What Works Clearinghouse

ies INSTITUTE OF EDUCATION SCIENCES

Adolescent Literacy August 2010

Fast ForWord®

Program Description[1]

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 to 100 minutes a day, five days a week, for 4 to 16 weeks, includes two components. The first component, the *Fast ForWord® Language*[2] and *Literacy*[3] series, aims to build cognitive skills such as memory, attention, processing, and sequencing, as well as language and reading skills, including listening accuracy, phonological awareness, and knowledge of language structures. The second component, the *Fast ForWord® to Reading*[4] 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, developed by scientists with expertise in the areas of brain plasticity, cognitive development, and reading instruction, is designed to adapt the nature and difficulty of the content based on individual students' responses.

1. The descriptive information for this program was obtained from a publicly available source: the program's website (http://www.scilearn.com, downloaded July 2009), as well as information provided to the WWC by the developer. The WWC requests developers to review the program description sections for accuracy from their perspective. 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 through December 2008.
2. The *Fast ForWord® Language* series, designed for elementary school students, includes three products: (1) *Fast ForWord® Language Basics*, which focuses on sound sequencing, fine motor skills, hand–eye coordination, pattern recognition, and color–shape recognition; (2) *Fast ForWord® Language*, which focuses on listening accuracy, phonological awareness, and language structures; and (3) *Fast ForWord® Language to Reading*, which focuses on the link between spoken and written language.
3. The *Fast ForWord® Literacy* series, designed for secondary school students and adults, includes two products: (1) *Fast ForWord® Literacy*, which focuses on listening accuracy, phonological awareness, and language structures; and (2) *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 and High School*, which was discontinued and replaced by the *Fast ForWord® Literacy* series.
4. 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.

Research[5]

Two studies of *Fast ForWord*® that fall within the scope of the Adolescent Literacy review protocol meet What Works Clearinghouse (WWC) evidence standards, and six studies meet WWC evidence standards with reservations. The eight studies included about 2,000 students, ranging in age from 5 to 17, who attended elementary, middle, and high schools[6] in Indiana, Maryland, North Carolina, Ohio, Pennsylvania, Virginia, an urban district in the northeastern United States, and Australia.[7]

Based on these eight studies, the WWC considers the extent of evidence for *Fast ForWord*® on adolescent learners to be small for the alphabetics and reading fluency domains and medium to large for the comprehension and general literacy achievement domains.

Effectiveness

Fast ForWord® was found to have no discernible effects on the alphabetics and general literacy achievement domains, and potentially positive effects on the reading fluency and comprehension domains for adolescent learners.

	Alphabetics	*Reading fluency*	*Comprehension*	*General literacy achievement*
Rating of effectiveness	No discernible effects	Potentially positive effects	Potentially positive effects	No discernible effects
Improvement index[8]	Average: +2 percentile points	+17 percentile points	Average: +8 percentile points	Average: +3 percentile points
	Range: –8 to +9 percentile points	na	Range: –6 to +15 percentile points	Range: –1 to +9 percentile points

na = not applicable

Additional program information

Developer and contact

Fast ForWord® was designed by university-based scientists, Drs. Merzenich, Jenkins, Tallal, Miller, and Mann, all of whom have expertise in the areas of brain plasticity, cognitive development, and reading instruction. *Fast ForWord*® is produced and distributed by the Scientific Learning Corporation, 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 who are listed in the searchable database on the Scientific Learning Corporation website.

Scope of use

Fast ForWord® products entered the market with *Fast ForWord*® *Language* in 1997 and *Fast ForWord*® *to Reading* (also known as *Fast ForWord*® *Reading*) in 2000.[9] *Fast ForWord*® products have been used by students struggling with reading, language,

5. The studies in this report were reviewed using WWC Evidence Standards, Version 1.0 (see the WWC Standards), as described in protocol Version 1.0.
6. The Adolescent Literacy topic area reviews studies of interventions administered to students in grades 4–12 (or 9–18 years of age). For studies that include samples of students that span both the Adolescent Literacy (grades 4–12) and Beginning Reading (grades K–3) topic areas and cannot be disaggregated by grade level, the Adolescent Literacy topic area also reviews any studies that include 5th-grade students or higher. For example, this report includes a combined sample of students from grades 3–6 (Rouse & Krueger, 2004), grades 2–8 (Scientific Learning Corporation, 2004b), and students aged 5–14 years (Scientific Learning Corporation, 2007a).
7. The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.
8. These numbers show the average and range of student-level improvement indices for all findings across the studies.
9. The year that *Fast ForWord*® *Literacy* entered the market was unavailable.

Additional program information *(continued)*

and learning problems, as well as with the general K–12 student population across the United States. Overall, *Fast ForWord®* has been used by more than 570,000 students in more than 3,700 schools nationwide.

Teaching

The *Fast ForWord® Language*, *Fast ForWord® to Reading,* and *Fast ForWord® Literacy* computer software uses exercises 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* aims 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* intends to improve students' skills in the areas of listening accuracy, phonological awareness, language structures, processing efficiency, memory, concentration, comprehension, and sequencing. As students listen through headphones and respond using the mouse, the software adapts to individual students' responses, adjusting the content and difficulty of items presented so that the student responds correctly approximately 80% of the time. The developer suggests multiple options for using the program, ranging from 30 minutes a day, five days a week, for 12 to 16 weeks, to 90 to 100 minutes a day, five days a week, for 4 to 8 weeks. All children start at the same basic level and progress individually as they attain proficiency.

Cost

A single license for *Fast ForWord® Language* is $900, with discounts available for multiple licenses. Each license for *Fast ForWord® to Reading* is $500, with no quantity discount.

Research

A total of 305 studies reviewed by the WWC investigated the effects of *Fast ForWord®* on adolescent learners. Two studies (Rouse & Krueger, 2004; Scientific Learning Corporation, 2007a) are randomized controlled trials that meet WWC evidence standards. Six studies (Beattie, 2000; Borman & Benson, 2006; Overbay & Baenen, 2002; Scientific Learning Corporation 2004a, 2004b, 2007b) are randomized controlled trials or quasi-experimental designs that meet WWC evidence standards with reservations. The remaining 297 studies do not meet either WWC evidence standards or eligibility screens.

Meets evidence standards

Rouse and Krueger (2004) conducted a randomized controlled trial of students in grades 3–6 in an urban district in the northeastern United States. Students scoring in the bottom 20% on the state's standardized reading test were randomly assigned within each grade and school to either the treatment group or the control group. The WWC based its effectiveness ratings on findings from comparisons of 237 students who received *Fast ForWord®* as a supplemental targeted pullout program during the regular school day and 217 control students who received regular reading instruction. The study reported students' outcomes after six to eight weeks of program implementation.

Scientific Learning Corporation (2007a) conducted a randomized controlled trial of 5- to 14-year-old students from four primary schools in the Perth metropolitan area in Western Australia. Students who had difficulties with language, literacy, auditory processing, attention, and/or behaviors were randomly assigned to the treatment and control groups. The WWC based its effectiveness rating on findings from comparisons of 68 students who received *Fast ForWord®* and 69 control group students who received regular classroom instruction. The study reported students' outcomes after three months of program implementation.

Meets evidence standards with reservations

Beattie (2000) conducted a randomized controlled trial of middle and high school students in suburban northern Virginia.

Research *(continued)*

Students with language deficits who ranged in age from 11 to 16 were randomly assigned by computer-generated procedures to one of five groups (Appendix 1.1 provides more details about these groups). The WWC based its effectiveness rating on findings from comparisons of 12 students who received *Fast ForWord*® and 12 control group students who received regular reading instruction. Although these analytic samples were shown to be equivalent at baseline, overall attrition of the study sample led to the study's rating of meets standards with reservations. The study reported students' outcomes after two months of program implementation.

Borman and Benson (2006) conducted a randomized controlled trial of 7th-grade students attending seven middle schools in Baltimore, Maryland. Students scoring below the 50th percentile on a district-administered reading test were randomly assigned within schools to either the treatment or the control group. Ninety students received the *Fast ForWord*® program as a supplemental targeted pullout program during the regular school day. Although post-attrition analytic samples were shown to be equivalent at baseline, overall and differential attrition of the study sample led to the study's rating of meets standards with reservations. The 98 students in the control group received nonliteracy instruction or participated in special activities and classes, such as art and gym, for their supplemental instruction. The study reported students' outcomes after two months of program implementation.

Overbay and Baenen (2002) conducted a quasi-experimental study that examined the effect of *Fast ForWord*® on students from the Wake County Public School System in Raleigh, North Carolina. The students participating in *Fast ForWord*® were matched to students from schools that were not using *Fast ForWord*® based on demographic factors and reading pretest scores. The WWC based its effectiveness rating on findings from comparisons of 355 students from grades 4–8 who used *Fast ForWord*® and 355 comparison group students who did not. The study reported students' outcomes after one academic year of program implementation.

Scientific Learning Corporation (2004a) conducted a quasi-experimental study that examined the effect of *Fast ForWord*® on 4th-grade students in four schools in Springfield, Ohio. Students who did not pass the Ohio Proficiency Test in 2002 constituted the study sample. The WWC based its effectiveness rating on findings from comparisons of 41 students who received *Fast ForWord*® and 50 comparison group students who attended schools that were not using *Fast ForWord*® and, like treatment group students, did not pass the Ohio Proficiency Test. The study reported students' outcomes after one semester of program implementation.

Scientific Learning Corporation (2004b) conducted a quasi-experimental study that examined the effect of *Fast ForWord*® on students from 16 public schools in Philadelphia, Pennsylvania. Students (primarily from 4th and 5th grades) were assigned to one of the three study groups. Group 1 received the *Fast ForWord*® intervention from September to November, group 2 received the *Fast ForWord*® intervention from December to February, and group 3 served as the control. The WWC based its effectiveness rating on findings from comparisons of 125 students in group 1 and 37 control group students, as well as comparisons of 131 students in group 2 and 37 control group students. The study reported students' outcomes after three months of program implementation.

Scientific Learning Corporation (2007b) conducted a quasi-experimental study that examined the effect of *Fast ForWord*® on students in grades 2–5 in Pendleton, Indiana. Students selected to receive the *Fast ForWord*® intervention were individually matched by school personnel, using grade-level and reading test scores, to students not using *Fast ForWord*®. The WWC based its effectiveness rating on findings from comparisons of 35 students in grades 4 and 5 who received *Fast ForWord*® and 35 comparison students who received the regular school curriculum. The study reported students' outcomes after four months of program implementation.

Research *(continued)*

Extent of evidence

The WWC categorizes the extent of evidence in each domain as small or medium to large (see the WWC Procedures and Standards Handbook, Appendix G). The extent of evidence takes into account the number of studies and the total sample size across the studies that meet WWC evidence standards with or without reservations.[10]

The WWC considers the extent of evidence for *Fast ForWord*® to be small for the alphabetics and reading fluency domains, and medium to large for the comprehension and general literacy achievement domains for adolescent learners.

Effectiveness

Findings

The WWC review of interventions for Adolescent Literacy addresses student outcomes in four domains: alphabetics, reading fluency, comprehension, and general literacy achievement. The studies included in this report cover all four domains. Alphabetics includes five constructs: phonemic awareness, phonological awareness, letter knowledge, print awareness, and phonics. Comprehension includes two constructs: reading comprehension and vocabulary development. General literacy achievement includes two constructs: general reading achievement and other literacy achievement. 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 adolescent learners.[11]

Alphabetics. Two studies reviewed findings in the alphabetics domain. Scientific Learning Corporation (2007a) did not find a statistically significant effect of *Fast ForWord*® on the Queensland University Inventory of Literacy (QUIL), nor was the effect large enough to be considered substantively important according to the WWC criteria (that is, an effect size of at least 0.25). Beattie (2000) did not find statistically significant effects of *Fast ForWord*® on the Letter-Word Identification, Word Attack, and Auditory Processing subtests of the Woodcock-Johnson tests of cognitive ability, or on the Wide Range Achievement Spelling subtest. The effects also were not large enough to be considered substantively important according to WWC criteria.

For the alphabetics domain, both studies showed indeterminate effects.

Reading fluency. Beattie (2000) did not find a statistically significant effect of *Fast ForWord*® on the Gray Oral Reading Test, but the effect was large enough to be considered substantively important according to WWC criteria.

Comprehension. Six studies reviewed findings in the comprehension domain. Beattie (2000) did not find a statistically significant effect of *Fast ForWord*® on the Woodcock-Johnson Passage Comprehension subtest, but the effect was large enough to be considered substantively important according to WWC criteria. Borman and Benson (2006) did not find a statistically significant effect of *Fast ForWord*® on the Terra Nova Reading test, and the effect was not large enough to be considered substantively important according to WWC criteria. Overbay and Baenen (2002) did not find a statistically significant effect of *Fast ForWord*® on the North Carolina End of Grade Reading Test, and the effect was not large enough to be considered substantively

10. The extent of evidence categorization was developed to tell readers how much evidence was used to determine the intervention rating, focusing on the number and size of studies. Additional factors associated with a related concept—external validity, such as the students' demographics and the types of settings in which studies took place—are not taken into account for the categorization. Information about how the extent of evidence rating was determined for *Fast ForWord*® is in Appendix A6.
11. The level of statistical significance was reported by the study authors or, when necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation, see the WWC Tutorial on Mismatch. For the formulas the WWC used to calculate the statistical significance, see WWC Procedures and Standards Handbook, Appendix C for clustering and WWC Procedures and Standards Handbook, Appendix D for multiple comparisons. In all studies except Borman and Benson (2002), Scientific Learning Corporation (2004a, 2004b), and Overbay and Baenen (2002), a correction for multiple comparisons was needed, so the significance levels may differ from those reported in the original studies.

Effectiveness *(continued)*

important according to the WWC criteria. Scientific Learning Corporation (2004a) did not find a statistically significant effect of *Fast ForWord*® on the Ohio Proficiency Test Reading score, but the effect was large enough to be considered substantively important according to WWC criteria. Scientific Learning Corporation (2004b) found, and the WWC confirmed, a statistically significant effect of *Fast ForWord*® on the Gates-MacGinitie Reading Test. Scientific Learning Corporation (2007b) did not find a statistically significant effect of *Fast ForWord*® on the Reading Measure of Academic Progress, and the effect was not large enough to be considered substantively important according to WWC criteria.

For the comprehension domain, one study showed statistically significant positive effects, two studies showed substantively important positive effects, and three studies showed indeterminate effects.

General literacy achievement. Five studies reviewed findings in the general literacy achievement domain. Rouse and Krueger (2004) did not find statistically significant effects of *Fast ForWord*® on the Clinical Evaluation of Language Fundamentals, *Success for All* assessment, and a state standardized reading test, and none of the effects were large enough to be considered substantively important according to WWC criteria. Scientific Learning Corporation (2007a) did not find statistically significant effects of *Fast ForWord*® on the Clinical Evaluation of Language Fundamentals Receptive and Expressive subtests, and neither of the effects was large enough to be considered substantively important according to WWC criteria. Borman and Benson (2006) did not find a statistically significant effect of *Fast ForWord*® on the Terra Nova Language test, and the effect was not large enough to be considered substantively important according to WWC criteria. Beattie (2000) did not find a statistically significant effect of *Fast ForWord*® on the Clinical Evaluation of Language Fundamentals, nor was the effect large enough to be considered substantively important according to WWC criteria. Scientific Learning Corporation (2007b) did not find a statistically significant effect of *Fast ForWord*® on the Language Measure of Academic Progress, and the effect was not large enough to be considered substantively important according to WWC criteria.

For the general literacy achievement domain, all five studies showed indeterminate effects.

Rating of effectiveness

The WWC rates the effects of an intervention in a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative. The rating of effectiveness takes into account four factors: the quality of the research design, the statistical significance of the findings, the size of the difference between participants in the intervention and the comparison conditions, and the consistency in findings across studies (see the WWC Procedures and Standards Handbook, Appendix E).

The WWC found *Fast ForWord*® to have no discernible effects for the alphabetics and general literacy achievement domains and potentially positive effects for the reading fluency and comprehension domains for adolescent learners

Improvement index

The WWC computes an improvement index for each individual finding. In addition, within each outcome domain, the WWC computes an average improvement index for each study and an average improvement index across studies (see WWC Procedures and Standards Handbook, Appendix F). The improvement index represents the difference between the percentile rank of the average student in the intervention condition and the percentile rank of the average student in the comparison condition. Unlike the rating of effectiveness, the improvement index is entirely based on the size of the effect, regardless of the statistical significance of the effect, the study design, or the analysis. The improvement index can take on values between –50 and +50, with positive numbers denoting favorable results for the intervention group.

The average improvement index for alphabetics is +2 percentile points across two studies, with a range of –9 to +9 percentile points across findings. The improvement index for reading fluency is +17 percentile points for a single finding from one study. The average improvement index for comprehension

The WWC found *Fast ForWord*® to have no discernible effects for the alphabetics and general literacy achievement domains and potentially positive effects for the reading fluency and comprehension domains for adolescent learners *(continued)*

is +8 percentile points across six studies, with a range of –6 to +17 percentile points across findings. The average improvement index for general literacy achievement is +3 percentile points across five studies, with a range of –1 to +9 percentile points across findings.

Summary

The WWC reviewed 305 studies on *Fast ForWord*® for adolescent learners.[12] Two of these studies meet WWC evidence standards; six studies meet WWC evidence standards with reservations; the remaining 297 studies do not meet either WWC evidence standards or eligibility screens. Based on the eight studies, the WWC found no discernible effects in the alphabetics and general literacy achievement domains, and potentially positive effects in the reading fluency and comprehension domains for adolescent learners. The conclusions presented in this report may change as new research emerges.

References

Meets WWC evidence standards

Rouse, C. E., & Krueger, A. B. (2004). Putting computerized instruction to the test: A randomized evaluation of a "scientifically based" reading program. *Economics of Education Review, 23*(4), 323–338.

Additional source:

Rouse, C. E., Krueger, A. B., & Markman, L. (2004). *Putting computerized instruction to the test: A randomized evaluation of a "scientifically based" reading program*. Cambridge, MA: National Bureau of Economic Research.

Scientific Learning Corporation. (2007a). *Students in Western Australia improve language and literacy skills: Educator's briefing*. Oakland, CA: Author.

Meets WWC evidence standards with reservations

Beattie, K. K. (2000). The effects of intensive computer-based language intervention on language functioning and reading achievement in language-impaired adolescents (Doctoral dissertation, George Mason University, 2000). *Dissertation Abstracts International, 61*(08A), 194–3116.

Additional source:

Given, B. K., Wasserman, J. D., Chari, S. A., Beattie, K., & Eden, G. F. (2008). A randomized, controlled study of computer-based intervention in middle school struggling readers. *Brain and Language, 106*(2), 83–97.

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.

Overbay, A., & Baenen, N. (2002). Fast ForWord *Evaluation, 2002–03* (Evaluation and Research Report no. 03.24). Raleigh, NC: Wake County Public School System.

Scientific Learning Corporation. (2004a). Improved Ohio Reading Proficiency Test scores by students in the Springfield City School District who used *Fast ForWord*® products. *MAPS for Learning: Educator Reports, 8*(8), 1–6.

Scientific Learning Corporation. (2004b). Improved reading achievement by students in the school district of Philadelphia who used *Fast ForWord*® products. *MAPS for Learning: Educator Reports, 8*(21), 1–6.

Scientific Learning Corporation. (2007b). 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.

12. Three single-case design studies were identified but are not included in this review because the WWC does not yet have standards for reviewing regression discontinuity or single-case design studies.

References *(continued)*

Studies that fall outside the Adolescent Literacy review protocol or do not meet WWC evidence standards

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.

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 not a primary analysis of the effectiveness of an intervention.

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 not a primary analysis of the effectiveness of an intervention.

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 not a primary analysis of the effectiveness of an intervention.

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. The study is ineligible for review because it does not include an outcome within a domain specified in the protocol.

Bishop, D., Adams, C., Lehtonen, A., & Rosen, S. (2005). Effectiveness of computerized spelling training in children with language impairments: A comparison of modified and unmodified speech input. *Journal of Research in Reading, 28*(2), 144–157. The study is ineligible for review because it does not use a comparison group.

Bluth, T. L. (2002). Fast ForWord Language *intervention: Does it really improve language and reading skills?* Unpublished master's thesis, St. Cloud State University, MN. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Camarata, S. M. (2008). *Fast ForWord*® does not significantly improve language skills in children with language disorders. *Evidence-Based Communication Assessment and Intervention, 2*(2), 96–98. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Carpenter, Z. A. (2005). *Effects of* Fast ForWord *on reading comprehension for elementary students*. Unpublished master's thesis, Eastern Washington University, Cheney. The study is ineligible for review because it does not use a sample within the age or grade range specified in the protocol.

Children's Hospital Boston. (2007). *Sound training rewires dyslexic children's brains for reading*. Boston, MA: Author. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Ciacera, K. B. (2007). *Will instruction using a computer-based cognitive skills development program, with audio and visual stimulation, increase the reading levels of male students in grades three through eight?* Unpublished research paper, Salem State College, MA. The study is ineligible for review because it does not use a comparison group.

Cohen, W., Hodson, A., O'Hare, A., Boyle, J., Durrani, T., McCartney, E., et al. (2005). Effects of computer-based intervention through acoustically modified speech (*Fast ForWord*) in severe mixed receptive-expressive language impairment: Outcomes from a randomized controlled trial. *Journal of Speech, Language, and Hearing Research, 48*(3), 715. The study is ineligible for review because it does not disaggregate findings for the age or grade range specified in the protocol.[13]

De Anda, I. (2000). Glasses for the ears: Technology provides a critical link to literacy. *Multimedia Schools: A Practical Journal of Technology, Including Multimedia, CD-ROM, Online, Internet, & Hardware in K–12, 7*(2). The study is ineligible for review because it does not use a comparison group.

13. The study is included in the *Fast ForWord*® intervention report released by the WWC Beginning Reading topic area.

References *(continued)*

DeLarco, A., & Wagonblott, A. (2003). *The effects of* Fast ForWord *intervention on the language performance*. Unpublished master's thesis, Buffalo State College, NY. The study is ineligible for review because it does not use a comparison group.

Divine, K. P., & Botkin, D. (2008). *A study of the longitudinal effects of* Fast ForWord *on student performance in Duval County*. Jacksonville, FL: Duval County Public Schools. The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

Eady, S. (2006). *Effects of* Fast ForWord *on reading skills of students who speak Spanish and English*. Unpublished master's thesis, Texas Tech University Health Sciences Center, Lubbock. The study is ineligible for review because it does not use a sample within the age or grade range specified in the protocol.

Education Commission of the States. (1999). Fast ForWord®. Denver, CO: Author. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Education Commission of the States. (2002). Fast ForWord®. Denver, CO: Author. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Friel-Patti, S., DesBarres, K., & Thibodeau, L. (2001). Case studies of children using *Fast ForWord. American Journal of Speech-Language Pathology, 10*(3), 203. The study is ineligible for review because it does not use a comparison group.

Friel-Patti, S., Frome Loeb, D., & Gillam, R. B. (2001). Looking ahead: An introduction to five exploratory studies of *Fast ForWord. American Journal of Speech-Language Pathology, 10*(3), 195–202. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Gillam, R. B. (1999). Computer-assisted language intervention using *Fast ForWord*®: Theoretical and empirical considerations for clinical decision-making. *Language, Speech, and Hearing Services in Schools, 30*(4), 363–370. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Gillam, R. B., Crofford, J. A., Gale, M. A., & Hoffman, L. M. (2001). Language change following computer-assisted language instruction with *Fast ForWord* or *Laureate Learning Systems* software. *American Journal of Speech-Language Pathology, 10*(3), 231. The study is ineligible for review because it does not use a sample within the age or grade range specified in the protocol.

Gillam, R. B., Loeb, D. F., & Friel-Patti, S. (2001). Looking back: A summary of five exploratory studies of *Fast ForWord. American Journal of Speech-Language Pathology, 10*(3), 269–273. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Gillam, R. B., Loeb, D. F., Hoffman, L. M., Bohman, T., Champlin, C. A., Thibodeau, L., et al. (2008). The efficacy of *Fast ForWord Language* intervention in school-age children with language impairment: A randomized controlled trial. *Journal of Speech, Language, and Hearing Research, 51*, 97–119. The study is ineligible for review because it does not use a sample within the age or grade range specified in the protocol.

Gillingham, G. G. (2001). Differential diagnosis and treatment of attention deficit hyperactivity disorder and central auditory processing disorders (Doctoral dissertation, United States International University, 2001). *Dissertation Abstracts International, 62*(04B), 97–2057. The study is ineligible for review because it does not use a comparison group.

Habib, M., Rey, V., Daffaure, V., Camps, R., Espesser, R., Joly-Pottuz, B., et al. (2002). Phonological training in children with dyslexia using temporally modified speech: A three-step pilot investigation. *International Journal of Language and Communication Disorders, 37*(3), 289–308. The study is ineligible for review because it does not examine an intervention conducted in English.

Hall, L. S. (2002). *Final report of the 2001–2002 Scientific Learning*/Fast ForWord *program*, REIS02-168-2. Dallas, TX: Dallas Independent School District, Division of Evaluation and Accountability. The study is ineligible for review because it does not use a comparison group.

References *(continued)*

Harrison, S., & Gimbel, J. F. (1998, March). *A collaborative computerized language training project between Gonzaga University and St. Luke's Rehabilitation Institute*. Paper presented at the annual conference of the American Council on Rural Special Education, Charleston, SC. The study is ineligible for review because it does not use a comparison group.

Ho, C. (2004). *An examination of* Fast ForWord Language *intervention for children with poor reading abilities*. Unpublished honors thesis, University of Western Australia, Perth. The study is ineligible for review because it does not use a comparison group.

Additional source:

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Additional source:

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Windsor, J. (2001). From the associate editor. *American Journal of Speech-Language Pathology, 10*(3), 194. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention.

Winters, J. L. (2000). Perceptions of middle school students concerning their language and reading abilities under different instructional interventions (Doctoral dissertation, George Mason University, 2000). *Dissertation Abstracts International, 61*(02A), 163–569. The study is ineligible for review because it does not include a student outcome.[14]

Studies with disposition pending

Barrett, M. L. (2002). *The effect of computer-assisted instruction for students with central auditory processing disorder using the* Fast ForWord® *program*. Unpublished master's thesis, Rowan University, Glassboro, NJ. The study is not included because it uses a design for which the WWC is currently developing standards.

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Seats, T. C. (1998). Treatment efficacy of temporal exercises in the habilitation of central auditory processing disorder (Master's thesis, Southern Connecticut State University, 1998). *Masters Abstracts International, 37*(02), 59–580. The study is not included because it uses a design for which the WWC is currently developing standards.

14. The study compared student self-ratings on reading performance survey items for three groups of students: (1) students exposed to *Fast ForWord*®, (2) students exposed to *SuccessMaker,* and (3) students in a control group. A total of 18 students completed the rating survey. Students were participating in the study described in Beattie (2000).

Appendix

Appendix A1.1 Study characteristics: Rouse & Krueger, 2004

Characteristic	Description
Study citation	Rouse, C. E., & Krueger, A. B. (2004). Putting computerized instruction to the test: A randomized evaluation of a "scientifically based" reading program. *Economics of Education Review, 23*(4), 323–338.
Participants	Groups were formed through a multistep process. Authors first identified an eligible population of students from four schools within one urban school district, focusing on third- to sixth-grade students who scored in the bottom 20% on the state's standardized reading test administered in the 2001–02 school year. Consent letters were sent to these students' parents. Principals in the schools were asked to identify students who could not sit through the daily 90- to 100-minute use of *Fast ForWord*®, those who had transferred to another school, and those students who might otherwise be unavailable (family away on long trip, for example). The remaining students were randomly assigned to either the treatment or control group, within each grade and school. In all, 237 students in the *Fast ForWord*® group and 217 students in the comparison group were included in the analysis sample.
Setting	The study took place in four schools in an urban district in the northeastern United States. Forty percent of the district's students were African-American and more than 50% were Hispanic. Almost 70% of students in the district qualified for the free or reduced-price lunch program, and 56% of the district's students spoke a language other than English at home. The authors describe test scores in these schools as well below average and note that schools in the district adopted a whole-school reform, *Success for All*.
Intervention	*Fast ForWord*® was primarily an add-on to regular reading instruction. In three schools, students in the treatment condition were pulled out of their regular classroom instruction for 90–100 minutes of computerized *Fast ForWord*® instruction per day and, in one school, they used *Fast ForWord*® for that same amount of time before or after school. Each school had to find a way to fit the use of *Fast ForWord*® into its unique schedule. In no case were students taken out of *Success for All*. The study reported students' outcomes after six to eight weeks of program implementation.
Comparison	The control group continued to receive the standard curriculum being used in district schools. Because the *Fast ForWord*® students used *Fast ForWord*® either during subjects such as math, science, language arts, special subjects (such as art, music, or gym), or homeroom, or—in the case of one school—before or after school, the counterfactual condition for the control group students was mixed.
Primary outcomes and measurement	For both the pretest and posttest, the authors administered the *Success for All* assessment, the Clinical Evaluation of Language Fundamentals–Third Edition (the receptive portion and the Listening to Paragraph supplemental test), and a state standardized reading test (the authors did not indicate which state). For a more detailed description of test outcome measures, see Appendix A2.4.
Staff/teacher training	*Fast ForWord*® staff provided training for *Fast ForWord*® instructors (those interacting with students) at the beginning of the study. Phone support was also provided for the duration of the study. Detailed information on the training of instructors was not provided.

Appendix A1.2 Study characteristics: Scientific Learning Corporation, 2007a

Characteristic	Description
Study citation	Scientific Learning Corporation. (2007a). *Students in Western Australia improve language and literacy skills: Educator's briefing*. Oakland, CA: Author.
Participants	Students between ages 5 and 14 identified by classroom teachers as having difficulties in language, literacy, auditory processing, attention, and/or behavior were randomly assigned to immediate or delayed treatment conditions, with 72 students in each group. The intervention group that received *Fast ForWord*® either between February and April or May and July of 2006 was compared to the group of students who had not received *Fast ForWord*® as of April 2006. In all, 68 students in the *Fast ForWord*® group and 69 students in the comparison group were included in the analysis sample.
Setting	The study took place at four primary schools in the Perth metropolitan area in Western Australia.
Intervention	*Fast ForWord*® participation was scheduled during class time for most students, generally in place of their language-arts lesson. A few students participated before school and during recess and/or lunch breaks. All *Fast ForWord*® sessions were monitored by trained parent volunteers under the supervision of the school's *Fast ForWord*® coordinator. Participants in the *Fast ForWord*® group used (1) the 50-minute *Fast ForWord*® *Language* protocol or the 48-minute *Fast ForWord*® *Middle and High School* protocol and (2) the 50-minute *Fast ForWord*® *Language to Reading* protocol. These protocols called for participants to use *Fast ForWord*® each day, five days a week, for 8 to 12 weeks. The study reported students' outcomes after three months of program implementation.
Comparison	The counterfactual in this study is regular classroom instruction. The comparison group used *Fast ForWord*® on a delayed schedule, either between May and July or July and September 2006.
Primary outcomes and measurement	All tests were administered by speech pathology and occupational therapy students who were trained in the assessment process by qualified speech pathologists. Study students' skills were measured both before and after use of the intervention. Alphabetic skills were measured by the Queensland University Inventory of Literacy (QUIL), whereas students' skills in comprehension were measured by the Clinical Evaluation of Language Fundamentals (CELF)–Fourth Edition. For a more detailed description of these outcome measures, see Appendices A2.1 and A2.4.
Staff/teacher training	Sonic Hearing, a private clinical practice with expertise in the *Fast ForWord*® programs, provided training for the parent monitors and support for the *Fast ForWord*® coordinator at each school. All *Fast ForWord*® sessions were monitored by these trained parent volunteers, under the supervision of the school's *Fast ForWord*® coordinator. In addition, the lab supervisors at the schools were trained in current and established findings on the neuroscience of how phonemic awareness and the acoustic properties of speech affect development of language and reading skills, information on the efficacy of the products, effective implementation techniques, and monitoring student progress.

Appendix A1.3 Study characteristics: Beattie, 2000

Characteristic	Description
Study citation	Beattie, K. K. (2000). The effects of intensive computer-based language intervention on language functioning and reading achievement in language-impaired adolescents (Doctoral dissertation, George Mason University, 2000). *Dissertation Abstracts International, 61*(08A), 194–3116.
Participants	Eighty-one 11- to 16-year-old students who scored in the bottom quartile on standardized reading or language tests were randomly assigned by computer-generated procedures to one of four intervention groups or to a control group in a two-step process.[1] The researchers first assigned 18 students to the two intervention groups that received a phase of *SuccessMaker* and *Fast ForWord®* and also concomitantly participated in a functional resonance imaging research project. Then, the remaining participants were randomly assigned across the five groups. To ensure an equal distribution among groups, fewer students were placed in the first two groups at the second step of randomization. For this review, the WWC reported results from 12 students in the *Fast ForWord®* group who were compared to 12 students in the comparison group.[2] Although the overall attrition rate was higher than 20%, the post-attrition intervention and comparison groups were equivalent on the pretest achievement measures.
Setting	The study took place in two middle schools and one middle-high school located in the suburbs of a large metropolitan area in northern Virginia.
Intervention	Students worked on *Fast ForWord®* for 90–94 minutes a day, five days a week. The intervention ended after each student completed 64–80 hours on the program. The study reported students' outcomes after two months of program implementation.
Comparison	The control group received the standard instruction provided as part of the regular school curriculum.
Primary outcomes and measurement	For both pre- and posttests, the author administered the Gray Oral Reading Test, four subtests of the Woodcock-Johnson Psycho-Educational Battery (Letter-Word Identification, Word Attack, Passage Comprehension, and Auditory Processing), the Spelling subtest of the Wide Range Achievement Test, and the Receptive Language subtest of the Clinical Evaluation of Language Fundamentals. For a more detailed description of these outcome measures, see Appendices A2.1–A2.4.
Staff/teacher training	No information on training for the teachers and staff in this study was provided. To facilitate the use of *Fast ForWord®*, computers were procured or updated to meet criteria for running *Fast ForWord®* software.

1. The first intervention group received two phases of *Fast ForWord®*; the second intervention group received two phases of *SuccessMaker*; and the third and fourth intervention groups received a phase of *Fast ForWord®* and a phase of *SuccessMaker*.
2. The analysis samples for the *Fast ForWord®* and *SuccessMaker* groups were not shown to be equivalent at baseline. Two other groups which combined *Fast ForWord®* and *SuccessMaker* are not appropriate counterfactuals because the measures of effects cannot be attributed solely to the *Fast ForWord®* program.

Appendix A1.4 Study characteristics: Borman & Benson, 2006

Characteristic	Description
Study citation	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, School of Education.
Participants[1]	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. These students also tended to have below-average outcomes on language skills. A total of 274 of these academically at-risk seventh-grade students took pretests (CTBS/5) in the spring of 2001. Random assignment was conducted separately within each of seven schools. Of the initial intervention and comparison students, listwise deletion of students with missing pretest or posttest data was conducted. Additionally, 13 students (eight from the treatment group and five from the control group) were dropped from the sample because they were determined to be outliers based on a substantial drop from pre- to posttest. In all, 90 students in the *Fast ForWord®* group and 98 students in the control group were included in the analysis sample (therefore, overall attrition was 31%). Although differential attrition between the treatment and control groups was 8%, the treatment and control groups were shown to be similar to each other at baseline. The groups primarily consisted of African-American (66.3% of both the intervention and comparison groups) and economically disadvantaged students (73.3% of the intervention group and 84.7% of the comparison group received free lunch).
Setting	The study took place in seven middle schools in the Baltimore City Public School System.
Intervention	In addition to their regular reading instruction, students 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 to supplement the regular classroom literacy instruction. Students received the program 100 minutes a day, five days a week, for at least 20 days under the supervision of an *Fast ForWord®*-trained teacher. The study reported students' outcomes after two months of program implementation.
Comparison	In addition to their regular reading instruction, comparison group students received nonliteracy instruction or participated in special activities and classes not related to literacy, such as art and gym.
Primary outcomes and measurement	The eligible outcomes are standardized (normal curve equivalent) CTBS/5 Terra Nova Language and Reading test scores. These tests were administered both before and after the intervention. For a more detailed description of test outcome measures, see Appendix A2.4.
Staff/teacher training	Before the start of the program, Scientific Learning provided training sessions for teachers operating the *Fast ForWord®* programs at the schools. No detailed information about these training sessions was provided by the authors.

1. In addition to the 188 students included in the analysis sample, the study also included 112 second-grade students who were excluded from the findings in this report because they did not fall in the grade range specified in the protocol.

Appendix A1.5 Study characteristics: Overbay & Baenen, 2002

Characteristic	Description
Study citation	Overbay, A., & Baenen, N. (2002). Fast ForWord® *evaluation, 2002–03* (Evaluation and Research, report no. 03.24). Raleigh, NC: Wake County Public School System.
Participants	During the 2002–03 school year, 616 third- to eighth-grade students received the *Fast ForWord®* program. Of these, 426 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. The remaining 190 were missing either pre- or posttest scores and, therefore, were not included in the matching process. The analysis sample for this review included students in grades 4–8: 355 students in the *Fast ForWord®* group and 355 in the comparison group.[1] *Fast ForWord®* was used in 10 elementary, middle, and high schools, and the comparison students were selected from schools that did not use *Fast ForWord®*. Additional findings reflecting students' outcomes by grade can be found in Appendix A4.
Setting	The study took place in one school district (10 treatment schools) in Raleigh, North Carolina.[2]
Intervention	During the school year, the intervention group used *Fast ForWord® Language*, *Fast ForWord® Language to Reading*, and *Fast ForWord® Reading*. Most of the *Fast ForWord®* participants (91.4%) used *Fast ForWord® Language*; the majority (60%) used more than one level of the program. The 8.6% who did not use *Fast ForWord® Language* had completed it in 2001–02.
Comparison	The counterfactual in this study is regular classroom instruction. However, the study authors note that students in the comparison group may have been exposed to a variety of other programs or interventions that were not controlled for in this study.
Primary outcomes and measurement	For both pre- and posttests, the authors used the End of Grade Reading Subtest. For a more detailed description of this outcome measure, see Appendix A2.3.
Staff/teacher training	No information about teacher or staff training was provided.

1. The study also presented data for students in grade 3, attending a total of six elementary schools, but these students do not fall within the age range of the WWC's Adolescent Literacy reviews, so they are not included in this report.
2. The number of control schools is not available.

Appendix A1.6 Study characteristics: Scientific Learning Corporation, 2004a

Characteristic	Description
Study citation	Scientific Learning Corporation. (2004a). Improved Ohio reading proficiency test scores by students in the Springfield City School District who used *Fast ForWord®* products. *MAPS for Learning: Educator Reports, 8*(8), 1–6.
Participants	Fourth-grade students who did not pass the fall 2002 Ohio Proficiency Test from four Title I designated schools were eligible to participate in the study. Each elementary school established its own method of identifying treatment and comparison group students for the study. The comparison group was formed by selecting 50 students with test scores from both fall 2002 and spring 2003 who had no exposure to *Fast ForWord®* products.[1] The intervention and comparison groups were shown to be equivalent on the Ohio Reading Proficiency Test pretest scores. In all, 41 students who used the *Fast ForWord®* products and 50 students in the comparison group were included in the analysis sample.
Setting	The study took place in four elementary schools in the Springfield City School District in Ohio.
Intervention	The study used *Fast ForWord® Language*, *Fast ForWord® Language to Reading*, and *Fast ForWord® to Reading 3* products. The *Fast ForWord® Language* protocol called for students to use the product for 100 minutes a day, five days a week, for four to eight weeks. The *Fast ForWord® Language to Reading* and *Fast ForWord® to Reading 3* protocols called for use of the product for 90 minutes a day, five days a week, for four to eight weeks. Students included in the treatment group were required to have used *Fast ForWord®* products for 20 or more days. Schools used different implementation models, with some schools having students use the products in the back of the classroom, and other schools sending students to computer labs that served between 7 and 24 students. The study reported students' outcomes after one semester of program implementation.
Comparison	The study did not describe the comparison condition. Presumably, the comparison group received the regular school curriculum.
Primary outcomes and measurement	The Ohio Reading Proficiency Test (a statewide assessment) was administered in the year of the study, before and after the intervention. For a more detailed description of this outcome measure, see Appendix A2.3.
Staff/teacher training	At each participating school, educators were trained in current and established neuroscience findings on how phonemic awareness and the acoustic properties of speech affect development of language and reading skills, information on the efficacy of the products, methods for assessment of potential candidates for participation, the selection of appropriate measures for testing and evaluation, effective implementation techniques, approaches for using Progress Tracker reports to monitor student performance, and techniques for measuring the gains students have achieved after they have finished using *Fast ForWord®* products.

1. The study authors did not provide detailed information on how comparison group students were selected (stating that comparison group students were "pseudo-randomly" selected).

Appendix A1.7 Study characteristics: Scientific Learning Corporation, 2004b

Characteristic	Description
Study citation	Scientific Learning Corporation. (2004b). Improved reading achievement by students in the school district of Philadelphia who used *Fast ForWord®* products. *MAPS for Learning: Educator Reports, 8*(21), 1–6.
Participants	Three groups of students in grades 2 to 8 (mainly fourth and fifth graders) participated in *Fast ForWord®* supplemental instruction during the 2003–04 school year. Groups 1 and 2 comprised the treatment group for this study. Group 1 used *Fast ForWord®* between September and November, and group 2 used *Fast ForWord®* between December and February. Group 3 served as the comparison group (and used *Fast ForWord®* between March and May). The participating schools determined which students were placed in the three groups. Students were assessed in September and March. In all, 256 students in the *Fast ForWord®* treatment group and 37 students in the comparison group were included in the analysis sample. Additional findings reflecting students' outcomes by grade and intervention group (1 versus 2) can be found in Appendix A4.
Setting	The study took place in 16 schools in the Philadelphia School District in Pennsylvania.
Intervention	Students participating in the *Fast ForWord®* group used a variety of *Fast ForWord®* products. All students used either the *Fast ForWord® Language* or *Fast ForWord® Middle and High School* product for an average of 25 days. In addition, about half of the students used *Fast ForWord® Language to Reading* products (which are part of the *Fast ForWord® Language* series), and one-tenth of the students used *Fast ForWord®* Reading 3 products (which are part of the *Fast ForWord® Reading* series). *Fast ForWord®* was used as a supplement to the regular reading curriculum. The study reported students' outcomes after three months of program implementation.
Comparison	Before March 2004, comparison group students received their regular reading curriculum.
Primary outcomes and measurement	The eligible outcome on this study is the Gates–MacGinitie Reading Test, which was administered both before and after the intervention. For a more detailed description of this outcome measure, see Appendix A2.3.
Staff/teacher training	Teachers were trained in current and established findings on the neuroscience of how phonemic awareness and acoustic properties of speech impact development of language and reading skills; information on the efficacy of the products; methods for assessment of potential product participants; the selection of appropriate standardized language measures for testing and evaluation; effective implementation techniques; instruction on the product, Progress Tracker, and the reports generated by the product that allow educators and coaches to monitor student performance; and techniques for measuring the progress and gains students achieve after they have finished using the product.

Appendix A1.8 Study characteristics: Scientific Learning Corporation, 2007b

Characteristic	Description
Study citation	Scientific Learning Corporation. (2007b). 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.
Participants	Two schools that used *Fast ForWord®* during the spring of 2007 selected students in grades 2 to 5 for the study based on their scores on the Measures of Academic Progress (MAP) assessment. To form a comparison group, school personnel individually matched—by grade level and fall and winter scores from the MAP Reading subtest—80 students in the *Fast ForWord®* group to 80 students not using *Fast ForWord®*. The study sample included 78 treatment and 78 comparison students. The analysis sample for this review included students in grades 4 and 5: 35 students in the *Fast ForWord®* group and 35 students in the comparison group.
Setting	This study took place in East Elementary and Maple Ridge Elementary in the South Madison Community School Corporation of Pendleton, Indiana.
Intervention	The intervention groups used *Fast ForWord® Language* and *Fast ForWord® Language to Reading* products. The South Madison Community School Corporation chose to use the 50-minute *Fast ForWord®* protocols, which called for students to use the product for 50 minutes a day, five days per week, for 6 to 10 weeks. The study reported students' outcomes after three months of program implementation.
Comparison	The comparison group received the standard district reading curriculum.
Primary outcomes and measurement	The outcomes on this study are students' reading and language scores on the MAP assessment, which was administered both before and after the intervention was used for the study. For a more detailed description of this outcome measure, see Appendices A2.3–A2.4.
Staff/teacher training	Educators were trained in current and established neuroscience findings on how phonemic awareness and the acoustic properties of speech impact development of language and reading skills, information on the efficacy of the products, methods for assessing potential candidates for participation, the selection of appropriate measures for testing and evaluation, effective implementation techniques, approaches for using Progress Tracker reports to monitor student performance, and techniques for measuring the gains students have achieved after they have finished using *Fast ForWord®* products.

Appendix A2.1 Outcome measures for the alphabetics domain

Outcome measure	Description
Phonemic awareness	
Woodcock-Johnson Psycho-Educational Battery–Revised, Tests of Cognitive Ability (WJ-R COG) (Auditory Processing Cluster for Phonemic Awareness)	This composite is a standardized measure of a student's ability to identify patterns among speech-based auditory stimuli. The score on this composite is derived from scores on three subtests: (1) the Sound Blending subtest measures the ability to synthesize sequences of sounds into whole words, (2) the Incomplete Words subtest measures the ability to identify a word with missing sounds, and (3) the Sound Patterns subtest measures the ability to indicate whether pairs of computer-generated sound sequences are the same or different (as cited in Beattie, 2000).
Phonics	
Woodcock-Johnson Psycho-Educational Battery–Revised, Tests of Achievement (WJ-R ACH) (Letter-Word Identification)	This standardized subtest, which assesses students' ability to identify words and letters, requires students to read aloud isolated letters and real words that range in frequency and difficulty (as cited in Beattie, 2000).
Woodcock-Johnson Psycho-Educational Battery–Revised, Tests of Achievement (WJ-R ACH) (Word Attack)	This standardized subtest measures phonemic decoding skills by asking students to read "pseudo" words (e.g., plurp, fronkett). Students are aware that the words are not real (as cited in Beattie, 2000).
Wide Range Achievement Test–Third Edition (WRAT-3) (Spelling subtest)	This standardized subtest is a paper-and-pencil assessment that measures students' ability to write their names, as well as letters and words from dictation. The dictated letters and words followed either phonetically regular or irregular patterns (as cited in Beattie, 2000).
Queensland University Inventory of Literacy (QUIL)	The QUIL is a standardized clinical assessment tool for measuring the phonological awareness skills of school-age children as they pertain to literacy. Three of the 10 subtests were administered to all students: Nonword Spelling, Phoneme Segmentation, and Phoneme Manipulation. In addition, students in years 4–7 were administered the Spoonerisms subtest, which assesses students' metalinguistic phoneme awareness (as cited in Scientific Learning Corporation, 2007a).

Appendix A2.2 Outcome measures for the reading fluency domain

Outcome measure	Description
Gray Oral Reading Test–Third Edition (GORT-3)	In this standardized test, students are required to read orally a variety of graded passages to measure reading rate, word identification, and comprehension skills. The Passage subtest assesses a combination of rate and accuracy. The Comprehension subtest requires a student to respond to five multiple choice questions following each story. The Oral Reading Quotient reflects a total measure of a student's oral reading performance and is calculated by combining the Passage and Comprehension scores (as cited in Beattie, 2000).

Appendix A2.3 Outcome measures for the comprehension domain

Outcome measure	Description
Reading comprehension and vocabulary development	
Woodcock-Johnson Psycho-Educational Battery–Revised, Tests of Achievement (WJ-R ACH) (Passage Comprehension)	In this standardized test, comprehension is measured by having students fill in missing words in a short paragraph (e.g., "Woof," said the _____, biting the hand that fed it.) (as cited in Beattie, 2000).
Ohio Proficiency Test (OPT), Reading subtest	This statewide assessment is administered to students in 4th, 6th, and 9th grade. The Reading subtest includes multiple choice, short answer, and extended response questions across four subscales: constructing meaning from fiction, examining/extending meaning in fiction, constructing meaning from nonfiction, and examining/extending meaning in nonfiction. The subtest contains two or three fiction or poetry selections and two or three nonfiction selections, which may include pamphlets, instruction booklets, and newspaper and magazine articles. The selections total about 1,200 to 1,500 words. Students may be asked to summarize or retell a story, to interpret vocabulary, or to infer information. Students may also be asked to make predictions, to distinguish facts from opinions, or to fill in a chart or diagram with information from the selection. Word usage, grammar, spelling, and mechanics do not affect scoring, unless the student's ideas are not clear to the evaluator (as cited in Scientific Learning Corporation, 2004a).
North Carolina End of Grade Test	The North Carolina End of Grade test measures students' achievement of the goals and objectives specified in the 2004 North Carolina English Language Arts Standard Course of Study (Content Standards). Reading comprehension is assessed by having students read authentic selections and then answer questions directly related to the selections. Knowledge of vocabulary is assessed indirectly through application and understanding of terms within the context of selections and questions. The authentic selections in the reading tests are chosen to reflect reading for various purposes such as literary experience, gaining information, and performing a task (as cited in Overbay & Baenen, 2002).
Gates–MacGinitie Reading Test (GMRT)	The GMRT is used to assess a student's decoding, vocabulary, and passage comprehension skills.[1] The test has two components that independently assess reading vocabulary and comprehension skills. The Vocabulary subtest measures each student's reading vocabulary by asking the student to choose one word or phrase that means most nearly the same as a presented word. The subtest contains 45 questions. The Comprehension subtest measures each student's ability to read and understand different types of prose. The subtest contains 11 passages of various lengths and subjects, and 48 questions (as cited in Scientific Learning Corporation, 2004b).
Measures of Academic Progress (MAP), Reading test	Developed by the Northwest Evaluation Association (NWEA), the MAP are state-aligned computerized adaptive tests that reflect the instructional level of each student and measure growth over time. The MAP is appropriate for students in grades 2 through 10. The untimed assessment typically features between 40 and 50 items. The assessment is usually tailored to the specific needs of individual organizations, but all NWEA MAP assessments draw from the same item bank. The Reading test draws items from the following areas: word meaning (such as use of context clues; use of synonyms, antonyms, and homonyms; use of component structure; or interpretation of multiple meanings), literal comprehension (such as recalling details, interpreting directions, sequencing details, classifying facts, or identifying main ideas), interpretive comprehension (such as drawing inferences, recognizing cause and effect, predicting events, or summarizing and synthesizing), and evaluative comprehension (such as distinguishing fact and opinion, recognizing elements of persuasion, evaluating validity and point of view, evaluating conclusions, or detecting bias and assumptions) (as cited in Scientific Learning Corporation, 2007b).
Comprehensive Test of Basic Skills (CTBS/5) Terra Nova Reading Composite	This assessment combines selected-response items with constructed-response items that allow students to produce short and extended responses. The Reading composite score is the average of Reading Comprehension and Vocabulary subtest scores (as cited in TerraNova Prepublication Technical Manual, July 1996). The Reading Comprehension subtest items focus on five objectives: (1) oral comprehension of passages read aloud, (2) basic understanding of literal meanings of passages, (3) analyzing text, (4) evaluating and extending meaning, and (5) identifying reading strategies. The Vocabulary subtest focuses on three objectives: (1) understanding word meaning, (2) identifying multi-meaning words, and (3) inferring words in context (as cited in Borman & Benson, 2006).

1. At levels D (4th grade) and up, either subtest or the combination of both subtests falls into the comprehension domain. At levels A, B, and C (grades 1, 2, and 3), the vocabulary measure, which taps decoding skills rather than word meanings, would fall in the alphabetics domain. For the Scientific Learning Corporation (2004b) study, which included students from grades 2–8, the WWC classified the Gates–MacGinitie Reading Test as a comprehension measure, as the majority of study participants came from grades 4 and 5 (levels D and up).

Appendix A2.4 Outcome measures for the general literacy achievement domain

Outcome measure	Description
General reading achievement	
Comprehensive Test of Basic Skills (CTBS/5) Terra Nova Language Composite	This assessment combines selected-response items with constructed-response items that allow students to produce short and extended responses. The Language Composite score is the average of scores on the Language and Language Mechanics subtests (as cited in TerraNova Prepublication Technical Manual, July 1996). The Language subtest covers four objectives: (1) introduction to print, (2) understanding sentence structure, (3) writing strategies, and (4) editing skills. The Language Mechanics subtest focuses on three objectives: (1) appropriate construction of sentences, phrases, and clauses; (2) appropriate writing conventions; and (3) editing skills (as cited in Borman & Benson, 2006).
Success for All assessment	The *Success for All* assessments (which are administered every 6–8 weeks) are a set of reading assessments closely aligned with the *Success for All* curriculum. The total score of the assessments reflects (1) students' scores on a paper-and-pencil assessment and (2) a more subjective assessment (by the evaluator) of the student's class work during the time period. For example, the subjective assessment might evaluate how well children understand the learning objective, how their writing has progressed, and how well they comprehend what is read to them. Therefore, the total score not only reflects students' reading and writing achievement, but it can also reflect educational behaviors and habits (e.g., note taking, direction following, attention and focus). The version of the paper-and-pencil assessment administered to students depends on students' ability level and language proficiency. The assessments are designed to closely match the individual state's assessment in both content and format (as cited in Rouse & Krueger, 2004).
State Standardized Reading Test	This is the state's criterion-referenced standardized test (the study authors did not specify which state). The exam is designed to be aligned with the curriculum standards of the state as well as to parallel critical aspects of the National Assessment of Educational Progress (NAEP). The state administers tests in reading, math, and writing annually (as cited in Rouse & Krueger, 2004).
Clinical Evaluation of Language Fundamentals–Third Edition (CELF-3), Receptive Language	This standardized assessment measures a student's ability to interpret and execute commands of increasing complexity and to understand relationships between words and categories. It addresses sentence structure, concepts and directions, and word classes (as cited in Beattie, 2000). The Receptive Language portion of the assessment includes five components: (1) sentence structure, in which students point to one of four pictures in response to an orally presented stimulus; (2) concepts and directions, in which students identify pictures of geometric shapes in response to orally presented direction; (3) semantic relations, in which students listen to four facts and then select two of four visually presented options; (4) word classes, in which students select two out of three or four orally presented words that go together; and (5) recalling sentences, in which students imitate an orally presented sentence (as cited in Rouse & Krueger, 2004).
CELF-4—Australian Standard Edition, Receptive Language	CELF-4 is a standardized test widely used to measure a student's overall oral language ability. The Receptive Language index is a cumulative measure of students' performance on subtests designed to best probe receptive aspects of language including comprehension and listening. The subtests cover topics such as Concepts & Following Directions, Word Classes, and Sentence Structure (as cited in Scientific Learning Corporation, 2007a).
CELF-4—Australian Standard Edition, Expressive Language	CELF-4 is a standardized test widely used to measure a student's overall oral language ability. The Expressive Language index is a cumulative measure of students' performance on subtests that probe expressive aspects of language including oral language expression. The subtests cover topics such as Word Structure, Recalling Sentences, and Formulated Sentences (as cited in Scientific Learning Corporation, 2007a).
Measures of Academic Progress (MAP), Language Test	Developed by the Northwest Evaluation Association, the MAP are state-aligned computerized adaptive tests that reflect the instructional level of each student and measure growth over time. The MAP is appropriate for students in grades 2 through 10. The untimed assessment typically features between 40 and 50 items. The assessment is usually tailored to the specific needs of individual organizations, but all NWEA MAP assessments draw from the same item bank. The Language Test draws items from the following areas: writing process, composition structure, grammar/usage, punctuation, and capitalization (as cited in Scientific Learning Corporation, 2007b).

Appendix A3.1 Summary of study findings for all domains[1]

	Domain			
	Alphabetics	Reading fluency	Comprehension	General literacy achievement
Meets WWC evidence standards				
Rouse & Krueger (2004)	nr	nr	nr	ind
Scientific Learning Corporation (2007a)	ind	nr	nr	ind
Meets WWC evidence standards with reservations				
Beattie (2000)	ind	(+)	(+)	ind
Borman & Benson (2006)	nr	nr	ind	ind
Overbay & Baenen (2002)	nr	nr	ind	nr
Scientific Learning Corporation (2004a)	nr	nr	(+)	nr
Scientific Learning Corporation (2004b)	nr	nr	+	nr
Scientific Learning Corporation (2007b)	nr	nr	ind	ind
Rating of effectiveness	**No discernible effects**	**Potentially positive effects**	**Potentially positive effects**	**No discernible effects**

nr = no reported outcomes under this domain

+ = study finding was positive and statistically significant

(+) = study finding was positive and substantively important, but not statistically significant

ind = study finding was indeterminate; that is, neither substantively important nor statistically significant

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices in each domain. More detailed information on findings for all measures within the domains and the constructs that factor into the domains can be found in Appendices A3.2–A3.5.

Appendix A3.2 Summary of study findings included in the rating for the alphabetics domain[1]

Outcome measure	Study sample[4]	Sample size (students)	Authors' findings from the study: Mean outcome[2] (standard deviation)[3] — *Fast ForWord*® group	Authors' findings from the study: Mean outcome[2] (standard deviation)[3] — Comparison group	WWC calculations: Mean difference[5] (*Fast ForWord*® – comparison)	WWC calculations: Effect size[6]	WWC calculations: Statistical significance[7] (at $\alpha = 0.05$)	WWC calculations: Improvement index[8]
Scientific Learning Corporation, 2007a[8,9]								
Queensland University Inventory of Literacy (QUIL)	Ages 5–14	137	8.49 (2.31)	7.93 (2.58)	0.56	0.23	ns	+9
Average for alphabetics (Scientific Learning Corporation, 2007a)[9]						**0.23**	**ns**	**+9**
Beattie, 2000[10]								
WJ-R ACH (Letter-Word Identification)	Ages 12–17	24	90.99 (21.29)	92.08 (13.15)	–1.09	–0.06	ns	–2
WJ-R ACH (Word Attack)	Ages 12–17	24	86.41 (14.34)	85.91 (12.87)	0.50	0.04	ns	+1
WJ-R COG (Auditory Processing Cluster for Phonemic Awareness)	Ages 12–17	24	82.58 (14.14)	85.66 (15.61)	–3.08	–0.20	ns	–8
Wide Range Achievement Test–Third Edition (WRAT-3) (Spelling subtest)	Ages 12–17	24	82.58 (15.10)	85.66 (13.13)	–3.08	–0.21	ns	–8
Average for alphabetics (Beattie, 2000)[11]						**–0.11**	**ns**	**–4**
Domain average for alphabetics across all studies[9]						**0.06**	**na**	**+2**

ns = not statistically significant

na = not applicable

WJ-R = Woodcock-Johnson Psycho-Educational Battery–Revised

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices for the alphabetics domain.
2. The intervention group values are the comparison group means plus the difference in means gains between the intervention and comparison groups.
3. The standard deviation across all students in each group shows how dispersed the participants' outcomes are: a smaller standard deviation on a given measure would indicate that participants had more similar outcomes.
4. The Adolescent Literacy topic area reviews studies of interventions administered to students in grades 4–12 (or 9–18 years of age). For studies that include samples of students that span both the Adolescent Literacy (grades 4–12) and Beginning Reading (grades K–3) topic areas and cannot be disaggregated by grade level, the Adolescent Literacy topic area reviews any studies that include 5th-grade students or higher. For example, this appendix includes a combined sample of students aged 5–14 years (Scientific Learning Corporation, 2007a).
5. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
6. For an explanation of the effect size calculation, see WWC Procedures and Standards Handbook, Appendix B.
7. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.

(continued)

Appendix A3.2 Summary of study findings included in the rating for the alphabetics domain[1] *(continued)*

8. The improvement index represents the difference between the percentile rank of the average student in the intervention condition and that of the average student in the comparison condition. The improvement index can take on values between –50 and +50, with positive numbers denoting favorable results for the intervention group.
9. Results for the early elementary school students (in 3rd grade or below) in this study are traditionally considered under the Beginning Reading topic area reviews; however, because there was no separate analysis for students in 3rd grade or below (grades covered by the Beginning Reading topic area) and 4th grade and above (areas covered by the Adolescent Literacy topic area), we report on the total sample of students here.
10. The level of statistical significance was reported by the study authors or, when necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation about the clustering correction, see the WWC Tutorial on Mismatch. For the formulas the WWC used to calculate the statistical significance, see WWC Procedures and Standards Handbook, Appendix C for clustering and WWC Procedures and Standards Handbook, Appendix D for multiple comparisons. In the case of Beattie (2000), a correction for multiple comparisons was needed, so the significance level may differ from that reported in the original study. In the case of Scientific Learning Corporation (2007a), no corrections for clustering or multiple comparisons were needed.
11. The WWC-computed average effect sizes for each study and for the domain across studies are simple averages rounded to two decimal places. The average improvement indices are calculated from the average effect sizes.

Appendix A3.3 Summary of study findings included in the rating for the reading fluency domain[1]

Outcome measure	Study sample	Sample size (students)	Author's findings from the study: Mean outcome[2] (standard deviation)[3] — *Fast ForWord*® group	Author's findings from the study: Mean outcome[2] (standard deviation)[3] — Comparison group	WWC calculations: Mean difference[4] (*Fast ForWord*® – comparison)	WWC calculations: Effect size[5]	WWC calculations: Statistical significance[6] (at $\alpha = 0.05$)	WWC calculations: Improvement index[7]
Beattie, 2000[8]								
Gray Oral Reading Test–Third Edition (GORT-3)	Ages 12–17	24	87.39 (16.47)	79.50 (17.74)	7.89	0.44	ns	+17
Average for reading fluency (Beattie, 2000)[9]						**0.44**	**ns**	**+17**

ns = not statistically significant

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices for the reading fluency domain.
2. The intervention group values are the comparison group means plus the difference in means gains between the intervention and comparison groups.
3. The standard deviation across all students in each group shows how dispersed the participants' outcomes are: a smaller standard deviation on a given measure would indicate that participants had more similar outcomes.
4. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
5. For an explanation of the effect size calculation, see WWC Procedures and Standards Handbook, Appendix B.
6. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
7. The improvement index represents the difference between the percentile rank of the average student in the intervention condition and that of the average student in the comparison condition. The improvement index can take on values between –50 and +50, with positive numbers denoting favorable results for the intervention group.
8. The level of statistical significance was reported by the study authors or, when necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation about the clustering correction, see the WWC Tutorial on Mismatch. For the formulas the WWC used to calculate the statistical significance, see WWC Procedures and Standards Handbook, Appendix C for clustering and WWC Procedures and Standards Handbook, Appendix D for multiple comparisons. In the case of Beattie (2000), no corrections for clustering and multiple comparisons were needed.
9. This row provides the study average, which in this instance is also the domain average. The domain improvement index is calculated from the average effect size.

Appendix A3.4 Summary of study findings included in the rating for the comprehension domain[1]

Outcome measure	Study sample[4]	Sample size (students)	Authors' findings from the study: Mean outcome[2] (standard deviation)[3] — *Fast ForWord*® group	Authors' findings from the study: Mean outcome[2] (standard deviation)[3] — Comparison group	WWC calculations: Mean difference[5] (*Fast ForWord*® – comparison)	WWC calculations: Effect size[6]	WWC calculations: Statistical significance[7] (at $\alpha = 0.05$)	WWC calculations: Improvement index[8]
Beattie, 2000[9]								
WJ-R ACH Passage Comprehension	Ages 12–17	24	97.17 (13.78)	93.25 (11.30)	3.92	0.30	ns	+12
Average for comprehension (Beattie, 2000)[10]						**0.30**	**ns**	**+12**
Borman & Benson, 2006[8]								
CTBS/5 Terra Nova Reading NCE Scores	Grade 7	188	36.99 (14.11)	34.03 (14.92)	2.96	0.20	ns	+8
Average for comprehension (Borman & Benson, 2006)[9]						**0.20**	**ns**	**+8**
Overbay & Baenen, 2002[8,11]								
North Carolina End of Grade	Grades 4–8	710	154.37	155.37	–1.00	–0.14	ns	–6
Average for comprehension (Overbay & Baenen, 2002)[9]						**–0.14**	**ns**	**–6**
Scientific Learning Corporation, 2004a[8]								
Ohio Proficiency Test, Reading Test	Grade 4	91	210.60 (16.65)	205.10 (16.97)	5.50	0.32	ns	+13
Average for comprehension (Scientific Learning Corporation, 2004a)[9]						**0.32**	**ns**	**+13**
Scientific Learning Corporation, 2004b[8,12]								
Gates–MacGinitie Reading Test	Grades 2–8	293	30.39 (14.37)	25.00 (10.60)	5.39	0.39	Statistically significant	+15
Average for comprehension (Scientific Learning Corporation, 2004b)[9]						**0.39**	**Statistically significant**	**+15**
Scientific Learning Corporation, 2007b[8,13]								
Measures of Academic Progress, Reading Test	Grades 4–5	70	34.90 (32.00)	30.50 (30.10)	4.40	0.14	ns	+6
Average for comprehension (Scientific Learning Corporation, 2007b)[9]						**0.14**	**ns**	**+6**
Domain average for comprehension across all studies[9]						**0.20**	**na**	**+8**

(continued)

Appendix A3.4 Summary of study findings included in the rating for the comprehension domain[1] *(continued)*

ns = not statistically significant
na = not applicable
WJ-R ACH = Woodcock-Johnson Psycho-Educational Battery–Revised, Tests of Achievement
CTBS/5 = Comprehensive Test of Basic Skills
NCE = Normal Curve Equivalent

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices for the comprehension domain. Subgroup findings from the same studies are not included in these ratings, but are reported in Appendix A4.
2. The intervention and control group values for Scientific Learning Corporation (2007b) are the ANCOVA adjusted mean values calculated using pretest scores as the covariates. For all other studies in this domain, the intervention group values are the comparison group means plus the difference in means gains between the intervention and comparison groups.
3. The standard deviation across all students in each group shows how dispersed the participants' outcomes are: a smaller standard deviation on a given measure would indicate that participants had more similar outcomes.
4. The Adolescent Literacy topic area reviews studies of interventions administered to students in grades 4–12 (or 9–18 years of age). For studies that include samples of students that span both the Adolescent Literacy (grades 4–12) and Beginning Reading (grades K–3) topic areas and cannot be disaggregated by grade level, the Adolescent Literacy topic area reviews any studies that include 5th-grade students or higher. For example, this appendix includes a combined sample of students from grades 2–8 (Scientific Learning Corporation, 2004b).
5. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
6. For an explanation of the effect size calculation, see WWC Procedures and Standards Handbook, Appendix B.
7. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
8. The improvement index represents the difference between the percentile rank of the average student in the intervention condition and that of the average student in the comparison condition. The improvement index can take on values between –50 and +50, with positive numbers denoting favorable results for the intervention group.
9. The level of statistical significance was reported by the study authors or, when necessary, calculated by the WWC to correct for clustering within classrooms or schools (corrections for multiple comparisons were not done for findings not included in the overall intervention rating). For an explanation about the clustering correction, see the WWC Tutorial on Mismatch. For the formulas the WWC used to calculate the statistical significance, see WWC Procedures and Standards Handbook, Appendix C. For the *Fast ForWord*® studies summarized here, no corrections for clustering or multiple comparisons were needed.
10. This row provides the study average, which in this instance is also the domain average. The WWC-computed domain average effect size is a simple average rounded to two decimal places. The domain improvement index is calculated from the average effect size.
11. This study reported the mean values for the outcome measure, not the standard deviations. The effect size for each grade was calculated through the F-statistics from the one way ANOVA reported in the study. The average effect size reported here is based on effect sizes that have been weighted by the sample size for each grade.
12. The means and standard deviations were aggregated across two intervention groups.
13. This study separately reported results for students in grades 3 and below and for students in grades 4 and above, along with aggregated results across all of the grade levels. Results for the second- and third-grade students in this study will be considered under the Beginning Reading topic area reviews.

Appendix A3.5 Summary of study findings included in the rating for the general literacy achievement domain[1]

Outcome measure	Study sample[4]	Sample size (students)	Authors' findings from the study: Mean outcome[2] (standard deviation)[3] *Fast ForWord®* group	Authors' findings from the study: Mean outcome[2] (standard deviation)[3] Comparison group	WWC calculations: Mean difference[5] (*Fast ForWord®* – comparison)	WWC calculations: Effect size[6]	WWC calculations: Statistical significance[7] (at $\alpha = 0.05$)	WWC calculations: Improvement index[8]
Rouse & Krueger, 2004[8]								
Success for All Assessment	Grades 3–6	373	4.06 (1.40)	4.03 (1.33)	0.03	0.02	ns	+1
CELF-3, Receptive Language	Grades 3–6	86	31.70 (18.43)	31.01 (16.59)	0.69	0.04	ns	+2
State Standardized Reading Test	Grades 3–6	454	44.18 (24.79)	43.03 (24.01)	1.15	0.05	ns	+2
Average for general literacy achievement (Rouse & Krueger, 2004)[9]						**0.04**	**ns**	**+1**
Scientific Learning Corporation, 2007a[8,9]								
CELF-4, Receptive Language	Ages 5–14	137	91.00 (12.40)	88.40 (14.12)	2.60	0.19	ns	+8
CELF-4, Expressive Language	Ages 5–14	137	88.00 (12.40)	85.00 (13.29)	3.00	0.23	ns	+9
Average for general literacy achievement (Scientific Learning Corporation, 2007a)[9]						**0.21**	**ns**	**+8**
Beattie, 2000[8]								
CELF-3, Receptive Language	Ages 12–17	24	86.08 (21.11)	86.83 (22.74)	–0.75	–0.03	ns	–1
Average for general literacy achievement (Beattie, 2000)[9]						**–0.03**	**ns**	**–1**
Borman & Benson, 2006[10]								
CTBS/5 Terra Nova Language NCE Scores	Grade 7	188	40.52 (11.22)	40.14 (11.59)	0.38	0.03	ns	+1
Average for general literacy achievement (Borman & Benson, 2006)[11]						**0.03**	**ns**	**+1**
Scientific Learning Corporation, 2007b[8,12]								
Measures of Academic Progress, Language Test	Grades 4–5	70	31.10 (27.90)	26.80 (26.60)	4.30	0.16	ns	+6
Average for general literacy achievement (Scientific Learning Corporation, 2007b)[9]						**0.16**	**ns**	**+6**
Domain average for general literacy achievement across all studies[9]						**0.08**	**na**	**+3**

(continued)

Appendix A3.5 Summary of study findings included in the rating for the general literacy achievement domain[1] *(continued)*

ns = not statistically significant
na = not applicable
CELF-3 = Clinical Evaluation of Language Fundamentals–Third Edition
CELF-4 = Clinical Evaluation of Language Fundamentals–Fourth Edition
CTBS/5 = Comprehensive Test of Basic Skills
NCE = Normal Curve Equivalent

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices for the general literacy achievement domain.
2. The intervention group values are the comparison group means plus the difference in means gains between the intervention and comparison groups tested immediately after the intervention for Beattie (2000) and Scientific Learning Corporation (2007a). The intervention group values are the comparison group means plus the regression-adjusted impacts for Borman and Benson (2006) and Rouse and Krueger (2004). The intervention and control group values for Scientific Learning Corporation (2007b) are the ANCOVA adjusted mean values calculated using pretest scores as the covariates.
3. The standard deviation across all students in each group shows how dispersed the participants' outcomes are: a smaller standard deviation on a given measure would indicate that participants had more similar outcomes.
4. The Adolescent Literacy topic area reviews studies of interventions administered to students in grades 4–12 (or 9–18 years of age). For studies that include samples of students that span both the Adolescent Literacy (grades 4–12) and Beginning Reading (grades K–3) topic areas and cannot be disaggregated by grade level, the Adolescent Literacy topic area reviews any studies that include 5th-grade students or higher. For example, this appendix includes a combined sample of students from grades 3–6 (Rouse & Krueger, 2004) and students aged 5–14 years (Scientific Learning Corporation, 2007a).
5. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
6. For an explanation of the effect size calculation, see WWC Procedures and Standards Handbook, Appendix B.
7. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
8. The improvement index represents the difference between the percentile rank of the average student in the intervention condition and that of the average student in the comparison condition. The improvement index can take on values between –50 and +50, with positive numbers denoting favorable results for the intervention group.
9. Results for the early elementary school students (in grades 3 and below) in this study are traditionally considered under the Beginning Reading topic area reviews; however, because there was no separate analysis for students in 3rd grade or below (grades covered by the Beginning Reading topic area) and 4th grade and above (areas covered by the Adolescent Literacy topic area), we report on the total sample of students here.
10. The level of statistical significance was reported by the study authors or, when necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation about the clustering correction, see the WWC Tutorial on Mismatch. For the formulas the WWC used to calculate the statistical significance, see WWC Procedures and Standards Handbook, Appendix C for clustering and WWC Procedures and Standards Handbook, Appendix D for multiple comparisons. For all *Fast ForWord*® studies summarized here, except Beattie (2000) and Borman & Benson (2006), a correction for multiple comparisons was needed, so the significance levels may differ from those reported in the original study.
11. The WWC-computed average effect sizes for each study and for the domain across studies are simple averages rounded to two decimal places. The average improvement indices are calculated from the average effect sizes.
12. This study separately reported results for students in grades 3 and below and for students in grades 4 and above, along with aggregated results across all of the grade levels. Results for the 2nd- and 3rd-grade students in this study will be considered under the Beginning Reading topic area reviews.

Appendix A4 Summary of subgroup findings for the comprehension domain[1]

Outcome measure	Study sample[4]	Sample size (students)	Authors' findings from the study: Mean outcome[2] (standard deviation)[3] — *Fast ForWord®* group	Authors' findings from the study: Mean outcome[2] (standard deviation)[3] — Comparison group	WWC calculations: Mean difference[5] (*Fast ForWord®* – comparison)	WWC calculations: Effect size[6]	WWC calculations: Statistical significance[7] (at $\alpha = 0.05$)	WWC calculations: Improvement index[8]
Overbay & Baenen, 2002[9]								
North Carolina End of Grade Test	Grade 4	114	148.39	150.90	–2.51	–0.35	ns	–14
North Carolina End of Grade Test	Grade 5	148	156.07	155.76	0.31	0.06	ns	+2
North Carolina End of Grade Test	Grade 6	78	149.80	151.59	–1.79	–0.23	ns	–9
North Carolina End of Grade Test	Grade 7	224	155.70	156.86	–1.16	–0.18	ns	–7
North Carolina End of Grade Test	Grade 8	146	157.70	158.18	–0.48	–0.08	ns	–3
Scientific Learning Corporation, 2004b[10,11]								
Gates–MacGinitie Reading Test	Group 1 vs. control; grades 2–8	162	30.70 (13.90)	25.00 (10.60)	5.70	0.43	Statistically significant	+17
Gates–MacGinitie Reading Test	Group 2 vs. control; grades 2–8	168	30.10 (14.80)	25.00 (10.60)	5.10	0.36	ns	+14
Gates–MacGinitie Reading Test	Group 1 vs. control; grade 4	56	26.90 (12.80)	23.20 (10.20)	3.70	0.31	ns	+12
Gates–MacGinitie Reading Test	Group 2 vs. control; grade 4	67	27.00 (15.20)	23.20 (10.20)	3.80	0.28	ns	+11
Gates–MacGinitie Reading Test	Group 1 vs. control; grade 5	103	35.40 (14.10)	30.60 (9.10)	4.80	0.34	ns	+14
Gates–MacGinitie Reading Test	Group 2 vs. control; grade 5	83	34.90 (13.40)	30.60 (9.10)	4.30	0.33	ns	+13

(continued)

Appendix A4 Summary of subgroup findings for the comprehension domain[1] *(continued)*

ns = not statistically significant

1. This appendix presents subgroup findings for measures that fall in the comprehension domain. Total group scores were used for rating purposes and are presented in Appendix A3.4.
2. The intervention group values are the comparison group means plus the difference in means gains between the intervention and comparison groups.
3. The standard deviation across all students in each group shows how dispersed the participants' outcomes are: a smaller standard deviation on a given measure would indicate that participants had more similar outcomes.
4. The Adolescent Literacy topic area reviews studies of interventions administered to students in grades 4–12 (or 9–18 years of age). For studies that include samples of students that span both the Adolescent Literacy (grades 4–12) and Beginning Reading (grades K–3) topic areas and cannot be disaggregated by grade level, the Adolescent Literacy topic area reviews any studies that include 5th-grade students or higher. For example, this appendix includes a combined sample of students from grades 2–8 (Scientific Learning Corporation, 2004b).
5. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
6. For an explanation of the effect size calculation, see WWC Procedures and Standards Handbook, Appendix B.
7. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
8. The improvement index represents the difference between the percentile rank of the average student in the intervention condition and that of the average student in the comparison condition. The improvement index can take on values between –50 and +50, with positive numbers denoting results favorable to the intervention group.
9. This study reported the mean values only for the outcome measure, not the standard deviations. The effect size was calculated through the F-statistics from the one way ANOVA reported in the study.
10. Treatment group 1 received the intervention from September to November, and treatment group 2 received the intervention from December to February.
11. The level of statistical significance was reported by the study authors or, when necessary, calculated by the WWC to correct for clustering within classrooms or schools (corrections for multiple comparisons were not done for findings not included in the overall intervention rating). For an explanation about the clustering correction, see the WWC Tutorial on Mismatch. For the formulas the WWC used to calculate the statistical significance, see WWC Procedures and Standards Handbook, Appendix C. For the *Fast ForWord*® studies summarized here, no corrections for clustering were needed.

Appendix A5.1 *Fast ForWord*® rating for the alphabetics domain

The WWC rates an intervention's effects for a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative.[1]

For the outcome domain of alphabetics, the WWC rated *Fast ForWord*® as having no discernible effects for adolescent learners. It did not meet the criteria for positive effects, potentially positive effects, mixed effects, potentially negative effects, or negative effects because no studies showed statistically significant or substantively important effects, either positive or negative.

Rating received

No discernible effects: No affirmative evidence of effects.

- Criterion 1: No studies showing a statistically significant or substantively important effect, either *positive* or *negative*.

  Met. No studies showed a statistically significant or substantively important effect, either positive or negative. Two studies showed indeterminate effects.

Other ratings considered

Positive effects: Strong evidence of a positive effect with no overriding contrary evidence.

- Criterion 1: Two or more studies showing statistically significant *positive* effects, at least one of which met WWC evidence standards for a *strong* design.

  Not met. No studies showed a statistically significant positive effect.

AND

- Criterion 2: No studies showing statistically significant or substantively important *negative* effects.

  Met. No studies showed a statistically significant or substantively important negative effect.

Potentially positive effects: Evidence of a positive effect with no overriding contrary evidence.

- Criterion 1: At least one study showing a statistically significant or substantively important *positive* effect.

  Not met. No studies showed a statistically significant or substantively important positive effect.

AND

- Criterion 2: No studies showing a statistically significant or substantively important *negative* effect and fewer or the same number of studies showing *indeterminate* effects than showing statistically significant or substantively important *positive* effects.

  Not met. No studies showed a statistically significant or substantively important negative effect. Two studies showed indeterminate effects, and no studies showed a statistically significant or substantively important positive effect.

Mixed effects: Evidence of inconsistent effects as demonstrated through either of the following criteria.

- Criterion 1: At least one study showing a statistically significant or substantively important *positive* effect, and at least one study showing 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.

  Not met. No studies showed a statistically significant or substantively important positive effect, and no studies showed a statistically significant or substantively important negative effect.

OR

- Criterion 2: At least one study showing a statistically significant or substantively important effect, and more studies showing an *indeterminate* effect than showing a statistically significant or substantively important effect.

  Not met. No studies showed a statistically significant or substantively important effect.

(continued)

Appendix A5.1 *Fast ForWord*® rating for the alphabetics domain *(continued)*

Potentially negative effects: Evidence of a negative effect with no overriding contrary evidence.

- Criterion 1: One study showing a statistically significant or substantively important *negative* effect and no studies showing a statistically significant or substantively important *positive* effect.

  Not met. No studies showed a statistically significant or substantively important effect, either positive or negative.

OR

- Criterion 2: Two or more studies showing statistically significant or substantively important *negative* effects, at least one study showing a statistically significant or substantively important *positive* effect, and more studies showing statistically significant or substantively important *negative* effects than showing statistically significant or substantively important *positive* effects.

  Not met. No studies showed a statistically significant or substantively important effect, either positive or negative.

Negative effects: Strong evidence of a negative effect with no overriding contrary evidence.

- Criterion 1: Two or more studies showing statistically significant *negative* effects, at least one of which met WWC evidence standards for a *strong* design.

  Not met. No studies showed a statistically significant negative effect.

AND

- Criterion 2: No studies showing statistically significant or substantively important *positive* effects.

  Met. No studies showed a statistically significant or substantively important positive effect.

1. For rating purposes, the WWC considers the statistical significance of individual outcomes and the domain-level effect. The WWC also considers the size of the domain-level effect for ratings of potentially positive or potentially negative effects. For a complete description, see the WWC Procedures and Standards Handbook, Appendix E.

Appendix A5.2 *Fast ForWord*® rating for the reading fluency domain

The WWC rates an intervention's effects for a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative.[1]

For the outcome domain of reading fluency, the WWC rated *Fast ForWord*® as having potentially positive effects for adolescent learners. It did not meet the criteria for positive effects because no studies showed statistically significant positive effects. The remaining ratings (mixed effects, no discernible effects, potentially negative effects, or negative effects) were not considered, as *Fast ForWord*® was assigned the highest applicable rating.

Rating received

Potentially positive effects: Evidence of a positive effect with no overriding contrary evidence.

- Criterion 1: At least one study showing a statistically significant or substantively important *positive* effect.

  Met. One study showed a substantively important positive effect.

AND

- Criterion 2: No studies showing a statistically significant or substantively important *negative* effect and fewer or the same number of studies showing *indeterminate* effects than showing statistically significant or substantively important *positive* effects.

  Met. No studies showed a statistically significant or substantively important negative effect, no studies showed indeterminate effects, and one study showed substantively important positive effects.

Other ratings considered

Positive effects: Strong evidence of a positive effect with no overriding contrary evidence.

- Criterion 1: Two or more studies showing statistically significant *positive* effects, at least one of which met WWC evidence standards for a *strong* design.

  Not met. No studies showed statistically significant positive effects.

AND

- Criterion 2: No studies showing statistically significant or substantively important *negative* effects.

  Met. No studies showed a statistically significant or substantively important negative effect.

1. For rating purposes, the WWC considers the statistical significance of individual outcomes and the domain-level effect. The WWC also considers the size of the domain-level effect for ratings of potentially positive or potentially negative effects. For a complete description, see the WWC Procedures and Standards Handbook, Appendix E.

Appendix A5.3 *Fast ForWord*® rating for the comprehension domain

The WWC rates an intervention's effects for a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative.[1]

For the outcome domain of comprehension, the WWC rated *Fast ForWord*® as having potentially positive effects for adolescent learners. It did not meet the criteria for positive effects because only one study showed statistically significant positive effects. The remaining ratings (mixed effects, no discernible effects, potentially negative effects, or negative effects) were not considered, as *Fast ForWord*® was assigned the highest applicable rating.

Rating received

Potentially positive effects: Evidence of a positive effect with no overriding contrary evidence.

- Criterion 1: At least one study showing a statistically significant or substantively important *positive* effect.

  Met. One study showed a statistically significant positive effect, and two studies showed substantively important positive effects.

AND

- Criterion 2: No studies showing a statistically significant or substantively important *negative* effect and fewer or the same number of studies showing *indeterminate* effects than showing statistically significant or substantively important *positive* effects.

  Met. No studies showed a statistically significant or substantively important negative effect. Three studies showed indeterminate effects, one study showed a statistically significant positive effect, and two studies showed substantively important positive effects.

Other ratings considered

Positive effects: Strong evidence of a positive effect with no overriding contrary evidence.

- Criterion 1: Two or more studies showing statistically significant *positive* effects, at least one of which met WWC evidence standards for a *strong* design.

  Not met. Only one study showed a statistically significant positive effect.

AND

- Criterion 2: No studies showing statistically significant or substantively important *negative* effects.

  Met. No studies showed a statistically significant or substantively important negative effect.

1. For rating purposes, the WWC considers the statistical significance of individual outcomes and the domain-level effect. The WWC also considers the size of the domain-level effect for ratings of potentially positive or potentially negative effects. For a complete description, see the WWC Procedures and Standards Handbook, Appendix E.

Appendix A5.4 *Fast ForWord*® rating for the general literacy achievement domain

The WWC rates an intervention's effects for a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative.[1]

For the outcome domain of general literacy achievement, the WWC rated *Fast ForWord*®as having no discernible effects for adolescent learners. It did not meet the criteria for positive effects, potentially positive effects, mixed effects, potentially negative effects, or negative effects because no studies showed statistically significant or substantively important effects, either positive or negative.

Rating received

No discernible effects: No affirmative evidence of effects.

- Criterion 1: No studies showing a statistically significant or substantively important effect, either *positive* or *negative*.

  Met. No studies showed a statistically significant or substantively important effect, either positive or negative. Five studies showed indeterminate effects.

Other ratings considered

Positive effects: Strong evidence of a positive effect with no overriding contrary evidence.

- Criterion 1: Two or more studies showing statistically significant *positive* effects, at least one of which met WWC evidence standards for a *strong* design.

  Not met. No studies showed a statistically significant positive effect.

AND

- Criterion 2: No studies showing statistically significant or substantively important *negative* effects.

  Met. No studies showed a statistically significant or substantively important negative effect.

Potentially positive effects: Evidence of a positive effect with no overriding contrary evidence.

- Criterion 1: At least one study showing a statistically significant or substantively important *positive* effect.

  Not met. No studies showed a statistically significant or substantively important positive effect.

AND

- Criterion 2: No studies showing a statistically significant or substantively important *negative* effect and fewer or the same number of studies showing *indeterminate* effects than showing statistically significant or substantively important *positive* effects.

  Not met. No studies showed a statistically significant or substantively important negative effect. Five studies showed indeterminate effects, and no studies showed a statistically significant or substantively important positive effect.

Mixed effects: Evidence of inconsistent effects as demonstrated through either of the following criteria.

- Criterion 1: At least one study showing a statistically significant or substantively important *positive* effect, and at least one study showing 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.

  Not met. No studies showed a statistically significant or substantively important negative effect.

OR

- Criterion 2: At least one study showing a statistically significant or substantively important effect, and more studies showing an *indeterminate* effect than showing a statistically significant or substantively important effect.

  Not met. No studies showed a statistically significant or substantively important effect.

(continued)

Appendix A5.4 *Fast ForWord*® rating for the general literacy achievement domain *(continued)*

Potentially negative effects: Evidence of a negative effect with no overriding contrary evidence.

- Criterion 1: One study showing a statistically significant or substantively important *negative* effect and no studies showing a statistically significant or substantively important *positive* effect.

  Not met. No studies showed a statistically significant or substantively important effect, either positive or negative.

OR

- Criterion 2: Two or more studies showing statistically significant or substantively important *negative* effects, at least one study showing a statistically significant or substantively important *positive* effect, and more studies showing statistically significant or substantively important *negative* effects than showing statistically significant or substantively important *positive* effects.

  Not met. No studies showed a statistically significant or substantively important effect, either positive or negative.

Negative effects: Strong evidence of a negative effect with no overriding contrary evidence.

- Criterion 1: Two or more studies showing statistically significant *negative* effects, at least one of which met WWC evidence standards for a *strong* design.

  Not met. No studies showed a statistically significant negative effect.

AND

- Criterion 2: No studies showing statistically significant or substantively important *positive* effects.

  Met. No studies showed a statistically significant or substantively important positive effect.

1. For rating purposes, the WWC considers the statistical significance of individual outcomes and the domain-level effect. The WWC also considers the size of the domain-level effect for ratings of potentially positive or potentially negative effects. For a complete description, see the WWC Procedures and Standards Handbook, Appendix E.

Appendix A6 Extent of evidence by domain

Outcome domain	Number of studies	Sample size		Extent of evidence[1]
		Schools	Students	
Alphabetics	2	7	161	Small
Reading fluency	1	3	24	Small
Comprehension	6	>42[2]	1,376	Medium to large
General literacy achievement	5	20	873[3]	Medium to large

1. A rating of "medium to large" requires at least two studies and two schools across studies in one domain and a total sample size across studies of at least 350 students or 14 classrooms. Otherwise, the rating is "small." For more details on the extent of evidence categorization, see the WWC Procedures and Standards Handbook, Appendix G.
2. The number of control schools in Overbay and Baenen (2002) is unknown.
3. For Rouse and Krueger (2004), we counted the number of students as 454, which is from the state assessment. The actual number of students might be higher, as we do not know to what extent the number of students from the three outcome measures overlapped.