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Oral Reading Fluency Growth: A Sample of Methodology and Findings*

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ABSTRACT

For the past 20 years, the growth of students' oral reading fluency has been investigated by a number of researchers using curriculum-based measurement. These researchers have used varied methods (student samples, measurement procedures, and analytical techniques) and yet have converged on a relatively consistent finding: General education students grow about a word per week in their fluency during the academic year, and students in special education progress more slowly. In this paper, we chronologically review early and late studies done on growth of fluency and then compare the studies on samples, measures, and conclusions.

The narrative structure of this paper is first chronological and then analytical, presenting the major findings and then comparing the manner in which the studies have been conducted. In the final section of the paper, we present the findings from two new studies.

A Chronology of Findings

When research on oral reading fluency was initially conducted at the Institute for Research on Learning Disabilities (late 1970s through the early 1980s), the specificity and methodology was much more general. For example, one of the first studies documented an average growth of about 1 word correct per minute throughout the year though sample sizes were small, no information was presented on the number of measures administered, and the statistical test was simply pre-post gains for students in grades 3-5. Note that students in the control group made no gains (Fuchs, Deno, and Mirkin, 1984).

Nearly two decades ago, Fuchs, Fuchs, Hamlett, Walz, and Germann (1993) documented the average slope of students in grades 1-6 using a least-squares regression between scores and calendar days with slope converted to a weekly time frame. For the 103 special and general education students, respectively: the weekly growth in words correct per minute was 1.5 and 2.0 in first and second grade, 1.0 and 1.5 in third grade, 0.85 and 1.1 in fourth grade, 0.5 and 0.8 in fifth grade, and 0.3 and 0.63 in sixth grade. With some students (up to 21% of the sample), a quadratic function was calculated and found to be significant: "For almost all of these cases, a slightly negatively accelerating pattern of progress was within one academic year" (p. 33). Yet, they also stated that "for the CBM oral passage reading measure, linear relationship contributed significantly to the description of student progress for 100%, 100%, 100%, 86%, 81%, and 24% of the individuals at Grades 1-6, respectively" (p.33).

Eight years later, Deno, Fuchs, Marston, and Shin (2001) conducted a far more reaching study in terms of geographic sampling plan and sample size with nearly 3,000 students tested from four regions of the country. With 2675 students in general education and 324 in special education classes, they reported 2.0 words correct per minute growth per week until students achieved 30 WRCM; thereafter, students in the general education population improved at least 1.0 word correct per minute/week. "For many students on each CBM measure, a linear relationship adequately modeled student progress within one academic year. When significant quadratic terms occurred, growth was almost consistently described by a negatively accelerating pattern in which student performance continues to improve over the course of a year, but the amount of progress gradually decreases" (p. 511).

In contrast, the current research is more specific, with expanded views of samples, increased sample sizes, within grade levels, measures are administered on a regular basis, and more

sophisticated statistical tests being used. For example, in a recent study by Keller-Margulis, Clemens, Im, Kwok, & Booth (2012), growth was documented using piecewise time periods with hierarchical linear models (HLM) for three student groups: Non-English language learners (Non-ELL), English language learners (ELL), and English language learners being monitored (ELL-M). Though they reported some significant differences in growth, the differences were not functionally critical. Importantly, growth appeared to be non-linear (within and across grades) for all groups.

Nese, Biancarosa, Anderson, Lai, Alonzo, and Tindal (2012) documented nonlinear slopes for students in grades 3-5 taking benchmark easyCBM measures (fall, winter, and spring). Their results indicated more growth occurred in the fall than in the winter, at least for students in grades 3 and 4, and more growth for students in earlier grades. More growth in the fall than in the winter has been reported in prior research with monotonic but decreasing gains in ORF across the school year. But as students progress in grade and skill, growth may become linear, or the trend may even reverse with less growth in fall and more in spring for older students. They also reported that the winter-spring error variance parameter significantly varied between students, but no student characteristic variable significantly explained this variance. Although the level-2 student variables explained 24% of the overall variance in ORF scores (correct words per minute, cwpm) between students, the final model indicated significant variance remained in both the intercept and the winter-spring slope parameters. Specific findings included:

1. The mean fall reading fluency score, after controlling for student characteristics, was about 88, 111, and 145 cwpm for students in grades 3, 4, and 5 respectively.
2. Across grade levels, females began the year reading about 4 more cwpm than males.
3. Students eligible for FRPL began the year reading about 11 cwpm less than students not eligible for FRL.
4. Students with disabilities (SWD) began the year reading about 37 cwpm less than general education students.
5. Limited English Proficiency (LEP) students began the year reading about 20 cwpm less than non-LEP students.
6. The mean winter reading fluency score, after controlling for student characteristics, was about 120, 136, and 154 cwpm for students in grades 3, 4, and 5 respectively.
7. The only significant slope predictor indicated that SWD demonstrated slower growth from fall to winter by about 4 cwpm than general education students.
8. The mean spring reading fluency score, after controlling for student characteristics, was about 122, 144, and 169 cwpm for students in grades 3, 4, and 5 respectively.
9. No student-level demographic variables significantly explained differences in the winter to spring change in ORF scores.

Comparison of Studies on Research Variables Referenced in Studying Growth of Reading Fluency

Researchers	Grades	N	Measure	N of Meas.	Slope Calc.	Ave. Growth (per week)
Fuchs, Deno, and Mirkin (1984)	Grades 3-5	64 Trt 77 Ctl	3rd grade passage reading test from Ginn 720	Unknown (from Nov. through May)	Pre-post difference @ 28 weeks	Treatment = 42-70 (1 wcpm) Control = 51-51 (0 wcpm)
Fuchs, et al. (1993)	1 – 6	16-25	'Generic passages were used' (p.31)	Unknown with 7+ measures for quadratic calculation	Ordinary Least Squares (OLS)	Grade 1 (n=19) @ 2.10 Grade 2 (n=25) @ 1.46 Grade 3 (n=14) @ 1.08 Grade 4 (n=16) @ .84 Grade 5 (n=20) @ .49 Grade 6 (n=23) @ .32
Deno et al. (2001)	1 – 6	2,999	'Grade-appropriate' as determined by LEAs	Weekly and seasonally (fall, winter, spring)	Ordinary Least Squares (OLS)	Grade 1-2 @ 1.82 (GE) Grade 1-2 @ .71 (SE) Grade 3-4 @ 1.11 (GE) Grade 3-4 @ .58 (SE) Grade 5-6 @ .62 (GE) Grade 1-2 @ .60 (SE)
Keller-Margulis, Clemens, Im, Kwok, & Booth (2012)	Grades 3-5	Grade 3 (1838), Grade 4 (2,151), and grade 5 (2,332) ELL, ELL-Monitor, and Non-ELL	Grade-level R-CBM probes from AIMSweb (2012)	Three measures in September, January (14 weeks later), and May (14 weeks later).	A piecewise model was fitted to the data that modeled growth	Found a seasonal effect in 3rd & 4th grade and with 3 groups. Table below is for successive grades and pieces 1 (Fall-Winter and piece 2 (winter-spring). Grade / Non-ELL / ELL / ELL-M 3: F–W 20 19 20 3: W–S 15 17 15 4: F–W 17 15 17 4: W–S 13 12 15 5: F–W 15 15 14 5: W–W 13 13 15
Nese, Biancarosa, Anderson, Lai, Alonzo, & Tindal (2012)	3 – 5	2,465	easyCBM passages	Benchmark passages (fall, winter, spring)	Hierarchical Linear Model (HLM) for linear and discontinuous growth	Season / Gr 3* / Gr 4* / Gr5 Fall 74 99 132 Winter 106 123 142 Spring 108 131 156 *curvilinear growth Season / Gr 3* / Gr 4* / Gr5 F-W 32 24 10 W-S 2 8 14

Summary and Conclusions

In early research, the student groups and their demographics were used to compare special and general education. However, we had little information on the impact of other student characteristics on growth (e.g. students with different levels of English proficiency or other student characteristics). Just as students were broadly sampled, the measures also were vaguely described in earlier research. Most recently, the research has used one of three dominant measurement systems: (a) easyCBM, (b) DIBELS, or (c) Aimsweb. Finally, linear models dominated the earlier research even though a large percentage of students showed non-linear growth as indicated vy Deno et al. (2001). The most recent statistical findings have documented that growth may not be linear but tapers within or across years: Much greater amounts of improvement have appeared in the early months or grades and it has diminished in the later months or years. Nevertheless, within year (weekly) growth in oral reading fluency has steadily ranged from .50 words correct per minute per week to 2.0 words correct per minute per week.

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