

# What Works Clearinghouse



## Accelerated Reader™

**Program Description<sup>1</sup>** *Accelerated Reader™* is a guided reading intervention used to supplement regular reading instruction in K–12 classrooms. Its aim is to improve students' reading skills through reading practice and quizzes on the books students read. The *Accelerated Reader™* program calls for students to select and read a book

and then take a computerized quiz based on the book's content and vocabulary. The computer software then provides teachers with information on the students' performance on the quiz, which allows teachers to monitor student progress and identify students who may need more reading assistance.

**Research<sup>2</sup>** One study of *Accelerated Reader™* that falls within the scope of the Adolescent Literacy review protocol meets What Works Clearinghouse (WWC) evidence standards, and one study meets WWC evidence standards with reservations. The two studies included 2,877 students from grade 4 to grade 8 who attended elementary and middle schools in Oregon and Texas.<sup>3</sup>

Based on these two studies, the WWC considers the extent of evidence for *Accelerated Reader™* on adolescent learners to be small for reading fluency and medium to large for comprehension. No studies that meet WWC evidence standards with or without reservations examined the effectiveness of *Accelerated Reader™* on adolescent learners in the alphabetics or general literacy achievement domains.

1. The descriptive information for this program was obtained from a publicly available source: the program's website (<http://www.renlearn.com/ar/>, downloaded August 2009). 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 by July 2009.
2. The studies in this report were reviewed using WWC Evidence Standards, Version 2.0 (see the WWC Procedures and Standards Handbook, Chapter III), as described in protocol Version 2.0.
3. The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.

**Effectiveness** *Accelerated Reader™* was found to have no discernible effects on reading fluency or comprehension for adolescent learners.

	<i>Alphabetics</i>	<i>Reading fluency</i>	<i>Comprehension</i>	<i>General literacy achievement</i>
<b>Rating of effectiveness</b>	na	No discernible effects	No discernible effects	na
<b>Improvement index<sup>4</sup></b>	na	Average: +7 percentile points	Average: +3 percentile points	na
	na	Range: +1 to +13 percentile points	Range: -2 to +10 percentile points	na

na = not applicable

### Additional program information

#### Developer and contact

Developed by Judi and Terry Paul, *Accelerated Reader™* is distributed by Renaissance Learning, Inc. Address: PO Box 8036, Wisconsin Rapids, WI 54495-8036. Email: answers@renlearn.com. Web: <http://www.renlearn.com/ar/>. Telephone: (800) 338-4204.

#### Scope of use

The *Accelerated Reader™* software prototype was created in 1984. In 1992, research began to focus on best practices related to *Accelerated Reader™*. These efforts led to the development of the *Accelerated Reader™ Best Classroom Practices* (formerly called *Reading Renaissance*), first introduced to educators in 1996 through professional development seminars. According to the developers, more than 63,000 schools nationwide are using *Accelerated Reader™* and Renaissance Learning's other reading programs in a wide variety of academic settings.<sup>5</sup>

#### Teaching

The recommended use of *Accelerated Reader™* involves a dedicated 30- to 60-minute block of time for reading practice.

Depending on the age and skill levels of the students, three activities may occur during a reading block: (1) reading texts to a child, (2) reading texts to a child using a paired-reading technique, or (3) independent reading by the child. As children develop decoding skills, they transition to guided independent reading. Initially, students take a norm-referenced, standardized measure of general reading achievement to determine their independent reading level. Then, students select books within a recommended readability range to read independently. After reading each book, students take a comprehension quiz and earn points based on the number of correct responses, the length of the book, and the readability level of the book. Teachers use data from the quizzes to monitor student progress, adjust students' reading ranges, or identify students who may need more reading assistance. Teachers use points to set individual student goals for the quantity and quality of student reading practice and to monitor each student's progress. Accumulation of points is intended to motivate student learning; teachers also may choose to implement a system of rewards, although Renaissance Learning does not recommend or require the use of extrinsic rewards.

4. These numbers show the average and range of student-level improvement indices for all findings across the studies.
5. Since April 2006, two versions of *Accelerated Reader™* have been available: (1) *Accelerated Reader™ Enterprise* and (2) *Accelerated Reader™ Service Subscription*. According to the developer, *Accelerated Reader™ Enterprise* provides access to all of the more than 130,000 quizzes, "enhanced" reporting, a tool for school-to-home communication, and additional technical support (<http://doc.renlearn.com/KMNet/R004109416GH6321.pdf>, downloaded August 2009). *Accelerated Reader™ Service Subscription* requires customers to purchase individual quizzes.

**Additional program information**  
(continued)

**Cost**

The school version of *Accelerated Reader*<sup>™</sup> software can be ordered for \$4 a student per year with a one-time school fee of \$1,599. This package includes Live Chat Support, access to the Renaissance Training Center, and two Getting Started Web Seminars. A package including professional development (AR 7.7 Enterprise Real Time Mentors Package) can be ordered for a one-time school fee of \$2,899 and a \$4 per student annual fee. This package includes six hours of web seminars, and three staff

members have unlimited access to a Renaissance Coach for six months. If professional development is not purchased as part of a package (for example, the Real Time Mentors Package), it is available at an additional cost and can be customized in terms of length and mode of delivery (onsite, telephone/online, regional seminars). The average annual cost of full implementation, which may vary depending on school size and components implemented, ranges from \$2,000 to \$10,000 per school year.<sup>6</sup>

**Research**

A total of 318 studies reviewed by the WWC investigated the effects of *Accelerated Reader*<sup>™</sup> on adolescent learners. One study (Bullock, 2005) is a randomized controlled trial that meets WWC evidence standards. One study (Nunnery & Ross, 2007) is a quasi-experimental design that meets WWC evidence standards with reservations. The remaining 316 studies do not meet either WWC evidence standards or eligibility screens.

**Meets evidence standards**

Bullock (2005) conducted a randomized controlled trial of students enrolled in grades 3–5 of an Oregon elementary school to examine the effects of *Accelerated Reader*<sup>™</sup>. Students in each of six classrooms were randomly assigned to either a treatment or a control group.<sup>7</sup> The WWC based its effectiveness ratings on findings from comparisons of 39 students who received *Accelerated Reader*<sup>™</sup> and 43 control group students who received regular reading instruction, across grades 4 and 5.<sup>8</sup> The study reported student outcomes after 10 weeks of program implementation.

**Meets evidence standards with reservations**

Nunnery and Ross (2007) conducted a quasi-experiment that examined the effects of *Accelerated Reader*<sup>™</sup> on students in grades 5 and 8 in Texas. Students who received *Accelerated Reader*<sup>™</sup> in their schools were compared to students who did not receive *Accelerated Reader*<sup>™</sup> in matched comparison schools. Study schools were matched on school performance, ethnic composition, English proficiency, poverty, and student mobility. The WWC based its effectiveness ratings on findings from two cohorts. Cohort 1 consisted of 912 grade 5 students in the 2000/01 school year: 442 were enrolled in one of nine intervention schools, and 470 were enrolled in one of nine comparison schools. Cohort 2 consisted of 891 grade 5 students in the 2001/02 school year: 437 were enrolled in one of nine intervention schools, and 454 were enrolled in one of nine comparison schools. Cohort 2 also included 482 grade 8 students in two intervention schools and 510 grade 8 students in two comparison schools.<sup>9</sup> The study reported student outcomes after two years of program implementation for the first cohort of students and after three years of implementation for the second cohort of students.<sup>10</sup>

6. The descriptive information for this program was obtained through communications with the developer.

7. Appendix A1.1 provides details on how this randomization was carried out.

8. Grade 3 students are excluded from the review because they fall outside the grade range of the Adolescent Literacy topic area; they will be included in the *Accelerated Reader*<sup>™</sup> intervention report for the Beginning Reading topic area.

9. The intervention and comparison groups at grade 8 for cohort 1 were not shown to be equivalent at baseline and, therefore, were excluded from the review.

10. The study also reported student outcomes after one year of program implementation, which is reported in Appendix A4, but these findings were not used for the study ratings.

## 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.<sup>11</sup>

The WWC considers the extent of evidence for *Accelerated Reader*<sup>™</sup> to be small for reading fluency and medium to large for comprehension for adolescent learners. No studies that meet WWC evidence standards with or without reservations examined the effectiveness of *Accelerated Reader*<sup>™</sup> in the alphabetic or general literacy achievement domains for adolescent learners.

## Effectiveness **Findings**

The WWC review of interventions for Adolescent Literacy addresses student outcomes in four domains: alphabetic, reading fluency, comprehension, and general literacy achievement. The studies included in this report cover two domains: reading fluency and comprehension. Comprehension includes two constructs: reading comprehension and vocabulary development. The findings below present the authors' estimates and WWC-calculated estimates of the size and statistical significance of the effects of *Accelerated Reader*<sup>™</sup> on adolescent learners.<sup>12</sup>

*Reading fluency.* Bullock (2005) reviewed findings in the reading fluency domain. The author did not find statistically significant effects of *Accelerated Reader*<sup>™</sup> on the Dynamic Indicators of Basic Early Literacy Skills (DIBELS), Oral Reading Fluency subtest across grades 4 and 5. The WWC-calculated average effect size across the two grades was not large enough to be considered substantively important according to WWC criteria (that is, an effect size of at least 0.25).<sup>13</sup>

*Comprehension.* Two studies reviewed findings in the comprehension domain. Bullock (2005) did not find statistically significant effects of *Accelerated Reader*<sup>™</sup> on the Standardized Test for Assessment of Reading (STAR) across grades 4 and 5, or on the 4J Vocabulary test for grade 4. The WWC-calculated average effect size across the two grades was not large enough to be considered substantively important according to WWC criteria (that is, an effect size of at least 0.25). Nunnery and Ross (2007) reported positive and statistically significant effects of the intervention for grade 5 students and did not find statistically significant effects of the intervention for grade 8 students on the reading subtest of the Texas Assessment of Academic Skills (TAAS) test. However, in calculating statistical significance, the authors did not account for clustering within classrooms and used transformed student test scores.<sup>14</sup> In WWC calculations, based on untransformed scores that account for clustering, none of these effects were statistically significant, and the calculated average effect size was not large enough to be considered substantively important according to WWC criteria (that is, an effect size of at least 0.25).

11. 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 *Accelerated Reader*<sup>™</sup> is in Appendix A6.
12. 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 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 Bullock (2005), no corrections for clustering or multiple comparisons were needed. In the case of Nunnery and Ross (2007), a correction for clustering was needed, so the significance levels may differ from those reported in the original study.
13. The WWC computes an average effect size as a simple average of the effect sizes across all individual findings within the study domain.
14. The authors reported that they transformed student test score data to induce normality on the test score distribution and to stabilize variances across schools and treatment groups.

## Effectiveness *(continued)*

In summary, the two studies that examined outcomes within the comprehension domain showed indeterminate effects; that is, effects that are neither statistically significant nor large enough to be considered substantively important according to WWC criteria.

### 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 *Accelerated Reader™* to have no discernible effects for reading fluency or comprehension on 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 reading fluency is +7 percentile points (based on one study), with a range of +1 to +13 percentile points across findings. The average improvement index for comprehension is +3 percentile points across two studies, with a range of -2 to +10 percentile points across findings.

### Summary

The WWC reviewed 318 studies on *Accelerated Reader™* for adolescent learners. One of these studies meets WWC evidence standards, and one study meets WWC evidence standards with reservations; the remaining 316 studies do not meet either WWC evidence standards or eligibility screens. Based on the two studies, the WWC found no discernible effects in reading fluency and comprehension for adolescent learners. The conclusions presented in this report may change as new research emerges.

## References

### Meets WWC evidence standards

Bullock, J. C. (2005). Effects of the *Accelerated Reader* on the reading performance of third, fourth, and fifth-grade students in one western Oregon elementary school (Doctoral dissertation, University of Oregon). *Dissertation Abstracts International*, 66(07A), 56–2529.

### Meets WWC evidence standards with reservations

Nunnery, J. A., & Ross, S. M. (2007). The effects of the School Renaissance program on student achievement in reading and mathematics. *Research in the Schools*, 14(1), 40–59.

### Additional source:

Nunnery, J. A., Ross, S. M., & Goldfeder, E. (2003). *The effect of School Renaissance on TAAS scores in the McKinney ISD*. Memphis, TN: Center for Research in Educational Policy.

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

Alvermann, D. E., & Rush, L. S. (2004). Literacy intervention programs at the middle and high school levels. In T. L. Jetton & J. A. Dole (Eds.), *Adolescent literacy research and practice*

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- Anderson, D. K., & Lawrence, C. B. (1995). *Accelerated Reader: A supplemental reading program tool to enhance student performance and motivate children to read at Bancroft School, grades 3–6, Minneapolis Public Schools*. Unpublished master's thesis, Mankato State University, MN. The study is ineligible for review because it does not use a comparison group.
- Anderson, J. R. (2001). *The impact of the Accelerated Reader program on student's [sic] learning, motivation, and attitude towards reading*. Unpublished master's thesis, State University of New York College at Brockport. The study is ineligible for review because it does not use a comparison group.
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- Arkebaure, C., MacDonald, C., & Palmer, C. (2002). *Improving reading achievement through the implementation of a balanced literacy approach*. Unpublished master's research project, Saint Xavier University, Chicago, IL. The study is ineligible for review because it does not use a comparison group.
- Bailey, C. (2007). *Winning the Accelerated Reader game: The effects of student choice and peer sharing on attitudes toward independent reading in an Accelerated Reader program*. In D. A. McAllister & S. C. Fritch (Eds.), *Culminating experience: Action research projects* (Vol. 8, part 1, spring 2006, pp. 15–48). Chattanooga, TN: University of Tennessee at Chattanooga. The study is ineligible for review because it does not examine the effectiveness of an intervention.
- Barrett, K., & Kreiser, D. (2002). *Improving student attitude and achievement in reading through daily reading practice and teacher intervention strategies*. Unpublished master's thesis, Saint Xavier University, Chicago, IL. The study does not meet WWC evidence standards because the measures of effectiveness cannot be attributed solely to the intervention—there was only one unit assigned to one or both conditions.
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- Barton, J. O. (2000). *A comparison of the effect of basal reading with Accelerated Reader to basal reading without Accelerated Reader on fifth-grade reading comprehension achievement scores* (Doctoral dissertation, The University of Mississippi). *Dissertation Abstracts International*, 61(08A), 78–3105. The study does not meet WWC evidence standards because the measures of effectiveness cannot be attributed solely to the intervention—there was only one unit assigned to one or both conditions.
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- Biggers, D. (2001). The argument against *Accelerated Reader*. *Journal of Adolescent & Adult Literacy*, 45(1), 72–75. The study is ineligible for review because it is not a primary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.
- Blair, H. B. (2006). *Teachers' perceptions of their preparation to choose and implement effective methods for teaching emergent readers*. Unpublished doctoral dissertation, East Tennessee State University, Johnson City. The study is ineligible for review because it does not examine the effectiveness of an intervention.
- Blanchard, K. M. (1996). *The comparison study of the Accelerated Reader program usage and reading comprehension gains*. Unpublished master's thesis, Mankato State University, MN. The study is ineligible for review because it does not use a comparison group.
- Bobo, J. C. (2001). *A comparison of two uses of the Accelerated Reader program*. Unpublished doctoral dissertation, Clemson University, SC. The study is ineligible for review because it does not use a comparison group.
- Bodeau, A. W. (2001). *A study of fifth grade student attitudes toward the Accelerated Reader program in the Osseo, Minnesota school district*. Unpublished master's thesis, St. Cloud State University, MN. The study is ineligible for review because it does not include an outcome within a domain specified in the protocol.
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# Appendix

## Appendix A1.1 Study characteristics: Bullock, 2005

Characteristic	Description
<b>Study citation</b>	Bullock, J. C. (2005). Effects of the <i>Accelerated Reader</i> on the reading performance of third, fourth, and fifth-grade students in one western Oregon elementary school (Doctoral dissertation, University of Oregon). <i>Dissertation Abstracts International</i> , 66(07A), 56–2529.
<b>Participants</b>	The study examined students in grades 3 to 5. For this review, the WWC analysis focused on fourth and fifth graders, as specified in the Adolescent Literacy review protocol. <sup>1</sup> Ninety-one percent of the students in the study school were white, and 61% qualified for free or reduced-price lunch. The fourth-grade sample included 45 students from two classrooms, and the fifth-grade sample included 37 students from two classrooms. Within each classroom, students were rank ordered by baseline reading fluency scores and were divided into two groups based on whether their rank was an odd or even number. A coin flip decided the assignment of each group to intervention or control status. <sup>2</sup> There was no attrition of students or classrooms between pretest and posttest.
<b>Setting</b>	The study took place in one elementary school near Eugene in western Oregon.
<b>Intervention</b>	Students in the intervention group participated in the <i>Accelerated Reader</i> <sup>TM</sup> program over a 10-week period. These students were provided with a minimum of 90 minutes per week of independent reading time during class and were required to visit the library and check out a minimum of one book a week. Books had to be drawn from the subset of library books for which <i>Accelerated Reader</i> <sup>TM</sup> quizzes were available. When they finished a book, students completed a brief, computerized, multiple-choice quiz on the book's content and received points based on the level of the book read and the number of questions answered correctly. During the weekly library visit, intervention teachers and the library specialist verified that intervention students had access to appropriate <i>Accelerated Reader</i> <sup>TM</sup> books.
<b>Comparison</b>	The control condition relied on the business-as-usual reading program throughout the 10 week study, without the addition of <i>Accelerated Reader</i> <sup>TM</sup> . As was the case for the intervention group, students in the control group were provided with a minimum of 90 minutes per week of independent reading time during class and 30 minutes per week of library time. Control students were asked to keep track of the books they read.
<b>Primary outcomes and measurement</b>	For both the pre- and posttest, students took the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Oral Reading Fluency subtest; the Standardized Test and Assessment in Reading (STAR); and the 4J Vocabulary assessment. <sup>3</sup> For a more detailed description of these outcome measures, see Appendices A2.1–A2.2.
<b>Staff/teacher training</b>	The author does not describe the training provided to study teachers.

1. Grade 3 students are excluded from the review because they fall outside the grade range of the Adolescent Literacy topic area; they will be included in the *Accelerated Reader*<sup>TM</sup> intervention report for the Beginning Reading topic area.
2. The author of the study describes the design as quasi-experimental. However, because the groups were assigned randomly to the treatment and control conditions, the WWC classified the study as a randomized controlled trial.
3. Only results for fourth-grade students were available on the 4J Vocabulary assessment due to errors in data collection for grades 3 and 5.

## Appendix A1.2 Study characteristics: Nunnery & Ross, 2007

Characteristic	Description
<b>Study citation</b>	Nunnery, J. A., & Ross, S. M. (2007). The effects of the School Renaissance program on student achievement in reading and mathematics. <i>Research in the Schools</i> , 14(1), 40–59.
<b>Participants</b>	The intervention group consisted of 11 schools that implemented <i>Accelerated Reader</i> <sup>TM</sup> . Two steps were used to identify comparison schools. The first step was taken to narrow the pool of potential comparison schools. In this step, the researchers used data from the Academic Excellence Indicator System (AEIS), which identifies—for each school in Texas (including the 11 treatment schools in this study)—40 demographically similar schools based on the percentage of African-American students, Hispanic students, white students, economically disadvantaged students, limited English proficient students, and student mobility. In the second step, from the group of 40 potential comparison schools identified for each treatment school, the most similar school not using <i>Accelerated Reader</i> <sup>TM</sup> was selected according to the schools' base-year accountability rating (low performing, acceptable, recognized, exemplary) and base-year percentage of economically disadvantaged students. One of the selected comparison schools declined to participate, and another two did not have appropriate grade-level scores for use in the study. These three comparison schools were replaced from the pool of similar schools. The analytic sample consisted of students in grades 5 and 8 who had three consecutive years of data between school years 1998/99 and 2001/02 (cohort 1 students had data from the 1998/99 through 2000/01 school years, and cohort 2 students had data from the 1999/2000 through 2001/02 school years). <sup>1</sup> The cohort 1 grade 5 analysis sample included 442 intervention students from nine schools who received <i>Accelerated Reader</i> <sup>TM</sup> in the 1999/2000 and 2000/01 school years and 470 nonparticipants from nine matched elementary schools. The cohort 2 grade 5 analysis sample consisted of 437 students from nine schools who received <i>Accelerated Reader</i> <sup>TM</sup> in the 1999/2000, 2000/01, and 2001/02 school years and 454 nonparticipants from nine matched elementary schools. The cohort 2 grade 8 analysis sample consisted of 482 students in two schools who received <i>Accelerated Reader</i> <sup>TM</sup> in the 1999/2000, 2000/01, and 2001/02 school years and 510 nonparticipants from two matched middle/junior high schools. Outcomes were measured at the end of the second year of intervention implementation for cohort 1 and at the end of the third year of intervention implementation for cohort 2.
<b>Setting</b>	The study took place in 18 elementary and 4 middle/junior high schools from nine districts in Texas. All 11 intervention schools were located in a suburban school district.
<b>Intervention</b>	According to study authors, <i>Accelerated Reader</i> <sup>TM</sup> was the primary reading curriculum in intervention schools. The study did not provide details on how the intervention was implemented.
<b>Comparison</b>	The comparison schools did not implement <i>Accelerated Reader</i> <sup>TM</sup> during the school years under study. No information is available on the reading curricula used in these schools.
<b>Primary outcomes and measurement</b>	For both pre- <sup>2</sup> and posttests, the authors used the Texas Assessment of Academic Skills (TAAS), Reading subtest. For a more detailed description of this outcome measure, see Appendix A2.2.
<b>Staff/teacher training</b>	No information on staff or teacher training was provided in the study.

1. Cohort 1 also included grade 8 students. However, for this group of students, the intervention and comparison groups were not shown to be equivalent at baseline. Therefore, cohort 1 grade 8 students were excluded from the review.
2. Although the baseline period was the 1998/99 school year, the authors used reading test score data from the 1999/2000 school year as a covariate for cohort 2 students. Grade 5 students in cohort 2 were in second grade during the 1998/99 school year, and second grade scores were not available to the authors; therefore, third grade reading test score data from the 1999/2000 school year were used as a covariate. The authors did not report the reason that 1999/2000 reading test score data were used as a covariate for grade 8 cohort 2 students. Because the authors used reading test score data from the 1999/2000 school year as a covariate for cohort 2 students, the pretest data for this cohort may reflect some effect of the first year of program implementation.

## Appendix A2.1 Outcome measures for the reading fluency domain

Outcome measure	Description
<b>Dynamic Indicators of Basic Early Literacy Skills (DIBELS) Oral Reading Fluency subtest</b>	The DIBELS Oral Reading Fluency measure is a standardized test of reading accuracy and speed, based on the number of words read correctly in one minute from connected text. Hesitations of more than three seconds, omitted words, and word substitutions are counted as errors, whereas prompt self-corrections are regarded as accurate (as cited in Bullock, 2005).

## Appendix A2.2 Outcome measures for the comprehension domain

Outcome measure	Description
<b>Vocabulary development construct</b>	
<b>4J Vocabulary</b>	4J Vocabulary is a curriculum-based assessment <sup>1</sup> which consists of 90 vocabulary words selected from a list of words in <i>World Book</i> . Each of the words has three possible synonym answer choices: (1) the correct response, (2) one near-response, and (3) one far-response. Items were field tested and normed with oral reading fluency measures. This measure was administered at the beginning and end of the 10-week study (as cited in Bullock, 2005).
<b>Reading comprehension construct</b>	
<b>Standardized Test and Assessment in Reading (STAR)</b>	This is an individually administered, nationally normed, computer-adaptive cloze assessment of a K–12 student's level of reading achievement that takes about 10 minutes to complete. Developed by Renaissance Learning, the developer of <i>Accelerated Reader</i> <sup>™</sup> , STAR measures a student's reading ability and reading level for diagnosis and progress monitoring. The test includes exercises such as selecting a word from the list to best complete a given sentence. The test is standardized, and scale scores exhibit moderate to strong correlation to other standardized reading tests (as cited in Bullock, 2005).
<b>Texas Assessment of Academic Skills (TAAS), Reading subtest</b>	The TAAS was the state-administered benchmark test in Texas for grades 3 to 8 and 10 until replaced by the Texas Assessment of Knowledge and Skills in 2003. Reading test objectives are consistent across grades and include mastery in identifying word meaning, supporting ideas, summarization, relationships and outcomes, inferences and generalizations, point of view, propaganda, and fact and opinion. The reading test consists of approximately 50 multiple-choice questions about passages of various length and style (as cited in Nunnery & Ross, 2007, <a href="http://ritter.tea.state.tx.us/student.assessment/resources/guides/tli.html">http://ritter.tea.state.tx.us/student.assessment/resources/guides/tli.html</a> , <a href="http://www.education.com/reference/article/Ref_Explanation_TAAS">http://www.education.com/reference/article/Ref_Explanation_TAAS</a> , and <a href="http://ritter.tea.state.tx.us/student.assessment/resources/guides/interpretive/2009_Interpretive_Guide_TAAS.pdf">http://ritter.tea.state.tx.us/student.assessment/resources/guides/interpretive/2009_Interpretive_Guide_TAAS.pdf</a> ).

1. Duesbery, L., Alonzo, J., Bettsworth, L., Yovanoff, P., & Tindal, G. (2003). *Predicting middle school reading achievement using practical curriculum based measures of reading*. Eugene, OR: University of Oregon.



## Appendix A3.1 Summary of study findings included in the rating for the reading fluency domain<sup>1</sup>

Outcome measure	Study sample	Sample size (students)	Author's findings from the study		WWC calculations			
			Mean outcome (standard deviation) <sup>2</sup>		Mean difference <sup>3</sup> (Accelerated Reader™ – comparison)	Effect size <sup>4</sup>	Statistical significance <sup>5</sup> (at $\alpha = 0.05$ )	Improvement index <sup>6</sup>
			Accelerated Reader™ group	Comparison group				
<b>Bullock, 2005<sup>7</sup></b>								
DIBELS Oral Reading Fluency <sup>8</sup>	Grade 4	45	132.70 (42.20)	119.30 (39.20)	13.40	0.32	ns	+13
DIBELS Oral Reading Fluency <sup>8</sup>	Grade 5	37	135.60 (50.50)	134.60 (39.30)	1.00	0.02	ns	+1
<b>Domain average for reading fluency<sup>9</sup></b>						<b>0.17</b>	<b>na</b>	<b>+7</b>

ns = not statistically significant

na = not applicable

DIBELS = Dynamic Indicators of Basic Early Literacy Skills

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices for the reading fluency domain.
2. 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.
3. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
4. For an explanation of the effect size calculation, see WWC Procedures and Standards Handbook, Appendix B.
5. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
6. 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.
7. 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 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 Bullock (2005), no corrections for clustering or multiple comparisons were needed.
8. The intervention and comparison group means are posttest scores reported by the authors in the article.
9. 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.

## Appendix A3.2 Summary of study findings included in the rating for the comprehension domain<sup>1</sup>

Outcome measure	Study sample	Sample size (clusters/students)	Authors' findings from the study			WWC calculations		
			Mean outcome (standard deviation) <sup>2</sup>		Mean difference <sup>3</sup> (Accelerated Reader™ – comparison)	Effect size <sup>4</sup>	Statistical significance <sup>5</sup> (at $\alpha = 0.05$ )	Improvement index <sup>6</sup>
		Accelerated Reader™ group	Comparison group					
<b>Bullock, 2005<sup>7</sup></b>								
STAR, Reading <sup>8</sup>	Grade 4	45	472.00 (249.90)	473.60 (163.70)	-1.60	-0.01	ns	0
STAR, Reading <sup>8</sup>	Grade 5	37	564.00 (263.10)	510.40 (153.10)	53.60	0.25	ns	+10
4J Vocabulary <sup>8</sup>	Grade 4	42	63.50 (16.20)	64.10 (14.20)	-0.60	-0.04	ns	-2
<b>Average for comprehension (Bullock, 2005)<sup>9</sup></b>						<b>0.11</b>	<b>na</b>	<b>+4</b>
<b>Nunnery and Ross, 2007<sup>7</sup></b>								
TAAS, Reading <sup>10</sup>	Grade 5, cohort 1	18/912	88.44 (18.11)	89.45 (18.11)	-1.01	-0.06	ns	-2
TAAS, Reading <sup>10</sup>	Grade 5, cohort 2	18/891	91.53 (15.64)	90.64 (15.64)	0.89	0.06	ns	+2
TAAS, Reading <sup>10</sup>	Grade 8, cohort 2	4/992	90.67 (16.38)	88.56 (16.38)	2.11	0.13	ns	+5
<b>Average for comprehension (Nunnery &amp; Ross, 2007)<sup>9</sup></b>						<b>0.04</b>	<b>na</b>	<b>+2</b>
<b>Domain average for comprehension across all studies<sup>9</sup></b>						<b>0.08</b>	<b>na</b>	<b>+3</b>

ns = not statistically significant

na = not applicable

STAR = Standardized Test and Assessment in Reading

TAAS = Texas Assessment of Academic Skills

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices for the comprehension domain. End of first year of intervention findings from Nunnery and Ross (2007) are not included in these ratings but are reported in Appendix A4.
2. 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. For Nunnery and Ross (2007), the pooled standard deviation across two conditions is reported for each group.
3. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
4. For an explanation of the effect size calculation, see WWC Procedures and Standards Handbook, Appendix B.
5. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
6. 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.

## Appendix A3.2 Summary of study findings included in the rating for the comprehension domain<sup>1</sup> *(continued)*

7. 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 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 Bullock (2005), no corrections for clustering or multiple comparisons were needed. In the case of Nunnery and Ross (2007), a correction for clustering was needed, so the significance levels may differ from those reported in the original study.
8. The intervention and comparison group means are posttest scores reported by the authors in the article.
9. The WWC-computed average effect sizes for each study and for the domain across studies are simple averages rounded to two decimal places. To prevent double counting within grade, the grade 4 effect in Bullock (2005) was calculated as a simple average of two effect sizes (for STAR Reading and 4J Vocabulary). The average effect size for the study was then calculated as a simple average of the grade 4 effect and grade 5 effect. The average improvement indices are calculated from the average effect sizes.
10. The intervention and comparison group means are calculated from author-reported untransformed scores by aggregating data across schools. The intervention group means are the comparison group means plus the difference in mean gains between the intervention and comparison groups. Because the authors used transformed scores to induce normality of the student test score distribution, the significance levels may differ from those reported in the original study.

## Appendix A4 Summary of end of first year of intervention findings for the comprehension domain<sup>1</sup>

Outcome measure	Study sample	Sample size (clusters/students)	Authors' findings from the study		WWC calculations			
			Mean outcome (standard deviation) <sup>2</sup>		Mean difference <sup>3</sup> (Accelerated Reader™ – comparison)	Effect size <sup>4</sup>	Statistical significance <sup>5</sup> (at $\alpha = 0.05$ )	Improvement index <sup>6</sup>
			Accelerated Reader™ group	Comparison group				
<b>Nunnery and Ross, 2007<sup>7</sup></b>								
TAAS, Reading <sup>8</sup>	Grade 4, cohort 1	18/912	87.27 (17.83)	87.64 (17.83)	–0.37	–0.02	ns	–1
TAAS, Reading <sup>8</sup>	Grade 4, cohort 2	18/891	89.01 (16.02)	87.77 (16.02)	1.24	0.08	ns	+3
TAAS, Reading <sup>8</sup>	Grade 7, cohort 2	4/992	88.38 (18.54)	87.27 (18.54)	1.11	0.06	ns	+2

ns = not statistically significant

TAAS = Texas Assessment of Academic Skills

1. This appendix presents findings from the end of the first year of intervention implementation for measures that fall in the comprehension domain. Findings from the end of the second and third year of intervention implementation were used for rating purposes and are presented in Appendix A3.2.
2. 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. For Nunnery and Ross (2007), the pooled standard deviation across two conditions is reported for each group.
3. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
4. For an explanation of the effect size calculation, see WWC Procedures and Standards Handbook, Appendix B.
5. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
6. 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.
7. 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 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 Nunnery and Ross (2007), a correction for clustering was needed, so the significance levels may differ from those reported in the original study.
8. The intervention and comparison group means are calculated from author-reported untransformed scores by aggregating data across schools. The intervention group means are the comparison group means plus the difference in mean gains between the intervention and comparison groups. Because the authors used transformed scores to induce normality of the student test score distribution, the significance levels may differ from those reported in the original study.

## Appendix A5.1 Accelerated Reader™ 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.<sup>1</sup> For the outcome domain of reading fluency, the WWC rated *Accelerated Reader*™ as having no discernible effects for adolescent learners.

### 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 statistically significant or substantively important effects, either positive or negative.

### 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 or substantively important positive effects.

#### AND

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

**Met.** No studies showed statistically significant or substantively important negative effects.

**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 statistically significant or 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.

**Not met.** No studies showed statistically significant or substantively important negative effects. One study showed indeterminate effects, and no studies showed statistically significant or substantively important positive effects.

**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 statistically significant or substantively important effects, either positive or negative.

#### 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 statistically significant or substantively important effects, and one study showed indeterminate effects.

(continued)

## Appendix A5.1 Accelerated Reader™ rating for the reading fluency 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 statistically significant or substantively important effects, 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 statistically significant or substantively important effects, 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 statistically significant negative effects.

**AND**

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

**Met.** No studies showed statistically significant or substantively important positive effects.

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 Accelerated Reader™ 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.<sup>1</sup> For the outcome domain of comprehension, the WWC rated *Accelerated Reader*™ as having no discernible effects for adolescent learners.

### 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.** None of the studies showed statistically significant or substantively important effects, either positive or negative.

### 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 statistically significant or substantively important negative effects.

**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 statistically significant or 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.

**Not met.** No studies showed statistically significant or substantively important negative effects, and two studies showed indeterminate effects, while no studies showed statistically significant or substantively important positive effects.

**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 statistically significant or substantively important effects, either positive or negative.

### 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 statistically significant or substantively important effects, and two studies showed indeterminate effects.

(continued)

## Appendix A5.2 Accelerated Reader™ rating for the comprehension 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 statistically significant or substantively important effects, 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 statistically significant or substantively important effects, 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 statistically significant negative effects.

**AND**

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

**Met.** No studies showed statistically significant or substantively important positive effects.

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 <sup>1</sup>
		Schools	Students	
Alphabetics	na	na	na	na
Reading fluency	1	1	82	Small
Comprehension	2	23	2,877	Medium to large
General literacy achievement	na	na	na	na

na = not applicable/not studied

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.