EFFECTIVENESS REPORT

Fluency Formula®

Second Grade Study

Long Island, New York

2003–2004

Final Report

Evaluation Research on the Effectiveness of Fluency Formula

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ABSTRACT

An independent third party evaluation of Scholastic's *Fluency Formula* was conducted during the 2003–2004 academic year in two suburban districts within close proximity to a major city in the northeastern United States. The primary purpose of this research was to investigate whether the addition of the *Fluency Formula* program to the regular second grade language arts curriculum results in significantly greater student outcomes in fluency and comprehension.

This quasi-experimental study employed random assignment at the classroom level to identify a total of 12 participating classrooms with 6 classes randomly assigned to the *Fluency Formula* condition and 6 to the control condition. The students in selected classrooms were pretested to determine their placement in either the high ability group (students with a Words Correct Per Minute (WCPM) between 49 and 71 at pretest, equating to between the 50th and 75th percentile on the Edformation Oral Fluency Assessment (OFA) fall norms or the low ability group (students with a WCPM score of 48 or lower, equating to below the 50th percentile on the OFA fall norms.)

Results revealed that in comparing treatments, low ability students receiving *Fluency Formula* achieved a statistically significant, educationally exemplary learning advantage. Low ability *Fluency Formula* students demonstrated growth that successfully moved them into the 50th percentile band, while the fluency skills of students in the low ability control group remained stagnant throughout the year.

Independent sample t-tests reveal that the low ability *Fluency Formula* group scored significantly higher at posttest than the low ability control group, $p < .001$ with an effect size of $d = .84$. Furthermore, paired sample t-tests confirmed the low ability *Fluency Formula* group's significant increase from pretest to posttest at $p < .001$, with an effect size of $d = .71$.

Comprehension results revealed a significant growth for both the low and high ability *Fluency Formula* students throughout the year. Although the differences between the *Fluency Formula* group and the control group were not statistically significant, changes in fluency were positively correlated with changes in comprehension.

Fluency Formula was universally well received by participating teachers and students. Fidelity of implementation was extremely high, as was students' engagement and motivation with the program.

This research reveals a fluency gap between lower and higher performing students, and provides evidence that Fluency Formula can help lower performing students begin to catch up in a single school year. Like many educational achievement gaps, the fluency gap is anticipated to widen over time if left untreated, and to impact more significantly on the complex matrix of skills comprising reading comprehension in the older grades. Further research should continue to explore the correlation between fluency and comprehension by tracking the performance of students with and without the benefits of Fluency Formula into third grade and beyond.

Introduction

This is the final report on a research study evaluating the effectiveness of *Fluency Formula*, a supplemental text-based program published by Scholastic Education. This research was conducted by Interactive Educational Systems Design (IESD), Inc., in collaboration with Scholastic Education's Research and Evaluation department.

Research and Theoretical Basis

Quality of reading instruction has emerged as a pressing national priority. *No Child Left Behind* and the *Reading First* legislation are intended to provide a framework for developing effective research-based reading instruction, as well as a support mechanism to ensure that teachers have an opportunity to develop skills in teaching the key components of reading.

Fluency is one of the five key components of reading instruction identified in the *Reading First* legislation. Currently, there is an increased national attention on fluency. The National Assessment of Educational Progress revealed that 44% of fourth grade students lacked the fluency necessary for comprehending grade-level text, thus determining a "close relationship" between fluency and reading comprehension (National Institute of Child Health and Human Development, 2000a, p. 3-1, citing Pinnell et al., 1995). In its explanation of this relationship, the NRP argued that "fluency helps enable reading comprehension by freeing cognitive resources for interpretation, but it is also implicated in the process of comprehension as it necessarily includes preliminary interpretive steps" (NICHHD, 2000a, p. 3-6).

Thus, fluency can and should be taught. Scholastic developed *Fluency Formula* in response to a strong understanding of the critical role fluency plays in attaching meaning to text. The product is based upon research and recommendations outlined in the Report of the National Reading Panel (NICHHD, 2000) that fluency instruction, practice, and assessment are essential for bridging the gap between word recognition and comprehension. Fluent reading requires speedy recognition of words, decoding accuracy, and oral expressiveness (prosody)—the three pillars of the *Fluency Formula* program.

In its meta-analysis of research on fluency instruction, the NRP found that repeated oral reading (guided or unguided) had a consistent and positive impact on word recognition, fluency, and comprehension as measured by a variety of test instruments and at a range of grade levels (NICHHD, 2000a, p. 3-3). The NRP reported that several more specific methods produced "clear improvement" (NICHHD, 2000a, p. 3-15), including:

- Repeated readings combined with other procedures such as a particular type of oral reading feedback (Reitsma, 1998) or phrasing support for the reader (Taylor, Wade, & Yekovich, 1985; NICHHD, 2000a, p. 3-15)
- Practice of oral reading while listening to the text being read simultaneously (NICHHD, 2000a, p. 3-15, citing van Bon, Boksebeld, Font Freide, & van den Hurk, 1991; Rasinski, 1990; Smith, 1979)

- Previewing a text through listening (NICHHD, 2000a, p. 3-15, citing Reitsma, 1988; Rose & Beattie, 1986)
- Receiving particular types of feedback (e.g., corrective feedback) during oral reading (NICHHD, 2000a, 3-15, citing Anderson, Wilkinson, & Mason, 1991; Pany & McCoy, 1988)

Based on its review of this critical research, the NRP recommended that teachers should assess fluency regularly, using both formal and informal methods (NICHHD, 2000a, p. 3-4). There are two fundamental reasons why the regular assessment of oral reading fluency is essential for all students in the elementary grades. First, reading fluency has repeatedly been shown to be one of the best overall indicators of reading comprehension. Secondly, regularly assessing fluency assists teachers in quickly identifying students who may have a fluency weakness that requires additional instructional focus.

Fluency Formula incorporates these research-based strategies into a regimen of guided fluency instruction influenced by Pearson and Gallagher's (1983) model for comprehension instruction, which includes the following components:

- Modeling
- Assisted practice
- Independent practice (Rasinski, 2003, citing Pearson & Gallagher, 1983)

A review of four successful first-grade intervention programs in the Handbook of Reading Research Vol. 3 (Kamil, Mosenthal, Pearson, & Barr [Eds.], 2000) suggests that fluency instruction can be effective as a component of comprehensive programs of reading instruction. All four of the successful programs emphasize reading words in text quickly and fluently, including a focus on "reading many different texts and rereading these texts to attain high levels of fluency" (Hiebert & Taylor, 2000, p. 467). Similarly, three out of four successful second grade intervention programs included a substantial focus on developing fluency (Hiebert & Taylor, 2000, p. 473, Table 26.6). Since many programs of reading instruction do not include a fluency component, *Fluency Formula* was designed as a supplemental component that teachers can add to such reading programs.

Overview of Fluency Formula

Scholastic's *Fluency Formula* was influenced by the work of Maryanne Wolf and her colleagues, who incorporate a developmental approach to teaching fluency, whereby there is repeated oral reading coupled with phonics speed drills, phrase-cued text passages, one-minute fluency readers, intensive vocabulary work, and the inclusion of fluency norms for continuous assessment. Scholastic *Fluency Formula* Kits include:

- **Direct Fluency Instruction Materials**—Each kit provides all the components and detailed teacher guidance necessary to integrate fluency instruction into daily lesson plans, including strategic instruction for all students plus intervention plans for struggling readers.
- **The Fluency Assessment System**—The National Reading Panel recommends that fluency be assessed formally on a regular basis. Many states and districts now require Oral Fluency Assessments (OFAs) as a measure of adequate yearly progress. Scholastic's *Fluency Formula* Assessment System is a nationally normed and validated assessment from Edformation that enables teachers to assess, diagnose, and tailor instruction to individual needs.
- **The *Fluency Formula* Library**—The *Fluency Formula* library of leveled books provides students with targeted independent fluency-building practice, as well as audio CDs to support students in reading aloud.

The *Fluency Formula* program is divided into six units: Partner Reading, Choral Reading, Expressive Reading, Readers Theater, Repeated Reading, and Expert Reading. Each unit is comprised of four weeks of instructional activities followed by one week dedicated to assessment. During the instructional weeks, teachers are directed to follow a five-day schedule of at least 15 minutes per day, as follows:

- Day 1: Direct instruction, whole class
- Day 2: Guided practice, whole class
- Day 3: Direct instruction, small group for students in need of special intervention
- Day 4: Guided practice, small group for students in need of special intervention
- Day 5: Assessment of selected students

Key academic advisors to and reviewers of *Fluency Formula* include Maryanne Wolf, Timothy Rasinski, Calvin L. Gidney, Phyllis C. Hunter, Wiley Blevins, and Kevin Feldman.

Purpose of Research

Research supports the hypothesis that developing fluency will result in increased reading comprehension, which in turn will lead to improved reading attitudes, since reading becomes more enjoyable and meaningful. Therefore, the primary purpose of this research project is to investigate whether the addition of the *Fluency Formula* program to regular second grade language arts curriculum results in significantly greater student outcomes in fluency and comprehension, as well as improved reading attitudes. A secondary purpose is to collect and analyze data on teacher implementation of *Fluency Formula*, which can aid in the interpretation of learning outcomes findings and can inform future product development decisions. Specific evaluation research questions follow in the next section.

Evaluation Research Questions

This evaluation of *Fluency Formula* investigated the following four questions focusing on program effectiveness, in addition to examining product implementation:

1. Do students exposed to a comprehensive reading program supplemented with Scholastic's *Fluency Formula* demonstrate a greater increase in fluency than students who do not receive targeted fluency instruction?
2. Do students exposed to a comprehensive reading program supplemented with Scholastic's *Fluency Formula* demonstrate a greater increase in passage comprehension than students who do not receive targeted fluency instruction?
3. Is there a correlation between increased fluency ability and passage comprehension skills?
4. As children's reading fluency and comprehension improve, will they also experience improvement in their attitudes toward reading?
5. What can be learned about *Fluency Formula* through teacher implementation of the product?

Treatments Compared

Experimental Treatment

The experimental treatment featured class use of the *Fluency Formula* program, with teachers following the six-unit curriculum sequence in the *Fluency Formula* Professional Guide and working with their students as they use the *Fluency Formula* materials accordingly. By design, students received different intensities of *Fluency Formula* instruction based on pre-treatment assessment of their oral fluency skill (as measured on the OFA):

- Students scoring below the 50th percentile on the OFA pretest were to receive four days of *Fluency Formula* instruction, including two days of small group instruction.
- Students scoring at or above the 50th percentile on the OFA pretest were to receive two days of *Fluency Formula* instruction, excluding the two days of small group instruction.

In addition, participating *Fluency Formula* teachers attended an after-school professional development session (approximately 2.5 hours) that presented the theory underpinning the program, introduced the components of the program, and explained the teacher's role in implementing it.

Experimental classes used the school's standard reading/English language arts materials, with teachers following district curriculum guidelines, if any. No other supplemental materials were used.

Control Treatment

The control treatment classes used the school's standard reading/English language arts materials, with teachers following district curriculum guidelines, if any. No other supplemental materials were used.

Control classes had no access to or use of the *Fluency Formula* program (student or teacher materials), and the control teachers did not participate in the *Fluency Formula* professional development session.

Equal Instructional Time

Experimental treatment teachers were directed to schedule at least 15 minutes of the regular school day to implement the *Fluency Formula* program. Thus, total instructional time was equivalent in both the experimental and control treatment groups, with the possible exception of a 15-minute take-home assignment from the *Fluency Formula* Fluency Workbook once per week.

Selection of Districts, Schools, and Classes

Two suburban districts in the northeastern United States agreed to participate in the study. Each district is within commuting distance to a major city. In one district, approximately 20% of the students were eligible for free lunch and 6.2% were Limited English Proficiency students. In the other district, approximately 19% of the students were eligible for free lunch and 7.5% were Limited English Proficiency students.

A total of 12 teachers participated in the study: 6 assigned to the experimental treatment group (3 per district) and 6 assigned to the control group (also 3 per district). In each district, several teachers volunteered to participate in the study, and teachers were selected based on identification of "matched" pairs of classes in the same school. Classes were matched to be as close as possible on prior student standardized reading test performance and/or student ability level, student ethnic composition, and teacher characteristics (e.g., number of years teaching, academic credentials). Each matched pair had a high degree of equivalence of students. In some cases, one teacher had several more years of teaching experience than her match, but all were identified as excellent teachers and none were novice teachers.

In each matched pair, one teacher was randomly assigned to the experimental treatment group, and the other was assigned to the control group. As an incentive, control group teachers were offered the option of receiving the *Fluency Formula* program and professional development for the 2004–2005 school year.

Class sizes ranged between 17 and 22 students. As of September 2003, there were 127 students in the experimental treatment classrooms and 125 students in the control classrooms. However, data analysis was limited to students who scored at or below the 75th percentile on the pretest of oral fluency. The final data analysis included 66 students in the experimental treatment classrooms and 62 students in the control classrooms.

Evaluation Research Methodology

This study followed a pre-posttest, treatment-comparison, quasi-experimental design. As noted previously, one key element of the design was that pairs of intact classes of students, matched for ability and teacher experience, were randomly assigned to the experimental *Fluency Formula* treatment group and the control group. While random assignment occurred at the class level, data analysis was completed at the student level. Thus, the study should be categorized as a quasi-experimental design rather than an experimental design.

The experimental treatment group was comprised of six classes of second grade students that used *Fluency Formula* with their teachers (three classes from each of two districts). The control group included six classes of second grade students that did not use *Fluency Formula* (three classes from each of the same two districts).

As stated earlier, in each group data analysis was limited to students who scored at or below the 75th percentile on the Edformation OFA (based on norm data available in October 2003), because the *Fluency Formula* program is not intended primarily for students who already demonstrate superior fluency skills.

Data Collection Instruments

This research included the following data collection instruments:

Outcome Measures (Achievement and Student Attitudes)

Edformation Oral Fluency Assessment (OFA) Benchmark Passages: Administered to students in both the experimental and control classrooms in October (pretest) and June (posttest). One-minute sample of students' oral reading of three brief grade-level passages. Normed, valid, and reliable for Grades 1 to 8. Assessment included in the *Fluency Formula* Assessment System (Scholastic Inc., 2003).

Woodcock-Johnson III Tests of Achievement (WJIII): Passage Comprehension subtest (Woodcock, McGrew, & Math, 2001): Administered to students in both the experimental and control classrooms in October (pretest) and June (posttest). Initial items involve the ability to match a pictographic representation of a word with an actual picture of the object. The next items are presented in multiple-choice format, requiring the subject to point to the picture represented by a phrase. The remaining items require the subject to read a short passage and identify a missing key word that makes sense in the context of the passage. The items become increasingly difficult by removing pictorial stimuli and increasing passage text length, level of vocabulary, etc. Normed, valid, and reliable for kindergarten to adult.

Woodcock-Johnson III Tests of Achievement (WJIII): Letter-Word Identification sub-test (Woodcock, McGrew, & Math, 2001a): Administered to students in both the experimental and control classrooms in October (pretest) only. Measures the subject's word-identification skills. Initial items require the individual to identify letters that appear in large type. The remaining items require the person to read individual words and pronounce them correctly; he or she is not required to know the meaning of the word. Normed, valid, and reliable for kindergarten to adult.

Woodcock-Johnson III Tests of Achievement (WJIII): Word Attack sub-test (Woodcock, McGrew, & Math, 2001b): Administered to students in both the experimental and control classrooms in October (pretest) only. Measures ability to apply phonic and structural analysis skills to the pronunciation of unfamiliar printed words. Initial items require the individual to produce the sounds for single letters. The remaining items require the person to read aloud letter combinations that are phonically consistent, regular patterns in English—but that are nonsense or low-frequency words; the items become more difficult as the complexity of the nonsense words increases. Normed, valid, and reliable for kindergarten to adult.

Elementary Reading Attitude Survey (ERAS) (McKenna & Kear, 1990): Administered to the whole class by reading items out loud, in both the experimental and control classrooms, in October (pretest) and June (posttest). Consists of 20 Likert rating scale questions about students' attitudes toward various reading-related activities. Each point on the four-point rating scale is represented by a cartoon drawing of Garfield the Cat with a different facial expression, ranging from a broad smile to a deep frown. Yields a Full scale score, a Recreational Reading subscale score (based on 10 items), and an Academic Reading subscale score (based on the other 10 items). Normed, valid, and reliable for Grades 1 to 6.

Implementation Measures

Ongoing experimental/control classroom observations: Classroom observations conducted during the identified fluency time. The goal of observations in the experimental classrooms was to assess how the different *Fluency Formula* units were implemented and implementation fidelity. The goal of observations in the control classrooms was to describe the reading instruction. Six observations were completed over the course of the year in experimental classrooms; two observations were completed in control classrooms.

Curriculum Pacing Checklists: The *Fluency Formula Professional Guide* was used to create a Curriculum Pacing Log for experimental teachers to complete each week of the study. This was a simple checklist of when and what teachers were implementing in the classroom from unit to unit, along with a space for teacher comments.

Teacher Response Questionnaires: Informal surveys to be completed by teachers at the end of each of the *Fluency Formula* units. Each consisted of mostly open-ended questions, with one set of rating scale items focusing on *Fluency Formula* instructional strategies.

Assessment Administration

Assessment administration and scoring was the responsibility of IESD researchers and Scholastic research and evaluation staff. All children and parent information remained confidential. Student records were assigned an Identification Code, so that each child could be identified solely through their code during data analysis.

Data Analysis Procedures

Data for fluency, comprehension, and reading attitudes were first analyzed in a 2 (Time: Pretest vs. Posttest) x 2 (Fluency Condition: Treatment vs. Control) x 2 (Initial Fluency Ability Group: low vs. high) mixed-model (analysis of variance) design, with time serving as a within-persons variable, and fluency condition and ability as between-persons variables. Students in the low initial fluency ability group were those scoring below the 50th percentile on the Edformation OFA pretest; those in the high initial fluency ability group were those scoring at or above the 50th percentile on the OFA pretest, but not exceeding the 75th percentile.[1] This variable was created to evaluate whether the impact of the treatment might depend on initial fluency ability level (which would be evidenced by a significant three-way interaction between time, condition, and fluency ability level). The low/high initial fluency ability also reflected planned variation in the actual *Fluency Formula* treatment. Low initial fluency ability students were designated for a 4-day-per-week *Fluency Formula* instructional plan, including small group instruction on Days 3 and 4. High initial fluency ability students were not designated for small group instruction on Days 3 and 4, although at least one teacher chose to provide all students in her class at least some of the Day 3–4 instruction.

[1] The 50th percentile rank corresponded to a raw score of 49 on the OFA using norms at the time that assignment to ability groups was made. The 75th percentile rank corresponded to a raw score of 71 using norms at the time that assignment to ability groups was made.

Follow-Up Analysis

Following this initial analysis, several additional variables were included in the analysis to determine whether the effect of the treatment depended on school district, gender, ethnicity, or free/reduced lunch status. Due to the small number of students in the various individual minority groups, all minority (i.e., non-white) groups were combined into a single ethnic minority group for the purposes of analysis. If any of these additional variables did not interact with the key treatment x time interaction, they were excluded from mention in this report.

Effect Sizes

Effect sizes (ES) were used to determine the educational significance of results. Effect sizes were calculated using the standardized mean difference formula employed by the National Reading Panel (NICHHD, 2000, p. 32).[2] This analysis measures the amount of student gain on a standardized test irrespective of initial level of performance.

Educational significance is an estimate of the educational meaningfulness of statistically significant changes in terms of actual student performance. In studies involving sufficiently large numbers of students, small differences in means are sometimes statistically significant; however, such differences may mean little in terms of actual student performance in the classroom. In this study, guidance by Cohen (Valentine & Cooper, 2003, citing Cohen, 1988) was followed to assess the practical educational significance of an effect. Cohen suggested that in social science research, an effect size of .50 (one-half of a standard deviation) should be viewed a medium-sized effect. Such an effect size is generally considered to be educationally significant.

Analyses of Implementation Data

For the data from classroom observations and the completed Curriculum Pacing Checklists and Teacher Response Questionnaires, IESD completed quantitative analyses (generating descriptive statistics) and qualitative analyses (categorical analysis to identify general themes).

[2] The effect size formula used by the National Reading Panel was (M1 –M2)/0.5 (sd1 + sd2), where M1 and M2 are the means of respective treatment and control group or pre- and post-tests, and sd1 and sd2 are the respective standard deviations of the treatment and control or pre- and posttests (*NICHHD, 2000, 32*).

Results

In this section, results on achievement and attitude outcomes, implementation of the *Fluency Formula* program, *Fluency Formula* teacher response questionnaires, and the control classroom observations are reported.

Subjects Dropped From Analysis

Data for 15 student subjects were dropped prior to analysis:

- Eight students had exited the program.
- One student had switched from the control to the treatment group.
- Four *Fluency Formula* treatment students were dropped, as they were unavailable for the *Fluency Formula* treatment at least 50% of the time. The classroom teacher mentioned that these students also had emotional and/or behavioral difficulties that interfered with their attention to the *Fluency Formula* instruction even when they were present in the classroom.
- Two students had a large number of absences (31 and 41, respectively).[3]

[3] z scores > 3.29, $p < .001$

Fluency-NCE Analysis

Changes in oral fluency performance as measured by the OFA Normal Curve Equivalent (NCE) scores at pretest compared to fluency NCEs at posttest were evaluated using a 2 (Time: Pretest vs. Posttest) x 2 (Fluency Condition: *Fluency Formula* Treatment vs. Control) x 2 (Initial Fluency Ability Group: low vs. high) mixed-model design, with time serving as a within-persons variable, and fluency condition and ability as between-persons variables. (The pretest Woodcock-Johnson III Basic Reading score—a cluster score based on scores on the WJII Letter-Word Identification and Word Attack sub-tests—was not used as a covariate in this analysis because the *Fluency Formula* experimental treatment and control groups did not differ significantly on this variable.[4]) In addition, district, gender, ethnicity (white vs. all others), and free/reduced lunch status were not included in the final analysis reported below, as none of these variables interacted with the primary interaction of interest (fluency condition x time).

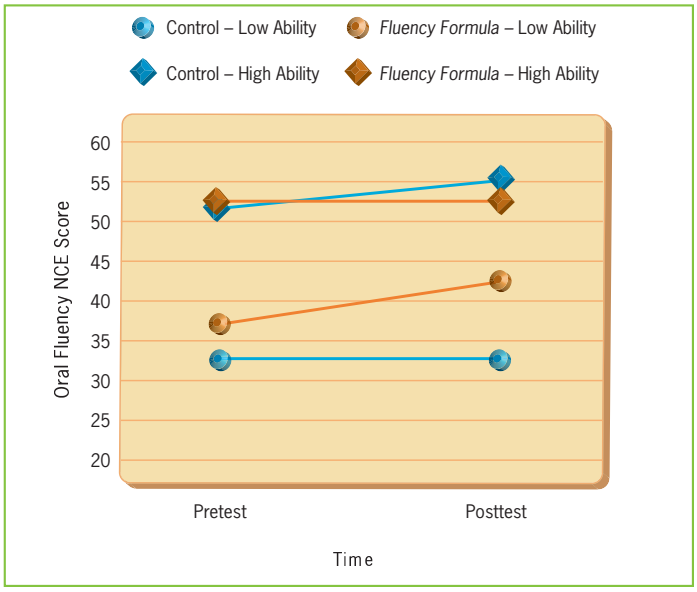
Results revealed a significant main effect of time.[5] On average, NCE scores increased from pretest to posttest.[6] More importantly, results also revealed a significant interaction between time, fluency condition, and initial ability level.[7] Means and standard deviations for the three-way interaction are presented in Table 1, and means for the interaction are plotted in Figure 1.

Table 1. Oral Fluency NCE Scores at Pretest and Posttest as a Function of Initial Fluency Ability Group and Fluency Treatment Condition

	Low Initial Ability				High Initial Ability			
	Control		*Fluency Formula* Treatment		Control		*Fluency Formula* Treatment	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
M	33.59	33.70	35.98	42.59	53.80	55.74	54.24	54.07
SD	10.79	11.10	8.71	10.02	3.70	7.57	3.38	8.03
N	35	35	37	37	27	27	29	29

[4] $p = .30$
[5] $F(1, 124) = 8.51, p < .01$
[6] The increase was from $M = 43.22$, $SD = 12.26$ at pretest to $M = 45.53$, $SD = 12.94$ at posttest.
[7] $F(1, 124) = 8.76, p < .01$

Figure 1. Oral Fluency NCE Scores at Pretest and Posttest as a Function of Fluency Treatment Condition and Initial Fluency Ability Level



As can be seen in Figure 1, the group that demonstrated the largest increase in oral fluency over time was the low initial fluency ability/*Fluency Formula* treatment group. Follow-up tests were used to evaluate the significance of the increase from pretest to posttest in each of the four groups, and differences between the control and *Fluency Formula* treatment groups (within each ability group) at pretest and posttest. Paired sample t-tests revealed a significant increase from pretest to posttest in the low ability *Fluency Formula* treatment group[8], with an effect size (d = .71) qualifying as an educationally significant difference. Comparisons within the remaining three groups were not significant.[9] Independent sample t-tests were used to compare the control and *Fluency Formula* treatment groups within each ability group. At pretest, the control and treatment groups did not differ significantly within either the low ability or the high ability groups.[10] At posttest, within the low ability group, the *Fluency Formula* treatment group scored significantly higher than the control group.[11] The effect size for this difference was d = .84, considered a large, educationally significant effect by most educational researchers. Within the high ability group, the treatment and control groups did not differ significantly.[12]

[8] mean change = 6.60, $t(36) = 4.24$, $p < .001$
[9] All ps > .13
[10] $p = .30$ for the low ability group and $p = .64$ for the high ability group
[11] $t(70) = 3.57$, $p < .001$
[12] $p = .43$

Fluency—Raw Score Analysis

Changes in oral fluency as measured by the Edformation OFA raw scores (words read correct per minute) at pretest to OFA raw scores at posttest were evaluated using a 2 (Time: Pretest vs. Posttest) x 2 (Fluency Condition: *Fluency Formula* Treatment vs. Control) x 2 (Initial Fluency Ability Group: low vs. high) mixed-model design, with time serving as a within-persons variable, and condition and ability as between-persons variables. (The pretest Woodcock-Johnson III Basic Reading score was not used as a covariate in this analysis because the *Fluency Formula* experimental treatment and control groups did not differ significantly on this variable.[13]) In addition, district, gender, ethnicity (white vs. all others), and free/reduced lunch status were not included in the final analysis reported below, as none of these variables interacted with the primary interaction of interest (fluency condition x time).

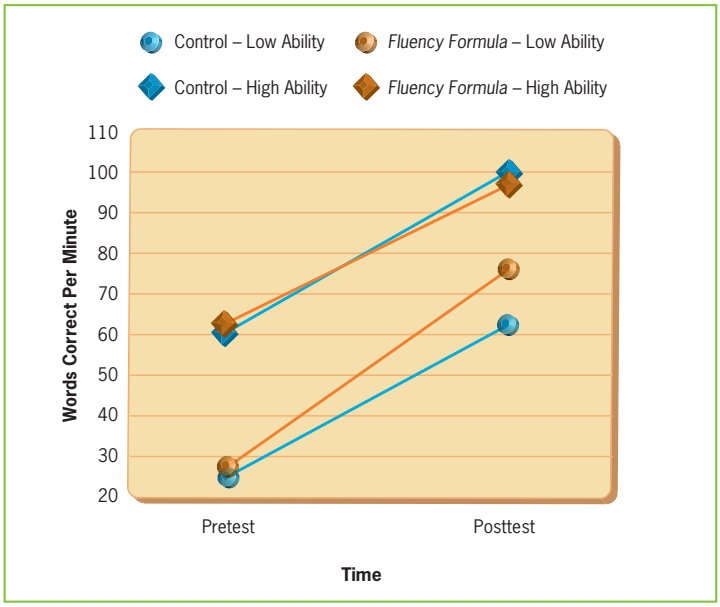
Results revealed a significant main effect of time.[14] On average, raw scores increased significantly from pretest to posttest.[15] More importantly, results also revealed a significant interaction effect between time, fluency condition, and initial ability level.[16] Means and standard deviations for the three-way interaction are presented in Table 2, and means for the interaction are plotted in Figure 2.

Table 2. Oral Fluency Raw Scores (Words Correct Per Minute) at Pretest and Posttest as a Function of Initial Fluency Ability Group and Fluency Treatment Condition

	Low Initial Ability				High Initial Ability			
	Control		*Fluency Formula* Treatment		Control		*Fluency Formula* Treatment	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
M	26.77	60.83	29.46	76.97	59.59	101.67	60.41	99.45
SD	12.83	22.40	11.13	17.53	6.36	13.79	5.85	14.43
N	35	35	37	37	27	27	29	29

[13] $p = .30$
[14] $F(1, 124) = 1062.71, p < .001$
[15] The increase was from $M = 42.09$, $SD = 18.65$ at pretest to $M = 82.86$, $SD = 24.25$ at posttest.
[16] $F(1, 124) = 10.93, p < .001$

Figure 2. Oral Fluency Raw Scores (Words Correct Per Minute) at Pretest and Posttest as a Function of Fluency Treatment Condition and Initial Fluency Ability Level



As can be seen in Figure 2, the group that achieved the largest increase in oral fluency over time was the low initial fluency ability/*Fluency Formula* treatment group. Follow-up tests were used to evaluate the significance of the increase from pretest to posttest in each of the four groups, and differences between the control and *Fluency Formula* treatment groups (within each ability group) at pretest and posttest. Paired sample t-tests revealed significant increases from pretest to posttest in each of the four conditions[17]. Independent sample t-tests were used to compare the control and *Fluency Formula* treatment groups within each ability group. At pretest, the control and treatment groups did not differ significantly within either the low ability or the high ability groups.[18] At posttest, within the low ability group, the *Fluency Formula* treatment group scored significantly higher than the control group.[19] The effect size for this difference was d = .81, considered a large, educationally significant effect by educational researchers. Within the high ability group, the treatment and control groups did not differ significantly.[20]

Comprehension–W-Score Analysis

Changes in passage comprehension as measured by the Woodcock-Johnson III Passage Comprehension test (W-scores at pretest to W-scores at posttest) were evaluated using the same 2 (Time: Pretest vs. Posttest) x 2 (Fluency Condition: *Fluency Formula* Treatment vs. Control) x 2 (Initial Fluency Ability Group: low vs. high) mixed-model design described previously. This analysis yielded a significant main effect for time[21], with scores significantly higher at posttest than at pretest.[22] The analysis also yielded two noteworthy interactions. The interaction between time and fluency condition approached but did not reach the p = .05 level of significance[23], with students in the control condition demonstrating a somewhat larger increase from pretest to posttest than did students in the *Fluency Formula* treatment condition.[24] However, the effect size for this difference (d = .29) did not reach the level of educational significance. These results are presented in detail in Table 3 and Figure 3.

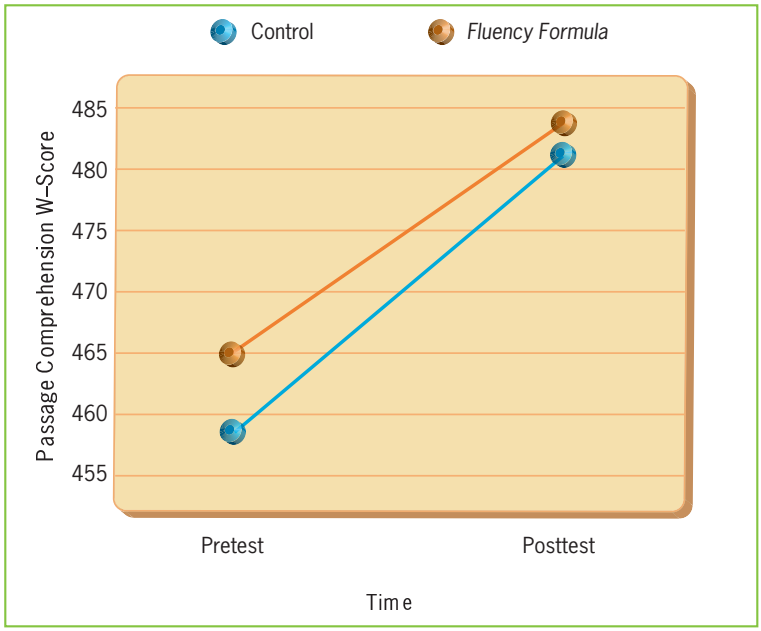
[17] All ps $< .001$
[18] $p = .34$ for the low ability group and $p = .62$ for the high ability group
[19] $t(70) = 3.42$, $p < .001$
[20] $p = .56$
[21] $F(1, 124) = 475.161$, $p < .001$
[22] The increase was from $M = 469.91$, $SD = 13.01$ at pretest to $M = 481.59$, $SD = 11.96$ at posttest.
[23] $F(1, 124) = 3.77$, $p = .054$
[24] $M = 21.40$, $SD = 10.63$ for control group students and $M = 18.05$, $SD = 9.80$ for *Fluency Formula* treatment group students.

The significant interaction between time and ability group[25], revealed that the low ability group achieved a larger increase from pretest to posttest than did students in the high ability group.[26] The effect size for this difference (d = .47) met the criterion for educational significance. However, the three-way interaction between time, fluency condition, and initial ability group was far from significant.[27]

Table 3. Woodcock-Johnson III Passage Comprehension W–Scores as a Function of Fluency Condition and Time

	Control		*Fluency Formula* Treatment	
	Pretest	Posttest	Pretest	Posttest
M	459.42	480.82	464.26	482.30
SD	13.74	13.05	11.93	10.88
N	62	62	66	66

Figure 3. Woodcock-Johnson III Passage Comprehension W-Scores As a Function of Condition and Time

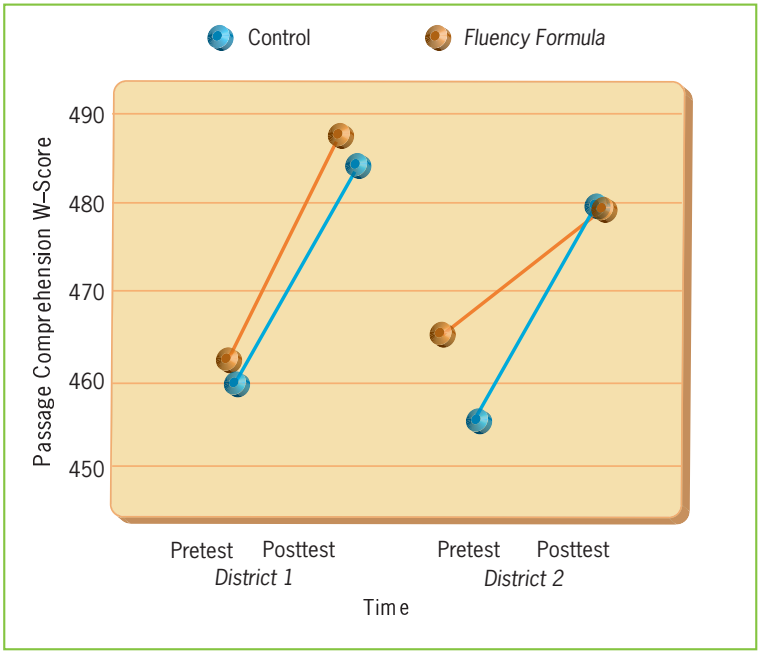


Additional analyses revealed that, while gender, ethnicity, and free/reduced lunch status did not interact with fluency condition, school district did. More specifically, a 2 (Time) x 2 (Fluency Condition) x 2 (Fluency Ability Group) x 2 (District) mixed-model ANOVA revealed a significant three-way interaction between time, fluency condition, and district.[28] Means and standard deviations for the three-way interaction are presented in Table 4, and means for the interaction are plotted in Figure 4. To aid in interpretation, Districts 1 and 2 are shown in the left and right portions of the graph, respectively.

[25] $F(1, 124) = 6.97, p < .01$
[26] $M = 21.75$, $SD = 10.68$ for low ability group students and $M = 17.00$, $SD = 9.22$ for high ability group students.
[27] $p = .58$
[28] $F(1, 120) = 7.75, p < .01$

Table 4. Woodcock-Johnson III Passage Comprehension W-Scores at Pretest and Posttest as a Function of District and Fluency Treatment Condition								
District 1					**District 2**			
Control			***Fluency Formula* Treatment**		**Control**		***Fluency Formula* Treatment**	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
M	460.92	480.60	463.26	484.17	458.41	480.97	465.39	480.19
SD	13.62	12.82	12.05	10.66	13.91	13.37	11.88	10.92
N	25	25	35	35	37	37	31	31

Figure 4. Woodcock-Johnson II Passage Comprehension W-Scores at Pretest and Posttest as a Function of District and Fluency Treatment Condition



Follow-up tests were used to evaluate the significance of the increase from pretest to posttest in each of the four groups, and differences between the control and *Fluency Formula* treatment groups (within each district) at pretest and posttest. Paired sample t-tests revealed a significant increase in comprehension in all four groups.[29] Independent sample t-tests were used to compare the control and *Fluency Formula* treatment groups at both pretest and posttest within each district. At pretest, the District 1 control and treatment groups did not differ.[30] However, the District 2 control group scored significantly lower than the District 2 *Fluency Formula* treatment group at pretest.[31] At posttest, the control and *Fluency Formula* treatment groups did not differ in either district.[32] These results suggest that while the District 2 control group started out

[29] All ps $< .001$
[30] $p = .49$
[31] $t(66) = 2.20$, $p < .05$
[32] Both ps $> .24$

somewhat lower than the District 2 *Fluency Formula* treatment group, the control group caught up to the treatment group at posttest. Indeed, an independent sample t-test revealed that, within District 2, the change from pretest to posttest was larger in the control group than in the *Fluency Formula* treatment condition.[33] The effect size for this difference was (d = .80), indicating a large, educationally significant difference.

Academic Reading Attitudes

Changes in academic reading attitudes as measured by the Elementary Reading Attitude Survey Academic Reading NCE scores were evaluated using a 2 (Time: Pretest vs. Posttest) x 2 (Fluency Condition: *Fluency Formula* Treatment vs. Control) x 2 (Initial Fluency Ability Group: low vs. high) mixed-model design, with time serving as a within-persons variable and fluency condition and fluency ability as between-persons variables. Results revealed no significant effects.[34]

A 2 (Time) x 2 (Fluency Condition) x 2 (Initial Fluency Ability Group: low vs. high) x 2 (Gender)[35] ANOVA revealed a significant three-way interaction between time, fluency condition, and gender. Means are shown in Table 5. Paired sample t-tests revealed no significant changes from pretest to posttest within any of the four combinations of Gender x Fluency Condition. Independent sample t-tests revealed that at posttest, female *Fluency Formula* treatment students scored lower on academic reading than female controls,[36] with an effect size (d = .54) indicating an educationally significant difference; all remaining comparisons were not significant.[37] Additional analyses revealed no significant status interactions involving district, ethnicity, or free/reduced lunch status.

Table 5. Academic Reading NCE Scores at Pretest and Posttest as a Function of Gender and Fluency Treatment Condition

	Girls				Boys			
	Control		*Fluency Formula* Treatment		Control		*Fluency Formula* Treatment	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
M	58.53	67.83	64.10	57.13	53.41	50.99	48.24	53.72
SD	20.72	21.03	20.09	18.88	26.17	24.43	22.69	22.63
N	26	26	30	30	36	36	36	36

[33] M = 22.57, SD = 10.52 for the control group and M = 14.81, SD = 8.93 for the *Fluency Formula* treatment group; $t(66) = 3.24$, $p < .005$
[34] All ps > .18
[35] $F(1, 120) = 8.76$, $p < .005$
[36] $t(54) = 2.01$, $p < .05$
[37] All ps > .31

Recreational Reading Attitudes

Changes in recreational reading attitudes as measured by the Elementary Reading Attitude Survey Recreational Reading NCE scores were evaluated using a 2 (Time: Pretest vs. Posttest) x 2 (Fluency Condition: *Fluency Formula* Treatment vs. Control) x 2 (Initial Fluency Ability Group: low vs. high) mixed-model design, with time serving as a within-persons variable, and fluency condition and ability as between-persons variables. Results revealed no significant effects.[38]

A 2 (Time) x 2 (Fluency Condition) x 2 (Initial Fluency Ability Group: low vs. high) x 2 (Gender) ANOVA revealed a three-way interaction between time, fluency condition, and gender that approached significance.[39] Means are shown in Table 6. Paired sample t-tests revealed no significant changes from pretest to posttest within any of the four combinations of Gender x Fluency Condition.[40] Independent samples t-test revealed no significant differences between the control and *Fluency Formula* treatment conditions within any of the four comparisons (pretest/posttest x gender).[41] Additional analyses revealed no significant interactions involving district, ethnicity, or free/reduced lunch.

Table 6. Recreational Reading NCE Scores at Pretest and Posttest as a Function of Gender and Fluency Treatment Condition

	Girls				Boys			
	Control		*Fluency Formula* Treatment		Control		*Fluency Formula* Treatment	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
M	52.00	60.22	51.73	54.30	49.21	40.75	48.11	46.88
SD	21.51	23.93	22.88	19.41	28.01	23.52	25.88	25.57
N	26	26	30	30	36	36	36	36

[38] All ps > .19
[39] $F(1, 120) = 3.86$, $p = .052$
[40] All ps > .07
[41] All ps > .17

Correlations Among Changes in Fluency, Comprehension, and Reading Attitudes

Correlational analyses were also performed to examine the relationship between pretest-to-posttest changes in fluency, comprehension, and attitudes. A summary of the correlations is presented in Table 7. As can be seen, changes in fluency were positively correlated with changes in comprehension. However, changes in reading attitudes were not correlated with changes in fluency or comprehension.

Table 7. Correlations Among Pretest-to-Posttest Changes in Fluency, Passage Comprehension, and Reading Attitudes

	Fluency	Passage Comprehension	Overall Attitude	Recreational Attitude
Passage Comprehension	.33**			
Overall Attitude	-.05	-.03		
Recreational Attitude	-.01	.00	.88**	
Academic Attitude	-.11	-.07	.89**	.68**

N = 128. ** $p < .01$ (two-tailed)

Fluency Formula Implementation

Data regarding *Fluency Formula* implementation come from two sources: (1) observations of experimental classrooms and (2) curriculum pacing checklists completed by experimental teachers on a weekly basis. Results from these two data sources are reported below. Where appropriate, recommendations for improving program implementation are included.

Experimental Classroom Observations

The six experimental classrooms were observed on two occasions during the Fall 2003 semester and four occasions during the Spring 2004 semester. These observations included:

- Day 1 direct instruction of the whole class during Unit 1, Partner Reading in October 2003
- Day 3 direct instruction of a small group during Unit 2, Choral Reading in December 2003
- Day 2 guided practice involving the whole class during Unit 3, Expressive Reading in January 2004
- Day 4 guided practice involving a small group during Unit 4, Reader's Theater in March 2004
- Days 3 and 4 during Unit 5, Reader's Theater in April 2004
- Days 3 and 4 during Unit 6, Expert Reading in May 2004. (Note that one teacher was absent during these observation days, so her classroom was not observed.)

Fidelity to the Fluency Formula Model

On each day, overall adherence to the *Fluency Formula* instructional model across the classrooms was high. Adherence to the instructional plan for Days 1, 3, and 4 was excellent. Adherence to the instructional plan for Day 2 was good (with most teachers emphasizing all but one of the specified instructional areas, and the others emphasizing all the specified instructional areas).

In most classrooms, the majority of the *Fluency Formula* materials were observed somewhere in the classroom. During the earlier observations, the materials tended to be spread throughout most of the classrooms; however, during the last two observations, there was an obvious dedicated fluency corner in most (Unit 5) or all (Unit 6) of the observed classrooms.

Observers recorded slight variations in program implementation from classroom to classroom. For example, the three teachers in District 1 developed their own comprehension worksheets (which may suggest a need for additional comprehension support built into the program). One teacher implemented Day 3 with the whole class, with a reading and/or ESL teacher working with the designated small group.

Reactions to the Program

In most of the classrooms, students were motivated, engaged, and enjoying the program. During observations, several teachers expressed satisfaction with or enthusiasm about *Fluency Formula*.

Learning Outcomes

Researchers observed fluency skill development in several classrooms throughout the school year. One teacher specifically commented that fluency skills were transferring to other reading situations and content areas.

Implementation Issues and Recommendations

Many of the implementation issues raised by teachers had to do with *Fluency Formula* materials. Several teachers wanted each student to have his or her own copy of each book. One teacher commented that the program was difficult to implement without a dedicated CD player and hardware for having several students listen to the read-along CDs at the same time. (Note: Evidence from the Curriculum Pacing Checklists suggests that this was a challenge in two classrooms.) One teacher requested that the sight word lists be placed on smaller individual cards so that the children could take them home to practice with their families.

A few teachers consistently reported that the program typically requires more than the estimated 15 minutes to complete.

Some teachers might require more detailed guidance for implementing the program optimally. For example, one teacher conducted small group instruction in the hallway outside the classroom, where the students were constantly distracted. One teacher was unsure what to do with the rest of the class during Day 3–4 small group activities with selected students. One teacher indicated that she was uncomfortable timing students for OFA assessments.

Curriculum Pacing Checklists

Between October 7, 2003 and May 28, 2004, the six teachers in the experimental classes were responsible for providing *Fluency Formula* instruction for 24 weeks during the school year. During four additional weeks, each teacher was responsible for implementing *Fluency Formula* assessment only; no instruction was planned for these assessment weeks.

For each week in which teachers provided *Fluency Formula* instruction, they completed a *Fluency Formula* Curriculum Pacing Checklist. The completed Checklists were analyzed using descriptive statistics to determine the level of implementation of the instructional components specified for each day of the *Fluency Formula* weekly instructional sequence.

Days 1 through 4 of the sequence—the days dedicated to instruction—were analyzed together and separately: together to get a sense of overall instructional implementation fidelity, and separately to determine day-by-day implementation fidelity. During each instructional day, *Fluency Formula* teacher materials directed the teachers to complete 5–8 instructional elements (depending on the specific day). Fidelity—across all four instructional days and for each individual day—was calculated as a percentage:

$$\frac{\text{Number of instructional elements completed}}{\text{Number of elements possible given the school schedule}}$$

The denominator in each calculation excluded days when *Fluency Formula* was not possible due to scheduled district or school events (e.g., holidays, conference days, class trips), but included days when teachers were absent for personal reasons.

Day 5—the day dedicated to assessment—was considered separately for two reasons. There were many four-day weeks during the school year due to scheduled district or school events, and teachers were directed to skip the Day 5 assessment activities during short weeks. Also, teachers were given flexibility in terms of how many and which assessment elements to implement each week (although formal assessment with a *Fluency Formula* Oral Fluency Assessment Progress Monitoring Passage was encouraged when possible). Thus, analysis of Day 5 implementation is presented primarily for the purpose of describing what the teachers did rather than evaluating implementation fidelity. The *Fluency Formula* Curriculum Pacing Checklists also afforded the teachers the opportunity to write open-ended comments about program implementation and impacts. Researchers analyzed these comments to identify implementation issues that might help explain the results with respect to learning outcomes that might inform future revisions to *Fluency Formula*.

Adherence to the Instructional Implementation Plan for Days 1–4

Teachers participated as fully as the district schedule would permit, and in general, there was good to excellent adherence to the *Fluency Formula* implementation plan for most instructional activities. Adherence for Days 1 and 3 was excellent for all teachers (more than 90% of the possible instructional elements completed per teacher). Adherence for Day 4 ranged from good to excellent; five out of the six teachers completed more than 90% of the possible instructional elements, with the sixth teacher completing 85% of the possible instructional elements.

Day 2 showed the greatest variation in adherence to the *Fluency Formula* implementation plan, ranging from fair (50–60% compliance) to excellent (more than 90% compliance). One explanation for the lower level of adherence in two classrooms was the lack of a dedicated CD player with hardware to enable several students to listen with headphones simultaneously. Scholastic may determine that it is more realistic to intersperse implementation of the CD-related instructional components at brief intervals throughout each week, which could be reflected in future versions of the teacher materials.

Implementation of Day 5 Assessment

Implementation of Day 5 assessment varied from classroom to classroom, both in terms of the percentage of possible assessment days implemented (ranging from 67% to 100%), to the actual pattern of specific assessment activities implemented. District schedules made it very difficult to carry out a five-day program on a consistent basis. The program's teacher materials should clearly articulate reasonable expectations with respect to Day 5 compliance, and should communicate priorities in terms of which assessment activities to complete if there is insufficient time to complete all of them.

Time per Day Required to Implement the Program

Since most of the teachers required more than 15 minutes per day to implement the program, we recommend revising the *Fluency Formula* materials to indicate a realistic range of time per day (e.g., at least 20–30 minutes per day).

Teacher Response Questionnaire

Experimental teachers were asked to complete a Teacher Response Questionnaire at the end of each unit. During the 2003–3004 school year, they completed six units and six questionnaires:

Unit 1: Partner Reading (questionnaire completed November 2003)

Unit 2: Choral Reading (questionnaire completed December 2003)

Unit 3: Expressive Reading (questionnaire completed February 2004)

Unit 4: Reader's Theater (questionnaire completed March 2004)

Unit 5: Repeated Reading (questionnaire completed May 2004)

Unit 6: Expert Reading (questionnaire completed June 2004)

Responses were analyzed using descriptive statistics, where appropriate. For open-ended questions, teacher responses were analyzed for common themes. In addition, researchers identified implementation issues that can inform future revisions to *Fluency Formula*.

Fluency Formula Techniques

Each of the six instructional techniques received positive comments by several teachers. However, a few teachers mentioned implementation challenges related to some of the techniques.

Partner Reading: Teachers praised the Partner Reading technique as a form of practice and/or reinforcement of oral fluency skills. However, Scholastic might want to consider making multiple copies of each book available to ease implementation, a request made by a few teachers. In addition, some teachers would benefit from guidance on meeting the challenge of the increased noise level during this activity.

Choral Reading: Teachers appreciated that the Choral Reading technique helped children to feel comfortable and relaxed while reading aloud. Scholastic might want to offer teachers specific guidance on handling slower readers who have difficulty staying up to speed and tracking properly during this technique.

Expressive Reading: The Expressive Reading technique was appreciated for the focus it placed on characters and how those characters speak. Teachers observed that this focus led to increased comprehension.

Readers Theater: Teachers especially enjoyed the Readers Theater technique, because the children were very attentive and motivated when working on plays. The teachers noticed an increase in the children's attention and exposure to new literary techniques.

Repeated Reading: The Repeated Reading technique was praised as a form of practice that increased fluency (including oral expressiveness), as well as comprehension.

Expert Reading: Teachers appreciated the Expert Reading technique as a method of reinforcing skills in a number of areas, including pacing, expression, intonation, and comprehension. However, Scholastic might want to offer teachers guidance on handling the slower readers who may initially find these concepts and skills somewhat confusing.

Specific *Fluency Formula* Instructional Strategies

Across all six units, Teacher Modeling was the highest rated *Fluency Formula* strategy. It consistently received a mean rating of 4, the highest rating possible. Other highly rated instructional strategies across the six units included Audio-Assisted Reading with Practice and Expert Reading Speeds, Building Phonics Fluency, Introducing and Practicing Sight Words, and FlipChart Word Lists.

Fluency Formula Instructional Materials

The teachers were very positive about the Read-Aloud Anthology readings and the books from the Fluency Library. Reactions to the Fluency Workbook readings were mixed.

Learning Outcomes

Students paid more attention to punctuation and read with greater expression as a result of participating in the *Fluency Formula* program.

Teacher judgments about the program's impact on reading comprehension were more mixed. Several teachers indicated improvement in their students' reading comprehension, which the teachers specifically attributed to improved fluency. However, two teachers did not find the level of comprehension support or development they had expected. One teacher indicated that her students improved in fluency but not as significantly in comprehension. A second teacher expressed concern midway through the school year because comprehension was not increasing as much as she had anticipated. It should be noted that these were the two teachers with the lowest level of adherence to the *Fluency Formula* program in general, and with dramatically lower levels of adherence to the Day 2 implementation plan compared to the other teachers (based on the analysis of Curriculum Pacing Checklists data).

Control Classroom Observations

The six control classrooms were observed once during the Fall 2003 semester, in early to mid December, and again during Spring 2004, in late May.

Scholastic identified 11 instructional elements or activities related to the development of reading fluency, which were prompted in the Control Classroom Observation Form:

- Model Fluent Reading
- Pace Emphasized
- Intonation Emphasized
- Phrasing/Rhythm Emphasized
- Read, Critique, and Reread
- Repeated Reading
- Partner Reading
- Choral Reading
- Readers Theatre
- Audio-Assisted Reading
- Timed Reading/OFA

Researchers observed the control classrooms for instances of these elements or activities, and to identify elements of the reading/language arts program not related to fluency.

Fluency-Related Instruction

The level of fluency-related instruction varied from classroom to classroom. About half of the identified fluency-related instructional elements/activities were observed in three of the control classrooms during each of the two observations. The other teachers were observed to implement noticeably fewer fluency-related instructional elements/activities, typically 2 to 4 out of the 11 fluency instructional elements/activities in each of the two observations.

Notwithstanding this variation, each of the control classroom teachers was observed to implement far fewer fluency-related instructional elements/activities than most of the experimental *Fluency Formula* classroom teachers.

Non-Fluency-Related Instruction

Instructional activities related to reading comprehension and vocabulary development were observed in most of the control classrooms during both observations. During the Fall 2003 observation, researchers also witnessed activities on making predictions in most control classrooms. Activities related to word walls and grammar were observed in most control classrooms during the Spring 2004 observation.

Limitations of This Study

This is the first research study to be conducted on the effectiveness of *Fluency Formula*. While it strongly suggests the positive impact of the program on oral reading fluency, particularly for lower performing students, there is not yet a body of evidence to support the impact *Fluency Formula* can have on fluency and reading comprehension.

To ensure generalizability, this research would need to be replicated in urban and rural settings, in districts with different demographic profiles, and in different regions of the United States. Additionally, only 12 classrooms from two districts were studied, 6 experimental and 6 control classrooms.

Variations in district curriculum, implementation, or teacher ability in even a few classrooms had potential to impact the results. Despite strong efforts to establish experimental treatment and control groups of equivalent pre-treatment ability, the two groups in District 2 were statistically different in Passage Comprehension ability at pretest. This might have accounted for different outcomes with respect to reading comprehension in the two districts.

Finally, it is also possible that learning advantages for reading comprehension might only be obtained in later grades or over several years of *Fluency Formula* instruction, while this research was only a one-year intervention.

Conclusions

This study revealed several noteworthy findings concerning the impact of the *Fluency Formula* program on fluency, comprehension, and reading attitudes, as well as teacher reactions to and implementation of *Fluency Formula*.

Impact on Fluency Development

Fluency Formula significantly increased oral reading fluency among students who initially scored low in fluency ability. Students in the control condition who scored low in initial fluency ability demonstrated no such increase. In comparing the two treatments, there was a statistically significant, educationally meaningful learning advantage for low fluency ability students receiving *Fluency Formula* instruction.

Fluency Formula did not have such an effect on fluency development among students initially at a high level of fluency, but neither did it give them a learning disadvantage. One possible explanation is that the two-day *Fluency Formula* intervention these students received was insufficient for a significant effect; perhaps if they had received the same four-day *Fluency Formula* intervention as the low fluency ability students, the high ability students would have achieved even greater improvement. This is an area for possible follow-up research.

Notwithstanding these outstanding questions, *Fluency Formula* has been proven to be a successful instructional program for low fluency ability students that can be implemented into regular classroom settings with a mix of ability levels. Over the course of the school year, several teachers and independent observers commented on students' growth in fluency skills in many of the *Fluency Formula* classrooms.

Impact on Reading Comprehension Development

In general, *Fluency Formula* demonstrated no instructionally meaningful advantage or disadvantage with respect to reading comprehension development.

In District 2, the control group achieved a larger increase in comprehension than the experimental *Fluency Formula* group that was both statistically and educationally significant. One possible explanation is that the control group students in District 2 scored lower in comprehension at pretest, so they had more latitude for improvement. It is also possible that the specific instructional strategies employed by the District 2 control teachers might have had a greater impact on comprehension development. Observations of control classrooms found instructional activities related to reading comprehension in most of these classrooms; however, the data is insufficient to enable meaningful comparison of District 2 *Fluency Formula* classrooms and control classrooms with respect to reading comprehension instruction. Another possibility is that there might have been an instructional component in the District 2 *Fluency Formula* classrooms that was less advantageous with respect to comprehension. We note that two of the three District 2 *Fluency Formula* teachers were those who most often had minor complaints about the program, who demonstrated the lowest levels of adherence to the program, and who most often had time management issues with the program. It is unclear what they chose to give up from their established instructional program in order to find sufficient time for *Fluency Formula*.

The fact that a larger increase in comprehension for the control group occurred only in District 2 suggests that district-specific characteristics and/or program implementation are more likely to be the cause of this outcome than characteristics of the *Fluency Formula* program. Note that in District 1, while no statistically significant difference was found, the mean gain in reading comprehension was actually slightly greater for the *Fluency Formula* group.

The findings from the passage comprehension assessment data were echoed by the feedback obtained from participating teachers. Over the course of the school year, several *Fluency Formula* teachers (mostly from District 1) commented on their students' improvement in comprehension.

Impact on Attitudes Toward Reading

Within each fluency ability group, no significant general advantage was found for either the *Fluency Formula* or control condition with respect to reading attitudes.

Girls receiving the control treatment tended to improve their attitudes toward Academic Reading more than girls receiving the *Fluency Formula* treatment. The data suggests that this is more likely to be explained by positive aspects of instruction in the control classrooms than negative aspects of instruction in the *Fluency Formula* classrooms. Nonetheless, Scholastic may want to review the reading selections provided in the *Fluency Formula* program to ensure that enough of them are engaging and motivating to girls.

Correlation of Outcomes

Changes in fluency were positively correlated with changes in passage comprehension. In other words, improvements in fluency tended to co-occur with improvements in reading comprehension. This is consistent with previous oral reading fluency research (NICHHD, 2000a, p. 3-1, citing Pinnell et al., 1995). Note, however, that a positive correlation is not evidence of a cause and effect relationship. In fact, this study did not find direct evidence of such a relationship. If the relationship between fluency and comprehension is, in fact, one of cause and effect, then perhaps Grade 2 is not when the effect is likely to occur. Or perhaps several years of fluency instruction and reinforcement is necessary before most students can reap its benefits in terms of comprehension development. Addressing these issues would require additional research.

Changes in reading attitudes were not correlated with changes in either fluency or comprehension. This lack of a relationship suggests that neither gains in fluency nor comprehension skills would be a direct cause of improved reading attitudes. It is possible that schools might need to examine other types of instructional interventions to improve students' attitudes toward reading.

Teacher Reaction to Fluency Formula

Fluency Formula was universally well received by participating teachers and students. Fidelity of implementation was extremely high, as was students' engagement and motivation with the program. Teachers praised the major *Fluency Formula* techniques: Partner Reading, Choral Reading, Expressive Reading, Reader's Theater, Repeated Reading, and Expert Reading. The few concerns expressed by teachers are addressed on the following page.

Across all six units, the highest rated *Fluency Formula* instructional strategies were Teacher Modeling, Audio-Assisted Reading with Practice and Expert Reading Speeds, Building Phonics Fluency, Introducing and Practicing Sight Words, and FlipChart Word Lists.

Program Adherence

In general, there was good to excellent adherence to the *Fluency Formula* implementation plan for most instructional days activities. However, adherence was more varied for Day 2, ranging from fair (50–60% compliance) to excellent (more than 90% compliance). If Scholastic determines that it is more realistic to intersperse some Day 2 instructional elements (e.g., those involving practice with the CDs) at brief intervals throughout each week, the program's teacher materials should be revised to reflect this.

In comparison, the highest level of fluency-related instruction observed in control classrooms incorporated about half of the identified fluency-related instructional elements/activities, and this occurred in only half of the control classrooms. Based on this observed finding, it is likely that the students in the experimental *Fluency Formula* group received much more fluency-related instruction than did the control group students.

Implementation of Day 5 assessment varied from classroom to classroom in the experimental *Fluency Formula* group. District schedules made it very difficult to carry out a five-day program on a consistent basis. The program's teacher materials should communicate reasonable expectations for Day 5 compliance, and should prioritize which assessment activities are the most important to complete if time is limited.

Time Required

The program required more than the estimated 15 minutes per day to implement as intended. An estimate of at least 20 to 30 minutes per day may be more realistic.

Program Materials and Hardware Requirements

There were a few instances of teachers enhancing the *Fluency Formula* program with their own related, comprehension-focused, instructional activities. Considering the findings with respect to reading comprehension (see Impact on Reading Comprehension Development, Page 29), Scholastic might want to consider providing additional, related, and optional comprehension activities with the program.

The program was difficult to implement in its entirety without a dedicated CD player and hardware to enable several students to listen at the same time. Lack of such equipment may explain the lower level of Day 2 adherence in two classrooms. Scholastic should consider specifying to schools and districts that such equipment is necessary for optimum program implementation.

Additional Guidance Needed

Some teachers might have benefited from more detailed guidance for implementing *Fluency Formula*. Specific issues requiring additional guidance included implementing small group instruction while keeping the remaining students on task, coping with the noise level when several students were reading aloud, and handling slower readers who had difficulty keeping up during Choral Reading and Expert Reading.

Future Research

This research reveals a fluency gap between lower and higher performing students, and provides evidence that *Fluency Formula* can help lower performing students begin to catch up in a single school year. Like many educational achievement gaps, the fluency gap is anticipated to widen over time if left untreated, and to impact more significantly on the complex matrix of skills comprising reading comprehension in the older grades. Further research should continue to explore the correlation between fluency and comprehension by tracking the performance of students with and without the benefits of *Fluency Formula* into third grade and beyond.

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EFFECTIVENESS REPORT

About Interactive Educational Systems Design (IESD), Inc.

Interactive Educational Systems Design (IESD), Inc. provides a variety of services related to the marketing, evaluation, and development of educational software, multimedia products, and Web sites. IESD was founded in 1984 by Ellen Bialo and Jay Sivin-Kachala, the firm's president and vice president. IESD's clients include software publishers, technology hardware manufacturers, nonprofit institutions, government agencies, and school districts.