

# What Works Clearinghouse



## Accelerated Reader

**Program description** The *Accelerated Reader* program is a guided reading intervention in which teachers are closely involved with student reading of text. It involves two components, the *Accelerated Reader* software and *Accelerated Reader Best Classroom Practices* (formerly called *Reading Renaissance*). The *Accelerated Reader* software is a computerized supplementary reading program. *Accelerated Reader* relies on independent reading practice

as a way of managing student performance by providing students and teachers feedback from quizzes based on books the students read. *Accelerated Reader Best Classroom Practices* are a set of recommended principles on guided independent reading (or teachers' direction of students' interactions with text) that ensure *Accelerated Reader* is implemented with integrity.<sup>2</sup>

**Research** Two studies of *Accelerated Reader* meet the What Works Clearinghouse (WWC) evidence standards. One of the studies evaluated 572 students from grades K to 3 attending 11 schools in a southern school district in the United States. The second study included 32 students in grade 3 attending one school in the Pacific Northwest.<sup>3</sup>

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

**Effectiveness** *Accelerated Reader* was found to have no discernible effects on reading fluency, mixed effects on comprehension, and potentially positive effects on general reading achievement.

	Alphabetics	Reading fluency	Comprehension	General reading achievement
Rating of effectiveness	na	No discernible effects	Mixed effects	Potentially positive effects
Improvement index <sup>4</sup>	na	+3 percentile points	Average: 0 percentile points Range: -12 to +12 percentile points	Average: +16 percentile points Range: +10 to +25 percentile points

na = not applicable

1. This report has been updated to include reviews of 62 studies that have been released since 2005. A complete list and disposition of all studies reviewed is provided in the references.
2. The descriptive information for this program was obtained from a publicly available source: the program's website ([www.renlearn.com/ar/](http://www.renlearn.com/ar/), downloaded July 2008). 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.
3. The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.
4. These numbers show the average and range of student-level improvement indices for all findings across the two studies.

## 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, USA. Email: [answers@renlearn.com](mailto:answers@renlearn.com). Web: [www.renlearn.com/ar/](http://www.renlearn.com/ar/). Telephone: (800) 338-4204.

### Scope of use

The *Accelerated Reader* software prototype was created in 1984. *Accelerated Reader Best Classroom Practices* (formerly called *Reading Renaissance*) was 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.

### Teaching

A primary best practice recommendation for use of *Accelerated Reader* is a dedicated 30–60 minute block of time for reading practice. Depending on the ages and skill levels of the students, three activities may occur during a reading block: reading texts to a child, reading texts to a child using a paired-reading technique, or 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—the level at which books are neither too easy nor too difficult and students are able to read without frustration. 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 targeted interventions. Teachers use points to set individual student goals for the quantity and quality of student reading practice and to monitor the student's progress. Accumulation of points is intended to motivate student learning; teachers also may choose to implement a system of rewards, though Renaissance Learning does not recommend or require the use of extrinsic rewards.

### Cost

The school version of *Accelerated Reader* software can be ordered for \$4 a student per year, with a one-time school fee of \$1,599. Professional development to learn *Accelerated Reader Best Classroom Practices* is available at 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 varies depending on the school size and components implemented, ranges from \$2,000 to \$10,000 per school year.

## Research

One hundred studies reviewed by the WWC investigated the effects of *Accelerated Reader* or some subset of its components. Two of these studies (Ross, Nunnery, & Goldfeder, 2004; Bullock, 2005) are randomized controlled trials that meet WWC evidence standards. The remaining 98 studies do not meet either WWC evidence standards or eligibility screens.

Ross, Nunnery, & Goldfeder (2004) was a randomized controlled trial that included 45 teachers and 572 students in grades K–3.<sup>5</sup> The study took place in 11 schools in Memphis, TN. Within each school,

a minimum of two teachers within one grade volunteered to be randomly assigned to implement either the intervention, *Accelerated Reader*, or the comparison, a commercially available basal reading program used across all schools. The study examines student outcomes during the first year of implementation.

Bullock (2005) was a randomized controlled trial that included 32 students from two third-grade classrooms in grade 3 in one school near Eugene, OR.<sup>6</sup> The students were randomly assigned to the intervention group or the control group. The intervention

5. The material presented here was drawn from Ross, Nunnery, & Goldfeder's (2004) larger study that assessed the effectiveness of *Accelerated Reader* in grades K–6.
6. The material presented here was drawn from Bullock's (2005) larger study that assessed the effectiveness of *Accelerated Reader* in grades 3–5.

## Research *(continued)*

group implemented *Accelerated Reader* for 10 weeks, spending at least 90 minutes a week independently reading trade books in the classroom and taking *Accelerated Reader* quizzes on each book. The control group also spent at least 90 minutes a week reading independently, choosing any book available in the school library, and not using the *Accelerated Reader* software.

### Extent of evidence

The WWC categorizes the extent of evidence in each domain as small or medium to large (see the [What Works Clearinghouse](#)

[Extent of Evidence Categorization Scheme](#)). 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>7</sup>

The WWC considers the extent of evidence for *Accelerated Reader* to be medium to large for comprehension and small for reading fluency and general reading achievement. No studies that meet WWC standards with or without reservations examined the effectiveness of *Accelerated Reader* in the alphabets domain.

## Effectiveness Findings

The WWC review of beginning reading addresses student outcomes in four domains: alphabets, reading fluency, comprehension, and general reading achievement.<sup>8</sup> The studies of *Accelerated Reader* presented in this report address outcomes in each of these domains except alphabets. The findings below include both the authors' estimates and WWC-calculated estimates of the size and statistical significance of the effects of *Accelerated Reader* on students.

*Reading Fluency.* Bullock (2005) reports, and the WWC confirms, no significant effect of *Accelerated Reader* on third-graders when measured using the Oral Reading Fluency subtest of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS).

*Comprehension.* Ross, Nunnery, & Goldfeder (2004) report a positive and statistically significant effect of *Accelerated Reader* on third grade student performance on the STAR Reading test.<sup>9</sup> In WWC computations, this positive effect is not statistically significant, but is considered substantively important according

to WWC criteria (an effect size greater than 0.25). Bullock (2005) reports, and the WWC confirms, no significant effect of *Accelerated Reader* on third graders when measured using the STAR Reading test. However, WWC calculations show the effect to be negative and substantively important according to WWC criteria (an effect greater than 0.25).<sup>10</sup>

*General reading achievement.* Ross, Nunnery, & Goldfeder (2004) show, and the WWC confirms, that *Accelerated Reader* has positive and statistically significant effects on a measure of general reading achievement (STAR Early Literacy test) when results are combined across kindergarten, first, and second grade students. When analyzed separately for each grade level, the effects are substantively important (greater than 0.25) but not statistically significant.

### Rating of effectiveness

The WWC rates the effects of an intervention on a given outcome domain as positive, potentially positive, mixed, no discernible

7. 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* is in Appendix A5.
8. For definitions of the domains, see the [Beginning Reading Protocol](#).
9. The STAR tests are developed and distributed by Renaissance Learning, which also distributes *Accelerated Reader*. According to Renaissance Learning research, the STAR Reading test and the STAR Early Literacy tests are correlated to other standardized reading tests. See Appendices A2.2 and A2.3.
10. The level of statistical significance was reported by the study authors or, where 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 [Technical Details of WWC-Conducted Computations](#). For the Ross, Nunnery, & Goldfeder (2004) study, a correction for clustering was needed.

## Effectiveness *(continued)*

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 Intervention Rating Scheme](#)).

## The WWC found *Accelerated Reader* to have no discernible effects for reading fluency, mixed effects for comprehension, and potentially positive effects for general reading achievement

### 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 [Technical Details of WWC-Conducted Computations](#)). The improvement index represents the difference between the percentile rank of the average student in the intervention condition versus the percentile rank of the average student in the comparison condition. Unlike the rating of effectiveness, the improvement index is based entirely on the size of the effect, regardless of the statistical significance of the effect, the study design, or the analyses. The improvement index can take on values between -50 and +50, with positive numbers denoting results favorable to the intervention group.

The improvement index for reading fluency for third grade students is +3 percentile points for one outcome in one study.

The average improvement index for comprehension for third grade students is 0 percentile points with a range of -12 to +12 percentile points for one outcome in both studies. The average improvement index for general reading achievement is +16 percentile points with a range of +10 to +25 percentile points across kindergarten, first, and second grade students in one study.

### Summary

The WWC reviewed 100 studies of *Accelerated Reader* or some of its components. Two of these studies meet WWC evidence standards; the remaining studies do not meet WWC evidence screens. Based on these two studies, the WWC found no discernible effects in reading fluency, mixed effects in comprehension, and potentially positive effects in general reading achievement. The evidence presented in this report is limited and may change as new research emerges.

## References

### Meet WWC evidence standards

Ross, S. M., Nunnery, J., & Goldfeder, E. (2004). *A randomized experiment on the effects of Accelerated Reader/Reading Renaissance in an urban school district: Preliminary evaluation report*. Memphis, TN: The University of Memphis, Center for Research in Educational Policy.

#### **Additional source:**

Nunnery J., Ross, S., & McDonald, A. (2006). A randomized experimental evaluation of the impact of *Accelerated Reader/Reading Renaissance* implementation on reading achievement in grades 3 to 6. *Journal of Education for Students Placed at Risk*, 11(1), 1–18.

Bullock, J. C. (2005). Effects of the *Accelerated Reader* on reading performance of third, fourth, and fifth-grade students in one western Oregon elementary school. University of Oregon; 0171 Advisor: Gerald Tindal. DAI, 66 (07A), 56-2529.

### Meet WWC evidence standards with reservations

None.

### Studies that fall outside the Beginning Reading protocol or do not meet WWC evidence standards

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**For more information about specific studies and WWC calculations, please see the [WWC Accelerated Reader Technical Appendices](#).**

# Appendix

## Appendix A1.1 Study Characteristics: Ross, Nunnery, & Goldfeder, 2004 (randomized controlled trial)

Characteristic	Description
<b>Study citation</b>	Ross, S.M., Nunnery, J., & Goldfeder, E. (2004). <i>A randomized experiment on the effects of Accelerated Reader/Reading Renaissance in an urban school district: Preliminary evaluation report</i> . Memphis, TN: The University of Memphis, Center for Research in Educational Policy.
<b>Participants</b>	In each of 11 schools, a minimum of two teachers at the same grade level volunteered to be randomly assigned either to implement <i>Accelerated Reader/Reading Renaissance</i> or to serve as a comparison teacher. Although participants were in grades K to 6, only students in grades K to 3 are relevant for this review. For grades K to 2, 32 teachers (642 students) were randomly assigned to an intervention or comparison group. The analysis sample included 394 students in grades K to 2 for whom pre- and posttest scores were available. There was no attrition of classrooms, but there was considerable student-level attrition in some grades, and the authors established equivalence of pretest scores for intervention and comparison students in the post-attrition sample. For third grade, 13 teachers (268 students) were randomly assigned to an intervention or a comparison group. There was no attrition of classrooms for the third grade sample, but approximately one-third of the students were missing either a pre- or posttest score, and 178 students are included in the analysis. Pretest scores were used as a covariate in outcome analyses. More than 80 percent of the students were eligible for free or reduced price lunch, and approximately 3 percent were identified as having a learning disability. <sup>1</sup>
<b>Setting</b>	Students attended 11 schools in Memphis, Tennessee.
<b>Intervention</b>	Teachers assigned to the intervention group implemented the <i>Accelerated Reader/Reading Renaissance</i> program (the computer software and the professional development on best practices for <i>Accelerated Reader/Reading Renaissance</i> ). The authors report that the study occurred over an eight-month period during the 2002–2003 school year—the first year of program implementation.
<b>Comparison</b>	All schools in the study used the same commercially available basal reading program. Participating schools were implementing sustained silent reading programs to support fluency, comprehension, and vocabulary development. Comparison teachers were told that the <i>Accelerated Reader/Reading Renaissance</i> program would be available to them in the following school year.
<b>Primary outcomes and measurement</b>	The STAR Early Literacy Test was administered to students in kindergarten to second grade in September (pretest) and April (posttest). The STAR Reading Test was administered to third graders at the same time points. For a more detailed description of these outcome measures, see Appendix A2.2–2.3.
<b>Staff/teacher training</b>	The developer of the program, Renaissance Learning, trained teachers assigned to the intervention group to implement <i>Accelerated Reader/Reading Renaissance</i> . In addition, at least once a month throughout the year, Renaissance Learning consultants met with teachers in order to provide technical assistance and feedback on implementation.

1. These demographic characteristics pertain to the entire K–6 grade sample, not only to the K–3 sample on interest for this review.

## Appendix A1.2 Study Characteristics: Bullock, 2005 (randomized controlled trial)

Characteristic	Description
<b>Study citation</b>	Bullock, J. C. (2005). Effects of the <i>Accelerated Reader</i> on reading performance of third, fourth, and fifth-grade students in one western Oregon elementary school. University of Oregon; 0171 Advisor: Gerald Tindal. DAI, 66 (07A), 56-2529.
<b>Participants</b>	The study examined students in grades 3–5, but the WWC analysis focused on third graders, as specified in the Beginning Reading protocol. Ninety-one percent of the students in the study school were white, and 61 percent qualified for free or reduced-price lunches. The third grade sample included 32 students, two classrooms, one school, and one school district. Experimental and control groups were created by first blocking on grade level, teacher, and reading ability. 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>1</sup> The author demonstrated the pretest equivalence of the intervention and control groups, and there was no attrition of students or classrooms between pretest and posttest.
<b>Setting</b>	The study was conducted in one elementary school near Eugene, Oregon.
<b>Intervention</b>	The intervention condition consisted of implementation of the <i>Accelerated Reader/Reading Renaissance</i> program over a 10-week period. Students in the intervention group 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/Reading Renaissance</i> quizzes were available. When finished with a book, students completed a brief, computerized, multiple-choice quiz on the book's contents 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/Reading Renaissance</i> books.
<b>Comparison</b>	The control condition relied on the business-as-usual reading program, without the addition of <i>Accelerated Reader/Reading Renaissance</i> . 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 were required to visit the library and check out a minimum of one book a week. Control students were free to choose any books in the library and asked to keep track of the books they read.
<b>Primary outcomes and measurement</b>	Reading fluency was measured using the Oral Reading Fluency subtest of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) administered by a trained educational assistant. Reading comprehension was measured using the STAR Reading Test, which is administered by computer and designed to customize tests for students' individual levels. The assessment lasted 15 minutes.
<b>Staff/teacher training</b>	Reading classes for the intervention and control groups were taught by the school's regular teachers. No information is given about any special training provided to those teachers.

1. The author of the study calls the design 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.



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

Outcome measure	Description
Oral Reading Fluency subtest of the Dynamic Indicators of Basic Early Literacy Skills (DIBELS) <sup>1</sup>	This is a standardized, individually-administered, one-minute oral reading fluency assessment designed to evaluate a student's accuracy and fluency with connected text (as cited in Bullock, 2005). It is designed to identify children who may need additional instructional support and monitor progress towards instructional goals.

1. The DIBELS is distributed by the Center on Teaching and Learning at the University of Oregon in Eugene, OR. Information on the DIBELS can be found at <http://dibels.uoregon.edu>. The website notes that the DIBELS oral fluency measure correlates .78 with the DIBELS measure of reading comprehension and .69 with the DIBELS measure of vocabulary.

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

Outcome measure	Description
STAR Reading Test <sup>1</sup>	This test is a computer-adaptive, norm-referenced test that measures student reading comprehension. It is designed for students who have at least a 100-word reading vocabulary and can be used with all students in grades 1–12. Students read passages of text and fill in key missing words from a set of options (modified cloze procedure). The assessment is designed for repeated administration throughout the school year to monitor progress (as cited in Ross, Nunnery, & Goldfeder, 2004).

1. This test was developed by Renaissance Learning, the developer of *Accelerated Reader*. According to research conducted by Renaissance Reading, STAR Reading Test scale scores are correlated with other standardized reading tests (such as, depending on the grade and time point, .67 to .85 for the California Achievement Test; .62 to .89 for the Gates McGinitie Test; and .71 for the Degrees of Reading Power test). (See: Nebelsick-Gullett, L. Review of STAR Reading, version 2.2. In B.S. Plake, J.C. Impara, & R.A. Spies (Eds.), *The fifteenth mental measurements yearbook*. Lincoln, NE: Buros Institute of Mental Measurements. Retrieved March 02, 2007, from Buros Institute of Mental Measurements website: <http://www.unl.edu/buros/>.)

## Appendix A2.3 Outcome measures in the general reading achievement domain

Outcome measure	Description
STAR Early Literacy Test <sup>1</sup>	This test measures seven domains: general readiness, graphophonemic knowledge, phonics, comprehension, phonemic awareness, structural analysis, and vocabulary. It is a computer-adaptive audio test (students wear headphones and the test is read to them). The test can be administered to non-readers and to students who do not have a high enough reading vocabulary (100 words) to take the STAR Reading Test on their own. The assessment is designed for repeated administration throughout the school year to monitor progress (as cited in Ross, Nunnery, & Goldfeder, 2004).

1. This test was developed by Renaissance Learning, the developer of *Accelerated Reader*. According to research conducted by Renaissance Reading, the STAR Early Literacy Test is correlated with other standardized reading tests (average correlations range from .57 to .64 with the Brigance K & 1 Screen for Kindergarten and First Grade, the DIAL, the Iowa Tests of Basic Skills, and the Stanford Achievement Test). (See: Graham, T. [2003]. Review of STAR Literacy. In B.S. Plake, J.C. Impara, & R.A. Spies [Eds.], *The fifteenth mental measurements yearbook*. Lincoln, NE: Buros Institute of Mental Measurements. Retrieved March 02, 2007, from Buros Institute of Mental Measurements website: <http://www.unl.edu/buros/>.)

## 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 (teachers/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 (randomized controlled trial)<sup>7</sup></b>								
DIBELS Oral Reading Fluency Test	Grade 3	2/32	116.30 (40.90)	112.80 (55.40)	3.50	0.07	ns	+3
<b>Domain average for reading fluency (Bullock, 2005)<sup>8</sup></b>						<b>0.07</b>	<b>ns</b>	<b>+3</b>

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 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 [Technical Details of WWC-Conducted Computations](#).
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, where 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 statistical significance, see [Technical Details of WWC-Conducted Computations](#).
8. 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 (teachers/ 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>Ross, Nunnery, &amp; Goldfeder, 2004 (randomized controlled trial)<sup>7</sup></b>								
STAR Reading Test	Grade 3	13/178	389.5 (139.6)	336.8 (198.3)	52.70	0.31	ns	+12
<b>Average for comprehension (Ross, Nunnery, &amp; Goldfeder, 2004)<sup>8</sup></b>						<b>0.31</b>	<b>ns</b>	<b>+12</b>
<b>Bullock, 2005 (randomized controlled trial)</b>								
STAR Reading Test	Grade 3	2/32	412.40 (149.50)	462.30 (182.40)	-49.90	-.30	ns	-12
<b>Average for comprehension (Bullock, 2005)<sup>8</sup></b>						<b>-.30</b>	<b>ns</b>	<b>-12</b>
<b>Domain average for comprehension across all studies<sup>8</sup></b>						<b>.00</b>	<b>na</b>	<b>0</b>

ns = not statistically significant

na = not applicable

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices for the comprehension 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. Ross, Nunnery, & Goldfeder (2004) adjusted posttest scores for pretest differences between study groups.
4. For an explanation of the effect size calculation, see [Technical Details of WWC-Conducted Computations](#).
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, where 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 statistical significance, see [Technical Details of WWC-Conducted Computations](#). In the case of Ross, Nunnery, & Goldfeder (2004), a correction for clustering was needed, so the significance levels may differ from those reported in the original studies.
8. 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 general reading achievement domain<sup>1</sup>

Outcome measure	Study sample	Sample size (teachers/ 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>Ross, Nunnery, &amp; Goldfeder, 2004 (randomized controlled trial)<sup>7</sup></b>								
STAR Early Literacy test	Kindergarten	7/92	644.40 (114.40)	569.20 (94.10)	75.20	0.69	ns	+25
STAR Early Literacy test	Grade 1	9/97	733.60 (96.20)	698.00 (97.80)	35.60	0.36	ns	+14
STAR Early Literacy test	Grade 2	16/205	791.70 (72.10)	772.70 (82.20)	19.00	0.25	ns	+10
<b>Average for general reading achievement (Ross, Nunnery, &amp; Goldfeder, 2004)<sup>8</sup></b>						<b>0.43</b>	<b>Statistically significant</b>	<b>+16</b>

ns = not statistically significant

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices for the general reading achievement 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. The authors adjusted posttest scores for pretest differences between study groups.
4. For an explanation of the effect size calculation, see [Technical Details of WWC-Conducted Computations](#).
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, where 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 statistical significance, see [Technical Details of WWC-Conducted Computations](#). In the case of Ross, Nunnery, & Goldfeder (2004), a correction for clustering was needed, so the significance levels may differ from those reported in the original study.
8. 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 A4.1 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.

### Rating received

**No discernible effects:** No affirmative evidence of effects.

- Criterion 1: None of the studies shows a statistically significant or substantively important effect, either *positive* or *negative*.

**Met.** *Accelerated Reader* has no studies that showed statistically significant or substantively important effects on reading fluency.

### 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.** *Accelerated Reader* had no studies that showed statistically significant or substantively important positive effects.

### AND

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

**Met.** *Accelerated Reader* had no studies that 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.** *Accelerated Reader* had no studies that 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.

**Met.** *Accelerated Reader* had no studies that showed statistically significant or substantively important negative effects.

**Mixed effects:** Evidence of inconsistent effects as demonstrated through EITHER of the following.

- 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.** *Accelerated Reader* had no studies that showed statistically significant or substantively important positive effects and no studies that showed statistically significant or substantively important negative effects.

### 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.** *Accelerated Reader* had no studies that showed statistically significant or substantively important positive effects and no studies that showed statistically significant or substantively important negative 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 Intervention Rating Scheme](#).



## Appendix A4.2 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 mixed effects.

### Rating received

**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.

**Met.** *Accelerated Reader* had one study that showed a substantively important (not statistically significant) positive effect and one study that showed a substantively important (not statistically significant) negative effect on comprehension.

**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.** *Accelerated Reader* had no studies showing an indeterminate effect on comprehension.

### 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.** *Accelerated Reader* had only one study that showed a substantively important (not statistically significant) positive effect.

**AND**

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

**Not met.** *Accelerated Reader* had one study that showed a substantively important (not statistically significant) 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.

**Met.** *Accelerated Reader* had one study that showed a substantively important (not statistically significant) 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.** *Accelerated Reader* had one study that showed a substantively important (not statistically significant) 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 Intervention Rating Scheme](#).

### Appendix A4.3 Accelerated Reader rating for the general reading 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.<sup>1</sup> For the outcome domain of general reading achievement, the WWC rated *Accelerated Reader* as having potentially positive effects.

#### 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.** *Accelerated Reader* had one study showing a statistically significant positive effect on general reading achievement.

#### 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.** *Accelerated Reader* had no studies showing negative or indeterminate effects on general reading achievement.

#### 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.** *Accelerated Reader* had only one study that showed a substantively important (not statistically significant) positive effect.

#### AND

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

**Met.** *Accelerated Reader* had no studies showing statistically significant or substantively important negative 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 Intervention Rating Scheme](#).

## Appendix A5    Extent of evidence by domain

Outcome domain	Number of studies	Sample size		Extent of evidence <sup>1</sup>
		Schools	Students	
Alphabetics	0	na	na	na
Fluency	1	1	32	Small
Comprehension	2	12	210	Medium to large
General reading achievement	1	12	426	Small

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.”