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Reading Readiness in Kindergarten:
Evaluation of a computer assisted program

Abstract

The present study explored the effects of a computer-assisted program on reading readiness skill development at the kindergarten level. A pre-test/post-test design was applied, using the Metropolitan Reading Test. The treatment consisted of using the "Early Reading" command module developed by the educational staff of Scott, Foresman and Company, and distributed through Texas Instruments. Subjects in the treatment group showed no overall statistically significant differences from subjects in the control group. However, statistically significant differences were noted in favour of the treatment group in the auditory subtest, while the control group, unexpectedly, fared better on the language subtest. The finding on the language subtest could be attributed to the strange, robot-like voice synthesizer which acted as an impediment to language comprehension in the treatment group. These results seem to indicate that computer-assisted reading readiness skill training may be effective for kindergarten children, although caution must be exercised in assuming that all CAI software in this area will be automatically beneficial.

The past decade has seen a dramatic increase of interest in developing reading readiness skills in kindergarten children. Reading readiness can be viewed as that state which enables a child to learn to read without undue strain or difficulty.

Traditionally, this readiness state was closely aligned to age whereby the mental age of six years was considered the time to introduce reading skills to a child. At present, however, reading readiness is viewed as occurring at different times for different children (Rowen, 1973). In essence, a child is seen as developing reading readiness skills practically from birth, and the degree of reading skills developed in kindergarten in particular, is viewed as a predictor of which children will likely be successful in a formalized reading program in grade one.

One possible new and powerful approach to improve reading readiness skills in kindergarten and nursery school education is through the use of micro-computers and appropriate software. However, the role of computer-assisted instruction (CAI) in early childhood education is yet to be clearly defined. It is important, though, that educators play a prominent part in evaluating specific programs according to educational criteria, and not accept uncritically products of professional programmers.

A study by Harriet Hungate (1982) involving computers and kindergarten children showed that kindergarten children could both learn how to use and learn from using computers. In this study, Hungate used these programs: Type Zero to Ten, Missing Number, Count Blocks, What's Different? (visual discrimination), My Name, and My Telephone Number. Reimer (1984) explored the effects of a LOGO programming experience at the kindergarten level. His study covered factors of readiness for grade one, creativity, and self-concept. In particular, the reading readiness skills addressed were for visual discrimination, visual motor skills, visual memory, and number recognition. Reimer found out "that a LOGO computer programming experience can be an important contributing factor in a five-year-old kindergarten child's readiness development for first grade" (abstract). Subjects in another study involving three to five-year-olds were given drill and practice computer programs that were designed to introduce the following pre-reading skills: alphabet, analogy skills, discrimination, and number recognition (Swigger, Campbell, and Swigger, 1983). Results indicated that girls preferred the drill and practice program, while boys preferred another program which focused on creative problem-solving. Children (3 to 5-year olds) attending the "Living-Learning-Laboratory for Young Children" at Ball State University received computer programs on alphabet recognition and numeral recognition (Williams, 1983). Results indicated cognitive growth, whereby, "The children seemed to recognize more letters and numerals on labels, signs, and charts than previous groups of children" (p.5).

The computer-assisted program chosen for the study was part of the "Early Reading" command module developed by the educational staff of Scott, Foresman and Company, and distributed through Texas Instruments (1980). The total package comprises three parallel programs: "Pick a Picture", "Pick a Word", and

"Pick a Story", each of which contains nine stories. Vocabulary is controlled with repetitions, and six new words are introduced in each story. Thirteen other short words (pronouns, articles, etc.) are also used; one interesting and mildly ironic feature is that the teacher is advised to teach these, if the child does not know them, by old-fashioned drill by printing each word on an unlined index card. One might have expected that a simple "electronic flashcard" program would have been incorporated into the package for such a contingency.

The program selected for the present study was "Pick a Picture", designed to help children recognize words on sight. The six new words in each story were introduced in a variety of ways and were visually reinforced with appropriate graphics. A voice synthesizer spoke each word and sentence for the child, asked the child to read the word or sentence, and instructed the child to find selected words within the sentence. The sentences were then combined to form a short story and the voice encouraged the child to read the story out loud. (See Appendix A for a sample activity.)

"Pick a Picture" was selected for the study because the level of challenge appeared appropriate for kindergarten-aged children, there was a consistent progression of skill requirements, the graphics and voice synthesizer seemed to be motivating, and the total approach of the program appeared to be "user friendly", with clear instructions, opportunity for self-correction, and positive feedback for correct responses.

Experimental research design

The children of middle class socio-economic families who served as subjects were those attending (half-time) the kindergarten classes in two nearby schools in the same suburb, in Saskatoon, Canada. Before exposure to the CAI, all forty had been pre-tested on the Metropolitan Readiness Level II, Form P (Nurss and McGauvran, 1976). From the results, the children were placed in rank order for raw score, then one from each adjacent pair was randomly allocated to either the experimental group or to the control group. The twenty children in the experimental group were then exposed to the CAI for two individual teaching sessions per week, over a ten-week period. The control group spent a similar amount of time on the computer, playing a non-verbal game in order to counter any possible placebo effect. The two groups were further matched in that they both shared the same kindergarten teacher. Both groups did not receive any formalized instruction in reading readiness skills from the teacher during the normal school day. Children in both groups spent most of their time at interest centers and circle time discussions.

After the CAI treatment was completed, Level II, Form Q,

of the Metropolitan Readiness Test was administered to both groups, and mean differences in raw scores were evaluated by analysis of variance for matched groups.

The evaluation instrument

The Metropolitan Readiness Test (MRT) consists of two test batteries, Level I and Level II. Level I was designed to be used from the beginning through the middle of the kindergarten year, and Level II for the end of kindergarten and the beginning of Grade I.

Level II, Form P, was used for the purpose of matching children in the present study, while Level II, Form Q, was used for post-treatment assessment. Thus, the children were matched on a test which was closely related to the criterion test, but there was no danger of any practice effect in the post-treatment testing.

The MRT Level II, Form P, consists of eight subtests, but the children were matched simply on total raw score on the six reading-related subtests. There are eight subtests in the MRT Level II, Form Q, of which children's post-treatment performances were evaluated on the same six reading-related areas. The relevant subtests of MRT Level II are:

Auditory. Beginning consonants (sound discrimination)
Sound-letter correspondence (identifying letters corresponding to specific sounds in words)

Visual. Visual matching (letters - lower and upper case, digits, and letter-like forms)
Finding patterns (locating embedded letter, digit, and letter-like groups)

Language. School language (concepts and grammatical structure)
Listening (comprehension)

Observations during the CAI treatment

During the treatment, the microcomputer appealed to the young children's natural, playful, exploratory behaviour. The feeling of accomplishment in achieving correct responses, or in playfully testing the microcomputer for various reactions was highly motivational for the youngsters. The voice synthesizer produced a robot-like accent which seemed to amuse the children. Although the manual suggests that adult assistance is necessary only to get started, it was found that the presence of an adult aide helped children over difficulties and to stay on task. The

treatment lasted for ten weeks, with each child choosing a story twice each week; no one seemed to tire of the program throughout its duration.

Results

One child from the control group was absent for the post-testing, so that the samples were reduced in number from twenty to nineteen, corresponding to his/her matched pair. The performance of the experimental group and control group was compared for:

1. overall raw score on MRT Level II, Form Q;

2. (a) raw score on the auditory tests;
   (b) raw score on the visual tests;
   (c) raw score on the language tests.

The results are summarized in Table 1.

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Table 1
Mean Scores of Experimental and Control Groups

	Exptl. Group	Control Group	Statistical Significance
MRT (Level II, Form Q) overall	45.11	43.79	not sig.
MRT (Level II, Form Q) auditory	20.58	18.26	$p < .05$
MRT (Level II, Form Q) visual	13.95	12.95	not sig.
MRT (Level II, Form Q) language	10.58	12.58	$p < .01$

* * * * *

Overall, there was no statistically significant difference between the two groups, nor between their performance on the visual tests. However, statistically significant differences were noted in the auditory tests (in favour of the experimental group) and on the language tests (in favour of the control group).

The lack of significance on the visual subtests was not surprising. The "Pick a Picture" program had emphasized spoken language, and the control group had also, no doubt, derived some sophistication in handling the visual aspects of the microcomputer display. Also, it should be remembered that the MRT visual subtests involved digits and non-letter stimuli, as well as actual letters.

The unexpected finding was that the difference between the groups' performance on the language subtests was convincingly

($p<.01$ level of statistical significance) in favour of the **control** group, in contrast to the experimental group's superiority on the Auditory subtests.

Examination of the MRT test item content suggests that the CAI appears to have sharpened the experimental group's decoding of "within-word" elements, but to have been relatively disadvantageous when it came to the reception of strings of words, i.e., continuous context. The most plausible explanation of these apparently contradictory effects is probably to be found in the nature of the spoken language which this particular CAI program employs. The artificial speech, produced by the voice synthesizer, was essentially monotonous and without inflection. It seems plausible to hypothesize that this encouraged children in the experimental group to focus their attention more sharply on specific sounds within stimulus words (hence leading to a superiority on the Auditory tests), but caused them to find the strange, robot-like monotone an impediment to comprehension (hence the inferiority on the Language tests).

It was further noted that the children from the experimental group who showed the greatest gains on the post-tests were those who had ranked lowest on the initial pre-test, while those who had showed a relatively high level of reading readiness on the pre-test, made relatively low gains. This phenomenon was no doubt partly due to a statistical repression effect, but it also underscores the fact that the children who are exposed to a reading readiness program should be those who demonstrate that they have not yet achieved reading readiness.

Discussion, conclusion, and limitation

From a total perspective, two valuable lessons were learned from the present study.

1. It should not be automatically assumed that CAI will be either **as** effective or **more** effective than alternative teaching methods. While exposure to CAI was followed by superior performance on the Auditory tests, the results on the Language tests suggest that, in certain circumstances, CAI might be **less** effective or even disadvantageous. The results of this study underscore the importance of good language models for young children when complex comprehension and thinking tasks are being fostered.

2. The study served as a reminder that any teaching strategy should be geared to the specific teaching objectives to be attained, and to the individual characteristics of the student. Specifically, children who have already demonstrated a readiness 7or reading do not need a reading readiness program, computer-assisted or conventional.

In conclusion, the present study, along with others previously cited, indicates that reading readiness computer software especially designed for young children does allow for the learning of reading readiness skills. A strength of this study is the discovery that there may also be possible negative effects of using CAI with young children as opposed to perhaps more traditional teaching methods. A limitation of the study is that the results are based on a small sample which prohibits generalization. Clearly, then, more research is required to further clarify the role of CAI to a wider population.

APPENDIX A

A Sample Activity From "Pick a Picture"

A sample activity from "Pick a Picture" is a story called "The Big Parade" (choice of picture number one out of a total possibility of nine numbered pictures with corresponding stories).

When the appropriate key on the computer is depressed, the story title "The Big Parade" is shown on the screen. The computer voice reads the title to the child, a picture of an elephant is displayed, and the computer voice states, "This is an elephant." The word "elephant" appears on the screen, after which the voice says, "This word is elephant," and asks the child to read the word. The child has time to read and study the word. Then the sentence "The elephant is big" appears one word at a time as the computer voice reads it.

The computer then gives directions for finding a word and states, "Find the word elephant." A red line appears under the first word in the sentence, and the child presses the space bar to move the red line under the word "elephant." Then ENTER is pressed and if the child has chosen correctly, the computer praises him or her, saying, "That is right." If the choice is not correct, the computer says, "Uh, oh. Find the elephant." The child continues to select until the right word is found. If the answer is right, the computer says so, and the elephant moves off the screen. A tiger now appears on the screen, and the steps are basically repeated again as in the elephant. Then "drum" is introduced, and the elephant plays the drum in the animal parade.

The first part of "The Big Parade" (and every "Pick a Picture" story) introduces new vocabulary individually and in simple sentences. The second part of the activity uses the same vocabulary in new sentences to make a short story. A story title appears, followed by the statement "A big tiger is in the parade." The computer voice reads the sentence aloud; then it's the child's turn to read the sentence aloud. Three other sentences are shown and read, one at a time, by the child. Each time, the child has the opportunity to read the sentence at his or her own pace and then press ENTER to go on.

At the end, the entire story is displayed and the computer says, "Read the story again. Then press ENTER to go on." The child is encouraged to carefully read the story again. If necessary, the child should be helped by an aide with any words that cause difficulty.

When the child has finished reading the story and has pressed ENTER, the computer asks, "Do you want to read this story again?" The child can press 1 for "yes" or 2 for "no." If the child presses 2, the display returns to the "Pick a Picture" title screen and the child can select another "Pick a Picture" story.

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