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# People or Machines? Measured Reading Comprehension from Different Reader Types

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## Abstract

Differences in reading comprehension were examined in students with disabilities after use of three reader modification types. Participants (n=10) conveniently selected from two school districts were students grades three through eight reading on a third grade level that received a reader as a modification in their Individualized Education Programs. Passages from the Pearson Group Reading Assessment and Diagnositic Evaluation (GRADE) normed for third grade were read to students using three reader types: human, tape-recorded voice or computerized text reading program. Reading comprehension questions were orally administered by the researchers. Results indicated that there was no significant difference between reader types as related to passage comprehension**.** Authors call for the individualization of reader types based on student need and the continued collaboration between university researchers and decision makers in P-12 schools.

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## *American Educational Concerns*

The adult success of the students in America's public schools depends greatly upon the ability of the schools to equip students with the knowledge needed to be productive members of society. Although one would hope that the schools in the United States were sufficiently able to prepare individuals for adult life, research has demonstrated mixed messages in this regard. One report released by the Center on Education Policy and the American Youth Policy Forum stated that even though improvements still need to be made, U.S. schools are making progress in reducing dropout rates, increasing student achievement (as measured through test scores), promoting safer school environments and employing teachers with higher levels of education (as cited in "Public Education Improving," 2000). Furthermore, long-term trends in reading and mathematics compiled by the *National Association of Educational Progress* (NAEP) indicate that in recent years, U.S. students have demonstrated overall improvements in reading and mathematics (Rampey, Dion, & Donahue, 2009).

Although some of the reported findings seem promising for U.S. students, other findings are far less optimistic. A report released by the Thomas B. Fordham Foundation asserted that even though U.S. schools spend more than many countries around the world to fund education, student achievement in academic subjects is among the lowest in comparison to schools abroad (Walberg, 1998). More recent reports from the *Trends in International Mathematics and Science Study* (TIMSS) indicated that although U.S. fourth and eighth graders performed above average in mathematics and science measures in 2003 (as compared to other countries in the study), U.S. students still lagged in comparison to several other countries, many of which were Asian (Gonzales et al., 2004). Further, *Program for International Student Assessment* (PISA) data

revealed that in 2006, U.S. students performed below average in science and mathematics measures as compared to twenty-nine other countries that are members of the Organization for Economic Cooperation and Development (OECD) (Baldi, Jin, Skemer, Green, & Herget, 2007). When analyzing data from the reading measures, researchers concluded that U.S. students only performed around average with respect to reading literacy (Lemke et al., 2004). Finally, a study compiled of household opinions regarding public school satisfaction in American cities concluded that although a majority of the residents in homes with children approved of their neighborhood elementary schools, many expressed disdain over the education provided in their local public schools (Carnevale & Desrochers, 1999). It appears that even though some progress has been made in American schools, problems still exist in both the ability and perceptions of the ability of U.S. schools to prepare students for success beyond school.

*Reading Instruction in America*

Although the research identifies deficits in the success of American schools at preparing students in several academic areas, problems with reading programs in the United States deserve special attention as reading is arguably the most important skill learned in formalized education. An article regarding the importance of reading skills stated that “reading is a foundational skill in all children’s academic careers; whether they become strong or weak readers has considerable bearing on their success in school and beyond” (Snow, Burns, & Griffin as cited in Fuchs et al., 2002, p. 295). Another source highlighted the importance of reading above other academic subjects by discussing the impact that reading skills have on student ability to excel in listening, writing, and speaking as well as the importance of reading in learning the knowledge associated with other school subjects (Walberg, 1998).

Problems associated with the effectiveness of reading programs in American public schools tend to first appear at the elementary school level, as early elementary grades are responsible for presenting primary skills related to pre-reading and initial reading strategies (Denton, West, & Walston, 2003). Suggestions for improving the presentation of such skills in elementary classrooms included student centered reading selections, connecting reading to other experiences had by students, and integrating the use of multiple intelligences to promote more diverse selections of books from which different learners may choose (Ediger, 2003). Other researchers of early reading instruction favor the study and use of phonics-based instructional approaches including letter-sound instruction, phonemic segmenting blending, and activities such as scaffolded spelling and word mapping, (Manyak, 2008) with the hope that regular practice of these skills will lead to improvements in early reading ability. Still yet, the most recent *Reading First* initiatives funded by the U.S. government call for reading instructional approaches that specifically address the "five essential components of reading instruction promoted by the program (phonemic awareness, phonics, vocabulary, fluency, and comprehension)" together, seeking to measure the effects of such systematic reading approaches on reading achievement in some of the nation's poorest performing schools (Gamse, Jacob, Horst, Boulay, & Unlus, 2008, p. 16). Interestingly, the impact report for the *Reading First* program revealed a statistically significant and positive effect for early decoding skills for first grade students, but no significant effect on the measured reading comprehension of the students studied in grades one, two, or three (Gamse et al., 2008). Although integrating various combinations of these reading instructional suggestions into the elementary reading program may aid (to various degrees) in the improved ability of schools to adequately deliver effective

reading instruction, more research is obviously needed to yield consistent findings to support improvements in reading for students in America.

*Reading Instruction and Students with Disabilities*

As the literature suggests, schools that are not being successful in their attempts to provide meaningful reading instruction to their students have ways in which they may attempt to improve their reading programs. Although many of these methods improve the success of the overall student population with regard to reading to some degree, teachers still have to consider the special needs population in order to determine what methods of instruction will work best for the struggling readers represented in that subset (Ehens & Gates, 2003). Examining students with special needs in the reading classroom has become increasingly important as legislation such as IDEA '97 [and subsequent reauthorizations of IDEA] compels school districts to understand that students should participate in the regular education classroom as much as they are able (Fuchs et al., 2002). Along with this concept of inclusion, researchers have started to include the special needs population in their research (Lutkus & Mazzeo, 2003), attempting to discover findings that may be beneficial for regular classroom teachers in terms of understanding the current state of reading knowledge in students with special needs as well as solutions that will be of the most benefit to these students with regard to learning how to read (Fuchs et al.).

*Use of Technology for Teaching Students with Disabilities*

Because some attention has been given to the topic of teaching reading to the special needs population in P-12 schools, programs that are designed to enhance the reading curriculum have been generated. Although many accommodations and modifications are implemented for improving reading instruction with the special needs population, applications of technology have been one of the most quickly developed and widely used as adaptive tools for students with

special needs in recent years (Ehens & Gates, 2003). Some examples of the technology used for improving the reading success of students with special needs include computer programs for promoting literacy (Forgrave, 2002), as well as electronic text reading software (Forgrave; MacArthur, Ferretti, Okolo, & Cavalier, 2001). Although one might assume that using text reading software would be beneficial as an accommodation to students with special needs in reading, consider the following statement from MacArthur et al.:

> Research on technology and reading comprehension has focused on the use of electronic texts to promote comprehension by compensating for poor component skills (such as word identification and vocabulary knowledge). Electronic text has been designed with a variety of enhancements, including speech synthesis, definitions, graphics, and supplementary text. The addition of speech synthesis to electronic texts seems like a straightforward way to compensate for difficulties in word recognition common to many students with reading disabilities. However, the research on such screen-reading software is mixed. (p. 297)

Publications related to the use of text reading software at this time appears to be less than definitive as to the reported benefits of using text reading software to improve the reading comprehension of students with special needs. Some authors suggest that the reading technology can be beneficial in a variety of ways such as easing frustration, improving social involvement and desire to perform in school, as well as improving the quality of academic output by the student at home (Quenneville, 2001). Lankutis and Kennedy (2002) advocated for the use of text reading and other technologies, describing how the use of these technologies with students with disabilities in one classroom seemed to be beneficial for the struggling readers and writers in the room. Hasselbring and Bausch (2005-2006) further portrayed the positive benefits of using

technology based text reading programs for students with disabilities by asserting that the use of such programs provides the opportunity for students that struggle with basic reading skills to enjoy a more equitable access to the general education curriculum. For example, these authors reported that teachers in Kentucky schools "have found that students with disabilities are more likely to reread text passages several times for clarity when using Read & Write Gold (a text reading program for a computer) than when listening to the text being read aloud by a teacher" (2008-2009, p. 74). Other scholars, however, represent a different view, noting that technology based reading accommodations are far behind technology programs for writing and that exposure to text does not necessarily improve reading ability (Lewis, 1998).

*Purpose of the Present Study*

In today's current high stakes educational environment, much attention has been placed on promoting the educational success of students with disabilities in the nation's schools. Because the need to ensure equitable access to the general education curriculum for all students with and without disabilities is so essential to the success of the students and education system in general, it is important to consider the reasons for which program modifications are selected and how these programs are utilized with students during instruction and assessment. For example, one explanation as to why technology based reading programs may not be as effective for students with disabilities is that teachers use these program modifications retroactively, after instruction is designed and delivered and not as an embedded tool for all students within the daily learning community (Nelson, 2006). Furthermore, it has been suggested that rather than providing a human reader as a program modification for the students with disabilities in the classroom, the use of text reading software programs by all would allow for more autonomy as the students can use them as often as they like and for whatever content is being read

(Hasselbring & Bausch, 2005-2006; Nelson, 2006). From this perspective, Hasselbring and Bausch, and Nelson assert that text reading program modifications extend beyond a traditional accommodation for students with reading disabilities and should be used as a routine tool in conjunction with other materials by educators to promote an educational environment that is in and of itself prepared to be utilized by a variety of learners.

Because technology enhancements to reading programs can be expensive, and because special educators and general education teachers need to integrate programs that will truly benefit students with special needs, further research needs to be completed to determine if the purchase and use of text reading software by school districts is truly more effective than other reader modification types (i.e. the use of a human reader or tape-recorded reader). Although some study has been given to the use of technology for reading instruction of students with disabilities, the present review did not find literature that effectively addressed the use of said technology for comprehension of reading as specifically measured by student performance outcomes, such as performance on assessments of reading comprehension. For this reason, the present research sought to contribute to the existing literature by measuring student performance in reading comprehension after use of a variety of reader modification types. As previous publications highlighted the mixed results of the use of technology based instructional supports in the classroom, it was hypothesized that students would fare better in reading comprehension of passages read by other means, namely, a human reader.

## Method

### *Participants*

The sample consisted of ten (mean age = 12.6 yrs.) students with disabilities conveniently selected from two school districts in Kentucky (eight from district one and two from district

two). All of the students were Caucasian, and the sample consisted of six boys and four girls. Two students were in the eighth grade, two in the seventh grade, three in the sixth grade, two in the fifth grade and one in the third grade. The students selected were identified by their schools districts as having a disability which made them eligible for a reader modification on their Individualized Education Plans (I.E.P.s). Further, all students selected were identified as performing on the third grade level in reading comprehension (as determined by norm referenced assessments used by the districts to determine eligibility for special education services). Although there were no intentional selection criteria with regard to particular disability types, students in the sample were identified as having a mild mental disability (MMD—4 students), Learning Disability (SLD—3 students), or Other Health Impairment (OHI—3 students).

*Materials*

Three reading passages and associated test questions were selected from the Level 3 (third grade) Pearson's Group Reading Assessment and Diagnostic Evaluation ("GRADE") test and randomly assigned to be read by a human, recorded by the same human voice to be played from a tape, or typed in a word processing program to be read by a text reader on a computer located at each school site. Each of the passages selected from the reading comprehension portion of the GRADE test were followed by four questions written by the testing company to assess comprehension of the written passage after it is read.

*Procedure*

Before arrival to the school sites, researchers randomly assigned students to the order in which they would receive each reader type. After collecting basic demographic information, researchers read from a prewritten protocol sheet to ensure consistency in administration of the instructions for the data collection. At each school, students were asked to listen to each passage

as it was being read by one of the three reader types. Although the order varied, each student listened to a passage as it was read by one of the researchers, a passage as it played through headphones for students to hear, and a passage played through headphones plugged into a text reading program on a computer. In an attempt to reduce confounds related to different voice timbres, the researcher that read the passage on site was also the researcher whose voice was recorded for the tape-recorded modification.

After the reading of each passage, the corresponding four reading comprehension questions were orally administered to the students. The researchers recorded the student answers for each question before proceeding to the next passage and reader type. Before proceeding to a new passage, researchers reread the instructions for responding to the students. After the data were collected, students were thanked for their time and provided with a pencil for their participation in the project.

## Results

Because the number of participants for this study was not sufficient for parametric analyses (N = 10), data were analyzed using a non-parametric statistical analysis; specifically, the Friedman Two-Way Analysis of Variance by Ranks (Siegel, 1956). Table one shows the Ranks of the participants under each reading modification type.

Table 1

Ranks under Each Reading Modification Type

| Subject # | 1-Human | 2-Tape | 3-Computer |
|---|---|---|---|
| 1 | 2.5 | 1 | 2.5 |
| 2 | 2 | 2 | 2 |
| 3 | 2 | 2 | 2 |
| 4 | 1.5 | 3 | 1.5 |
| 5 | 2 | 1 | 3 |
| 6 | 2.5 | 1 | 2.5 |
| 7 | 1 | 3 | 2 |
| 8 | 2 | 1 | 3 |
| 9 | 3 | 2 | 1 |
| 10 | 3 | 1.5 | 1.5 |
| Totals | 21 | 17 | 22 |

Results from the Friedman analysis revealed no significant difference in the relative ranking of student performance by reading modification type $\chi^2 = 1.4$, df (2). Table 2 shows mean reading comprehension score (out of 4 questions) with each reader modification by disability type.

Table 2

Mean Reading Comprehension Score Based on Student Disability Type

| Disability | Human | Tape | Computer | Mean Total Across Sections (out of 12) |
|---|---|---|---|---|
| MMD (n= 4) | 2 | 2.5 | 2 | 6.5 |
| SLD (n= 3) | 2.33 | 3 | 2.33 | 7.67 |
| OHI (n= 3) | 3.33 | 3.67 | 3 | 10.0 |

As can be seen from the table above, although differences in reader type were not significant, students performed slightly better when using the tape recorded reader. Students identified as having Other Health Impairments performed better on each of the three passages read as compared to the other disability types, followed by students with learning disabilities and lastly, students with mild mental disabilities.

## Discussion

The results of the present study fail to reject the null hypothesis and therefore do not support the hypothesis that students better comprehend text read to them by a human than they do when passages are read from tape or text reader programs. Although there was no significant difference among any of the reader types, inspection of the means indicated that the tape-recorded passages yielded the highest overall reading comprehension score regardless of disability type. This finding warrants further study with a larger sample. It could possibly be attributed to the combination of the benefits of a human reader and a technology based application. That is to say, the tape recorded reader included a human voice (as compared to the electronic voice without human inflection from the text reading computer program) and

headphones, which may allow students to better attend to the passage being read without having to compete with additional aural stimuli.

The other finding worthy of further study is that the types of disability that students have may relate to student reading comprehension more than does the type of reader that they receive. When comparing the mean scores on the reading comprehension passages by disability type, the results indicated that although students scored highest when using the tape recorded reader, students with Other Health Impairments performed highest on all three passage comprehension tests, followed by students with Learning Disabilities, and finally, students with Mild Mental Disabilities. These results are not surprising as students with mental disabilities demonstrate overall cognitive deficits which would impede performance in many academic and adaptive behavior domains, whereas students with learning disabilities demonstrate deficits in specific areas (i.e. reading, writing) that are significantly lower than what would be expected from them based upon their intellectual ability (*Kentucky Administrative Regulations, Chapter 707 section 1*, 2007). In Kentucky, students that identified as Other Health Impaired are eligible for special education services due to a health problem that affects "strength, vitality, or alertness" without necessarily targeting specific language processing or overall cognitive functioning (*Kentucky Administrative Regulations, Chapter 707 section 1,* 2007). Students with Other Health Impairments may very well be able to comprehend reading text when well, and be eligible for readers only when their health problems necessitate such an accommodation. As such, it is not surprising that this group of students performed better in reading comprehension measures as compared to the other two disability types, both of which negatively affect reading ability more significantly (via processing difficulties or overall cognitive deficits).

*Limitations of Study and Recommendations for Further Research*

This study included a small sample of students (n = 10) conveniently sampled from school districts in close proximity to the researchers. Future studies would benefit from larger samples sampled randomly rather than by convenience, and could potentially benefit from a research design that allows for repeated collection of reading comprehension scores with each reader type. Such changes to the sample size and research design would allow future researchers to employ data analyses that are more powerful and produce findings more representative of a targeted population. Researchers may also want to include a larger sample such that analyses related to grade level or other demographic variables may be included. Additionally, all data were generated at individual school sites and as such, other factors related to specific school environments may influence student performance. Although all of the schools provided reasonably quiet surroundings for the administration of the reading passages and assessments, the room used at one school was particularly warm. Researchers recall some of the students complaining about the heat. Additionally, school personnel were in the room during the administration of the reading passages and assessments at some of the school sites. Future studies would increase validity of findings by standardizing the environmental conditions in which the research data are gathered.

Researchers pursuing a similar line of inquiry might find it useful to assess reading comprehension levels of participants prior to conducting the study rather than using school assessment data. This would ensure that the beginning reading levels were current and that they were obtained uniformly. In addition, it might be useful to compare student reading comprehension after use of various reader types as well as to compare the performance of students with each reader type as grouped by disability. Such comparisons should contribute to

scholarly discourse by determining if the disability related findings in this study were unique to this study, or if further investigation of this finding is warranted.

A final consideration for future research is related to the reading levels used for the passage selection. As this study targeted reader types, all students in the study were determined to be able to read on a third grade reading level. The passages used and questions asked were also constructed on the third grade reading level. Future studies may consider employing different reading level passages based upon the actual grade of the student, rather than just the reading grade level of the student. Such a study would allow for comparison of reader types as specific accommodations for the reading levels expected of students based on their age or grade as well as their actual independent reading ability. Results of such future study would contribute to the understanding of the overall efficacy of each reader type as an accommodation for comprehending texts on a variety of levels, all of which students with disabilities will have to understand in order to be successful in their various learning situations. Information from this type of study could benefit educators that teach students with disabilities as these students are expected to not only make progress with respect to their individualized education programs, but also, to demonstrate competency on grade level standardized assessments—assessments that are not adapted to their independent reading comprehension levels.

*Final Considerations*

Although the current research is limited most significantly by the small number of participants, the findings from the research still provide evidence for the need to consider student factors when determining not only the need for an oral reader to access passages for comprehension, but also, when determining the type of oral reader provided to the student. Although future studies are necessary to better understand the conditions under which and

students for whom various reader types are optimal, the current research highlights the importance of selecting accommodations and modifications based on student need as opposed to mandates that text reading software be used for all students with readers simply because the software was purchased and therefore available. To that end, the researchers suggest that research-oriented collaborative efforts between university faculty and P-12 schools of any size take place. Although there are no guarantees of samples sufficient for generalizing results, such research efforts should build relationships that allow university faculty to assist decision makers in schools (from superintendent to classroom teacher) with the process of making well-informed decisions driven by the data collected. For the researchers' part, such interest and assistance with P-12 schools should open the door for future study and contribution to the field. In short, all schools serve students so all schools, regardless of size, deserve to have some assistance from researchers in education and researchers in education should recognize that it is often those school systems with fewer students (and less resources) that need assistance the most.

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