to hear words to be able to use those words in their speaking vocabularies. Captions neither added nor detracted from the child's ability to use the target words, whereas narration was necessary.

Obstacle 3: Absence or Loss of Motivation to Read

As predicted, children who believed that they were competent readers were able to recognize the most words. These children were able to read more words because they either invested more effort in this task or the material was easy. This finding was qualified by the child's gender. Boys whose reading competence and utility beliefs were high outscored girls whose reading competence and utility beliefs were higher. The opposite was true for boys and girls whose reading competence and utility beliefs were low; girls outscored boys.

Boys whose beliefs about television competence and utility were high had oral reading rates higher than those of boys whose beliefs about their television competence and utility were low. Interestingly, the opposite finding was true for girls. These boys may have found television a more accessible medium, believing that they could process its messages successfully. Salomon (1984) reports that children with high self-confidence toward obtaining information and learning from a particular kind of source will invest sustained effort in the task and persist in doing so. These boys may have worked at processing the information received from television and were, therefore, able to read more fluently than boys who were not as competent or who did not find television useful for learning new information.

Implications for reading. Learning to read is an important curricular component for children in early elementary school. This process can be difficult and frustrating at times. Television programs with captions provide an opportunity for children to practice reading while taking part in a "fun" and motivating context. Neuman (1995) argued that educating a child regarding the educational potential of both reading and television, especially when combined, would result in maximal comprehension. When instructed regarding the educational potential of the medium of placing captions on the screen, children have an opportunity to see and benefit from the combination. In the study reported here, children were not instructed about the educational nature of either medium or instructed to use the captions to help them learn new words. Making the child aware of the reasons for captions on the screen might make the child work harder to process information when captions are present. This area needs to be explored in future studies in which children can be taught media literacy skills that will make them more critical viewers and help them maximize the benefits of captions to improve their reading skills.

Although using captioned television provides teachers with an additional tool for teaching reading, the clips used in this study were carefully designed to maximize the child's likelihood of successfully learning words. Most programs on television are not designed in this manner, so educators need to review programs and make choices that are appropriate, keeping in mind such factors as speed of narration, structure of text found in video clips, and level of words to be learned.

Implications for television. Televisions are found in over 99% of the homes in the United States. Children from all backgrounds have access to this medium. Enabling the captions option on the television immediately provides a print-rich environment for children who may not have access to other forms of print. In two recent longitudinal studies, continuous use of captions over an extended time (i.e., 8–10 months to 17 months) resulted in higher scores on standardized reading tests for children with learning disabilities and children with limited or no English proficiency (Haugh et al., 1998; Koskinen et al., 1997). Captions played an important role in motivation and comprehension for many types of readers: older, learning disabled, hearing impaired, and English-as-second-language readers (Austin, 1984; Goldman & Goldman, 1988; Koskinen et al., 1986; Neuman & Koskinen, 1992). No harm will come from turning the captions on, whereas many positive effects may occur—especially with programs that have clearly defined and integrated educational goals and teaching methods.

One significant factor that may impede access to this technology is the date of manufacture of television sets. Televisions built after mid-July 1993 have captioning technology built in and readily accessible, whereas televisions produced prior to this date would need to be equipped with a decoder box at an additional expense. Because television ownership is so widespread, most families may already own a television with the caption-decoding capacity built into the set.

A caveat for these findings and their generalizability to learning words from current television programs is that the supporting texts were written at a level that the average second grader would be able to read without difficulty. Then, specific, more difficult words were inserted throughout the easier text and repeated a number of times. Scripts on television have not been developed in this manner; therefore, these results may not generalize to current chil-

dren's programming. If the goal of a program is to help children learn words and improve reading skills, developers and producers of programs need to make a concerted effort to create their programs using the available literature on reading and, specifically, captions. It is unknown what the full impact would be of embedding difficult words within reading competence levels on children's ability to recognize words and read faster. But because the surrounding text posed little difficulty for most readers in this study, theory would suggest that the children could read that text with little attention to decoding. Therefore, they had more cognitive resources to allocate to the more difficult words. More studies examining captions in a natural (uncontrived) setting as well as in a structured setting (i.e., similar to this study) are necessary to determine the effect that choosing an easier script would have on a child's ability to read new vocabulary words.

Another area that needs to be explored is one's attention to the captions on the screen. Samuels (1994) proposed that attention is at the heart of automatic information processing. For children to attend to the story line, they must be able to decode words automatically. The amount of time spent looking at the captions would be a good indicator of the level of automaticity that the child has achieved as well as an indicator of how effective captions are at evoking reading behavior. In addition, does continuous exposure to captions on screen result in decreased attention to the captions? These are questions that need to be explored to determine the most effective use of captions.

Overall, beginning readers can learn to recognize words in print by viewing captions on television; at the same time, narration can help readers comprehend information regarding the story line. As children get older, they focus more on events that play an important role in the central structure of the story (van den Broek, Lorch, & Thurlow, 1996). When captions were present, they appeared to serve as a focusing agent, helping readers to identify the central story elements while keeping them from attending to incidental content. Over time, this may help accelerate the readers' ability to concentrate on and extract the more important central structures in a story. This shift suggests a switch from dependence on concrete, peripheral features to reliance on central story elements (Wright & Huston, 1983). It is recommended that captions be left on, even as a child moves toward automated reading, not because they still help with decoding (although they might help for difficult words), but rather because they keep children on track and free from the distracting incidental audio and visual elements on television.

References

Adler, R. (1985). Using closed-captioned television in the classroom. In L. Gambrell & E. McLaughlin (Eds.), *New directions in reading: Research and practice* (pp. 11–18). Bethesda, MD: Yearbook of the State of Maryland International Reading Association.

Anderson, D. R., Huston, A. C., Schmitt, K. L., Linebarger, D. L., & Wright, J. C. (in press). Adolescent outcomes associated with early childhood television viewing. *Monographs of the Society for Research in Child Development.*

Austin, B. A. (1984). Motivations for television viewing among deaf and hearing students. *American Annals of the Deaf, 129,* 17–22.

Baker, L., & Brown, A. L. (1984). Metacognitive skills and reading. In P. D. Pearson (Ed.), *Handbook of reading research* (3rd ed., pp. 353–394). New York: Longman.

Cohen, J. (1982). *Statistical power analysis for the behavioral sciences* (rev. ed.). New York: Academic Press.

Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences.* Hillsdale, NJ: Erlbaum.

Eccles, J. S., Roeser, R., Wigfield, A., & Freedman-Doan, C. (1999). Academic and motivational pathways through middle childhood. In L. Balter & C. S. Tamis-LeMonda (Eds.), *Child psychology: A handbook of contemporary issues* (pp. 287–317). Philadelphia, PA: Psychology Press/Taylor & Francis.

Ezell, H. K., Kohler, F. W., Jarzynka, M., & Strain, P. S. (1992). Use of peer-assisted procedures to teach QAR reading comprehension strategies to third-grade children. *Education and Treatment of Children, 15*(3), 205–227.

Flood, J., & Lapp, D. (1991). Reading comprehension instruction. In J. Flood, J. M. Jensen, D. Lapp, & J. R. Squire (Eds.), *Handbook of research on teaching the English language arts* (pp. 732–742). New York: Macmillan.

Fry, E. (1968, April). Readability formula that saves time. *Journal of Reading, 11,* 513–516; 575–577.

Garza, T. (1991). Evaluating the use of captioned video materials in advanced foreign language learning. *Foreign Language Annals, 24,* 239–258.

Gladdhart, M., Lebbin, C., & Layton, K. (1987). *Using closed-captioned television as an instructional medium for teaching normal hearing children sight words.* Unpublished manuscript.

Goldman, M., & Goldman, S. (1988). Reading with closed captioned TV. *Journal of Reading, 31,* 458.

Griffin, R., & Dumestre, J. (1993). An initial evaluation of the use of captioned television to improve the vocabulary and reading comprehension of Navy sailors. *Journal of Educational Technology Systems, 21,* 193–206.

Haugh, J. A., Wilson, R. M., & Koskinen, P. S. (1998, December). *Captioned television and vocabulary development: Effects of home viewing on second-language learners.* Paper presented at the meeting of the National Reading Conference, Austin, TX.

Healy, J. M. (1990). *Endangered minds: Why our children don't think.* New York: Simon and Schuster.

Huston, A. C., & Wright, J. C. (1997). Mass media and children's development. In W. Damon, I. E. Sigel, & K. A. Renninger (Eds.), *Handbook of child psychology: Vol. 4. Child psychology in practice* (5th ed., pp. 999–1058). New York: Wiley.

Jensema, C., McCann, R., & Ramsey, S. (1996). Closed-captioned television presentation speed and vocabulary. *American Annals of the Deaf, 141,* 284–292.

Koskinen, P. S., Bowen, C. T., Gambrell, L. B., Jensema, C. J., & Kane, K. W. (1997, March). *Captioned television and literacy development: Effects of home viewing on learning disabled students.* Paper presented at the meeting of the American Educational Research Association, Chicago, IL.

Koskinen, P. S., Wilson, R. M., Gambrell, L. B., & Jensema, C. J. (1986). Using closed captioned television to enhance reading skills of learning disabled students. In J. A. Niles & R. V. Lalik (Eds.), *Solving problems in literacy: Learners, teachers, and researchers* (pp. 61–65). Rochester, NY: National Reading Conference.

Koskinen, P. S., Wilson, R. M., Gambrell, L. B., & Jensema, C. J. (1991). Captioned video technology and television-based reading instruction. In S. Clewell (Ed.), *Literacy: Issues and practice* (pp. 39–47). Bethesda, MD: Yearbook of the State of Maryland International Reading Association.

Koskinen, P. S., Wilson, R. M., & Jensema, C. J. (1985). Closed-captioned television: A new tool for reading instruction. *Reading World, 24,* 1–7.

Linebarger, D. L. (2000). *Summative evaluation of* Between the Lions: *A report to WGBH Educational Foundation.* Kansas City, KS: Juniper Gardens Children's Project, University of Kansas.

MacBeth, T. M. (1996). Indirect effects of television: Creativity, persistence, school achievement, and participation in other activities. In T. M.

MacBeth (Ed.), *Tuning in to young viewers: Social science perspectives on television* (pp. 149–219). Thousand Oaks, CA: Sage.

Mogilner, A. (1992). *Children's writer's word book.* Cincinnati, OH: Writer's Digest Books.

National Research Council. (1998). *Preventing reading difficulties in young children.* Washington, DC: National Academy Press.

Neuman, S. (1995). *Literacy in the television age: The myth of the TV effect* (2nd ed.). Norwood, NJ: Ablex.

Neuman, S., & Koskinen, P. (1992). Captioned television as comprehensible input: Effects of incidental word learning from context for language minority students. *Reading Research Quarterly, 27,* 95–106.

Parks, C. (1994). *Closed captioned TV: A resource for ESL Literacy Education* (EDRS No. EDO-LE-94-02). Washington, DC: National Clearinghouse for ESL Literacy Education.

Price, K. (1984, Fall). Closed-captioned TV: An untapped resource. *MATSOL Newsletter, 12,* 4–5.

Rickelman, R. J., Henk, W. A., & Layton, K. (1991). Closed-captioned television: A viable technology for the reading teacher. *The Reading Teacher, 44,* 598–599.

Salomon, G. (1984). Television is "easy" and print is "tough": The differential investment of mental effort as a function of perceptions and attributions. *Journal of Educational Psychology, 76,* 647–658.

Samuels, S. J. (1994). Toward a theory of automatic information processing in reading, revisited. In R. B. Ruddell, M. Rapp Ruddell, & H. Singer (Eds.), *Theoretical models and processes of reading* (4th ed., pp. 816–837). Newark, DE: International Reading Association.

Spath, S. B. (1990). A study of closed-captioned television and word recognition for third and fourth-grade below average readers. *Dissertation Abstracts International, 50,* 1929.

van den Broek, P., Lorch, E. P., & Thurlow, R. (1996). Children's and adults' memory for television stories: The role of causal factors, story-grammar categories, and hierarchical level. *Child Development, 67,* 3010–3028.

Wilkinson, G. S. (1993). *Wide Range Achievement Test: Administration Manual* (3rd Ed.). Wilmington, DE: Jastak.

Wright. J. C., & Huston, A. C. (1983). A matter of form: Potentials of television for young viewers. *American Psychologist, 38,* 835–843.

Appendix

Sample Video Script and Reading Passage

Below is one of the five video scripts used and its accompanying reading passage test. The 10 featured target words are capitalized here for emphasis only; they were not capitalized in the captions.

Video Script Session 3: Billy Bug and the Violin

His mother tells Billy Bug to go to his violin lesson. Billy is GLUM. He takes his violin and STRIDES down the road. He STRIDES until he sees a ball in the air. What fun to play ball with my BUDDIES, Billy thinks. Billy keeps walking down the road. He STRIDES and STRIDES until he reaches the stairs. Ah, my violin lesson has started. Oh there's the ball again. I think I will play ball with my BUDDIES. Billy feels CHEERFUL. Oh boy, my BUDDIES are playing a soccer game. Ut-oh. A carpenter comes down the road. The carpenter is a GENTLE man. Come with me, says the GENTLE carpenter. We must make a new violin for you. Ah, Billy feels CHEERFUL again. Wait here, says the GENTLE carpenter. Come, Billy. The GENTLE carpenter takes Billy's hand. Oh, what an UNUSUAL tree with such MAGNIFICENT birds. Listen to the song the MAGNIFICENT birds are singing. We will make a UNUSUAL violin for you from this tree of MAGNIFICENT birds. The carpenter and Billy began making the violin. Billy looks CHEERFUL as he helps make the UNUSUAL violin. Ah, the violin is made. The GENTLE carpenter gives Billy the new violin. It's magic. Thank you. The magic violin plays the same SPLENDID song that the MAGNIFICENT birds sing. Billy feels SATISFIED as he plays his wonderful violin. Ut-oh, the UNUSUAL tree is sick. Oh no, a sick tree. Something is eating the sick tree. Oh, HARMFUL worms are killing the tree. This is a UNUSUAL tree, says Billy, please stop eating it. No, says the HARMFUL worm, and keeps eating the sick tree. Ah-ha, an idea. Billy feels CHEERFUL. He plays his magic violin and feels SATISFIED. The HARMFUL worm stops eating and follows the SPLENDID music. Now all the HARMFUL worms are following the SPLENDID music. Billy is so SATISFIED as he plays his magic violin. He watches the last HARMFUL worm fall into the water. He feels CHEERFUL and cheers. Then he feels SATISFIED as he plays the SPLENDID music so the MAGNIFICENT birds will return. Ah, the sick tree looks SPLENDID again. He feels CHEERFUL. Billy looks SATISFIED as he plays his very UNUSUAL violin.

Reading Passage for Billy Bug and the Violin

Billy is sad. He strides until he sees a ball in the air. I think I will play ball with my buddies. Billy feels cheerful. Oh no. Come with me, says the gentle carpenter. We must make a new violin for you. Come, Billy.

Ah, the violin is made. It is magic. Thank you. The magic violin plays the same splendid song that the magnificent birds sing. Billy feels satisfied as he plays his wonderful violin. Oh no, the unusual tree is sick. Oh no, a sick tree. Something is eating the sick tree. Oh, harmful worms are killing the tree.

Received August 9, 2000
Revision received November 20, 2000
Accepted November 20, 2000 ■