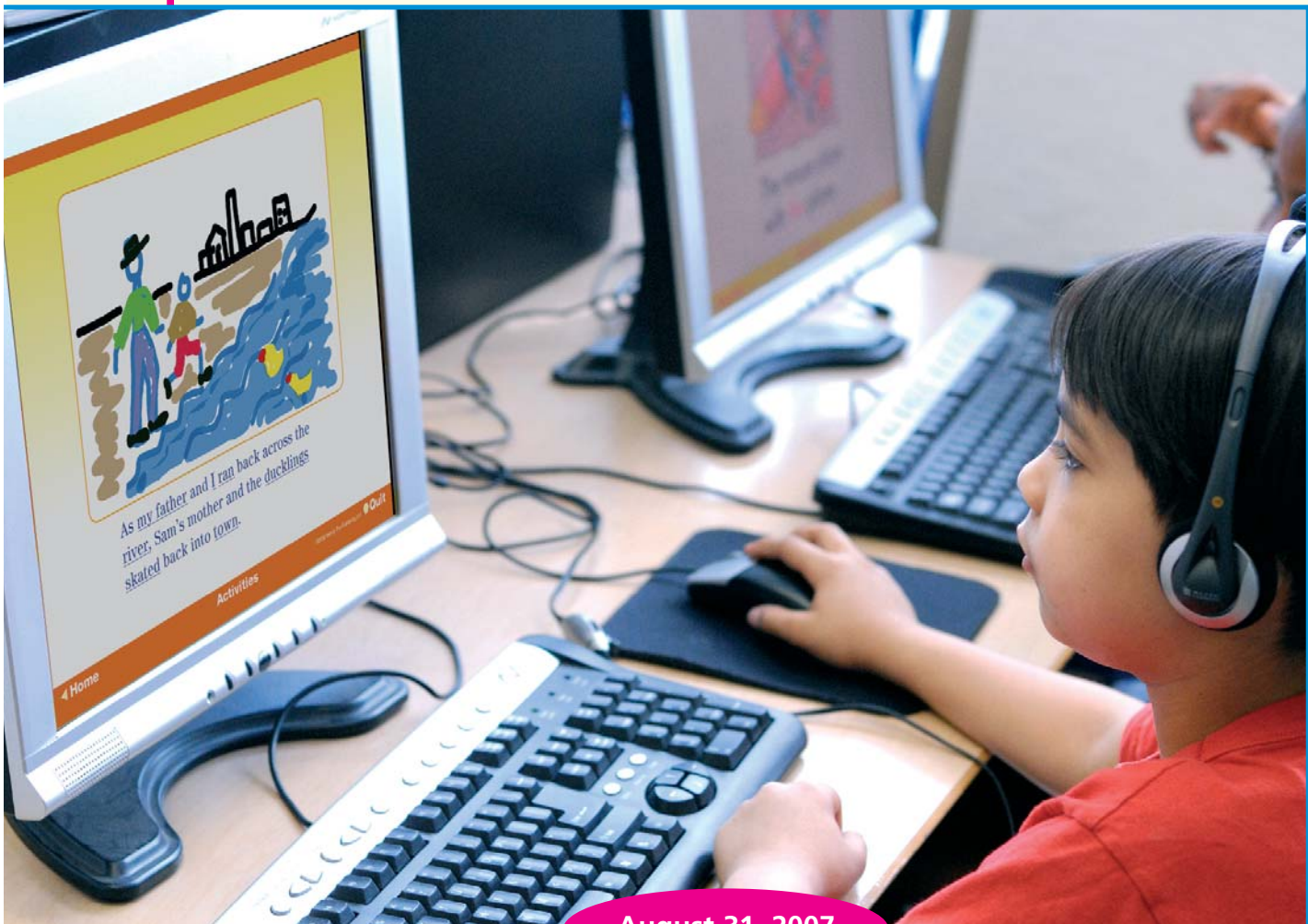


Effects of AWARD Reading, a technology-based Approach to Literacy Instruction, on the Reading Achievement and Attitudes Toward Reading of Diverse K-1 Students in the United States of America



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The purpose of this report is to describe the United States Research Project to Determine the Achievement Effects of AWARD Reading in Kindergarten and Grade One. This document describes the procedures used to implement and test the hypotheses of this research investigation. The results of the empirical data collected and conclusions reached from the analyses of these data are also included.

## Research Objectives

The objectives of the United States Research Project to Determine the Achievement Effects of AWARD Reading on Students in Grades Kindergarten and Grade 1 are described below. These objectives were designed to analyze the effects of an innovative intervention on the literacy development of young USA readers.

The objectives and specific hypotheses examined in this study were:

- Will an integrated technology and print-based program (AWARD Reading) deliver student outcomes that are significantly above those that are obtained by Basal Reading programs alone in reading attitudes, phonics abilities, sight word knowledge, reading fluency, and recall of information read?
- Will English Language Learners advance more rapidly in learning to read English through an integrated technology and print-based program (AWARD Reading) than is possible through the use of Basal Reading programs alone?
- Can a new model be created for more effective technology and print instruction in the United States and can that model be showcased to policy and educational leaders so that USA educational literacy programs can become more effective?



## Procedures

During the 2006-2007 school year, a scientifically-validated research study was conducted following a quasi-experimental, quantitative control versus experimental design. During this 20-week investigation, Kindergarten and Grade 1 students and teachers in five schools, in Texas, New Jersey, and New York, were randomly assigned to intervention (AWARD) or non-intervention treatments (Basal Reader program).

As shown in Table 1 on page 6 of this report, the total number of students that were involved in this study was 7,564. The total average percent of Economically Disadvantaged Students in the study was 67.9%. The average percent of Economically Disadvantaged Students per School District was 67.7%. The average percent of Economically Disadvantaged Students represented in the state of Texas was 54.6%, and in the state of New York was 18.3%.

The percent of English Language Learners in the total school district populations was 30.8%. The percent of English Language Learners in the Texas schools represented in this study were 25.4% and 13.8%. (This percentage was only available for the Texas schools in the study.) Because the percent of English Language Learners in the state of the Texas in 2006-2007 was 15.6%, the schools in the study were representative of the total state population. Similarly, the percent of students with disabilities in the school population in the Texas sites was 10.2%. The percent of students with disabilities in the total state of Texas school districts in 2006-2007 was 11.6%. These numbers demonstrate that the schools in this study represent the majority of schools from the sampled regions in the United States. These schools were selected because they represent the most frequently occurring percentage of these types of populations that exist in the public schools of America in 2006-2007.



These schools, although located at dissimilar sites (Texas, New Jersey, and New York), contained both experimental and control Kindergarten and First Grade subjects in each school. The interventions at all schools were identical.

Prior to beginning the study, the schools in this study were selected and AWARD materials were shipped. Implementation Researcher, Dr. Mary Jo Campbell, began the research study by visiting each site. She met with all administrators and control/experimental teachers. She ensured that all questions were answered concerning pretests. Dr. Campbell also visited each school and wrote several e-mails throughout the study to collaborate with teachers and administrators. These continuous correspondences became individual data units that not only validated that the study was conducted as planned and designed, but provided valuable information concerning any implementation issues that needed to be addressed. If any question concerning a treatment or control procedure occurred, the answer to that inquiry was delivered immediately, so as to not interrupt any treatment or control condition in any classroom.

At the onset of the investigation, the Implementation Researcher also met with teachers and administrators at both sites. During this meeting, the researcher established that the administrative procedures to be followed at each school were in place. Procedures were also delivered as to how to administer post achievement and attitude tests of students and surveys of teachers' abilities instruments. Dates were established for pre-testing and end-of-study assessments.

Table 1.

Socioeconomic Statistics												
Code	School	Grade Range	Number of Students in this School	% Economically Disadvantaged in this School	% Economically Disadvantaged in the School District	% Economically Disadvantaged in the State	% English Language Learners in this School	% English Language Learners in the School District	% English Language Learners in the State	% Students w/Disabilities in this School	% Students w/Disabilities in the School District	% Students w/Disabilities in the State
WKC	Weslaco Cleckler-Heald Weslaco, Texas	PreK-6	888	83.7	87.2	54.6	27.3	25.4	15.6	9	9.9	11.6
WKE	Weslaco Cleckler-Heald Weslaco, Texas	PreK-6	888	83.7	87.2	54.6	27.3	25.4	15.6	9	9.9	11.6
WG1E	Raul A. Gonzalez Jr. Elementary – Weslaco, Texas	PreK-5	701	94.4	87.2	54.6	44.2	25.4	15.6	10.1	9.9	11.6
WG1C	Raul A. Gonzalez Jr. Elementary – Weslaco, Texas	PreK-5	701	94.4	87.2	54.6	44.2	25.4	15.6	10.1	9.9	11.6
WGKE	Raul A. Gonzalez Jr. Elementary – Weslaco, Texas	PreK-5	701	94.4	87.2	54.6	44.2	25.4	15.6	10.1	9.9	11.6
WGKC	Raul A. Gonzalez Jr. Elementary – Weslaco, Texas	PreK-5	701	94.4	87.2	54.6	44.2	25.4	15.6	10.1	9.9	11.6
SIE	Smith Elementary Spring, Texas	PreK-5	1,020	44	52.5	54.6	7.5	13.8	15.6	11.7	11	11.6
SIC	Smith Elementary Spring, Texas	PreK-5	1,020	44	52.5	54.6	7.5	13.8	15.6	11.7	11	11.6
NY1E	Autumn Lane Elementary School Rochester, New York	PreK-2	472	22.9	24.4	18.3						
NY1C	Autumn Lane Elementary School Rochester, New York	PreK-2	472	22.9	24.4	18.3						

During this initial visit at each school, the Implementation Researcher also ensured that all experimental teachers received a full day of professional development sessions concerning how to use the experimental intervention AWARD materials. Experimental teachers were trained and had opportunities to use lessons in the AWARD Reading Program before the study began. All teachers also learned the actions they were to take daily throughout the study to assure that each of the hypotheses in this could be assessed.

Experimental and control teachers were told the time of day in which the intervention and control conditions would be taught. Control teachers taught their basal reading programs at the same time period each day as the experimental group utilized the AWARD Reading Program. Control teachers administered the basal program for the full time period. Both groups of experimental and control teachers were told that the administrators in their schools would be observing their classrooms to ensure that the same amount of daily literacy instruction was occurring in control and experimental classrooms, and to assure that the materials were being used as prescribed by the authors of the program. These actions were taken to ensure that the implementation of the study would meet research validity standards.

The Implementation Researcher also returned to each school during the investigation to observe instruction and verify program implementation. The experimental and control classrooms taught the interventions or control treatments five days a week for 5 months from January 3, 2007 to May 15, 2007. Thus, treatments continued for 20 weeks, with an additional 3 weeks being allocated for pretesting and 3 weeks for post assessment. Pretests were administered December 10–19, 2007. Post tests were administered from May 29–June 9, 2007.

Teacher-training sessions were conducted within the first three weeks of the start of the school year. Before the first lesson of the intervention occurred, pretests were administered for all students. The student achievement measures were valid assessments of each of the reading domains described in the hypotheses of this study. The same assessments were administered for pre and post tests. These assessments were:

1. New Zealand Assessment Instruments used by Emeritus Professor Warwick Elley in prior research studies. Copies of these instruments were delivered by AWARD program developers to the Coordinating and Implementation Researchers, and research schools during the summer months of 2006, prior to the initiation of this research study. These assessments were administered so that comparisons could be made between the results of this study in the USA and prior studies that occurred in other English-speaking nations in the world. The New Zealand tests contained 5 components that assessed letter name knowledge, and phonics ability. These tests were
  - (A). A test of 13 alphabet letters as well as 10 initial sounds of these letters that students identified through saying the name of letters depicted by pictorial words;
  - (B). 22 separate phonemes that students were to identify by saying the initial sound of pictures which depicted the most frequently occurring initial letter sounds;
  - (C). 10 initial sounds of words read aloud;
  - (D). 10 sounds were deleted, and students were asked to recognize and identify where the deleted sounds occurred;
  - (E). 10 words in which students were to substitute the beginning or ending sounds spoken by the test administrator; and,
  - (F). 15 items in which students were to sound out words that contained 2-8 letters. The average length of the word to be sounded out was 3.8 letters.

The total number of items on the New Zealand test was 80.

**2.** Sight Word Knowledge Test. Students were asked to read 20 sight words that varied in length from 2 letters to 3 full syllables. The average length of words students were asked to read was 5 letters long. This test was designed to assess students' sight word knowledge.

**3.** DIBELS Literacy Assessment. Copies of this assessment, like the two previous ones, were delivered to the Coordinating and Implementation Researchers and the research schools during the summer months of 2006, prior to the initiation of this research study. DIBELS is a reading record in which the percent of student's correctly answered questions are computed as well as the total number of self-corrections that a student makes while reading orally. These tests are administered individually. DIBELS is the most frequently used assessment measure in Kindergarten and First Grade in the United States of America.

**4.** Garfield Student Attitude Assessment. This standardized reading attitude assessment is the most widely used test of its type for Kindergarten and First Grade students in the United States of America. It was published in The Reading Teacher, and copies were made by the Implementation Researchers and delivered to the research schools during the summer months of 2006, prior to the initiation of this research study. This standardized achievement measure contains 20 items that assess students' abilities to enjoy reading, with 10 of these items measuring how frequently students engage in recreational reading. The remaining 10 items assess the pleasure that students experience when engaged in academic, school-based reading.

**5.** Yopp-Singer Test of Phonemic Segmentation. This standardized achievement test contains 22 items in which students are asked to break

a word apart into the separate sounds that are represented in each word. This test is administered individually and students are asked to say the sounds that they hear within 22 specific words. This test assesses the most frequent initial, middle, and ending sounds of the English language.

**6.** Recall of information read Assessment. This test is included as a part of the DIBELS literacy assessment. It contained 6 questions which require students to recall specific facts contained in two passages that students read orally.

After all pre and post tests were completed, all tests were shipped to Edinboro (PA) University. All tests were scored and entered by Ms. Helgert, Graduate Assistant of the Implementation Researcher. All data were entered by the same person to ensure consistency in data-entry procedures. Intervention and control group scores were entered into a SPSS database and analyzed through ANCOVA or ANOVA statistics, with intervention versus control group variables being the dependent measure. Growth scores from pre to post assessments were analyzed. Data were also analyzed through control and experimental comparisons between sub-groups within the student population. These analyses enabled researchers to identify the effects of treatments on English Language Learners as well as the other sub-populations described in Table 1 (page 6). Data were also analyzed to determine the effects of treatments on gender as well as on the variables of age, entering achievement level, and student ethnic origins.



## Experimental Intervention Treatment

The AWARD Reading Program was placed in several classrooms in Texas, New Jersey, and New York. Five beginning reading skills contained in this integrative technology and text-based program were examined in this research study. These beginning reading skills were:

**Knowledge of the Alphabet**

**Phonemic Awareness**

**Oral Reading Fluency**

**Word Identification**

**Recall of Information Read**

The program was used in self-contained classrooms in Texas. Schools in New Jersey and New York used the program for support services. All students in all classes represented mixed ability groups and ethnic backgrounds. The total number of students involved in the selection process of this research study was 3,081. These students were enrolled in self contained classrooms or supplemental support reading programs. A description of the treatment implemented in this study follows.

AWARD Reading is a comprehensive, balanced literacy core curriculum program that integrates printed books and interactive technology for Kindergarten–Grade 3 students. It was developed over a five-year period by internationally recognized literacy experts. AWARD incorporates the five essential components of *Reading First*. These five essential domains of reading ability were validated by the National Reading Panel Report (NICHD, 2000) as necessary for literacy success. AWARD contains a scope and sequence that has been aligned with state and national standards in the United States of America.

The 36-week program for each grade level is a result of scientific, evidenced-based best practices and data obtained from focus group testing with educators and administrators across the United States. The program contains sequential, weekly lesson plans and suggestions for instruction and independent literacy activities for whole group, small group, and independent individual student practice. This study was designed to determine if the benefits of this program could be realized after only 20 weeks of the program content had been used.

The program contains both narrative and informational texts. Computer-based interactive technology is used to extend the ideas in each text through animation. Students are using some technology with text every day. These essential instructional principles in the print and technology components emphasize the following scientifically-based procedures in every lesson:

**Systematic phonics instruction**

**Sequential learning**

**Explicit instruction**

**Differentiated instructional options**

**Immediate feedback tools for reporting progress to parents and students**

**Objective-based skills assessment**

**Teacher observations and student literacy behavioral checklists**

**Benchmark print and electronic texts for guided reading placement/assessment**

**Lessons reflecting best practices**

**Research-based instruction that has proven to increase literacy in classrooms in English-speaking nations**

## Data Analyses

Gain scores for each variable were computed by subtracting post test scores from pretest scores. Group means were substituted for missing gain scores by inserting the mean of individual demographic groups (class type x grade x gender). Scores with incomplete demographic data ( $n = 9$ ) were omitted from all data analyses. Construct scores were derived from variable gain scores. The *Yopp Singer* construct was derived from the total 20 items on the Yopp Singer assessment.

The *phonics* construct was derived by adding the 13 items to assess students' abilities to name letters of the alphabet, 12 items designed to assess students' abilities to identify initial letter sounds, 10 items in which students were to say frequently occurring phonic sounds, 10 items in which students identified sounds presented by pictures and oral presentations, and 15 items to assess initial, medial and ending sounds (from the New Zealand Assessments). Thus, the *phonics* construct contained 60 items.

The *word reading* construct was derived by adding the deletion and substitution items from words read on the New Zealand Assessment with the Sight Word Knowledge Test items, resulting in a construct of 50 items that assessed students' abilities to read frequently occurring English words.

The *reading fluency* construct was derived by adding the number of words read correctly and self-correction percentage scores obtained from the two passages that students read orally on the DIBELS pre and post-assessment measures. This construct measured students' abilities to read continuous text in the form of sentences and paragraphs.

The *recall of information read* construct was derived by adding scores obtained on questions that assessed students' abilities to recall facts read in the sentences and paragraphs cited above. Since students read two paragraphs on pre and post DIBELS tests, this construct contained 6 pretest items and 6 post test items.

The *attitude* construct was derived by adding together the gain scores of students on the pre-to-post administrations of the Total, Recreational Reading Subtest, and Academic Reading Subtest Attitude Components of the Garfield Attitude Assessment Measure. This construct contained 20 items.

Once constructs were created, four sets of two-way ANOVAs were conducted. The first set of two-way ANOVAs analyzed all constructs by class type (control, treatment) and grade level (Kindergarten, First Grade). The second set of two-way ANOVAs analyzed all constructs by class type (control, treatment) and gender (male, female). The third set of two-way ANOVAs analyzed all constructs by class type (control, treatment) and LEP status (no LEP, LEP). The fourth set of two-way ANOVAs analyzed all constructs by class type (control, treatment) and race (Caucasian, African American, Hispanic). In addition to testing for statistical significance of mean group differences, standardized mean differences were calculated using Cohen's  $d$  (Cohen, 1988).

## Results

Data analyses revealed the following effects of the intervention treatment for Kindergarten and First Grade children. Results are cited as they inform each hypothesis of this study.

1. Will an interactive technology and print-based program (AWARD Reading) deliver student outcomes that are significantly above those that are obtained by Basal Reading programs alone in reading attitudes, phonics skills, sight word knowledge, reading fluency, and recall of information read abilities for Kindergarten and First Grade Students in the United States of America?

Data analyses revealed that the AWARD intervention produced significantly higher achievement for Kindergarten and First Grade students in several domains of beginning reading abilities. These data are highly significant, especially considering that such differences were obtained after only 20 weeks' use of the AWARD Reading Program. Significant differences occurred in each of the 5 domains of reading abilities assessed in this study. Each of these domains will be reported separately.

### Phonics Abilities

Significant differences occurred between experimental and control groups at the  $p = .05$  level for four of the components of phonics abilities, with experimental groups demonstrating higher levels of achievement than control groups. The only non-significant phonic ability between experimental and control group subjects occurred when gain scores for Grade 1 students on the Yopp-Singer Test were analyzed. These data found no significant differences between the experimental and control on phonetic segmentation ( $F = 2.599$ ,  $df = 1$ ,  $p = .11$ .) However, Kindergarten experimental subjects significantly outperformed Kindergarten control subjects on the Yopp-Singer Test of phonetic segmentation, scoring 4 more items on the 20-item assessment

correctly by study's end (a 20% increase above control subjects' performances in only 20 weeks, [F=4.89, df= 1, p=.03]).

The absence of a significant difference on this one phonics assessment for First Graders demonstrates that time spent with computer-based activities did not impair these children's abilities to learn how to segment phonetic sounds. That is, even though controlled First Grade classrooms experienced twice the amount of teacher-directed instruction in this particular phonetic skill (phonemic segmentation) than did First Grade experimental classrooms, other elements within the AWARD Program appeared to compensate for the difference in time allotted to explicit instruction in this one segment of phonics knowledge. Experimental First Grade subjects did not score significantly lower than their control counterparts, even though the number of minutes they received direct instruction in phoneme segmentation was half the amount of time that control subjects received (as determined by post-hoc analyses of the number of minutes allocated to instruction in phonics segmentation in the first 20 lessons of AWARD and the basal programs used in the experimental and control treatments of this study).

### **Word Reading – Ability to Read Words**

At the Kindergarten level, there were no significant differences between the experimental and control groups in growth of sight-word knowledge during the 20-week intervention period (F= .024,df = 1, p = .88). The post-hoc analysis revealed that both the experimental and control groups of Kindergarten children grew at the same rate. However, by the time students reached First Grade, the use of technology with print, as presented through the AWARD Reading Program, demonstrated that it significantly increased students' abilities to read words after only 20 weeks of instruction (F = 5.46, df = 1, p = .02).

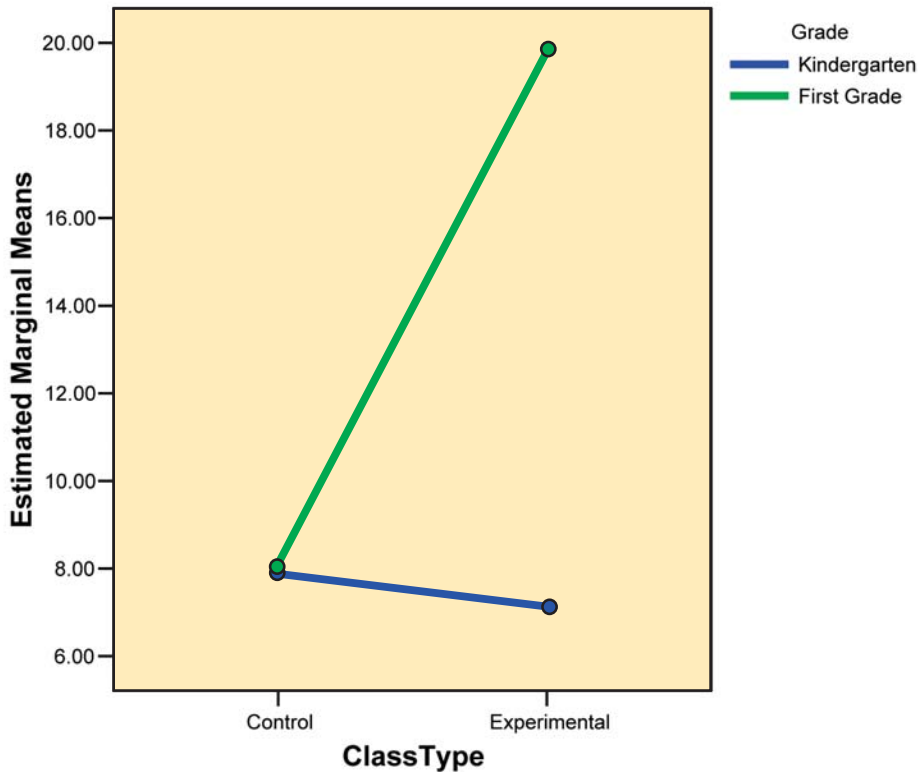
## Text, Sentence, Paragraph, and Word Fluency (DIBELS)

As expected, students at the Kindergarten level did not differ in the amount of text that they could read fluently from the beginning to the end of the 20-week treatment. This result occurred because most Kindergarten students have not yet reached text-reading fluency by December of their Kindergarten year (or four months into their formal beginning reading instructional period). The DIBELS assessment is designed for students who have had a full year of beginning Kindergarten reading instruction, or for Kindergarten students who have been taught for longer than 20 weeks. The reason DIBELS was used as a mid-year assessment with the Kindergarten students in this study, however, was because in 2005 and continuing until today, many USA school districts are using DIBELS as a December benchmark test in their district. In this study, the DIBELS assessment demonstrated that experimental and control Kindergarten students increased in their abilities to read more words in continuous text by December, regardless of the type of treatment they received. This increase resulted in the ability to read, on average, eight more words orally after 20 weeks of instruction.

By First Grade, however, the effects of the AWARD Reading Program and its use of integrated technology and text produced highly significant gains in children's ability to read fluently. As shown in Figure 1 on the next page of this report (the Estimated Marginal Means of Reading Fluency for Kindergarten and First Grade Students), experimental First Grade children grew in their ability to read text significantly more fluently than control subjects. Experimental subjects demonstrated to fluently read 20 more words than control subjects ( $F = 21.82$ ,  $df = 1$ ,  $p > .001$ ). Equally important, as shown in Figure 1 overleaf, without the experiences provided by AWARD, control First Grade Students performances were no higher than their control

Kindergarten subjects. These data demonstrated that no growth in fluency or fluent textual reading occurred for First Graders as a result of their basal reading program, after only 20 weeks of instruction.

Figure 1. Estimated Marginal Means of Reading Fluency



### Recall of Information Read

Gain scores of experimental and control subjects' recall of information on six recall questions on DIBELS were not significantly different. This result was not unexpected. Both treatments demonstrated to gain basic, foundational recall abilities, with AWARD Reading demonstrating to build significantly higher foundational word-reading abilities. These significantly higher word-level competencies would likely be reflected in higher level, inferential, and conceptual retention abilities. These abilities, known in later years of schooling

as the independent comprehension of literal, inferential, and applied information (Block & Pressley, 2007), were not assessed in this study. Because these abilities were not assessed, it is recommended that future research be conducted to determine the full impact of interactive technology and print-based programs on literal, inferential, and applied comprehension. Such studies need to examine the results on Kindergarten and First Grade students' comprehension when instruction has occurred for longer than 20 weeks.

Data from this study demonstrated that Kindergarten students moved from an inability to recall a single fact from the material that they read orally at the beginning of the year to an ability to recall one fact 20 weeks later. At the First Grade level, students were able to process two full paragraphs and remember at least one fact more after having had 20 weeks of reading instruction in either a traditional format or the treatment group than they did at the beginning of the treatment period, but again, the amount gained was not significant between control and experimental subjects ( $F = .12$ ,  $df = 1$ ,  $p = .73$ ).

### **Attitudes toward Reading**

Among the most difficult trends in education to reverse is the decline in positive attitudes toward reading that students demonstrate as they progress from year to year in their school histories. This decline has been shown to result in large part as a consequence of the difficulties or boredom that students experience in their reading programs. It is important to report that the use of the AWARD Reading Program not only reduced this decline, but also reversed the trend entirely for the Kindergarten and First Grade students in this study.

In Kindergarten and First Grade, students in the controlled traditional basal reading treatment continued to decrease in their positive attitudes to

reading by the end of the treatment period. Specifically, in only 20 weeks of basal reading instruction, control subjects reduced their positive attitudes toward reading by an average of 10.6%. Alternatively, experimental students who participated in the AWARD Reading Program not only did not decrease their positive attitudes toward reading, but also rather increased their positive attitudes to read for academically related as well as recreational-related purposes. This increase in positive attitudes was highly significant and resulted in a 2% positive growth after only 20 weeks of instruction ( $F = 21.89$ ,  $df = 1$ ,  $p > .001$ ).

### **Gender Differences on Achievement Measures**

There were no significant differences between male and female students in their performance or amount of growth on the Yopp-Singer Test ( $F = .301$ ,  $df = 1$ ,  $p = .58$ ). There were significant differences between male and female students in their ability to complete the items that assessed phonic abilities ( $F = .004$ ,  $df = 1$ ,  $p = .95$ ). Similarly, there were no gender differences between students in the control and experimental groups on their performances on the Garfield Attitude Assessment ( $F = .232$ ,  $df = 1$ ,  $p = .63$ ).

Alternatively, there were significant differences between male and females in their ability to read words ( $F = 8.82$ ,  $df = 1$ ,  $p = .003$ ). This gender effect resulted with females performing significantly higher than males at the Kindergarten and First Grade levels in their ability to read words, regardless of the type of treatment that these students received. In like manner, significant differences existed between Kindergarten and First Grade males and females in their abilities to read continuous text fluently. This difference favored female subjects and was consistent whether children received the experimental or control treatment ( $F = 15.78$ ,  $df = 1$ ,  $p > .001$ ).

Female students also outperformed males in recall of information read

abilities regardless of the treatment that they received ( $F = 4.05$ ,  $df = 1$ ,  $p = .045$ ). These data suggest that 20 weeks of traditional basal reading instruction or interactive technology and print programs (as represented by AWARD Reading) was not a significantly long enough period of intervention to reduce the traditional head start that female Kindergarten and First Grade students have demonstrated which places them above their male classmates in reading words, text, and responding to factual questions.

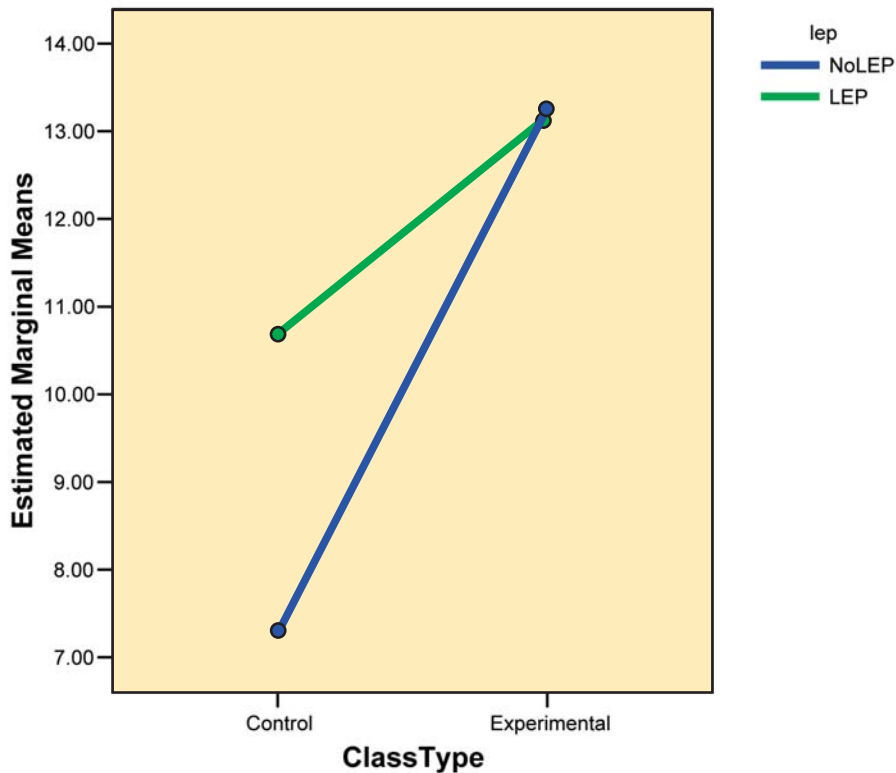
2. Will English Language Learners advance more rapidly in reading English through an integrated, interactive technology and print-based intervention (AWARD Reading Program) than is possible through the use of basal reading programs alone?

There were no significant differences between program effects on students whose first language was not English on the Yopp-Singer Test ( $F = .611$ ,  $df = 1$ ,  $p = .44$ ). These data demonstrate that the control and intervention programs were equally effective in developing this ability for Kindergarten and First Grade students. There was a significant difference, however, between students who had a limited English proficiency in their ability to learn phonics when compared to students who use English as their first language. This difference in favor of native English speakers sustained its significance regardless of the type of treatment received ( $F = 5.91$ ,  $df = 1$ ,  $p = .02$ ). Similarly, students with Limited English Proficiency scored significantly lower than students who spoke English as their first language in their word reading abilities, despite the type of treatment that they received ( $F = 3.62$ ,  $df = 1$ ,  $p = .06$ ).

Among the most significance findings of this study, however, is the impact that the technology and text integrated approach to teaching reading (AWARD Reading Program) had on young limited English proficient students'

reading fluency, as measured by DIBELS. Students who experienced the AWARD program who had limited English proficiency closed the gap in their abilities to read fluently when compared to their English language native speaking peers. Specifically, if limited English proficient students experienced the AWARD program, they scored significantly higher in their fluent reading abilities than peers who experienced the basal reading program ( $F = 5.18, df = 1, p = .02$ ). Moreover, as shown in Figure 2 below, control subjects of limited English language speaking abilities were unable to read fluently in Kindergarten through First Grade. These subjects continued to demonstrate the traditional reading fluency achievement gap evidenced when basal reading programs alone are used for literacy instruction.

Figure 2. Estimated Marginal Means of Reading Fluency in Limited English Proficiency Students and Native English Speakers



There were no significant differences in the amount of growth between limited English speakers or native English speakers in their ability to answer factual comprehensive questions over material read orally regardless of the type of treatment received ( $F = .182$ ,  $df = 1$ ,  $p = .67$ ). Similarly, there were no significant differences between limited English speakers and native English speakers in their growth in attitude toward reading based on the type of treatment received ( $F = .0001$ ,  $df = 1$ ,  $p = .99$ ).

### Effects of Treatments by Ethnicity

While there were no significant differences between Caucasian, African American, and Hispanic subjects in their phonics abilities regardless of the type of treatment that they received ( $F = .63$ ,  $df = 2$ ,  $p = .53$ ), there were significant treatment effects for experimental Caucasian readers in Kindergarten and First Grade in word reading abilities ( $F = 6.05$ ,  $df = 2$ ,  $p = .003$ ). On average, Caucasian students in the experimental treatment were able to read twice as many words on the post assessment than control subjects. Specifically, Caucasian students in Kindergarten and First Grade who experienced the experimental treatment scored twice as well as peers from Caucasian decent who received a control treatment ( $F = 6.05$ ,  $df = 2$ ,  $p = .003$ ).

While Hispanic and African American students also increased in the number of words they were able to read on post assessments, a significant difference did not occur, based on treatment that these two groups of students received ( $F = 7.65$ ,  $df = 2$ ,  $p = .001$ ;  $F = .15$ ,  $df = 1$ ,  $p = .70$ , with the first statistic being based on race differences and the second statistic being based on control versus experimental treatment effects).

Among the most significant findings in this study was the impact of the interactive technology and text-based reading programs (AWARD Reading)

on students' abilities to increase the number of words that they can read fluently. The differences between ethnic group fluency rates and the types of treatment received were highly significant, ( $F = 7.86$ ,  $df = 1$ ,  $p = .006$  for experimental vs. controlled treatments;  $F = 3.88$ ,  $df = 2$ ,  $p = .02$  for differences between ethnic groups; and,  $F = 6.61$ ,  $df = 2$ ,  $p = .002$  for the interactive effect between experimental and control group and ethnic group). More specifically, Caucasian students who experienced AWARD Reading gained (on average) the ability to read 24 more words in the same amount of time that control classroom Caucasian students increased their speed by only 7 words. Similarly, African American children who experienced AWARD Reading increased their fluency by 10 words at treatment's end, compared to the same ethnic group in controlled classrooms, who increased by only 6.8 words (on average).

Unfortunately, the differences between Hispanic children did not differ regardless of the type of treatment that they experienced. They were the lowest group in total increased ability to read words fluently of the three populations examined.

There were no significant differences between the interaction of treatment effects, ethnicity, and students' abilities to recall information read ( $F = 6.9$ ,  $df = 2$ ,  $p = .51$ ).

Among the significant findings of this study was the impact of AWARD Reading on African American and Hispanic Kindergarten and First Grade children's attitudes toward reading. When compared with their peers who were in traditional controlled conditions, African American experimental students increased their positive attitudes toward reading after 20 weeks by 48% above control classmates. Similarly, Hispanic readers at the Kindergarten and First Grade levels increased their positive attitudes for reading 15% higher than their controlled counterparts ( $F = 8.80$ ,  $df = 2$ ,  $p > .0001$ ).

3. Can a new model be created for a more effective interactive technology and print-based instruction in the early years in the United States, and can that model be showcased to policy and educational leaders so that USA educational literacy programs can become more effective?

Based on the results of this study, the answer to this hypothesis is yes. In all areas that were investigated, to some degree, significant differences occurred for Kindergarten and First Grade students' abilities and attitudes toward reading after having been exposed to 20 weeks of instruction using an interactive technology and text integration, evidence through AWARD Reading. These data are highly significant in producing a new model for instruction for our youngest, emergent readers.

## Conclusions

What have we learned from this study? First, the time has come (and some would say is long past due) to infuse an interactive, integrative technology and print-based curricula into contemporary education, especially for our youngest most computer-savvy population. In the past, technology was not a common staple for daily instruction in classrooms across America, especially at the Kindergarten and First Grade level. What did occur was to place a few computers to the side of the room for small group or individual student use.

This study demonstrated that technology can be used by teachers as the centerpiece of instruction. Such a finding is especially important to highlight because past research has suggested that most teachers require extensive, long-lasting, continuous professional development activities before they can effectively use technologically-based, interactive lessons with print-based instruction.

The teachers in this study had limited professional development, yet grew rapidly in their abilities to implement AWARD Reading. This rapid

learning curve transferred to an almost immediate, highly significant growth in young readers' literacy achievement and positive attitudes. Teachers report that the ease in implementing this program explained how they were able to become highly successful in using technology as the centerpiece of their reading instruction. Data from this study demonstrated that when technology is used as a centerpiece to instruction, as it was in the AWARD Reading Program, similar rapid growths in teacher competences and student literacy is likely to occur in other Kindergarten and First Grade classrooms. These greater growths are also more likely to occur at a significantly higher rate than would occur through a traditional, teacher-guided print-media-alone format. These significant growths in teacher technological competence also transferred to significant student achievement gains in basic decoding skills, as well as in their students' more advanced abilities of word reading, positive literacy attitudes, and the successful independent, and fluent reading of text.

Such results are possible at the Kindergarten and First Grade level, and as such make a major contribution to the body of knowledge in two ways. First, prior to this study many classrooms in the United States followed a hierarchical presentation of reading. Curricula began by teaching the alphabet, single letter sounds, two letter words, single sentences, two sentences, recall of information read skills, and then fluency. Very little time was relegated to the development of basic concepts, positive attitudes, composition, grammar, digital literacy, and vocabulary which are essential for contemporary beginning readers, struggling readers, and limited English speakers' success in our world today.

The AWARD program infuses all of these dimensions of reading ability simultaneously in a highly engaging interacting technological format. To illustrate, students learn single sounds at the same time they are learning words; learn to comprehend passages while they write words using passages just read; develop concepts through viewing actual pictures as they interact



with technology; play games to build motivation and positive attitudes; and, engage in personalized, individualized re-teaching activities continuously to strengthen weaker understandings.

It is highly significant that a commercial program can be developed infusing technology into the classroom in such a way that the multitasked trend of reduced attitudes toward reading as children progress through school cannot only be halted but reversed. This is the first program that has demonstrated to do it even though many others in the past have tried and failed. Such jarring results were available for all subjects regardless of their ethnicity, entering reading level, or gender. Even students with minority culture experiences will perform well when they have the opportunity to learn basic reading concepts through a technology program such as AWARD.

To sum up, Kindergarten experimental subjects outperformed controls in all components of phonics abilities and first grade subjects outperformed their peers in five of these phonics components. All experimental subjects had significant gains in their abilities to read continuous text. By First Grade, a significant gain occurred for experimental subjects in their fluency rates, and this increased fluency was particularly large for Limited English Proficient readers. AWARD Reading significantly increased positive attitudes toward reading. Experimental Caucasian students were able to read more than twice as many words after 20 weeks of instruction than their control counterparts, which was also highly significant statistically. Caucasians and African Americans were significantly more fluent at the end of their experimental treatment than their control counterparts. While all experimental populations greatly increased their positive attitudes toward reading, the phenomenal growth of African American experimental subjects must be noted. They increased by 48% in positive attitudes. The 15% increase in this area by Hispanic populations is also very significant.

## Limitations

This study was based on a representative sample of students in the United States; however, data cannot be validly extrapolated beyond this cultural, social, and historical context. The data in the study was based on a 20-week intervention period. The effects of extending each learning environment for a longer period of time were not examined. Due to resource constraints, treatments for control and experimental subjects were not assessed for the full 36-week duration that is prescribed by both control and experimental curricula. However, in many school districts a full 36 weeks of instruction each year does not occur. Thus, data in this study are very representative of instructional practices in the United States of America when practical, school-based teaching interferences and interruptions are considered.

## Implications for Future Research and Practice

In the 21<sup>st</sup> century in which our new younger generation will be living, it is important that we use the data from this study to expand our research and pedagogical frontiers. From the earliest introduction to reading, more students must have the opportunity to learn the skills of successfully interacting with technology and print in an integrated fashion. Such is the way that “reading” will exist throughout their lives. To find products that meet this vision and simultaneously match the standards mandated by *Reading First* and *No Child Left Behind* legislation is a challenge. This study demonstrates that the AWARD program meets this challenge and is a sufficiently sophisticated and highly motivational training program that our nation’s tech-savvy emergent and elementary-aged students need.

More studies need to be conducted to document how programs such as AWARD can present challenging, integrative concepts with such success that

even less able readers “love” reading more. We now know that readers “love” to be challenged and learn to read with remarkable motivation and speed when they can use the technology-based tools that dominate their lives before they begin school.

In like fashion, after having surveyed hundreds of vendors at numerous reading conventions, it is well documented that it is difficult to find technology that gives students chances for guided practice with teacher direction. Too many of present technology-based literacy programs are designed to merely provide more one-on-one instruction without any teacher guidance (Manzo, 2007). There are even fewer programs at the primary levels that provide successful integration of technology with teaching the basic concepts of print and literacy. Knowing just how large a role technology plays in student’s lives, it is imperative that we conduct more studies like the one reported here.

Ted Hasselbring, the creator of Read 180 (a print and computer-based reading intervention program for upper elementary through secondary school students) advises present educational leaders to use programs that are founded on research-based instructional principles and that have scientific, empirically tested evidence of their effects in schools. This study is one such examination of one such program, and as such has enabled us to take a step forward to more scientifically validated instruction in the classrooms of the United States of America.

Prior to this study, we were certain that there were many things that Kindergarten and First Grade students needed to become good readers. We also knew that they were using technology in a wide variety of formats outside of the school setting. What we did not have was as much evidence as we would have liked in how to create an effective method of bringing the motivational qualities of technology to teacher-directed instruction. AWARD Reading demonstrated to be one such method. Especially when in thinking about Kindergarten to Grade 1

readers, the difficulty of producing a program that can accommodate the wide-range of emerging literacy knowledge is very difficult, particularly when software is a component of a structured program. AWARD seems to have bridged this gap.

Also prior to this study and the creation of AWARD Reading, many teachers complained that they did not have the time to sit and explore all of the features of technology-based literacy programs and that they did not know how to implement them. There is a need for additional studies of the several effects of specific, theoretically grounded, integrated literacy learning environments, and methods of overcoming the above concerns by the educators who use them. Similarly, while this study examined the effects of contemporary literacy learning environments on students' literacy development over a 20-week period, more research is need to understand the effects of these environments on students' long-term literacy growth, vocabulary development, fluency, and decoding abilities. Data in this study can be used as the foundation upon which more effective literacy learning environments for below-, on-, or above-grade level readers can be designed.

Second, it was noted in teachers' interviews and researchers' field notes/observations that students' highest quality writing experiences occurred when they were involved in the experimental versus the control conditions of this study. More studies are needed to determine the effects of AWARD Reading learning environments on students' writing abilities.

Lastly, prior to this study, researchers theorized that a reason cited for low reading achievement is that below-grade level readers do not receive enough traditional basal instruction. For this theory to be supported, less able readers in the control group should have outperformed other below grade level readers in the AWARD Reading program. These results did not occur on any of the achievement indices.

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