

# What Works Clearinghouse™



Beginning Reading

Updated March 2013

## Fast ForWord®

### Program Description<sup>1</sup>

*Fast ForWord*® is a computer-based reading program intended to help students develop and strengthen the cognitive skills necessary for successful reading and learning. The program, which is designed to be used 30–100 minutes a day, 5 days a week, for 4–16 weeks, includes three series. The *Fast ForWord*® *Language*<sup>2</sup> series and the *Fast ForWord*® *Literacy*<sup>3</sup> series aim to build cognitive skills such as memory, attention, processing, and sequencing. They also strive to build language and reading skills, including listening accuracy, phonological awareness, and knowledge of language structures. The *Fast ForWord*® *to Reading*<sup>4</sup> series (also known as the *Fast ForWord*® *Reading* series) aims to increase processing efficiency and further improve reading skills such as sound–letter associations, phonological awareness, word recognition, knowledge of English language conventions, vocabulary, and comprehension. The program is designed to adapt the nature and difficulty of the content based on individual student’s responses.

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### Research<sup>5</sup>

The What Works Clearinghouse (WWC) identified nine studies of *Fast ForWord*® that both fall within the scope of the Beginning Reading topic area and meet WWC evidence standards. Seven studies meet standards without reservations and two studies meet WWC evidence standards with reservations, and together, they included 1,390 students from several areas of the United States and Western Australia.

The WWC considers the extent of evidence for *Fast ForWord*® on the reading skills of beginning readers to be medium to large for two outcome domains—alphabets and comprehension—and small for one outcome domain—reading fluency. There were no studies that meet standards in the general reading domain, so we do not report on the effectiveness of *Fast ForWord*® for that domain in this intervention report. (See the Effectiveness Summary on p. 5 for further description of all domains.)

### Effectiveness

*Fast ForWord*® was found to have positive effects on alphabets, no discernible effects on reading fluency, and mixed effects on comprehension for beginning readers.

**Table 1. Summary of findings<sup>6</sup>**

Outcome domain	Rating of effectiveness	Improvement index (percentile points)		Number of studies	Number of students	Extent of evidence
		Average	Range			
Alphabets	Positive effects	+6	–21 to +19	5	784	Medium to large
Reading fluency	No discernible effects	+7	na	1	308	Small
Comprehension	Mixed effects	+6	–12 to +21	4	702	Medium to large

na = not applicable

### Program Information

#### Background

Scientific Learning Corporation is the producer and distributor of *Fast ForWord*®. Address: 300 Frank H. Ogawa Plaza, Suite 600, Oakland, CA 94612–2040. Email: customerservices@scilearn.com. Web: <http://www.scilearn.com>. Telephone: (888) 665-9707. Fax: (510) 444-3580. The program can be purchased from local *Fast ForWord*® providers listed in a searchable database on the Scientific Learning Corporation website.

#### Program details

*Fast ForWord*® products, which entered the market in 1997, were developed for students with reading, language, and learning problems. The *Fast ForWord*® *Language*, *Fast ForWord*® *to Reading*, and *Fast ForWord*® *Literacy* computer software uses exercises (computer games) that aim to develop the cognitive processes necessary for reading. *Fast ForWord*® *Language* intends to build cognitive skills of memory, attention, processing, and sequencing, as well as language and reading skills, such as listening accuracy, phonological awareness, and language structures. *Fast ForWord*® *to Reading* works to further improve cognitive and reading skills through exercises focused on sound–letter associations, phonological awareness, word recognition, knowledge of English language conventions, vocabulary, and comprehension. *Fast ForWord*® *Literacy* endeavors to improve students' skills in the areas of listening accuracy, phonological awareness, language structures, processing efficiency, memory, concentration, comprehension, and sequencing. *Fast ForWord*® products use software that adapts content to student responses to test items. Content and duration are continuously adjusted so that students should be able to achieve correct response rates of approximately 80%. The developer suggests multiple delivery options for using the program, ranging from 30 minutes a day, 5 days a week, for 12–16 weeks, to 90–100 minutes a day, 5 days a week, for 4–8 weeks. All students start at the same basic level and progress individually as they attain proficiency.

#### Cost<sup>7</sup>

A single license for *Fast ForWord*® *Language* costs \$999, with discounts available for multiple licenses. Each license for *Fast ForWord*® *to Reading* costs \$554, with no quantity discount. Cost information for *Fast ForWord*® *to Literacy* is available from the developer.

## Research Summary

The WWC identified 342 studies that investigated the effects of *Fast ForWord*® on the reading skills of beginning readers.

The WWC reviewed 25 of those studies against group design evidence standards. Seven studies (Borman, Benson, & Overman, 2009; Scientific Learning Corporation, 2004, 2005a, 2005b, 2005c, 2006, 2007) are randomized controlled trials that meet WWC evidence standards without reservations, and two studies (Overbay & Baenen, 2003; Scientific Learning Corporation, 2008) are quasi-experimental designs that meet WWC evidence standards with reservations. Those nine studies are summarized in this report. Sixteen studies do not meet WWC evidence standards. The remaining 317 studies do not meet WWC eligibility screens for review in this topic area. Citations for all 342 studies are in the References section, which begins on p. 8.

**Table 2. Scope of reviewed research**

<b>Grade</b>	K, 1, 2, 3
<b>Delivery method</b>	Whole class
<b>Program type</b>	Curriculum/Supplement

### Summary of studies meeting WWC evidence standards without reservations

Borman, Benson, and Overman (2009) conducted a randomized controlled trial of 118 academically at-risk second-grade students from four urban schools in Baltimore, Maryland.<sup>8</sup> The intervention group included 62 students who used the *Fast ForWord*® *Language* program as a supplemental targeted pullout program during the regular school day. The comparison group included 56 students who received nonliteracy instruction or participated in special activities and classes, such as art and gym, for supplemental instruction. The intervention group received the *Fast ForWord*® *Language* program for at least 20 days over the 3-month period.

Scientific Learning Corporation (2004) conducted a randomized controlled trial that examined the effects of the *Fast ForWord*® *Language* program on academically at-risk students in grades K–3 in nine urban districts in the United States. Teachers identified students performing in the bottom quartile of their language arts classes, who were then randomly assigned, within each grade and gender strata, to either the *Fast ForWord*® group or the comparison group. The WWC based its effectiveness ratings on findings from comparisons of the 266 students who received *Fast ForWord*® and the 160 comparison students who received their regular reading and language arts curriculum. The study reported students' outcomes after 6 weeks of program implementation.

Scientific Learning Corporation (2005a) conducted a randomized controlled trial of 197 first- and second-grade students from three school districts in the United States. The intervention group included 75 first-grade and 23 second-grade students who used *Fast ForWord*® *to Reading 1*. The comparison group included 78 first-grade and 21 second-grade students who used the regular school curriculum. The study reported students' outcomes after 8–12 weeks of program implementation.

Scientific Learning Corporation (2005b) conducted a randomized controlled trial of 50 third-grade students from an elementary school in Lancaster, South Carolina. The intervention group included 25 students who used *Fast ForWord*® *to Reading 2*. The comparison group included 25 students who used the regular school curriculum. The study reported students' outcomes after 4 weeks of program implementation.

Scientific Learning Corporation (2005c) conducted a randomized controlled trial of 38 second- and third-grade students from an elementary school in Fern Park, Florida. The intervention group included 20 students who used *Fast ForWord*® *to Reading 1* or *2*. The comparison group included 18 students who used the regular school curriculum. The study reported students' outcomes after 3 months of program implementation.

Scientific Learning Corporation (2006) conducted a randomized controlled trial of 48 kindergarten students from a suburban elementary school in the United States. All of the students were low-performing readers. The intervention group included 25 students who used *Fast ForWord*® *to Reading Prep*. The comparison group included 23 students who used the regular school curriculum. On average, students used the *Fast ForWord*® *to Reading Prep* product for 33 days.

Scientific Learning Corporation (2007) conducted a randomized controlled trial of 63 early elementary school students from four public primary schools in the Perth metropolitan area of Western Australia. The intervention group included 32 students who used the *Fast ForWord® Language* and *Fast ForWord® Language to Reading* programs. The comparison group included 31 students who used the regular language arts curriculum. The study reported students' outcomes after 6–10 weeks of program implementation.

### Summary of studies meeting WWC evidence standards with reservations

Overbay and Baenen (2003) conducted a quasi-experiment of 142 third-grade students in the Wake County Public School System in North Carolina. The intervention group included 71 students from six elementary schools who used the *Fast ForWord®* program. The comparison group included 71 students from different schools who did not use *Fast ForWord®*. Comparison group students were selected to match the intervention group students on demographic characteristics and reading pretest scores. The study reported students' outcomes after 9 months (an academic year) of program implementation.

Scientific Learning Corporation (2008) conducted a quasi-experiment of 308 second-grade students from four elementary schools in Perrysburg, Ohio. The intervention group included 127 students from two schools who were selected to use the *Fast ForWord® Language* and *Fast ForWord® Language to Reading* products. The comparison group included 181 students from two different schools who used the regular reading curriculum. The study reported students' outcomes after 4 months of program implementation.

### Effectiveness Summary

The WWC review of *Fast ForWord*® for the Beginning Reading topic area includes student outcomes in four domains: alphabets, reading fluency, comprehension, and general reading achievement. The nine studies of *Fast ForWord*® that meet WWC evidence standards reported findings in three of the four domains: (a) alphabets, (b) fluency, and (c) comprehension. The findings below present the authors' estimates and WWC-calculated estimates of the size and the statistical significance of the effects of *Fast ForWord*® on beginning readers. For a more detailed description of the rating of effectiveness and extent of evidence criteria, see the WWC Rating Criteria on p. 63.

#### Summary of effectiveness for the alphabets domain

Five studies that meet WWC standards without reservations reported findings in the alphabets domain.

Scientific Learning Corporation (2004) reported a statistically significant positive difference between the *Fast ForWord*® group and the comparison group on the phonological awareness measure: the Isolation subtest of the Phonological Awareness Test (PAT). When adjusted for multiple comparisons, the WWC found a positive, but not statistically significant, effect on the PAT Isolation subtest. Comparison of the groups on the PAT Deletion subtest was not statistically significant. The study authors provided means and standard deviations but did not report the significance level for the comparison of the groups on the Letter-Word Identification subtest of the Woodcock-Johnson (WJ) Psycho-Educational Battery. The average effect size across the three outcomes was not large enough to be considered substantively important according to WWC criteria (i.e., an effect size of at least 0.25). The WWC characterizes these study findings as an indeterminate effect.

Scientific Learning Corporation (2005a) reported a statistically significant positive difference between the *Fast ForWord*® group and the comparison group on two measures of phonological awareness: the Letter Sounds and Phonological Awareness subtests of the Test of Phonological Awareness (TOPA). In data provided directly to the WWC, the authors subsequently found, and the WWC confirmed, that the two subtests were also individually statistically significant. The WWC characterizes these study findings as a statistically significant positive effect.

Scientific Learning Corporation (2005b) reported, and the WWC confirmed, a statistically significant positive difference between the *Fast ForWord*® group and the comparison group on two combined phonics measures: the Sight Word Efficiency and Phonemic Decoding Efficiency subtests of the Test of Word Reading Efficiency (TOWRE).<sup>9</sup> The WWC characterizes these study findings as a statistically significant positive effect.

Scientific Learning Corporation (2006) reported a statistically significant positive difference between the *Fast ForWord*® group and the comparison group on the WJ Letter-Word Identification subtest (phonics) and negative differences on the Initial Sound Fluency subtest (phonological awareness) and the Letter Naming Fluency subtest (letter knowledge) of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS).<sup>10</sup> According to WWC calculations, the three effects were not statistically significant. The study authors provided the WWC with analyses of four additional measures: the Phonological Awareness subtest of the TOPA and the Initial Sound Discrimination, Initial Sound Knowledge, and Non-Word Recognition subtests of Reading Edge. The WWC found positive, but not statistically significant, effects on all these outcomes. The average effect size across all outcomes was not large enough to be considered substantively important according to WWC criteria. Thus, the WWC characterizes these study findings as an indeterminate effect.

Scientific Learning Corporation (2007) reported a positive difference for a subgroup of early elementary students between the *Fast ForWord*® group and the comparison group on the Queensland University Inventory of Literacy (phonological awareness). According to WWC calculations, the difference was not statistically significant. The effect size reported by the study authors was not large enough to be considered substantively important according to WWC criteria. The WWC characterizes this study finding as an indeterminate effect.

Thus, for the alphabetics domain, two studies showed statistically significant positive effects and three studies showed indeterminate effects.<sup>11</sup> This results in a rating of positive effects, with a medium to large extent of evidence.

**Table 3. Rating of effectiveness and extent of evidence for the alphabetics domain**

Rating of effectiveness	Criteria met
<b>Positive effects</b> <i>Strong evidence of a positive effect with no overriding contrary evidence.</i>	In the five studies that reported findings, the estimated impact of the intervention on outcomes in the <i>alphabetics</i> domain was positive: two studies showed statistically significant positive effects and met WWC evidence standards for having a strong design. No studies showed statistically significant or substantively important negative effects.
Extent of evidence	Criteria met
<b>Medium to large</b>	Five studies that included 784 students and at least 18 schools <sup>12</sup> reported evidence of effectiveness in the <i>alphabetics</i> domain.

**Summary of effectiveness for the reading fluency domain**

One study that meets WWC standards with reservations reported findings in the reading fluency domain.

Scientific Learning Corporation (2008) reported a positive difference between the *Fast ForWord*<sup>®</sup> group and the comparison group on the DIBELS Reading Fluency subtest. According to WWC calculations, the difference was not statistically significant. The effect size reported by the study authors was not large enough to be considered substantively important according to WWC criteria. The WWC characterizes this study finding as an indeterminate effect.

Thus, for the reading fluency domain, one study showed indeterminate effects. This results in a rating of no discernible effects, with a small extent of evidence.

**Table 4. Rating of effectiveness and extent of evidence for the reading fluency domain**

Rating of effectiveness	Criteria met
<b>No discernible effects</b> <i>No affirmative evidence of effects.</i>	In the one study that reported findings, the estimated impact of the intervention on outcomes in the <i>reading fluency</i> domain was neither statistically significant nor large enough to be substantively important.
Extent of evidence	Criteria met
<b>Small</b>	One study that included 380 students in four schools reported evidence of effectiveness in the <i>reading fluency</i> domain.

**Summary of effectiveness for the comprehension domain**

Four studies that meet WWC standards (with or without reservations) reported findings in the comprehension domain.

Borman, Benson, and Overman (2009) reported no statistically significant difference in comprehension between the *Fast ForWord*<sup>®</sup> group and the comparison group on the Total Reading portion of the Terra Nova. The effect was not large enough to be considered substantively important according to WWC criteria. The WWC characterizes this study finding as an indeterminate effect.

Scientific Learning Corporation (2004) reported, and the WWC confirmed, a statistically significant positive difference between the *Fast ForWord*<sup>®</sup> group and the comparison group on the Test of Auditory Comprehension of Language–Revised (TACL-R). The WWC characterizes this study finding as a statistically significant positive effect.

Scientific Learning Corporation (2005c) reported a statistically significant positive difference between the *Fast ForWord*<sup>®</sup> group and the comparison group on the Degrees of Reading Power test. The WWC attempted to verify the statistically significant result but could not, although the effect size was substantively important according to WWC criteria. The WWC characterizes this study finding as a statistically significant positive effect.

Overbay and Baenen (2003) reported a negative, but not statistically significant, difference between the *Fast ForWord*® and comparison groups using the North Carolina End of Grade Test. Although it was not statistically significant, the negative effect size was large enough to be considered substantively important according to WWC criteria (i.e., less than  $-0.25$ ). The WWC characterizes this study finding as a substantively important negative effect.

Thus, for the comprehension domain, two studies showed statistically significant positive effects, one study showed substantively important negative effects, and one study showed indeterminate effects. This results in a rating of mixed effects, with a medium to large extent of evidence.

**Table 5. Rating of effectiveness and extent of evidence for the comprehension domain**

Rating of effectiveness	Criteria met
<b>Mixed effects</b> <i>Evidence of inconsistent effects.</i>	In the four studies that reported findings, the estimated impact of the intervention on outcomes in the <i>comprehension</i> domain was mixed: two studies showed statistically significant positive effects, one study showed a substantively important negative effect, and one study showed an indeterminate effect.
Extent of evidence	Criteria met
<b>Medium to large</b>	Four studies that included 702 students and at least 20 schools <sup>12</sup> reported evidence of effectiveness in the <i>comprehension</i> domain.

### References

#### Studies that meet WWC evidence standards without reservations

Borman, G. D., Benson, J. G., & Overman, L. (2009). A randomized field trial of the Fast ForWord language computer-based training program. *Educational Evaluation and Policy Analysis*, 31(1), 82–106.

**Additional source:**

Borman, G. D., & Benson, J. (2006). *Can brain research and computers improve literacy? A randomized field trial of the Fast ForWord® Language computer-based training program* (WCER Working Paper No. 2006-5). Madison, WI: University of Wisconsin–Madison, Wisconsin Center for Education Research.<sup>13</sup>

Scientific Learning Corporation. (2004). Improved language skills by children with low reading performance who used Fast ForWord Language. *MAPS for Learning: Product Reports*, 3(1), 1–13.

**Additional source:**

Miller, S. L., Merzenich, M. M., Tallal, P., DeVivo, K., Linn, N., Pycha, A.,...Jenkins, W. M. (1999). *Fast ForWord training in children with low reading performance*. Proceedings of the 1999 Dutch National Speech-Language Association Meeting.

Scientific Learning Corporation. (2005a). Improved early reading skills by students in three districts who used Fast ForWord® to Reading 1. *MAPS for Learning: Product Reports*, 9(1), 1–5.

**Additional sources:**

Scientific Learning Corporation. (2005d). Improved early reading skills by students in the Springfield City School District who used Fast ForWord® to Reading 1. *MAPS for Learning: Educator Reports*, 9(25), 1–5.

Scientific Learning Corporation. (2006). *Springfield students surpass their peers in early reading: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

Scientific Learning Corporation. (2005b). Improved reading skills by students in the Lancaster County School District who used Fast ForWord® to Reading 2. *MAPS for Learning: Educator Reports*, 9(8), 1–4.

Scientific Learning Corporation. (2005c). Improved reading skills by students in Seminole County School District who used Fast ForWord® to Reading 1 and 2. *MAPS for Learning: Educator Reports*, 9(17), 1–6.

**Additional source:**

Scientific Learning Corporation. (2005). *Seminole County School District, FL: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

Scientific Learning Corporation. (2006). Improved reading skills by students who used Fast ForWord® to Reading Prep. *MAPS for Learning: Product Reports*, 10(1), 1–6.

Scientific Learning Corporation. (2007). *Students in Western Australia improve language and literacy skills: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

#### Studies that meet WWC evidence standards with reservations

Overbay, A., & Baenen, N. (2003). *Fast ForWord® evaluation, 2002–03* (Eye on Evaluation, E&R Report No. 03.24). Raleigh, NC: Wake County Public School System.

Scientific Learning Corporation. (2008). Improved reading skills by students in the Perrysburg Exempted Village Schools who used Fast ForWord® products. *MAPS for Learning: Educator Reports*, 12(2), 1–6.

**Additional source:**

Scientific Learning Corporation. (2008). *Students in Perrysburg, Ohio, improve their reading fluency after using Fast ForWord products: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

#### Studies that do not meet WWC evidence standards

Carpenter, Z. A. (2005). *Effects of Fast ForWord on reading comprehension for elementary students* (Unpublished master's thesis). Eastern Washington University. The study does not meet WWC evidence standards because



the estimates of effects did not account for differences in pre-intervention characteristics while using a quasi-experimental design.

Fey, M. E., Finestack, L. H., Gajewski, B. J., Popescu, M., & Lewine, J. D. (2010). A preliminary evaluation of Fast ForWord-Language as an adjuvant treatment in language intervention. *Journal of Speech, Language, and Hearing Research, 53*(2), 430–449. The study does not meet WWC evidence standards because it is a randomized controlled trial in which the combination of overall and differential attrition rates exceeds WWC standards for this area, and the subsequent analytic intervention and comparison groups are not shown to be equivalent.

Scientific Learning Corporation. (n.d.). *Discovery Elementary students improve IRI and ISAT scores with Fast ForWord*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com/results/success-stories/case-studies/discovery-elementary-students-improve-iri-isat-scores-with-fast-forword.php> The study does not meet WWC evidence standards because the measures of effect cannot be attributed solely to the intervention—there was only one unit of analysis in one or both conditions.

Scientific Learning Corporation. (n.d.). *Fast ForWord success at Show Low primary school*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com/results/success-stories/case-studies/fast-forword-success-at-show-low-primary-school.php> The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

Scientific Learning Corporation. (2003). Improved reading skills by students in the Cobb County School District in Georgia who used Fast ForWord® products. *MAPS for Learning: Educator Reports, 8*(5): 1–4. The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

**Additional sources:**

Scientific Learning Corporation. (2004). Improved reading skills by students in the Cobb County School District in Georgia who used Fast ForWord® products. *MAPS for Learning: Educator Reports, 8*(5), 1–4.

Scientific Learning Corporation. (2006). *Cobb County School District improves reading skills at 10 times the expected rate: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

Scientific Learning Corporation. (2004). Improved cognitive and early reading by students in the Berlin School District who used Fast ForWord® products. *MAPS for Learning: Educator Reports, 8*(31), 1–5. The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

**Additional source:**

Scientific Learning Corporation. (2004). *Berlin School District, WI: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

Scientific Learning Corporation. (2004). Improved language and early reading skills by students who used Fast ForWord® to Reading 3. *MAPS for Learning: Educator Reports, 8*(3), 1–3. The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

Scientific Learning Corporation. (2004). Improved language skills by students at Mora School District who used Fast ForWord® Language. *MAPS for Learning: Educator Reports, 8*(19), 1–4. The study does not meet WWC evidence standards because the measures of effect cannot be attributed solely to the intervention—there was only one unit of analysis in one or both conditions.

**Additional source:**

Scientific Learning Corporation. (2006). *Students improve 26 percentiles more than comparison group: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

Scientific Learning Corporation. (2004). Improved language skills by students in the Brainerd School District who used Fast ForWord® products. *MAPS for Learning: Educator Reports, 8*(29), 1–5. The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

**Additional source:**

Scientific Learning Corporation. (2004). *Brainerd School District, Brainerd, MN: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

Scientific Learning Corporation. (2004). Improved reading achievement by students in the Pawhuska and Harlandale School Districts who used Fast ForWord® to Reading 3. *MAPS for Learning: Educator Reports*, 8(13), 1–3. The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

**Additional source:**

Scientific Learning Corporation. (2006). *Third-graders' scores improve 60% more than comparison group: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

Scientific Learning Corporation. (2005). Improved reading achievement by students in the School District of Philadelphia who used Fast ForWord® products during the 2004–2005 school year. *MAPS for Learning: Educator Reports*, 9(30), 1–8. The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

Scientific Learning Corporation. (2005). Improved reading skills by students in the School District of Philadelphia who used Fast ForWord® products. *MAPS for Learning: Educator Reports*, 9(31), 1–6. The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

Scientific Learning Corporation. (2006). Improved reading skills by students in School District 16 who used Fast ForWord® products. *MAPS for Learning: Educator Reports*, 10(32), 1–6. The study does not meet WWC evidence standards because the estimates of effects did not account for differences in pre-intervention characteristics while using a quasi-experimental design.

**Additional source:**

Scientific Learning Corporation. (2006). *Fast ForWord users in School District 16 outperform peers and improve from 45th to 81st percentile: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

Scientific Learning Corporation. (2007). Improved reading skills by students in the South Madison Community School Corporation who used Fast ForWord® products. *MAPS for Learning: Educator Reports*, 11(34), 1–7. The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

**Additional source:**

Scientific Learning Corporation. (2007). *Fast ForWord participants in Indiana made greater gains in reading than a comparison group: Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

Scientific Learning Corporation. (2010). Improved reading achievement by students in the Cleveland Heights–University Heights City School District who used Fast ForWord® products: 2009–2010. *MAPS for Learning: Educator Reports*, 14(5), 1–8. The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

**Additional source:**

Scientific Learning Corporation. (2010). *Fast ForWord participants improve 89% more than comparison group (Research Report 14(5)B): Educator's briefing*. Oakland, CA: Author. Retrieved from <http://www.scilearn.com>

Soboleski, P. K. (2011). *Fast ForWord: An investigation of the effectiveness of computer assisted reading intervention* (Unpublished doctoral dissertation). Bowling Green State University, OH. The study does not meet WWC evidence standards because the measures of effect cannot be attributed solely to the intervention—there was only one unit of analysis in one or both conditions.

### Studies that are ineligible for review using the Beginning Reading Evidence Review Protocol

Adesope, O. O., Lavin, T., Thompson, T., & Ungerleider, C. (2011). Pedagogical strategies for teaching literacy to ESL immigrant students: A meta-analysis. *British Journal of Educational Psychology*, 81(4), 629–653. The

study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Agnew, J. A., Dorn, C., & Eden, G. F. (2004). Effect of intensive training on auditory processing and reading skills. *Brain and Language, 88*(1), 21–25. The study is ineligible for review because it does not use a comparison group design or a single-case design.

Agocs, M. M., Burns, M. S., Ley, L. E., Miller, S. L., & Calhoun, B. M. (2006). Fast ForWord Language. In R. J. McCauley & M. E. Fey (Eds.), *Treatment of language disorders in children* (pp. 471–508). Baltimore, MD: Paul H. Brookes Publishing. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Al Otaiba, S., Puranik, C. S., Ziolkowski, R. A., & Montgomery, T. M. (2009). Effectiveness of early phonological awareness interventions for students with speech or language impairments. *The Journal of Special Education, 43*(2), 107–128. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Arendal, L., & Mann, V. (2000). *Fast ForWord Reading: Why it works*. Berkeley, CA: Scientific Learning Corporation. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Bailey, R. (2007). *Study offers help for dyslexic children*. Hanover, NH: Dartmouth College Office of Public Affairs. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Bailey, T. (2010). Auditory pathways and processes: Implications for neuropsychological assessment and diagnosis of children and adolescents. *Child Neuropsychology, 16*(6), 521–548. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Battin, R. R., Young, M., & Burns, M. (2000). Use of Fast ForWord® in remediation of central auditory processing disorders. *Audiology Today, 12*(2), 13–15. This study is ineligible for review because it does not include an outcome within a domain specified in the protocol.

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**Appendix A.1: Research details for Borman, Benson, & Overman, 2009**

Borman, G. D., Benson, J. G., & Overman, L. (2009). A randomized field trial of the Fast ForWord language computer-based training program. *Educational Evaluation and Policy Analysis, 31(1)*, 82–106.

**Table A1. Summary of findings**

**Meets WWC evidence standards without reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index (percentile points)	Statistically significant
Comprehension	118 students	–5	No

**Setting** The study took place in four urban schools in the Baltimore City Public School System.

**Study sample** Students were eligible for the study if they scored below national norms on the total reading outcome for the district-administered Comprehensive Test of Basic Skills, Fifth Edition (CTBS/5) during the spring of 2000. A total of 141 academically at-risk second-grade students (71 intervention and 70 comparison) took pretests (CTBS/5) in the spring of 2001. Random assignment was conducted separately within each school. The analysis sample of students with both pretest and posttest information included 62 intervention students and 56 comparison students.<sup>14</sup> The groups consisted primarily of African-American (92% of the intervention students and 94% of the comparison students) and economically disadvantaged students (75% of students in both groups received free lunch). There were slightly more male participants (52% of the intervention students and 56% of the comparison students) than female participants.

**Intervention group** In addition to their regular reading instruction, students who were randomly assigned to the intervention condition used the *Fast ForWord® Language* software program in school resource rooms. The resource rooms served as a targeted pullout program offered during the regular school day supplementing the regular classroom literacy instruction. Students received the program 100 minutes a day, 5 days a week, for at least 20 days between April and June 2001, under the supervision of a *Fast ForWord®*-trained teacher.

**Comparison group** In addition to their regular reading instruction, comparison group students received nonliteracy instruction or participated in special activities and classes, such as art and gym.

**Outcomes and measurement** The total reading portion of the CTBS/5 Terra Nova was used as both the pretest (Form B in April 2001) and an outcome measure (Form A in June 2001).<sup>15</sup> For a more detailed description of this outcome measure, see Appendix B.

**Support for implementation** Before the start of the program, Scientific Learning provided training sessions for teachers operating the *Fast ForWord®* programs at the schools.

**Appendix A.2: Research details for Scientific Learning Corporation, 2004**

Scientific Learning Corporation. (2004). Improved language skills by children with low reading performance who used Fast ForWord Language. *MAPS for Learning: Product Report*, 3(1), 1–13.

**Table A2. Summary of findings**

**Meets WWC evidence standards without reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index (percentile points)	Statistically significant
Alphabetics	426 students	+1	No
Comprehension	404 students	+21	Yes

**Setting** The study was conducted in nine school districts in the United States.

**Study sample** In this randomized study, teachers from nine school districts identified 585 students who performed in the bottom quartile of their language arts classes. These students were primarily from grades K–3; 145 students were excluded from the study prior to group assignment if they received special education services or did not complete the pre-evaluations. The remaining 440 students were randomly assigned,<sup>16</sup> within each grade and gender strata, to either the *Fast ForWord*<sup>®</sup> group or the comparison group on a fixed 1.74:1 ratio. The analysis sample included 266 students in the *Fast ForWord*<sup>®</sup> group and 160 students in the comparison group. However, the overall student attrition rate ranged from 8% to 15%, depending on the outcome. The overall and differential attrition rates of students met WWC standards for low attrition.

**Intervention group** Students in the intervention group played seven selected games from the *Fast ForWord*<sup>®</sup> *Language* program for one hour and 40 minutes a day, 5 days a week, for an average of about 30 school days. Most students stopped playing when the student reached a 90% performance level on five of the seven games.

**Comparison group** The comparison group received the standard instruction provided in the regular reading and language arts curriculum.

**Outcomes and measurement** For both the pretest and posttest, students took the Isolation and Deletion subtests of the Phonological Awareness Test (PAT), the Letter-Word Identification subtest of the Woodcock-Johnson (WJ) Psycho-Educational Battery,<sup>17</sup> and the Test of Auditory Comprehension of Language. For a more detailed description of these outcome measures, see Appendix B.

**Support for implementation** No details about training were provided.

**Appendix A.3: Research details for Scientific Learning Corporation, 2005a**

Scientific Learning Corporation. (2005a). Improved early reading skills by students in three districts who used Fast ForWord® to Reading 1. *MAPS for Learning: Product Reports, 9(1)*, 1–5.

**Table A3. Summary of findings**

**Meets WWC evidence standards without reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index (percentile points)	Statistically significant
Alphabets	197 students	+9	Yes

**Setting** The study was conducted in three schools located in different districts and states. One school was described as being located in a rural district and another in an urban district. The third school was located in the Springfield City School District, Ohio.

**Study sample** During the spring of the 2004–05 school year, 158 first-grade students and 50 second-grade students from three different schools participated in the study. At one school, students from both grades participated, whereas only first-grade students participated at the other two schools. Using random assignment within schools and grades, 103 low-achieving students were assigned to the *Fast ForWord*® group (78 first-grade students and 25 second-grade students), and 105 students served as a comparison group (80 first-grade students and 25 second-grade students). Four students (two intervention and two comparison) who were older than age 9 at one or both testing times were removed from the analysis sample because they were too old for the norms of the Test of Phonological Awareness (TOPA). Additionally, three intervention students and four comparison students moved during the study. Therefore, the analysis sample included 197 students: 75 first-grade students and 23 second-grade students in the intervention group, and 78 first-grade students and 21 second-grade students in the comparison group. Seven study participants (one intervention student and six comparison students) had used the *Fast ForWord*® *Basics* product before participating in the study. Results for a subsample of 93 students in the Springfield City School District were also reported in a separate manuscript (Scientific Learning Corporation, 2005d) and can be viewed in Appendix D.1.

**Intervention group** All students in the *Fast ForWord*® group used the *Fast ForWord*® to Reading 1 product, a computer-based product designed using first-grade curriculum standards. The *Fast ForWord*® to Reading 1 protocol called for students to use the product for 48 minutes a day, 5 days a week, for 8–12 weeks. Students were pulled out of class to use the program in a computer lab, where two paraprofessionals monitored the students but did not assist with the content except to give instructions.

**Comparison group** Students in the comparison group took part in the regular school curriculum.

**Outcomes and measurement** The Phonological Awareness and Letter-Sounds subtests of the Early Elementary version of the TOPA were used for both the pretest and posttest. For a more detailed description of these outcome measures, see Appendix B.

**Support for implementation**

Teachers and the paraprofessionals who were monitoring the computer labs were given background information on how phonemic awareness and the acoustic properties of speech can impact development of language and reading skills. They were also trained to implement the program, including approaches for using *Progress Tracker*, the program’s reporting system, to monitor student performance. Teachers were also trained to assess potential participants for the study and to assess student outcomes.

**Appendix A.4: Research details for Scientific Learning Corporation, 2005b**

Scientific Learning Corporation. (2005b). Improved reading skills by students in the Lancaster County School District who used Fast ForWord® to Reading 2. *MAPS for Learning: Educator Reports, 9(8), 1–4.*

**Table A4. Summary of findings**

**Meets WWC evidence standards without reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index (percentile points)	Statistically significant
Alphabetics	50 students	+12	Yes

**Setting**

The study took place in a K–5 elementary school in Lancaster, South Carolina.

**Study sample**

During the spring of the 2004–05 school year, 50 third-grade students participated in the study. The sample included one entire classroom of students along with randomly selected students from other third-grade classrooms. Twenty-five students were randomly assigned to the *Fast ForWord*® group, and 25 students were assigned to a comparison group. All study participants had used one or more of the *Fast ForWord*® products before participating in the study. However, none had previously used *Fast ForWord*® to Reading 2, the focus of this study. Approximately 63% of the students in the study school were Caucasian and 35% were African American. Nearly 36% of students received free or reduced-price lunch.

**Intervention group**

All students in the *Fast ForWord*® group used the computer-based *Fast ForWord*® to Reading 2 product. The *Fast ForWord*® to Reading 2 protocol called for students to use the product for 48–90 minutes a day, 5 days a week, for 4–12 weeks. Students missed the social studies and science portions of the school curriculum during participation in the intervention.

**Comparison group**

Comparison group students used the social studies and science portions of the school curriculum while the intervention was being used with intervention group students. All students were using SRA/McGraw-Hill’s Open Court Reading for their whole group reading instruction as part of their regular school curriculum.

**Outcomes and measurement**

The Sight Word Efficiency and Phonemic Decoding Efficiency subtests of the Test of Word Reading Efficiency (TOWRE) were used as both the pretest and the posttest. For a more detailed description of these outcome measures, see Appendix B.



**Support for implementation**

The intervention teachers were given background information on how phonemic awareness and the acoustic properties of speech can impact development of language and reading skills. They were then trained to implement the program, including approaches for using *Progress Tracker*, the program’s reporting system, to monitor student performance. Teachers were also trained to assess potential participants for the study and to assess student outcomes.

**Appendix A.5: Research details for Scientific Learning Corporation, 2005c**

Scientific Learning Corporation. (2005c). Improved reading skills by students in Seminole County School District who used *Fast ForWord® to Reading 1 and 2*. *MAPS for Learning: Educator Reports*, 9(17), 1–6.

**Table A5. Summary of findings**

**Meets WWC evidence standards without reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index (percentile points)	Statistically significant
Comprehension	38 students	+19	Yes

**Setting**

The study was conducted in an urban pre-K to fifth grade elementary school in Fern Park, Florida.

**Study sample**

During the spring of the 2004–05 school year, 15 second-grade students and 23 third-grade students participated in the study. Using random assignment stratified by grade, academic skill level, and previous *Fast ForWord®* use, 20 students were assigned to the *Fast ForWord®* group and 20 students to a comparison group. Two students assigned to the comparison group later dropped out of the study, so the analysis was conducted with a sample of 18 students in the comparison group. Sixteen study participants had used one or more of the *Fast ForWord®* products before participating in the study; however, none had previously used *Fast ForWord® to Reading 1 or 2*, the focus of this study. At the study school, approximately 56% of the students were Caucasian, 22% were Hispanic, and 21% were African American. Nearly two-thirds of students in the study were receiving free or reduced-price lunch, compared with 57% of students at the school.

**Intervention group**

All students in the *Fast ForWord®* group used the *Fast ForWord® to Reading 1 or 2* products. The *Fast ForWord® to Reading 1 and 2* protocols called for students to use the product for 48 minutes a day, 5 days a week, for 4–8 weeks. Students were pulled out of class to use the program in a computer lab, where a certified teacher and a paraprofessional oriented the students to the product and made sure they understood the tasks. Once the students started the product, no assistance was given.

**Comparison group**

Students in the comparison group took part in the regular school curriculum.

### Outcomes and measurement

The Degrees of Reading Power (DRP) test was used as both the pretest and the posttest. For a more detailed description of this outcome measure, see Appendix B.

### Support for implementation

The intervention teachers were given background information on how phonemic awareness and the acoustic properties of speech can impact development of language and reading skills. They were then trained to implement the program, including approaches for using *Progress Tracker*, the program's reporting system, to monitor student performance. Teachers were also trained to assess potential participants for the study and assess student outcomes.

## Appendix A.6: Research details for Scientific Learning Corporation, 2006

Scientific Learning Corporation. (2006). *Improved reading skills by students who used Fast ForWord® to Reading Prep. MAPS for Learning: Product Reports, 10(1), 1–6.*

**Table A6. Summary of findings**

**Meets WWC evidence standards without reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index (percentile points)	Statistically significant
Alphabetics	48 students	+2	No

### Setting

The study took place in a suburban elementary school.

### Study sample

During the fall of the 2005–06 school year, 48 low-performing kindergarten students participated in the study. Using random assignment, 25 students were assigned to the *Fast ForWord®* group and 23 students to a comparison group. A total of seven students in the study were receiving other services: four in the intervention group (one for speech, two for special education, and one was an English language learner) and three in the comparison group (two for speech and one for special education).

### Intervention group

All students in the *Fast ForWord®* group used the *Fast ForWord® to Reading Prep* product. The *Fast ForWord® to Reading Prep* protocol called for students to use the product for 30 minutes a day, 5 days a week, for 12–16 weeks. Intervention group students were pulled out of their classroom at the beginning of the day to receive the instruction in the intervention.

### Comparison group

Students in the comparison group took part in the regular school curriculum, which included oral language and group activities.

### Outcomes and measurement

The Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Initial Sound Fluency and Letter Naming Fluency subtests and the Woodcock-Johnson (WJ) Letter-Word Identification subtest were administered as pretests in mid-September and as posttests in mid-December. The Test of Phonological Awareness (TOPA) and Reading Edge (Initial Sound Discrimination, Initial Sound Knowledge, and Non-Word Recognition subtests) were also administered as posttests in mid-December. Findings on the TOPA and Reading Edge tests were not included in the original study but were provided directly to the WWC by the study authors. For a more detailed description of these outcome measures, see Appendix B.

**Support for implementation**

The intervention teachers were given background information on how phonemic awareness and the acoustic properties of speech can impact development of language and reading skills. They were then trained to implement the program, including approaches for using *Progress Tracker*, the program’s reporting system, to monitor student performance. Teachers were also trained to assess potential participants for the study and to assess student outcomes.

**Appendix A.7: Research details for Scientific Learning Corporation, 2007**

Scientific Learning Corporation. (2007). *Students in Western Australia improve language and literacy skills: Educator’s briefing*. Retrieved from <http://www.scilearn.com>

**Table A7. Summary of findings**

**Meets WWC evidence standards without reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index (percentile points)	Statistically significant
Alphabetics	63 students	+5	No

**Setting**

The study was conducted in four public primary schools in the Perth metropolitan area of Western Australia.

**Study sample**

This randomized study included 63 early elementary school students, who were identified by their teachers as having difficulties with language, literacy, auditory processing, attention, or behavior. The students ranged in age from 5–8.<sup>18</sup> Thirty-two students were randomly assigned to the *Fast ForWord*® group, and 31 were assigned to the comparison group.

**Intervention group**

Students in the *Fast ForWord*® group used the *Fast ForWord*® *Language*, *Fast ForWord*® *Middle & High School*, and *Fast ForWord*® *Language to Reading* products. The study protocol called for students to use the products for approximately 50 minutes per day, 5 days per week, over a period of 6–10 weeks between either February and April or May and July of 2006.

**Comparison group**

Students in the comparison group received their regular language arts instruction.

**Outcomes and measurement**

For both the pretest and posttest, student outcomes were assessed with Queensland University Inventory of Literacy (QUIL).<sup>19</sup> A composite score was calculated from three subtests: Non-word Spelling, Phoneme Segmentation, and Phoneme Manipulation. For a more detailed description of this outcome measure, see Appendix B.

**Support for implementation**

Teachers were provided information on product research findings, program implementation, and progress monitoring.

**Appendix A.8: Research details for Overbay and Baenen, 2003**

Overbay, A., and Baenen, N. (2003). *Fast ForWord® Evaluation, 2002–03* (Eye on Evaluation, E&R Report No. 03.24). Raleigh, NC: Wake County Public School System.

**Table A8. Summary of findings**

**Meets WWC evidence standards with reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index (percentile points)	Statistically significant
Comprehension	142 students	-12	No

**Setting** The study was conducted at public schools in Wake County, North Carolina.

**Study sample** During the 2002–03 school year, 80 third-grade students received the *Fast ForWord®* program.<sup>20</sup> Of these, 71 were matched with students from non-*Fast ForWord®* schools based on race, limited English proficiency status, a special programs code, free and reduced-price lunch status, and reading pretest scores. Nine students were missing either pre- or posttest scores. *Fast ForWord®* was used in six elementary schools, and the comparison students were taken from schools that did not use *Fast ForWord®*.

**Intervention group** For the entire range of grades and intervention group students in the study, 91% used *Fast ForWord® Language*, 56% used *Fast ForWord® Language to Reading*, and 13% used *Fast ForWord® to Reading*.

**Comparison group** No information is provided.

**Outcomes and measurement** North Carolina’s End of Grade test was used as both the pretest and the posttest. For a more detailed description of this outcome measure, see Appendix B.

**Support for implementation** No information is provided.

**Appendix A.9: Research details for Scientific Learning Corporation, 2008**

Scientific Learning Corporation. (2008). *Students in Perrysburg, Ohio, improve their reading fluency after using Fast ForWord products: Educator’s briefing*. Retrieved from <http://www.scilearn.com>

**Table A9. Summary of findings**

**Meets WWC evidence standards with reservations**

Outcome domain	Sample size	Study findings	
		Average improvement index (percentile points)	Statistically significant
Reading fluency	308 students	+7	No

**Setting** The study was conducted in the four Perrysburg Exempted Village Schools, located in northern Ohio. The schools belong to one of the highest achieving districts in the state of Ohio.

<b>Study sample</b>	The study was conducted during the fall of the 2006–07 school year with second-grade students from four elementary schools. Students from two schools were assigned to the intervention group, and students from the other two schools were assigned to the comparison group. The analysis sample consisted of 127 students who received <i>Fast ForWord</i> ® products and 181 students in the comparison group. The WWC verified that the groups were equivalent at baseline for the analysis sample and subsample of high performing students. Findings for the analysis sample can be found in Appendix C.2. Additional findings reflecting high-performing students' outcomes can be found in Appendix D.2. <sup>21</sup>
<b>Intervention group</b>	Students in the intervention group used the <i>Fast ForWord</i> ® <i>Language Basics</i> , <i>Fast ForWord</i> ® <i>Language</i> , <i>Fast ForWord</i> ® <i>Language to Reading</i> , <i>Fast ForWord</i> ® <i>to Reading 1</i> , and <i>Fast ForWord</i> ® <i>to Reading 2</i> products for 30 to 50 minutes per day for an average of 57 days over a 4-month period.
<b>Comparison group</b>	Students in the comparison group participated in their schools' regular reading curriculum.
<b>Outcomes and measurement</b>	For both the pretest and posttest, students took the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Oral Reading Fluency subtest. <sup>22</sup> For a more detailed description of this outcome measure, see Appendix B.
<b>Support for implementation</b>	Teachers were provided information about how phonemic awareness and speech sounds impact language development and reading skills. Teachers were also trained in methods for assessment of potential candidates for participation, the selection of appropriate measures for testing and evaluation, evaluation methods, and effective implementation techniques.

Appendix B: Outcome measures for each domain

Alphabetics	
<b>Phonological awareness construct</b>	
<i>Dynamic Indicators of Basic Early Literacy Skills (DIBELS): Initial Sound Fluency subtest</i>	This standardized test measures a student’s ability to identify the initial sound in an orally presented word. The student is presented with four pictures and is asked to identify the picture that starts with the same sound presented orally by the examiner (as cited in Scientific Learning Corporation, 2006).
<i>PAT: Deletion subtest</i>	The PAT Deletion subtest measures a student’s ability to remove specific sound parts (syllables or phonemes) from words (e.g., “Say chair. Now say it again, but don’t say /ch/.”) (as cited in Scientific Learning Corporation, 2004).
<i>Phonological Awareness Test (PAT): Isolation subtest</i>	The PAT Isolation subtest measures a student’s ability to identify individual phonemes through a task that involves isolating phonemes located at the beginning, end, and middle of words (as cited in Scientific Learning Corporation, 2004).
<i>Queensland University Inventory of Literacy (QUIL)</i>	This standardized test assesses the phonological skills of school-age students (as cited in Scientific Learning Corporation, 2007). The composite score is determined from subtests including Phoneme Manipulation, Phoneme Segmentation, Nonword Spelling, and Spoonerisms.
<i>Reading Edge: Initial Sound Discrimination subtest</i>	This subtest of the Reading Edge test is a software-based assessment in a game format called “Jules Rampart Cooks with Gusto.” It measures students’ skills in segmenting words into phonemes or sound units and recognizing and discriminating individual phonemes in common spoken words (as cited in Scientific Learning Corporation, 2006). <sup>23</sup>
<i>Test of Phonological Awareness (TOPA): Phonological Awareness subtest</i>	The TOPA is a standardized, group-administered test designed to measure students’ skill in identifying individual phonemes. The 10 ending sound-same items require students to identify which of three words ends with the same sound as a target word, and the 10 ending sound-different items ask students to mark which of a group of four words ends in a different sound from the others (as cited in Scientific Learning Corporation, 2005a).
<b>Letter knowledge construct</b>	
<i>DIBELS: Letter Naming Fluency subtest</i>	This is a subtest of a standardized measure in which students are presented with a page of upper- and lower-case letters arranged in a random order and are asked to name as many letters as they can. The score is the number of letters named correctly in one minute (as cited in Scientific Learning Corporation, 2006).
<b>Phonics construct</b>	
<i>Reading Edge: Initial Sound Knowledge subtest</i>	This subtest of the Reading Edge test is a software-based assessment in a game format called “Squid Sisters.” The Initial Sounds Knowledge subtest measures students’ skill in identifying the letter on the computer that corresponds to an orally presented sound (as cited in Scientific Learning Corporation, 2006).
<i>Reading Edge: Non-Word Recognition subtest</i>	This subtest of the Reading Edge test is a software-based assessment, which is also based on “Squid Sisters.” The Non-Word Recognition subtest measures students’ skill in decoding nonwords by asking them to choose a correct word from a group of other nonsense words. The words start with one syllable and increase in difficulty (as cited in Scientific Learning Corporation, 2006).
<i>Test of Word Reading Efficiency (TOWRE): Phonemic Decoding Efficiency subtest</i>	The TOWRE is a standardized, nationally normed measure. The Phonetic Decoding Efficiency subtest measures the number of pronounceable printed nonwords that can be accurately decoded within 45 seconds (as cited in Scientific Learning Corporation, 2005b).
<i>TOPA: Letter Sounds subtest</i>	The TOPA is a standardized, group-administered test designed to measure students’ skill in identifying the sounds of individual letters. The Letter Sounds subtest requires students to spell simple pseudo-words that are given as the names of “funny animals.” The words vary from two to five phonemes in length, and they are all single syllable. The student’s score is the total number of words spelled correctly (as cited in Scientific Learning Corporation, 2005a).
<i>TOWRE: Sight Word Efficiency subtest</i>	The TOWRE is a standardized, nationally normed measure. The Sight Word Efficiency subtest assesses the number of real printed words that can be accurately identified within 45 seconds (as cited in Scientific Learning Corporation, 2005b).
<i>Woodcock-Johnson (WJ): Letter-Word Identification subtest</i>	The WJ Letter-Word Identification subtest measures a student’s skill in identifying individual letters and words (as cited in Scientific Learning Corporation, 2006).

*WJ Psycho-Educational Battery–Revised: Letter-Word Identification subtest* The Letter-Word Identification subtest measures the students' reading identification skills, through a task that involves matching a rebus with an actual picture of the object, as well as identifying isolated letters and words that appear in the test book (as cited in Scientific Learning Corporation, 2004).

### Phonological awareness and phonics construct

*TOPA* The TOPA measures students' ability to identify individual phonemes in spoken words and understand the relationships between letters and phonemes in English (as cited in Scientific Learning Corporation, 2006).

### Reading fluency

*DIBELS: Oral Reading Fluency subtest* This is a subtest of a standardized measure of reading accuracy and fluency. Students read a passage for one minute. The score is the number of words that the student reads correctly in one minute (as cited in Scientific Learning Corporation, 2008).

### Comprehension

*Comprehensive Test of Basic Skills, Fifth Edition (CTBS/5) Terra Nova: Total Reading subtest* This is a group-administered, standardized assessment of reading comprehension (as cited in Borman, Benson, and Overman, 2009).

*Degrees of Reading Power (DRP)* This is an untimed, standardized test requiring students to read a nonfiction passage with a word or set of words missing. Students select an appropriate answer to complete the sentence from a set of four or five alternatives (as cited in Scientific Learning Corporation, 2005c).

*North Carolina End of Grade Test* This is a standardized state assessment designed to match the North Carolina curriculum. It uses multiple-choice questions with reading passages and is designed to measure comprehension skills. Students read eight reading selections of varying genres and answer three to nine comprehension questions for each (as cited in Overbay and Baenen, 2003).

*Test of Auditory Comprehension of Language–Revised (TACL-R)* This diagnostic test examines a student's understanding of spoken language and consists of the following three subtests: Grammatical Morphemes, Elaborated Sentences, and Word Classes and Relations. The test measures receptive vocabulary, grammar, sentence structure, word classes (e.g., noun, verb, modifiers, etc.), and word ordering (as cited in Scientific Learning Corporation, 2004).

Appendix C.1: Findings included in the rating for the alphabetics domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			p-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
<b>Scientific Learning Corporation, 2004<sup>a</sup></b>								
<i>PAT: Isolation subtest</i>	Grades K–3	376 students	93.6 (18.2)	91.3 (17.5)	2.3	0.13	+5	0.03
<i>PAT: Deletion subtest</i>	Grades K–3	377 students	89.8 (16.2)	89.9 (17.1)	–0.1	–0.01	0	> 0.05
<i>WJ-R: Letter-Word Identification subtest.</i>	Grades K–3	426 students	88.3 (17.3)	89.5 (17.9)	–1.2	–0.07	–3	> 0.05
<b>Domain average for alphabetics (Scientific Learning Corporation, 2004)</b>						<b>0.02</b>	<b>+1</b>	<b>Not statistically significant</b>
<b>Scientific Learning Corporation, 2005a<sup>b</sup></b>								
<i>TOPA: Phonological Awareness subtest</i>	Grades 1 and 2	197 students	53.7 (25.0)	46.8 (25.7)	6.9	0.27	+11	< 0.05
<i>TOPA: Letter Sounds subtest</i>	Grades 1 and 2	197 students	42.7 (18.4)	38.9 (19.3)	3.8	0.20	+8	< 0.05
<b>Domain average for alphabetics (Scientific Learning Corporation, 2005a)</b>						<b>0.24</b>	<b>+9</b>	<b>Statistically significant</b>
<b>Scientific Learning Corporation, 2005b<sup>c</sup></b>								
<i>TOWRE: Phonemic Decoding Efficiency subtest</i>	Grade 3	50 students	107.9 (15.1)	103.1 (12.3)	4.7	0.34	+13	> 0.05
<i>TOWRE: Sight Word Efficiency subtest</i>	Grade 3	50 students	99.9 (16.1)	96.3 (10.4)	3.6	0.26	+10	> 0.05
<b>Domain average for alphabetics (Scientific Learning Corporation, 2005b)</b>						<b>0.30</b>	<b>+12</b>	<b>Statistically significant</b>
<b>Scientific Learning Corporation, 2006<sup>d</sup></b>								
<i>DIBELS: Initial Sound Fluency subtest</i>	Kindergarten	47 students	14.6 (8.5)	19.8 (9.8)	–5.2	–0.57	–21	> 0.05
<i>Reading Edge: Initial Sound Discrimination subtest</i>	Kindergarten	43 students	29.4 (17.6)	23.4 (13.2)	6.0	0.38	+15	> 0.05
<i>DIBELS: Letter Naming Fluency subtest</i>	Kindergarten	47 students	26.1 (11.5)	28.0 (11.0)	–1.8	–0.16	–6	> 0.05
<i>Reading Edge: Initial Sound Knowledge subtest</i>	Kindergarten	43 students	61.5 (44.1)	58.8 (42.2)	2.7	0.06	+2	> 0.05
<i>Reading Edge: Non-Word Recognition subtest</i>	Kindergarten	41 students	15.4 (15.5)	12.5 (14.5)	2.9	0.19	+8	> 0.05
<i>WJ: Letter Word Identification subtest</i>	Kindergarten	48 students	109.6 (9.9)	105.1 (7.4)	4.5	0.50	+19	0.06
<i>TOPA</i>	Kindergarten	47 students	106.0 (11.7)	105.0 (11.7)	1.0	0.08	+3	> 0.05
<b>Domain average for alphabetics (Scientific Learning Corporation, 2006)</b>						<b>0.07</b>	<b>+3</b>	<b>Not statistically significant</b>



Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			p-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
<b>Scientific Learning Corporation, 2007<sup>a</sup></b>								
<i>Queensland University Inventory of Literacy (QUIL)</i>	5- to 8-year-olds	63 students	8.6 (2.7)	8.2 (2.9)	0.4	0.13	+5	> 0.05
<b>Domain average for alphabetics (Scientific Learning Corporation, 2007)</b>						<b>0.13</b>	<b>+5</b>	<b>Not statistically significant</b>
<b>Domain average for alphabetics across all studies</b>						<b>0.15</b>	<b>+6</b>	<b>na</b>

**Table Notes:** For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the average change expected for all students who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average student’s percentile rank that can be expected if the student is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of each study’s domain average was determined by the WWC. na = not applicable. PAT= Phonological Awareness Test. TOPA = Test of Phonological Awareness. DIBELS = Dynamic Indicators of Basic Early Literacy Skills. WJ = Woodcock-Johnson. TOWRE = Test of Word Reading Efficiency.

<sup>a</sup> For Scientific Learning Corporation (2004), a correction for multiple comparisons was needed and resulted in a WWC-computed critical p-value of 0.017 for the PAT Isolation subtest; therefore, the WWC does not find the result to be statistically significant. The p-values for the PAT subtests presented here were reported in the original study. The p-value for the Letter-Word Identification subtest was computed by the WWC. Group mean outcome values are regression adjusted to control for differences in pretest scores, using data requested by the WWC and provided by the study authors. Pretest standard deviations were used for effect size calculations. This study is characterized as having an indeterminate effect because the mean effect is neither statistically significant nor substantively important according to WWC criteria (i.e., an effect size greater than 0.25).

<sup>b</sup> For Scientific Learning Corporation (2005a), a correction for multiple comparisons was needed, but did not affect whether any of the contrasts were found to be statistically significant. The p-values presented here were provided by the study authors. The study authors reported joint significance for the two TOPA subtests; subsequent author calculations reported directly to the WWC showed individual significance, which was verified by the WWC after correcting for multiple comparisons. Standard deviations presented for these measures were requested by the WWC for the purpose of effect size calculation and were received from the study authors. The means and mean difference are regression adjusted to control for differences in pretest scores, using data requested by the WWC and provided by the study authors. This study is characterized as having a statistically significant positive effect because the effect for at least one measure within the domain is positive and statistically significant and no effects are negative and statistically significant, accounting for multiple comparisons. For more information, please refer to the WWC Standards and Procedures Handbook, version 2.1, p. 96.

<sup>c</sup> For Scientific Learning Corporation (2005b), no corrections for clustering or multiple comparisons were needed. The p-values presented here were provided by the study authors. The study authors reported joint significance for the two TOWRE subtests; however, subsequent author calculations reported directly to the WWC showed that the individual subtests were not statistically significant, so no corrections for multiple comparisons were made. This study is characterized as having a statistically significant positive effect because the mean effect size for two measures is positive and statistically significant.

<sup>d</sup> For Scientific Learning Corporation (2006), a correction for multiple comparisons was needed, but did not affect whether any of the contrasts were found to be statistically significant. The p-value for the WJ Letter-Word Identification subtest was reported in the original article. The p-values for other outcome measures presented here were computed by the WWC. Findings on the TOPA and Reading Edge tests were not included in the original study but were provided directly to the WWC by the study authors. The WWC calculated the *Fast ForWord*<sup>®</sup> group means for two DIBELS subtests and WJ Letter-Word Identification subtest using a difference-in-differences approach (see the WWC Procedures and Standards Handbook, Version 2.1) and additional data provided by the study authors. The program means were calculated by adding the impact of the program (i.e., difference in mean gains between the intervention and comparison groups) to the unadjusted comparison group posttest means. The *Fast ForWord*<sup>®</sup> and comparison group mean outcome values for Reading Edge subtests are the unadjusted posttest means. This study is characterized as having an indeterminate effect because the mean effect is neither statistically significant nor substantively important according to WWC criteria.

<sup>e</sup> For Scientific Learning Corporation (2007), p-values and significance levels for the adjusted mean difference between the *Fast ForWord*<sup>®</sup> group and comparison group were not reported by the study authors and were calculated by the WWC. This study is characterized as having an indeterminate effect because the effect is neither statistically significant nor substantively important according to WWC criteria.

Appendix C.2: Findings included in the rating for the reading fluency domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			p-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
<b>Scientific Learning Corporation, 2008<sup>a</sup></b>								
<i>DIBELS: Oral Reading Fluency subtest</i>	Grade 2	4 schools/ 308 students	101.4 (36.0)	94.8 (38.0)	6.7	0.18	+7	> 0.05
<b>Domain average for reading fluency (Scientific Learning Corporation, 2008)</b>						<b>0.18</b>	<b>+7</b>	<b>Not statistically significant</b>

**Table Notes:** For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the average change expected for all students who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average student’s percentile rank that can be expected if the student is given the intervention. The statistical significance of each study’s domain average was determined by the WWC. DIBELS = Dynamic Indicators of Basic Early Literacy Skills.

<sup>a</sup> For Scientific Learning Corporation (2008), a correction for clustering was needed. The p-value was not reported in the original study and was computed by the WWC. The *Fast ForWord*® and comparison group mean outcome values for this measure are the regression adjusted means to control for differences in pretest scores (ANCOVA) provided by the study authors to the WWC. These were reported to the WWC by the study authors in a separate appendix attached to the original study. This study is characterized as having an indeterminate effect because the effect is neither statistically significant nor substantively important according to WWC criteria (i.e., an effect size greater than 0.25).

Appendix C.3: Findings included in the rating for the comprehension domain

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			p-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
<b>Borman, Benson, and Overman, 2009<sup>a</sup></b>								
<i>CTBS Terra Nova: Total Reading subtest</i>	Grade 2	118 students	nr	nr	nr	-0.12	-5	> 0.05
<b>Domain average for comprehension (Borman, Benson, and Overman, 2009)</b>						<b>-0.12</b>	<b>-5</b>	<b>Not statistically significant</b>
<b>Scientific Learning Corporation, 2004<sup>b</sup></b>								
<i>Test of Auditory Comprehension of Language-Revised (TACL-R)</i>	Grades K-3	404 students	47.0 (7.9)	42.5 (8.2)	4.5	0.56	+21	< 0.0001
<b>Domain average for comprehension (Scientific Learning Corporation, 2004)</b>						<b>0.56</b>	<b>+21</b>	<b>Statistically significant</b>
<b>Scientific Learning Corporation, 2005<sup>c</sup></b>								
<i>Degrees of Reading Power</i>	Grades 2 and 3	38 students	41.9 (15.8)	33.2 (18.8)	8.8	0.50	+19	< 0.05
<b>Domain average for comprehension (Scientific Learning Corporation, 2005c)</b>						<b>0.50</b>	<b>+19</b>	<b>Statistically significant</b>
<b>Overbay and Baenen, 2003<sup>d</sup></b>								
<i>North Carolina End-of-Grade Test</i>	Grade 3	142 students	243.2 (nr)	245.9 (nr)	-2.8	-0.32	-12	0.06

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			p-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
Domain average for comprehension (Overbay and Baenen, 2003)						-0.32	-12	Not statistically significant
Domain average for comprehension across all studies						0.16	+6	na

**Table Notes:** For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the average change expected for all students who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average student’s percentile rank that can be expected if the student is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of each study’s domain average was determined by the WWC. na = not applicable. nr = not reported. CTBS = Comprehensive Test of Basic Skills.

<sup>a</sup> For Borman et al. (2009), no corrections for clustering or multiple comparisons were needed. The effect size and p-value presented here were reported in the original study. The effect size is a treatment coefficient from an ordinary least squares regression analysis (model 2, p. 112). This study is characterized as having an indeterminate effect because the effect is neither statistically significant nor substantively important according to WWC criteria (i.e., an effect size greater than 0.25).

<sup>b</sup> For Scientific Learning Corporation (2004), no corrections for clustering or multiple comparisons were needed. The p-value presented here was reported in the original study. The group means are regression adjusted to control for differences in pretest scores, using data provided to the WWC by the study author. Pretest standard deviations were used for effect size calculations. The study is characterized as having a statistically significant positive effect because univariate statistical tests are reported for each outcome measure, the effect for at least one measure within the domain is positive and statistically significant, and no effects are negative and statistically significant.

<sup>c</sup> For Scientific Learning Corporation (2005c), no corrections for clustering or multiple comparisons were needed. The p-value presented here was reported in the original study. Standard deviations presented for this measure were requested by the WWC for the purpose of effect size calculation and were received from the study author. The means and mean difference are regression adjusted to control for differences in pretest scores, using data provided to the WWC by the study author. The study authors listed the effect as statistically significant. The WWC attempted to verify that result but could not. The study is characterized as having a statistically significant positive effect because univariate statistical tests are reported for each outcome measure, the effect for at least one measure within the domain is positive and statistically significant, and no effects are negative and statistically significant.

<sup>d</sup> For Overbay and Baenen (2003), no corrections for clustering or multiple comparisons were needed. The p-value presented here was reported in the original study. The group mean values reported in the table are unadjusted posttest means. The study is characterized as having a substantively important negative effect because the single effect is not statistically significant and less than -0.25. For more information, please refer to the WWC Standards and Procedures Handbook, version 2.1, p. 97.

**Appendix D.1: Description of subgroup findings for the alphabetics domain**

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			p-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
<b>Scientific Learning Corporation, 2005d<sup>a</sup></b>								
<i>TOPA: Letter Sounds subtest</i>	Springfield, OH: Grades 1 and 2	93 students	42.9 (16.4)	36.7 (18.3)	6.2	0.36	+14	< 0.05
<i>TOPA: Phonological Awareness subtest</i>	Springfield, OH: Grades 1 and 2	93 students	55.7 (24.6)	47.1 (25.8)	8.6	0.34	+13	< 0.05

**Table Notes:** The supplemental findings presented in this table are additional findings from the study in this report that do not factor in the determination of the intervention rating. Total group scores across the three districts were used for rating purposes and are presented in Appendix C.1 (Scientific Learning Corporation, 2005a). For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the average change expected for all students who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average student’s percentile rank that can be expected if the student is given the intervention. TOPA = Test of Phonological Awareness.

<sup>a</sup> For Scientific Learning Corporation (2005d), a correction for multiple comparisons was needed but did not affect whether any of the contrasts were found to be statistically significant. The p-values presented here were reported directly to the WWC by the study authors and reflect joint significance for the two TOPA subtests. The group means are regression adjusted to control for differences in pretest scores, using data requested by the WWC and provided by the study authors.

**Appendix D.2: Description of subgroup findings for the reading fluency domain**

Outcome measure	Study sample	Sample size	Mean (standard deviation)		WWC calculations			p-value
			Intervention group	Comparison group	Mean difference	Effect size	Improvement index	
<b>Scientific Learning Corporation, 2008<sup>a</sup></b>								
<i>DIBELS: Oral Reading Fluency subtest</i>	Grade 2/ high performing students	4 schools/ 83 students	147.1 (20.3)	138.2 (23.5)	8.9	0.40	+16	> 0.05

**Table Notes:** The supplemental findings for high-performing students presented in this table are additional findings from the study in this report that do not factor in the determination of the intervention rating. For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the average change expected for all students who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average student’s percentile rank that can be expected if the student is given the intervention. DIBELS = Dynamic Indicators of Basic Early Literacy Skills.

<sup>a</sup> For Scientific Learning Corporation (2008), a correction for clustering was needed. The p-value was not reported in the original study and was computed by the WWC. *Fast ForWord*® group mean outcome values are the unadjusted comparison group posttest means plus the difference in mean gains between the intervention and comparison groups. Comparison group means are unadjusted.

### Endnotes

<sup>1</sup> The descriptive information for this program was obtained from a publicly available source: the program's website (<http://www.SciLearn.com>, downloaded June 2011). The WWC requests developers review the program description sections for accuracy from their perspective. The program description was provided to the developer in June 2011; however, the WWC received no response. Further verification of the accuracy of the descriptive information for this program is beyond the scope of this review. The literature search reflects documents publicly available by December 2012.

<sup>2</sup> The *Fast ForWord® Language* series, designed for elementary school students, includes three products: (a) *Fast ForWord® Language Basics*, which focuses on sound sequencing, fine motor skills, hand-eye coordination, pattern recognition, and color-shape recognition; (b) *Fast ForWord® Language*, which focuses on listening accuracy, phonological awareness, and language structures; and (c) *Fast ForWord® Language to Reading*, which focuses on the link between spoken and written language.

<sup>3</sup> The *Fast ForWord® Literacy* series, designed for secondary school students and adults, includes two products: (a) *Fast ForWord® Literacy*, which focuses on listening accuracy, phonological awareness, and language structures; and (b) *Fast ForWord® Literacy Advanced*, which focuses on processing efficiency, memory, concentration, comprehension, and sequencing. Students in at least two of the studies included in this review used *Fast ForWord® Middle & High School*, which was discontinued and replaced by the *Fast ForWord® Literacy* series.

<sup>4</sup> The *Fast ForWord® Reading* series, designed for students at all reading levels, includes six products. *Fast ForWord® Reading Prep* focuses on letter recognition, phonological awareness, and letter-sound associations. *Fast ForWord® Reading Levels 1, 2, 3, 4, and 5* focus on a variety of skills, depending on the level. For example, Level 1 focuses on early reading skills such as phonemic awareness, early decoding skills, vocabulary knowledge, and motivation for reading, and Level 5 focuses on skills suitable for more advanced readers in upper elementary, middle, or high school, such as reading comprehension and vocabulary skills.

<sup>5</sup> The previous report was released in July 2007. This report has been updated to include reviews of 228 studies that have been reviewed since 2007. Of the additional studies, 226 were not within the scope of the Beginning Reading review protocol or were within the scope of the Beginning Reading review protocol but did not meet evidence standards. Two new studies meet WWC evidence standards: Scientific Learning Corporation (2007, 2008). The report also confirms prior ratings of the seven studies that meet standards (with or without reservations) in the initial report. A complete list and disposition of all studies reviewed is provided in the references. The studies in this report were reviewed using WWC Evidence Standards, version 2.1, as described in the Beginning Reading review protocol, version 2.1. The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.

<sup>6</sup> For criteria used in the determination of the rating of effectiveness and extent of evidence, see the WWC Rating Criteria on p. 63 of this report. These improvement index numbers show the average and range of student-level improvement indices for all findings across the studies.

<sup>7</sup> The developer provided cost information for July 2007. The WWC converted costs to 2013 dollars using the consumer price index.

<sup>8</sup> The study also included 201 seventh-grade students in elementary/middle and middle schools (Borman, Benson, and Overman, 2009), but these students do not fall within the scope of the WWC's Beginning Reading review protocol.

<sup>9</sup> The authors reported joint significance for the two subtests, which were analyzed together using a MANOVA procedure (Scientific Learning Corporation, 2005b).

<sup>10</sup> For Scientific Learning Corporation (2006), the statistical significance of the Woodcock-Johnson finding had a  $p$ -value = 0.06, which does not meet the WWC criterion for a statistically significant finding. The study authors did not report on the statistical significance of the DIBELS findings.

<sup>11</sup> Indeterminate effects are defined as effects that are not statistically significant and with effect sizes smaller than 0.25 and larger than -0.25.

<sup>12</sup> Scientific Learning Corporation (2004; 2005a) reports school districts instead of schools. The WWC conservatively assumes one participating school per district.

<sup>13</sup> Borman and Benson (2006) received a rating that differed from the main citation rating (meets WWC standards with reservations) because of a high attrition rate.

<sup>14</sup> Authors also reported analyses for two slightly different samples of second graders:  $n = 112$  (Borman and Benson, 2006) and  $n = 107$  (Borman, Benson, and Overman, 2009). These samples excluded students determined to be outliers based on a substantial performance drop from pre- to posttest, which resulted in a higher attrition rate and a lower rating for both analyses (meets WWC standards with reservations).

<sup>15</sup> The study also included CTBS Language scores, but this measure does not fall within the scope of the WWC's Beginning Reading review protocol.

<sup>16</sup> This information was requested by the WWC and provided by the study authors.

<sup>17</sup> The Woodcock-Johnson statistics were not presented in the article (Scientific Learning Corporation, 2004) but were provided to the WWC by the study authors.

<sup>18</sup> The study also included 74 older students ages nine to 14, but these students do not fall within the scope of the WWC's Beginning Reading review protocol (Scientific Learning Corporation, 2007).

<sup>19</sup> Students' outcomes were also assessed with the Receptive Language and Expressive Language subtests of the Clinical Evaluation of Language Fundamentals, 4th Edition (CELF-4), Australian Standardized Edition. These measures do not fall within the scope of the WWC's Beginning Reading review protocol (Scientific Learning Corporation, 2007).

<sup>20</sup> The intervention was also used with seven students in grade 1 and 78 students in grade 2, but analyses were not reported for these samples in Overbay and Baenen (2003). The study also included data for students in grades 4–8, attending a total of six elementary and four middle schools, but these students do not fall within the age range of the WWC's Beginning Reading review protocol.

<sup>21</sup> Findings for a subsample of struggling students are not included in this report, because the analytic intervention and comparison groups were not shown to be equivalent (Scientific Learning Corporation, 2008).

<sup>22</sup> Students in the intervention group were also assessed with the Reading Edge composite score, but the results for this test are not included in this report because the test was not administered to the comparison group (Scientific Learning Corporation, 2008).

<sup>23</sup> The Reading Edge test was developed by Scientific Learning Corporation, which also developed *Fast ForWord*<sup>®</sup>. Although there is no evidence of obvious overalignment between the measure and the intervention (intervention student receiving exposure to the measure during the course of treatment), the WWC notes that the developer of the intervention and the developer of the measure were the same.

### Recommended Citation

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## WWC Rating Criteria

### Criteria used to determine the rating of a study

Study rating	Criteria
<b>Meets WWC evidence standards without reservations</b>	A study that provides strong evidence for an intervention's effectiveness, such as a well-implemented RCT.
<b>Meets WWC evidence standards with reservations</b>	A study that provides weaker evidence for an intervention's effectiveness, such as a QED or an RCT with high attrition that has established equivalence of the analytic samples.

### Criteria used to determine the rating of effectiveness for an intervention

Rating of effectiveness	Criteria
<b>Positive effects</b>	Two or more studies show statistically significant positive effects, at least one of which met WWC evidence standards for a strong design, AND No studies show statistically significant or substantively important negative effects.
<b>Potentially positive effects</b>	At least one study shows a statistically significant or substantively important positive effect, AND No studies show a statistically significant or substantively important negative effect AND fewer or the same number of studies show indeterminate effects than show statistically significant or substantively important positive effects.
<b>Mixed effects</b>	At least one study shows a statistically significant or substantively important positive effect AND at least one study shows a statistically significant or substantively important negative effect, but no more such studies than the number showing a statistically significant or substantively important positive effect, OR At least one study shows a statistically significant or substantively important effect AND more studies show an indeterminate effect than show a statistically significant or substantively important effect.
<b>Potentially negative effects</b>	One study shows a statistically significant or substantively important negative effect and no studies show a statistically significant or substantively important positive effect, OR Two or more studies show statistically significant or substantively important negative effects, at least one study shows a statistically significant or substantively important positive effect, and more studies show statistically significant or substantively important negative effects than show statistically significant or substantively important positive effects.
<b>Negative effects</b>	Two or more studies show statistically significant negative effects, at least one of which met WWC evidence standards for a strong design, AND No studies show statistically significant or substantively important positive effects.
<b>No discernible effects</b>	None of the studies shows a statistically significant or substantively important effect, either positive or negative.

### Criteria used to determine the extent of evidence for an intervention

Extent of evidence	Criteria
<b>Medium to large</b>	The domain includes more than one study, AND The domain includes more than one school, AND The domain findings are based on a total sample size of at least 350 students, OR, assuming 25 students in a class, a total of at least 14 classrooms across studies.
<b>Small</b>	The domain includes only one study, OR The domain includes only one school, OR The domain findings are based on a total sample size of fewer than 350 students, AND, assuming 25 students in a class, a total of fewer than 14 classrooms across studies.

### Glossary of Terms

<b>Attrition</b>	Attrition occurs when an outcome variable is not available for all participants initially assigned to the intervention and comparison groups. The WWC considers the total attrition rate and the difference in attrition rates across groups within a study.
<b>Clustering adjustment</b>	If intervention assignment is made at a cluster level and the analysis is conducted at the student level, the WWC will adjust the statistical significance to account for this mismatch, if necessary.
<b>Confounding factor</b>	A confounding factor is a component of a study that is completely aligned with one of the study conditions, making it impossible to separate how much of the observed effect was due to the intervention and how much was due to the factor.
<b>Design</b>	The design of a study is the method by which intervention and comparison groups were assigned.
<b>Domain</b>	A domain is a group of closely related outcomes.
<b>Effect size</b>	The effect size is a measure of the magnitude of an effect. The WWC uses a standardized measure to facilitate comparisons across studies and outcomes.
<b>Eligibility</b>	A study is eligible for review and inclusion in this report if it falls within the scope of the review protocol and uses either an experimental or matched comparison group design.
<b>Equivalence</b>	A demonstration that the analysis sample groups are similar on observed characteristics defined in the review area protocol.
<b>Extent of evidence</b>	An indication of how much evidence supports the findings. The criteria for the extent of evidence levels are given in the WWC Rating Criteria on p. 63.
<b>Improvement index</b>	Along a percentile distribution of students, the improvement index represents the gain or loss of the average student due to the intervention. As the average student starts at the 50th percentile, the measure ranges from -50 to +50.
<b>Multiple comparison adjustment</b>	When a study includes multiple outcomes or comparison groups, the WWC will adjust the statistical significance to account for the multiple comparisons, if necessary.
<b>Quasi-experimental design (QED)</b>	A quasi-experimental design (QED) is a research design in which subjects are assigned to intervention and comparison groups through a process that is not random.
<b>Randomized controlled trial (RCT)</b>	A randomized controlled trial (RCT) is an experiment in which investigators randomly assign eligible participants into intervention and comparison groups.
<b>Rating of effectiveness</b>	The WWC rates the effects of an intervention in each domain based on the quality of the research design and the magnitude, statistical significance, and consistency in findings. The criteria for the ratings of effectiveness are given in the WWC Rating Criteria on p. 63.
<b>Single-case design</b>	A research approach in which an outcome variable is measured repeatedly within and across different conditions that are defined by the presence or absence of an intervention.
<b>Standard deviation</b>	The standard deviation of a measure shows how much variation exists across observations in the sample. A low standard deviation indicates that the observations in the sample tend to be very close to the mean; a high standard deviation indicates that the observations in the sample tend to be spread out over a large range of values.
<b>Statistical significance</b>	Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups. The WWC labels a finding statistically significant if the likelihood that the difference is due to chance is less than 5% ( $p < 0.05$ ).
<b>Substantively important</b>	A substantively important finding is one that has an effect size of 0.25 or greater, regardless of statistical significance.

Please see the [WWC Procedures and Standards Handbook \(version 2.1\)](#) for additional details.