Accelerated Math®

This intervention report presents findings from a systematic review of Accelerated Math® conducted using the WWC Procedures and Standards Handbook (version 3.0) and the Secondary Mathematics review protocol (version 3.1). No studies of Accelerated Math® that fall within the scope of the Secondary Mathematics review protocol meet What Works Clearinghouse (WWC) group design standards. Because no studies meet WWC design standards at this time, the WWC is unable to draw any conclusions based on research about the effectiveness or ineffectiveness of Accelerated Math® on the mathematics achievement of secondary students, who are typically in grades 9–12. Research that meets WWC design standards is necessary to determine the effectiveness or ineffectiveness of this intervention.

Intervention Description

Accelerated Math®, published by Renaissance Learning, is a software tool that provides practice problems for students in grades K–12 and provides teachers with reports to monitor student progress. Accelerated Math® creates individualized student assignments, scores the assignments, and generates reports on student progress. The software is typically used with the math curriculum being used in the classroom to add practice for students and help teachers differentiate instruction through the program’s progress-monitoring data. This review focuses on studies of Accelerated Math®’s secondary mathematics content, which includes Algebra I, Geometry, and Algebra II.

Research

The WWC identified 80 studies of Accelerated Math® that were published or released between 1983 and 2017.

Four studies are within the scope of the Secondary Mathematics review protocol but do not meet WWC group design standards (see the Glossary of Terms in this document for a definition of this term and other commonly used research terms).

- One study was a randomized controlled trial in which the combination of overall and differential attrition rates exceeds WWC standards for this area, and the equivalence of the analytic intervention and comparison groups at baseline was necessary, but not demonstrated (Lambert & Algozzine, 2009).
- One study was a randomized controlled trial in which the random assignment was jeopardized, and the equivalence of the analytic intervention and comparison groups at baseline was necessary, but not demonstrated (Ysseldyke & Tardrew, 2007).
- One study was a randomized controlled trial in which the measures of effectiveness could not be attributed solely to the intervention because there was only one intervention classroom (Springer et al., 2007).
- One study used a quasi-experimental design and did not demonstrate equivalence of the analytic sample (Renaissance Learning, 2017).

Eight studies are out of the scope of the Secondary Mathematics review protocol because they have an ineligible study design.

Sixty-eight studies are out of the scope of the Secondary Mathematics review protocol for reasons other than study design.
References

Studies of *Accelerated Math® Algebra* that meet WWC group design standards without reservations

None.

Studies of *Accelerated Math® Algebra* that meet WWC group design standards with reservations

None.

Studies of *Accelerated Math® Algebra* that do not meet WWC group design standards


*Additional source:*


Renaissance Learning, Inc. (2017). *Special report: Trends in student outcome measures: The role of individualized math practice.* Wisconsin Rapids, WI: Author. The study does not meet WWC group design standards because equivalence of the analytic intervention and comparison groups is necessary and not demonstrated.


*Additional source:*


*Additional sources:*


Studies of *Accelerated Math® Geometry* that meet WWC group design standards

None.

Studies of *Accelerated Math® Geometry* that do not meet WWC group design standards

None.
Studies of *Accelerated Math® Algebra II* that meet WWC group design standards

None.

Studies of *Accelerated Math® Algebra II* that do not meet WWC group design standards

None.

Studies of *Accelerated Math®* that are ineligible for review using the Secondary Mathematics Evidence Review Protocol


Bach, S. (2001). *An evaluation of Accelerated Math in a seventh grade classroom.* Wisconsin Rapids, WI: Renaissance Learning, Inc. The study is ineligible for review because it is out of the scope of the protocol.


Brem, S. K. (2003). *AM users outperform controls when exposure and quality of interactions are high: A two-year study of the effects of Accelerated Math on math performance in a Title I elementary school.* Tempe: Arizona State University. The study is ineligible for review because it does not use a sample aligned with the protocol.

**Additional source:**


Caputo, M. T. (2007). *A comparison of the effects of the Accelerated Math program and the Delaware Procedural Fluency Workbook program on academic growth in grade six at X middle school* (Unpublished doctoral dissertation). Wilmington University, DE. The study is ineligible for review because it does not use a sample aligned with the protocol.


Crawford, L. (2013). Effects of an online mathematics curriculum for English language learners. *Computers in the Schools, 30*(3), 248–270. The study is ineligible for review because it is out of the scope of the protocol.

Gaeddert, T. J. (2001). *Using Accelerated Math to enhance student achievement in high school mathematics courses* (Unpublished master's thesis). Friends University, Wichita, KS. Retrieved from https://eric.ed.gov/?id=ED463177 The study is ineligible for review because it is out of the scope of the protocol.


Additional sources:


Hongerholt, M. (2006). *The effect of the Accelerated Math program on the Minnesota basic skills test scores of ninth graders* (Unpublished master's thesis). Winona State University, Winona, MN. The study is ineligible for review because it is out of the scope of the protocol.


Kariuki, P. N., & Gentry, C. J. (2010, November). *The effects of Accelerated Math utilization on grade equivalency score at a selected elementary school*. Paper presented at the annual conference of the Mid-South Educational Research Association, Mobile, AL. Retrieved from https://eric.ed.gov/?id=ED513432 The study is ineligible for review because it does not use a sample aligned with the protocol.

Kerns, G. M. (2005). *Moving from good to great: The evolution of learning information systems in Milford school district (Delaware)*. *Dissertation Abstracts International 65*(12A), 157-4416. The study is ineligible for review because it does not use a sample aligned with the protocol.


Additional source:


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Additional source:


Nevada Department of Education and the Leadership and Learning Center. (2010). Innovation and remediation interim report: A collaborative project between the Nevada Department of Education and the Leadership and Learning Center. Englewood, CO: The Leadership and Learning Center. The study is ineligible for review because it does not use a sample aligned with the protocol.

Additional source:
Renaissance Learning, Inc. (2010). Nevada Department of Education: Accelerated Math is a “high-gain program.” Wisconsin Rapids, WI: Education Research Department, Renaissance Learning, Inc.

Nobiliensky, C., & Smith, A. (2005). Accelerated Math helps the Wisconsin Center for Academically Talented Youth rapidly advance mathematics skills of students in its accelerated learning program. Wisconsin Rapids, WI: Renaissance Learning, Inc. The study is ineligible for review because it does not use a sample aligned with the protocol.


Additional sources:


Renaissance Learning, Inc. (1999). Accelerated Math and Math Renaissance improves math performance (Scientific Research: Quasi-Experimental series). Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2000). Accelerated Math: Pilot schools report. Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2001). Accelerated Math: Canadian pilot schools report. Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use an eligible design.

Renaissance Learning, Inc. (2002). Accelerated Math Fluency™ leads to growth in computational fluency. Wisconsin Rapids, WI: Educational Research Department, Renaissance Learning. The study is ineligible for review because it is out of the scope of the protocol.
Renaissance Learning, Inc. (2002). *Elementary school achieves big gains on Michigan educational assessment program*. Wisconsin Rapids, WI: Educational Research Department, Renaissance Learning. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2002). *Inner-city school more than doubles passing rates on North Carolina end-of-grade test*. Wisconsin Rapids, WI: Educational Research Department, Renaissance Learning. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2004). *Achievement gap at a Texas elementary school reduced by 88%*. Wisconsin Rapids, WI: Educational Research Department, Renaissance Learning. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2004). *Average number of students meeting Delaware state standards increases by more than 15 percentage points*. Wisconsin Rapids, WI: Education Research Department, Renaissance Learning. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2004). *First and second grade students demonstrate accelerated growth with Math Renaissance: Union County Primary School, Blairsville, Georgia*. Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2004). *Increased achievement on ITBS scores directly relates to the implementation level of math management software*. Wisconsin Rapids, WI: Educational Research Department, Renaissance Learning. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2004). *Percentage of students scoring “at or above grade level” on Minnesota Comprehensive Assessment increases 43.5 points*. Wisconsin Rapids, WI: Educational Research Department, Renaissance Learning. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2005). *Iowa school boosts Iowa Test of Basic Skills reading and math scores: Richardson Elementary School*. Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2005). *Washington school dramatically improves reading and math state test scores*. Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2006). *Iowa elementary school pairs best practices with student motivation and sees significant gains in Iowa Test of Basic Skills scores: Hawthorne Elementary School*. Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2006). *Reading and math state test scores climb at rural Texas school: Finley-Oates Elementary School*. Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2007). *Accelerated Math software and best practices: Key scientifically based research summary*. Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use an eligible design.

Renaissance Learning, Inc. (2007). *Junior high school credits impact of Renaissance tools with recognition in Texas accountability ratings*. Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use an eligible design.


Renaissance Learning, Inc. (2007). *Test scores on the rise and library growth skyrocketing at Indiana elementary school*. Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use a sample aligned with the protocol.
Renaissance Learning, Inc. (2007). *Texas junior high school makes extensive gains on the TAKS.* Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2010). *The Research Foundation for Accelerated Math for Intervention: Evidence-based strategies to help students struggling in mathematics.* Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use an eligible design.


Renaissance Learning, Inc. (2012). *Arkansas schools awarded smallest improvement grants see biggest gains with Renaissance tools.* Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use a sample aligned with the protocol.

Renaissance Learning, Inc. (2012). *Using Renaissance Learning programs to support vocabulary development.* Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use an eligible design.

Renaissance Learning, Inc. (2015). *The Research Foundation for Accelerated Math Fluency: The critical role of automaticity in accelerating math achievement.* Wisconsin Rapids, WI: Author. The study is ineligible for review because it is out of the scope of the protocol.

Renaissance Learning, Inc. (2016). *The Research Foundation for Accelerated Math.* Wisconsin Rapids, WI: Author. The study is ineligible for review because it does not use an eligible design.

Richter, M. P. (2006). *The effect of a supplemental mathematics support class (Accelerated Math) on students’ academic achievement* (Unpublished master’s thesis). California State University, Stanislaus. The study is ineligible for review because it is out of the scope of the protocol.


**Additional source:**


Scott, A. M. (2005). *A quantitative examination of Title I and non-Title I elementary schools in East Tennessee using fourth grade math and reading standardized test scores* (Unpublished doctoral dissertation). East Tennessee State University, Johnson City. The study is ineligible for review because it is out of the scope of the protocol.


**Additional sources:**


Spicuzza, R., & Ysseldyke, J. E. (1999). *Using Accelerated Math to enhance instruction in a mandated summer school program.* Minneapolis, MN: Minneapolis Public Schools. The study is ineligible for review because it does not use a sample aligned with the protocol.


Stessman, M. (2006). *Closing the economic achievement gap: A case study of a successful Kansas secondary school* (Unpublished master’s thesis). Wichita State University, KS. The study is ineligible for review because it is out of the scope of the protocol.


**Additional source:**

Theisen, W. (2006). *Will the implementation of individualized self-paced instruction via the Accelerated Math software program improve math competency for target math students?* (Unpublished master’s thesis). Winona State University, Winona, MN. The study is ineligible for review because it is out of the scope of the protocol.

Vannatta, C. H. (2001). *Integrating Accelerated Math into the high school classroom* (Unpublished master’s thesis). Minot State University, ND. The study is ineligible for review because it is out of the scope of the protocol.


West, M. D. (2005). *The effectiveness of using Accelerated Math to increase student mathematical achievement and its impact on student and parent attitudes toward mathematics* (Unpublished master’s thesis). University of Georgia, Athens. The study is ineligible for review because it is out of the scope of the protocol.

**Additional sources:**


The study is ineligible for review because it does not use a sample aligned with the protocol.

**Additional sources:**


Endnotes

1 The descriptive information for this intervention comes from a publicly available source—the developer's website (www.renaissance.com, downloaded May 2017). The WWC provided the developer with the intervention description in May 2017 and asked the developer to review it for accuracy from its perspective. The WWC subsequently incorporated feedback from the developer. Further verification of the accuracy of the descriptive information for this intervention is beyond the scope of this review.

2 The WWC previously released reports on Accelerated Math® under the Elementary School Mathematics (ESM) topic area in September 2010, the Middle School Mathematics (MSM) topic area in September 2008, and the High School Mathematics (HSM) topic area in July 2011. The WWC prepared the reports using the WWC Procedures and Standards Handbook (version 1.0 for the MSM report, and version 2.0 for the ESM and HSM reports) and the specific topic area review protocols (ESM version 1.1, MSM version 1.0, and HSM version 2.0). In June 2015, the WWC restructured the reviews of research on math interventions into two areas instead of three. These two review areas are Primary Mathematics (which includes interventions in which math is presented through multi-topic materials and curricula, typically used in grades K–8), and Secondary Mathematics (which includes interventions organized by math content area [e.g., algebra, geometry, and calculus], typically taught in grades 9–12). These two areas replaced the prior ESM, MSM, and HSM topic areas, which were organized by student grade level. The WWC is updating and replacing intervention reports written under the prior topic areas.

The literature search reflects documents publicly available by February 2017. This updated report includes reviews of 41 studies that the previous WWC intervention reports did not include. Of the additional studies, 39 were not within the scope of the protocol and 2 were within the scope of the protocol but did not meet WWC group design standards. A complete list and disposition of all studies reviewed are provided in the references.

The current report, which includes reviews of all previous studies that met WWC group design standards with reservations or did not meet WWC group design standards in the MSM and HSM reports, resulted in a revised disposition for five studies.

Gaeddert (2001) and Hongerholt (2006) are ineligible for review in this report, whereas they were previously rated does not meet WWC group design standards in the HSM intervention report. In both cases, the change in rating was due to a change in the procedures for review under the WWC Procedures and Standards Handbook (version 3.0), whereby master's theses are no longer eligible for review.

Ysseldyke and Bolt (2007) and Nunnery and Ross (2007) were previously rated as meet WWC group design standards with reservations in the MSM intervention report. These two studies are now rated as ineligible for the Secondary Mathematics intervention report. The current dispositions differ due to different eligibility requirements under the Secondary Mathematics topic area.

Ysseldyke and Bolt (2007) conducted analyses on a pooled sample that included pre-Algebra and Algebra students, and the Nunnery and Ross (2007) study examined a pre-Algebra sample.

Ysseldyke and Tardrew (2007) is rated does not meet WWC group design standards in this report, whereas it had previously received a rating of meets WWC group design standards with reservations in the MSM intervention report. The current rating differs from the prior MSM review because the current review focuses on the grades 9 and 10 analytic sample, rather than grades 6-8, and equivalence of the analytic sample was necessary but was not demonstrated. The current rating is consistent with the rating in the prior HSM intervention report (which also reviewed grades 9 and 10).

3 Reviews of studies in this report used the standards from the WWC Procedures and Standards Handbook (version 3.0) and the Secondary Mathematics review protocol (version 3.1). The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.

Recommended Citation

Glossary of Terms

Attrition: Attrition occurs when an outcome variable is not available for all subjects initially assigned to the intervention and comparison groups. If a randomized controlled trial (RCT) or regression discontinuity design (RDD) study has high levels of attrition, the validity of the study results can be called into question. An RCT with high attrition cannot receive the highest rating of Meet WWC Group Design Standards without Reservations, but can receive a rating of Meet WWC Group Design Standards with Reservations if it establishes baseline equivalence of the analytic sample. Similarly, the highest rating an RDD with high attrition can receive is Meet WWC RDD Standards with Reservations.

For single-case design research, attrition occurs when an individual fails to complete all required phases or data points in an experiment, or when the case is a group and individuals leave the group. If a single-case design does not meet minimum requirements for phases and data points within phases, the study cannot receive the highest rating of Meet WWC Pilot Single-Case Design Standards without Reservations.

Baseline: A point in time before the intervention was implemented in group design research and in regression discontinuity design studies. When a study is required to satisfy the baseline equivalence requirement, it must be done with characteristics of the analytic sample at baseline. In a single-case design experiment, the baseline condition is a period during which participants are not receiving the intervention.

Clustering adjustment: An adjustment to the statistical significance of a finding when the units of assignment and analysis differ. When random assignment is carried out at the cluster level, outcomes for individual units within the same clusters may be correlated. When the analysis is conducted at the individual level rather than the cluster level, there is a mismatch between the unit of assignment and the unit of analysis, and this correlation must be accounted for when assessing the statistical significance of an impact estimate. If the correlation is not accounted for in a mismatched analysis, the study may be too likely to report statistically significant findings. To fairly assess an intervention's effects, in cases where study authors have not corrected for the clustering, the WWC applies an adjustment for clustering when reporting statistical significance.

Confounding factor: A confounding factor is a component of a study that is completely aligned with one of the study conditions, making it impossible to separate how much of the observed effect was due to the intervention and how much was due to the factor.

Design: The method by which intervention and comparison groups are assigned (group design and regression discontinuity design) or the method by which an outcome measure is assessed repeatedly within and across different phases that are defined by the presence or absence of an intervention (single-case design). Designs eligible for WWC review are randomized controlled trials, quasi-experimental designs, regression discontinuity designs, and single-case designs.

Effect size: The effect size is a measure of the magnitude of an effect. The WWC uses a standardized measure to facilitate comparisons across studies and outcomes.

Eligibility: A study is eligible for review and inclusion in this report if it falls within the scope of the review protocol and uses either an experimental or matched comparison group design.

Equivalence: A demonstration that the analysis sample groups are similar on observed characteristics defined in the review area protocol.
Extent of evidence  

An indication of how much evidence from group design studies supports the findings in an intervention report. The extent of evidence categorization for intervention reports focuses on the number and sizes of studies of the intervention in order to give an indication of how broadly findings may be applied to different settings. There are two extent of evidence categories: small and medium to large.

- **small**: includes only one study, or one school, or findings based on a total sample size of less than 350 students and 14 classrooms (assuming 25 students in a class)
- **medium to large**: includes more than one study, more than one school, and findings based on a total sample of at least 350 students or 14 classrooms

Gain scores  

The result of subtracting the pretest from the posttest for each individual in the sample. Some studies analyze gain scores instead of the unadjusted outcome measure as a method of accounting for the baseline measure when estimating the effect of an intervention. The WWC reviews and reports findings from analyses of gain scores, but gain scores do not satisfy the WWC’s requirement for a statistical adjustment under the baseline equivalence requirement. This means that a study that must satisfy the baseline equivalence requirement and has baseline differences between 0.05 and 0.25 standard deviations Does Not Meet WWC Group Design Standards if the study’s only adjustment for the baseline measure was in the construction of the gain score.

Group design  

A study design in which outcomes for a group receiving an intervention are compared to those for a group not receiving the intervention. Comparison group designs eligible for WWC review are randomized controlled trials and quasi-experimental designs.

Improvement index  

Along a percentile distribution of individuals, the improvement index represents the gain or loss of the average individual due to the intervention. As the average individual starts at the 50th percentile, the measure ranges from –50 to +50.

Intervention  

An educational program, product, practice, or policy aimed at improving student outcomes.

Intervention report  

A summary of the findings of the highest-quality research on a given program, product, practice, or policy in education. The WWC searches for all research studies on an intervention, reviews each against design standards, and summarizes the findings of those that meet WWC design standards.

Multiple comparison adjustment  

An adjustment to the statistical significance of results to account for multiple comparisons in a group design study. The WWC uses the Benjamini-Hochberg (BH) correction to adjust the statistical significance of results within an outcome domain when study authors perform multiple hypothesis tests without adjusting the p-value. The BH correction is used in three types of situations: studies that tested multiple outcome measures in the same outcome domain with a single comparison group; studies that tested a given outcome measure with multiple comparison groups; and studies that tested multiple outcome measures in the same outcome domain with multiple comparison groups. Because repeated tests of highly correlated constructs will lead to a greater likelihood of mistakenly concluding that the impact was different from zero, in all three situations, the WWC uses the BH correction to reduce the possibility of making this error. The WWC makes separate adjustments for primary and secondary findings.

Please see the WWC Procedures and Standards Handbook (version 3.0) for additional details.
### Outcome domain
A group of closely-related outcomes. A domain is the organizing construct for a set of related outcomes through which studies claim effectiveness.

### Quasi-experimental design (QED)
A quasi-experimental design (QED) is a research design in which study participants are assigned to intervention and comparison groups through a process that is not random.

### Randomized controlled trial (RCT)
A randomized controlled trial (RCT) is an experiment in which eligible study participants are randomly assigned to intervention and comparison groups.

### Rating of effectiveness
For group design research, the WWC rates the effectiveness of an intervention in each domain based on the quality of the research design and the magnitude, statistical significance, and consistency in findings. For single-case design research, the WWC rates the effectiveness of an intervention in each domain based on the quality of the research design and the consistency of demonstrated effects.

### Regression discontinuity design (RDD)
A design in which groups are created using a continuous scoring rule. For example, students may be assigned to a summer school program if they score below a preset point on a standardized test, or schools may be awarded a grant based on their score on an application. A regression line or curve is estimated for the intervention group and similarly for the comparison group, and an effect occurs if there is a discontinuity in the two regression lines at the cutoff.

### Single-case design
A research approach in which an outcome variable is measured repeatedly within and across different conditions that are defined by the presence or absence of an intervention.

### Standard deviation
The standard deviation of a measure shows how much variation exists across observations in the sample. A low standard deviation indicates that the observations in the sample tend to be very close to the mean; a high standard deviation indicates that the observations in the sample tend to be spread out over a large range of values.

### Statistical significance
Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups. The WWC labels a finding statistically significant if the likelihood that the difference is due to chance is less than 5% ($p < .05$).

### Study rating
The result of the WWC assessment of a study. The rating is based on the strength of the evidence of the effectiveness of the educational intervention. Studies are given a rating of Meets WWC Design Standards without Reservations, Meets WWC Design Standards with Reservations, or Does Not Meet WWC Design Standards, based on the assessment of the study against the appropriate design standards. The WWC has design standards for group design, single-case design, and regression discontinuity design studies.

### Substantively important
A substantively important finding is one that has an effect size of 0.25 or greater, regardless of statistical significance.

### Systematic review
A review of existing literature on a topic that is identified and reviewed using explicit methods. A WWC systematic review has five steps: 1) developing a review protocol; 2) searching the literature; 3) reviewing studies, including screening studies for eligibility, reviewing the methodological quality of each study, and reporting on high quality studies and their findings; 4) combining findings within and across studies; and, 5) summarizing the review.

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Please see the WWC Procedures and Standards Handbook (version 3.0) for additional details.
An intervention report summarizes the findings of high-quality research on a given program, practice, or policy in education. The WWC searches for all research studies on an intervention, reviews each against evidence standards, and summarizes the findings of those that meet standards.

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