The Impact of Differentiated Silent Reading Instruction Targeting Comprehension and Efficiency in Grades 4 and 5

Kristin M. Gehsmann, Ed.D.[1], Alexandra N. Spichtig, Ph.D.[2], Jeffrey P. Pascoe, Ph.D.[2], and John D. Ferrara, M.Ed.[2]
[1]East Carolina University, Greenville, NC, USA, and [2]Taylor Associates Communications, Inc., Winooski, Vermont, USA

Introduction

A student's comprehension level is typically used as a basis for differentiated reading instruction in U.S. classrooms. An important, yet rarely considered, mediating variable is reading efficiency. Some students, for example, read quickly with poor comprehension, while others demonstrate proficient comprehension but read in a slow and labored fashion. This study examined the impact of web-based, adaptive, scaffolded silent reading instruction targeting both reading comprehension and efficiency in students with differing levels of reading efficiency.

Method

In this randomized control trial, 426 U.S. students in grades 4 and 5 were paired based on their initial scores on the Group Reading Assessment Diagnostic Evaluation (GRADE; Williams, 2001) and demographic factors (e.g., gender, race, ethnicity, and EL, SPED, and FRPL status). Random assignment was used to divide the pairs between the treatment and control groups. Students in the control group received "business as usual" reading instruction during their 25-minute supplemental literacy block, while those in the treatment group engaged in web-based, adaptive, scaffolded silent reading instruction during the same time. Reading comprehension was reassessed at the end of the school year. Reading efficiency was also evaluated at both the beginning and at the end of the school year using an eye movement recording system (Visagraph; Taylor, 2009). To evaluate the effects of reading instruction on students of low versus high reading-efficiency levels, treatment and control groups were further divided into two groups – those with pretest reading rates above versus at or below 150 wpm (approximately the national mean for these two grades combined; Spichtig et al., 2016).

Control Group

Students in the control group engaged in business-as-usual instruction during their 25-minute supplemental literacy block. They were exposed to a variety of instructional approaches including reading grade-level books in pairs or small groups, oral reading practice, book discussions, teacher-directed guided reading groups, and silent reading practice. Instruction was typically delivered by classroom teachers but in some cases was provided by special educators or literacy interventionists. Programs used by the control group were both computer-based and offline.

Treatment Group

Students in the treatment group read self-selected informational or literary texts from an extensive digital library appropriate for their individual level of reading proficiency. Texts were presented to students in two formats: a traditional static text format and a guided window text display with a window that traveled across lines of text from left-to-right and down the screen at each student's individualized reading rate. Following each reading, students completed ten comprehension questions aligned with Common Core State Standards (CCSSI, 2010).

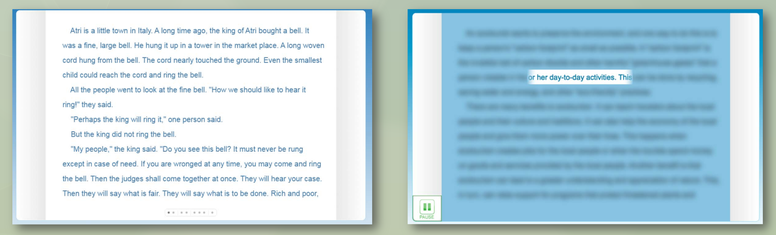

Figure 1. Static text format (left) and guided window text display (right), within which words could be distinguished while only general features of text such as paragraph breaks and word shape could be discerned outside of the window.

Eye-Movement Recordings

Eye-movement recordings were obtained from 210 students (105 control/treatment students) at both the start and the end of the school year using a low-cost, portable eye-movement recording system that uses goggles fitted with infrared emitters and sensors to measure corneal reflections at a sampling rate of 60 Hz (Visagraph, Taylor, 2009). Students wore the goggles while reading standardized grade 4 passages from a normed test booklet (Figure 2). Each passage comprised 12 lines of text containing about 120 words. Data from the first and last line were discarded to minimize anomalies while starting and ending a passage. Efficiency data were based on the middle 10 lines of text, which contained 100 words. Each test passage was followed by a brief comprehension check involving 10 true/false questions.

Figure 2. Student reading text from a normed test booklet while eye movements were recorded using the Visagraph.

Measures

Measures included GRADE Total Test, Vocabulary, and Comprehension Standard Scores (SS), and silent reading efficiency scores as measured by the Visagraph including reading rate (words per minute; wpm), number of fixations, number of short-range regressions, and average fixation duration. Grade-level norms for the GRADE measures and Visagraph efficiency measures have been published (for GRADE norms see Williams, 2001; for Visagraph efficiency norms see Spichtig et al., 2016). This study focused on students' comprehension scores and the silent reading rate measure.

Results

Students within the low-efficiency group (pretest reading rates at or below 150 wpm) had a mean pretest reading rate of 122 wpm (SD=20 wpm) and a comprehension score of 101.3 SS (SD=11.5 SS). Students within the high-efficiency group (pretest reading rates above 150 wpm) had a mean pretest reading rate of 202 wpm (SD=44 wpm) and a comprehension score of 115.6 SS (SD=12.9 SS).

Instructional effects were compared across treatment/control groups and high/low-efficiency groups. Linear regression analyses (Mplus, version 8; Muthén & Muthén, 1998–2017) showed that students who began with low efficiency increased their reading rates the most. In addition, the low-efficiency treatment group achieved significantly larger gains in reading efficiency (p=.013) as compared to their peers in the control group. Students who began with high efficiency increased their comprehension scores the most. Further, the high-efficiency treatment group achieved significantly larger gains in reading comprehension (p=.017) as compared to their peers in the control group.

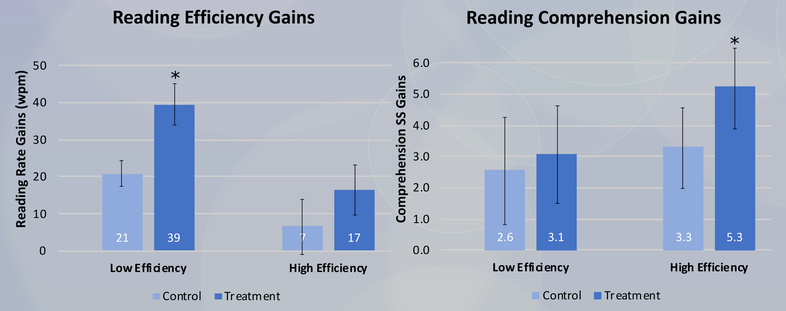

Figure 3. Reading efficiency gains (left) and reading comprehension gains (right) grouped by initial low/high reading efficiency sub-groups (≤150 wpm versus >150 wpm). * p<.05 compared to control group.

Conclusions

The outcomes reported here are promising with regard to the prospect of using educational technology as a means to provide adaptive instruction that is also developmentally sensitive.

The larger reading efficiency gains seen in the low-efficiency treatment group suggest that scaffolded silent reading instruction was beneficial to students who were still in the midst of developing the ability to decode words efficiently. Students within the high-efficiency groups were already able to read and comprehend grade-level texts at rates averaging 202 wpm. This rate implies relatively little effort was being spent on word-level decoding, which likely accounts for the larger comprehension level gains achieved by the students in the high-efficiency treatment group.

From a developmental perspective, this study highlights the importance of developing reading efficiency as students transition from "learning to read" to "reading to learn." Better recognizing developmental patterns can help teachers prioritize not only *what* to teach students, but *when* and *how* to do so (Gehsmann & Templeton, 2011/2012; Templeton & Gehsmann, 2014).

References

Common Core State Standards Initiative (2010). National Governors Association Center for Best Practices and the Council of Chief State School Officers. Washington, DC: Authors. www.corestandards.org.

Gehsmann, K. M. & Templeton, S. (2011/2012). Stages and standards in literacy: Teaching developmentally in the age of accountability. *Journal of Education*, *192*(1) p. 5-16.

Muthén, L. K., & Muthén, B. O. (1998 – 2017). *Mplus user guide* (8th ed.). Los Angeles, CA: Muthén & Muthén. Program Copyright © 1998-2017 Muthén & Muthén. V.8. April 2017.

Spichtig, A.N., Hiebert, E.H., Vorstius, C., Pascoe, J.P., Pearson, P.D., & Radach, R. (2016). The decline of comprehension-based silent reading efficiency in the United States: A comparison of current data with performance in 1960. *Reading Research Quarterly, 51*(2), 239–259.

Taylor, S. E. (2009). *Visagraph III: Implementation guide*. Huntington Station, NY: Taylor Associates Communications.

Templeton, S. & Gehsmann, K. M. (2014). *Teaching reading and writing: The developmental approach (PreK-8)*. Boston: Pearson.

Williams, K. T. (2001). *The Group Reading Assessment and Diagnostic Evaluation (GRADE). Technical Manual*. San Antonio, TX: Pearson Education, Inc.