

# What Works Clearinghouse

## Detailed Study Report



**Reviewed Study:** Schneider, C. L. (2000). *Connected Mathematics and the Texas Assessment of Academic Skills. Dissertation Abstracts International, 62 (02), 503. (UMI No. 3004373)*

WWC Study Reports are intended to support decision making; neither the What Works Clearinghouse (WWC) nor the U.S. Department of Education endorses any interventions. No single Study Report should be used as a basis for making policy decisions because (1) few studies are designed and implemented flawlessly and (2) all studies are tested on a limited number of participants, using a limited number of outcomes, at a limited number of times, so generalizing from one study to any context is very difficult. To highlight these issues, the WWC Study Reports describe in detail the specifics of each study, focusing primarily on studies that provide the best evidence of effects (randomized controlled trials). Systematic reviews of the evidence will be conducted to summarize the results of the individual studies.

See the WWC [Brief Study Report \(PDF\)](#) for a summary of this study.

**Topic:** Curriculum-Based Interventions for Increasing K–12 Math Achievement—Middle School

**Intervention:** Connected Mathematics Project

**Research Design:** Quasi-Experimental Design with Matching

**Study Rating:** 

**Date Released:** September 15, 2004

**Summary of Results:** Schneider found no statistically significant differences between the intervention and comparison groups on the school-level Texas Assessment of Academic Skills (TAAS) analyzed in the study. The findings may have been affected by only three schools implementing more than one-third of the total math problems in each year and grade. In addition, the sample size was small.

 = Meets Evidence Standards     = Meets Evidence Standards with Reservations     = Does Not Meet Evidence Standards

The What Works Clearinghouse ([www.whatworks.ed.gov](http://www.whatworks.ed.gov)) was established in 2002 by the [U.S. Department of Education's Institute of Education Sciences](#) to provide educators, policymakers, researchers, and the public with a central and trusted source of scientific evidence of what works in education. Please email all questions and comments to [info@whatworks.ed.gov](mailto:info@whatworks.ed.gov). The What Works Clearinghouse is administered by the U.S. Department of Education through a contract to a joint venture of the [American Institutes for Research](#) and the [Campbell Collaboration](#).

---

## **Intervention: Connected Mathematics Project**

### ***Operational Features***

Between 1991 and 1997, the Connected Mathematics Project (CMP) received funding from the National Science Foundation to develop a mathematics curriculum for middle school (grades 6 through 8). The CMP, developed at Michigan State University, is reported to adhere to the National Council of Teachers of Mathematics (NCTM) Curriculum and Evaluation Standards.

The key feature of the CMP is that it is a problem-centered curriculum that provides skills practice. The CMP is a comprehensive mathematics curriculum that has 24 units, with eight units at each of three grade levels. Each unit contains four to seven investigations. Each investigation in turn contains one to five problem sets and ends with a mathematical reflection activity.

Support for implementing the CMP curriculum includes professional development prior to implementation and follow-up professional development each summer after implementation. In addition, pilot sites in this study provided regular meetings with their teachers throughout the school year.

In this study, the intervention group consisted of 23 schools that were using the CMP, and the comparison group consisted of 25 schools that were not using the CMP. For the comparison schools, Schneider does not provide any information on what curriculum they were using.

### ***People, Settings, and Timing***

This study was conducted in Texas. Although districts within Texas volunteered to pilot the CMP curriculum, implementation at the school and teacher level was not voluntary.

Schneider's study focuses on the schools in Texas that were using the CMP curriculum. Schools participating in the pilot CMP represented rural, suburban, and urban areas. Schneider reports that many of these schools have predominantly minority students.

Three groups of students are the focus of this study. Group 1 students experienced the CMP curriculum from grades 6 through 8 between 1996–1997 and 1998–1999. Group 2 students experienced the curriculum in grades 6 and 7 in 1997–1998 and 1998–1999. Students in Group 3 had the curriculum only while they were in grade 6 in 1998–1999.

### ***Cost Information***

Cost information on the CMP curriculum is provided on the publisher's website [www.phschool.com/math/cmp/index.html](http://www.phschool.com/math/cmp/index.html). The cost varies by the number of units purchased.

### ***Intended Duration***

The CMP is designed to be a year-long curriculum in grades 6 through 8. Schneider reports on the effects of varying length of curriculum implementation on three groups of students. Group 1 students had the curriculum for three years in grades 6 through 8. Group 2 students had the curriculum for two years in grades 6 and 7. Group 3 students had the curriculum only in grade 6.

### ***Scientific Rationale***

Schneider does not provide a scientific rationale for this study.

## **Overview of the Study**

### ***Purpose***

The purpose of the study is to determine whether the use of the CMP, a new curriculum, affects student achievement in a state-mandated assessment. Because of high-stakes testing and accountability in Texas, districts prefer a curriculum that is aligned to the Texas state assessment test. Both the CMP curriculum and the state assessment are reported to be aligned with the NCTM standards.

### ***Intervention Fidelity***

Schneider surveyed the teachers in the target schools in this study to determine intervention fidelity. In most instances, only one teacher from a school responded for each grade level and year. Schneider reports that schools varied in their level of implementation. Although the CMP curriculum was taught throughout the whole year, no school reported having the goal

---

of completing all the problems at any grade level.

Schneider also created a category of high-use schools—those that reported teaching more than one-third of the total number of problems for a grade and year. Schneider reports separate analyses for this group of schools.

### **Outcome Measures**

The state assessment—Texas Assessment of Academic Skills (TAAS)—is the primary outcome measure used in the study. According to the Texas Education Agency, TAAS is a criterion-referenced assessment that measures problem-solving and critical-thinking skills and is aligned with the NCTM standards. Thus, for WWC purposes, this outcome measure has evidence of face validity and reliability and is properly aligned.

This study reports two levels of data for the student achievement in the state assessment in the study: the school-level passing rates on TAAS and the student-level scores on the Texas Learning Index (TLI).

Because the unit of intervention delivery was at the school level and the selection of comparable comparison schools was also done at the school level, this report focuses on the school-level TAAS passing rates and on the school-level TLI scores, which the author was able to provide in a follow-up. Unlike the student-level TLI statistic, the school-level TLI scores do not have the problem of dependence and clustering within schools and classes.

### **Research Design**

The research design for this study is quasi-experimental with matching. The CPM pilot schools that sent 6th-, 7th-, and 8th-grade teachers to a six-day summer professional development program conducted by the Texas Statewide Systematic Initiative (SSI) in 1996, 1997, and 1998 are the 23 intervention schools.

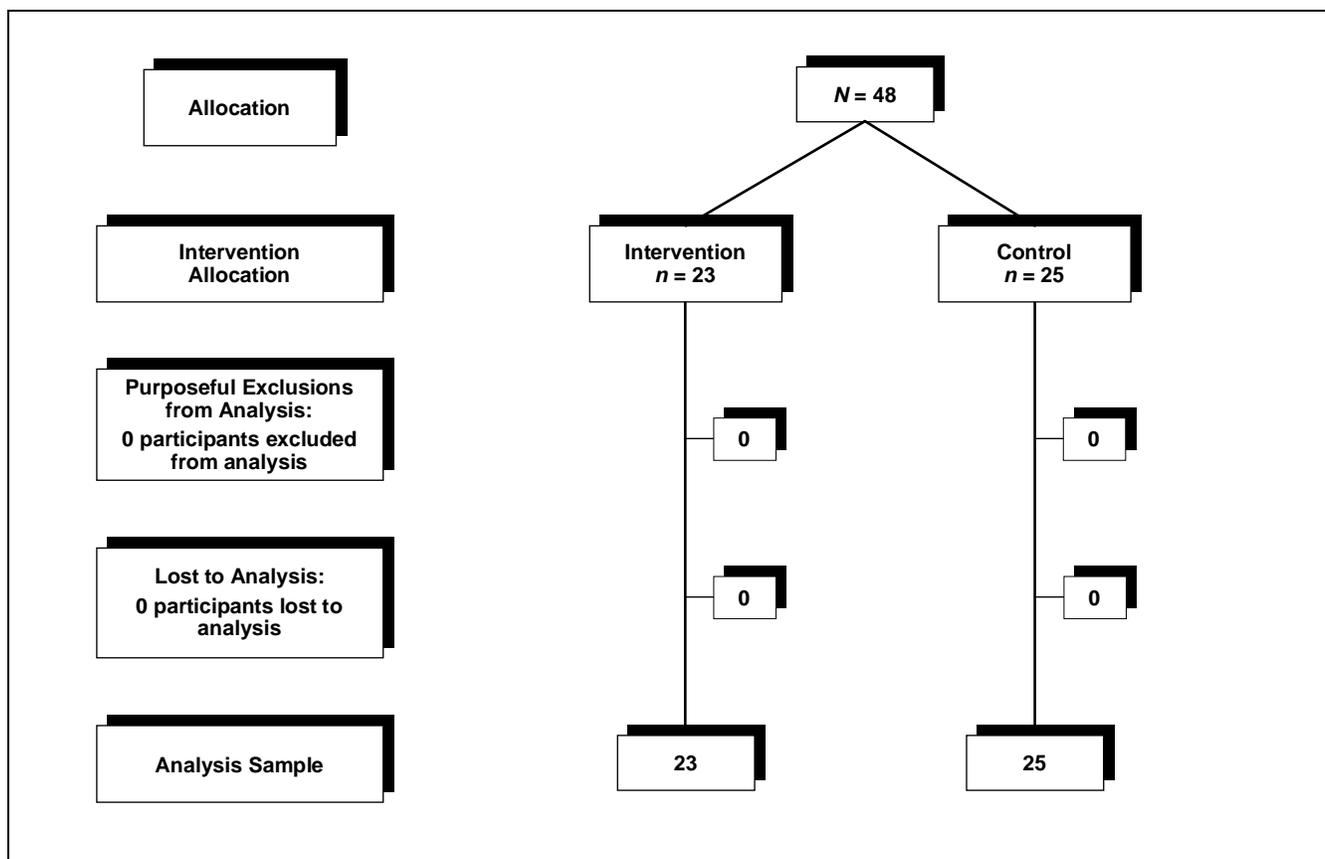
To select the comparison schools, Schneider reports running a regression analysis on the demographic data, prior school-level TAAS passing rates, and school enrollment for both the intervention schools and the potential pool of comparison schools. Schools with the closest match on the predicted value on the current TAAS passing rate with the same grade levels encompassed by the intervention schools are those selected as comparisons. Based on these selection criteria, 23 matched schools were identified. Two more comparison schools were then added because they were feeder schools to two of the comparison schools. Thus, the final total number of comparison schools used in the study is 25.

Schneider's analysis is at the school level, which is the same level as the unit of intervention delivery.

### **Participant Flow**

The study started with 23 intervention schools using the CMP curriculum and 25 comparison schools not using the CMP curriculum. The same number of intervention and comparison schools remained throughout the analysis. (See Figure 1.)

**Figure 1. Participant Flow (Schools)**



---

## Reference Periods

The time frame for investigating the CMP curriculum in this study is school years 1996–1997 to 1998–1999. The teachers first received professional development in the CMP in the summer of 1996. Pretest measures used for matching are taken from years 1994, 1995, and 1996.

## Baseline Data

Schneider provides the following derived baseline data based on the pretest TAAS passing rates for each of the intervention and comparison schools. (See Table 1.)

**Table 1. Pretest Characteristics of the Study Sample**

Characteristic	Intervention	Comparison	<i>p</i> Value
TAAS passing rate: Mean ( <i>SD</i> )	71.7(16.97)	72.4 (16.68)	N/A <sup>a</sup>
Sample size (school)	23	23 <sup>b</sup>	N/A <sup>a</sup>

Note. TAAS = Texas Assessment of Academic Skills

<sup>a</sup>Schneider did not test for pretest differences.

<sup>b</sup>Schneider does not provide the TAAS passing rates for the two additional comparison schools that were added to the sample later in the matching process.

## Statistical Methods

Schneider uses hierarchical linear modeling (HLM) to analyze data at the school level and across all schools. Schneider also reports separate analyses by group. In addition, Schneider provides a separate analysis of the three schools using the CMP curriculum that were classified as high implementation together with the corresponding comparison schools.

## Outcomes and Estimation

Schneider uses HLM to determine significance of the school-level passing rate on the TAAS. Across all groups (with varying duration of intervention) and all schools, no statistically significant difference is found between schools using the CMP curriculum and the comparison schools on the TAAS passing rate for mathematics. When analysis is separated by group, no difference is found between schools using the CMP curriculum and comparison schools. The difference is also not significant between schools using the CMP curriculum designated as high-implementation schools and their matched comparison schools.

In a follow-up, Schneider provided WWC with the posttest mean scores on the TLI for each intervention and comparison school and for each group. Table 2 shows the mean and standard deviations of the TLI posttest scores at the school level for each group. The effect sizes computed by WWC between the intervention and comparison groups are not significant. (See Table 3 and Figures 2a to 2c.)

## Cautions

The sample size at the school level is too small to allow for sufficiently precise estimates of the effect size.

**Table 2. Impact Reported by Schneider (2000): School-Level Posttest Scores on TLI Math Achievement**

Group (duration of intervention)	Posttest scores on math achievement: TLI mean ( <i>SD</i> )		Intervention group estimated effect size (and significance)
	CMP Intervention	Comparison	CMP
Group 1 (1997–1999)	73.2 (6.37)	72.9 (5.46)	NR <sup>a</sup>
Group 2 (1998–1999)	72.3 (6.59)	74.2 (5.29)	NR <sup>a</sup>
Group 3 (1999)	73.6 (5.41)	74.5 (6.37)	NR <sup>a</sup>

Note. TLI = Texas Learning Index.

<sup>a</sup> Schneider does not report effect sizes but reports that the difference was not significant in the hierarchical linear modeling analysis of school-level passing rates on the Texas Assessment of Academic Skills.

**Table 3. Impact Calculated by WWC: School-Level TLI Posttest Scores**

Group (duration of intervention)	CMP Intervention group mean score ( <i>SD</i> )	Comparison group mean score ( <i>SD</i> )	Estimated Effect <sup>a</sup>			
			Mean difference	Effect size <sup>b</sup>	CI <sup>c</sup>	<i>p</i> Value <sup>d</sup>
Group 1	73.2 (6.37)	72.9 (5.46)	0.30	0.05	± .61	> .05
Group 2	72.3 (6.59)	74.2 (5.29)	-1.90	-0.31	± .62	> .05
Group 3	73.6 (5.41)	74.5 (6.37)	-0.90	-0.15	± .66	> .05

Note. TLI = Texas Learning Index

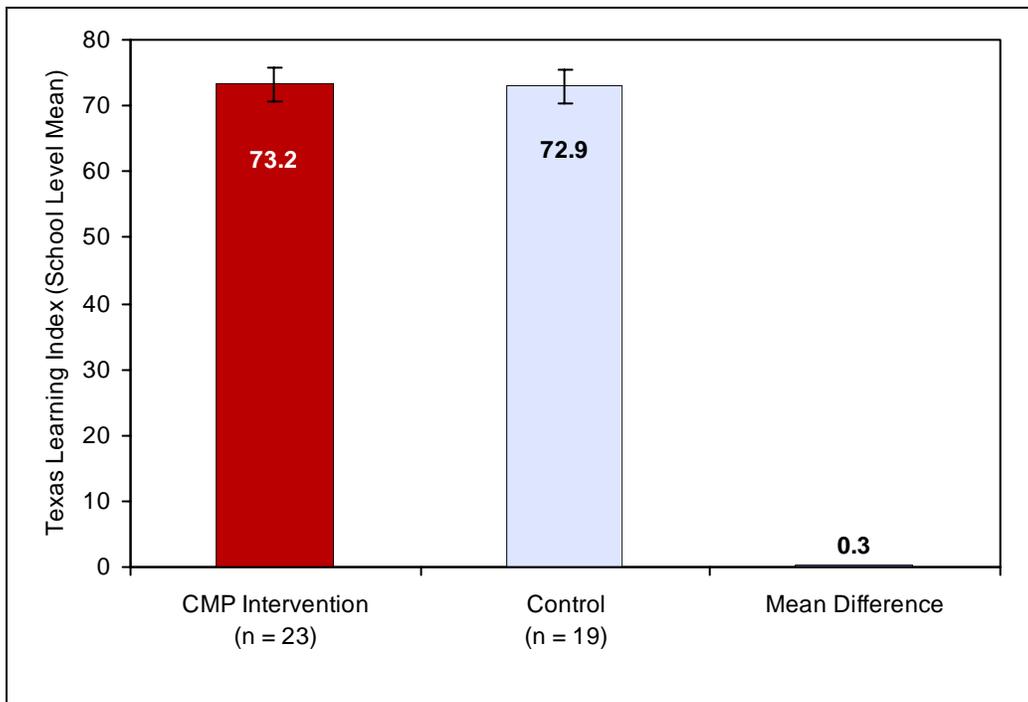
<sup>a</sup> Effect is shown both as the mean difference between the intervention and comparison groups and as a relative effect size, which is equal to the ratio of the mean difference to the standard deviation of the outcome measure.

<sup>b</sup> All estimates of effect size are based on the *d*-index.

<sup>c</sup> Confidence interval around the effect size estimate.

<sup>d</sup> Reflects significance level of the effect size estimate.

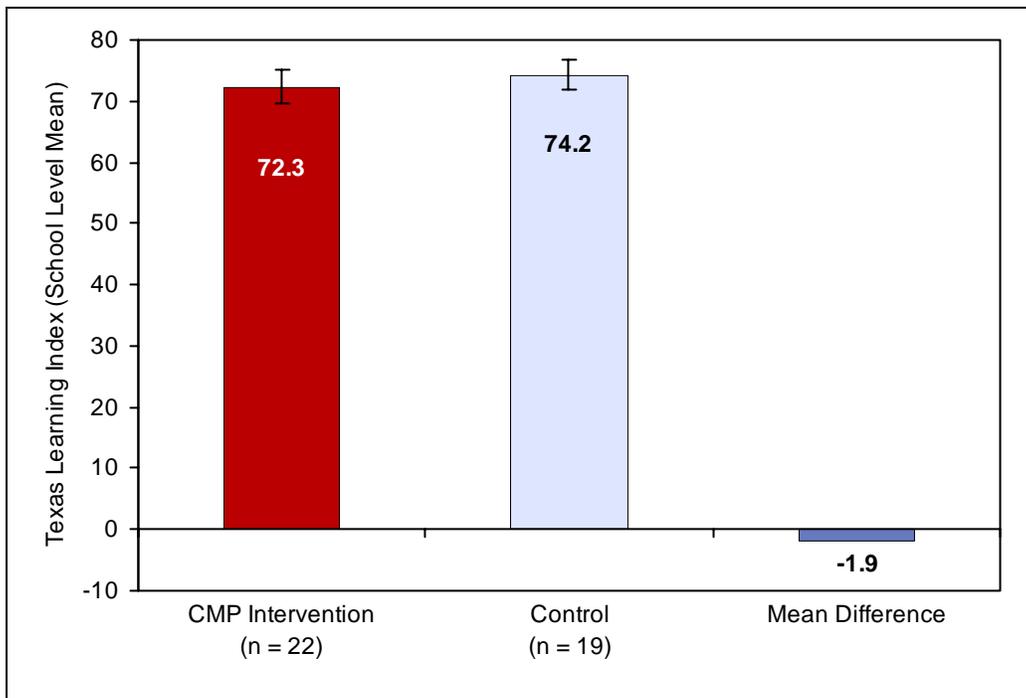
**Figure 2a. Impact Reported by Schneider (2000):<sup>a</sup> School-Level TLI Posttest Scores in Group 1**



Note. TLI = Texas Learning Index.

<sup>a</sup> Confidence intervals are computed by the WWC. Schneider reports that the intervention group scores do not differ significantly from the comparison group scores on the Texas Assessment of Academic Skills.

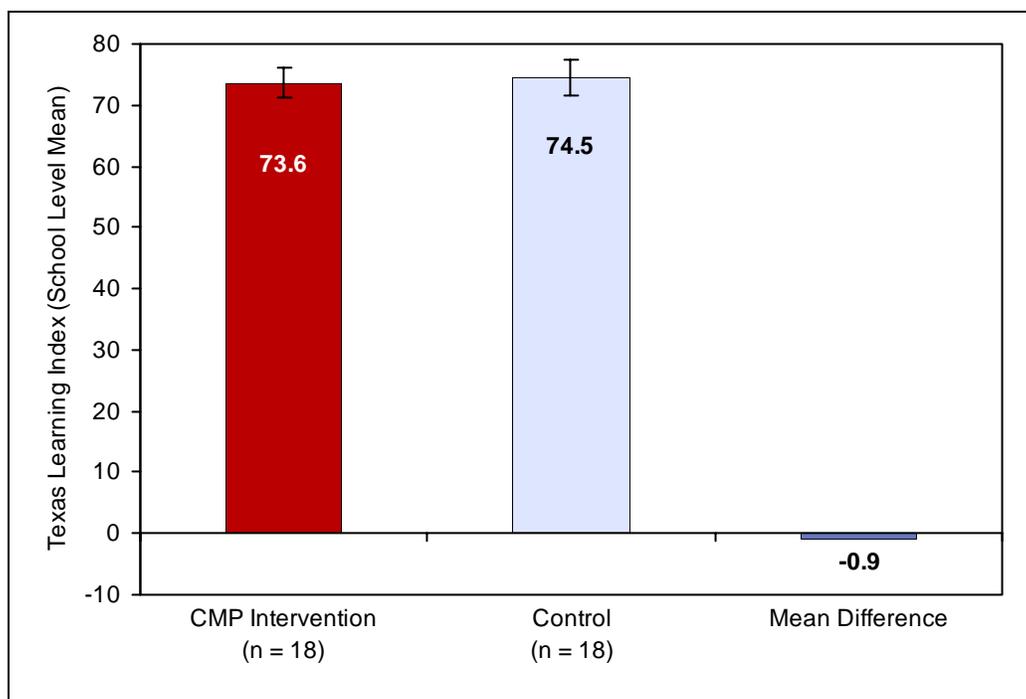
**Figure 2b. Impact Reported by Schneider (2000):<sup>a</sup> School-Level TLI Posttest Scores in Group 2**



Note. TLI = Texas Learning Index.

<sup>a</sup> Confidence intervals are computed by the WWC. Schneider reports that the intervention group scores do not differ significantly from the comparison group scores on the Texas Assessment of Academic Skills.

**Figure 2c. Impact Reported by Schneider (2000):<sup>a</sup> School-Level TLI Posttest Scores in Group 3**



Note. TLI = Texas Learning Index.

<sup>a</sup> Confidence intervals are computed by the WWC. Schneider reports that the intervention group scores do not differ significantly from the comparison group scores on the Texas Assessment of Academic Skills.

## Intervention Developer Contact Information

Contact the local Prentice Hall Sales Representative at their general number 1-800-848-9500; or contact CMP at 517-432-2820 or visit the website [www.math.msu.edu/cmp/index.html](http://www.math.msu.edu/cmp/index.html).

## Related Studies

See reports on [other studies of Middle School Math curricula](#).

See reports on other studies of the [Connected Mathematics Project](#).

## Report Production

**Date created:** September 15, 2004

**Topic area reviewed under:** Curriculum-Based Interventions for Increasing K–12 Math Achievement—Middle School

## WWC Study Ratings<sup>a</sup>: Schneider (2000)

### Causal Validity: Meets WWC Standards with Reservations, a Quasi-Experimental Design with Matching and No Attrition or Disruption Problems

Intervention schools were matched on relevant variables to similar comparison schools in Texas. Pretest differences between the two groups after the selection of the matched comparison schools were not addressed by the author. There was no attrition at the school level, and no extraneous events were identified that appeared to confound the intervention’s effect.

Other Study Characteristics	Study Rating	Study-Specific Information
Intervention Fidelity	●●	The CMP intervention is well implemented and designed and meets the definition of middle school math. Schneider also provides enough information about the curriculum, the population, and the setting to allow replication. Schneider states that no schools intended to implement all the units of the curriculum in a single grade and year, yet Schneider does not report any deviation of the intervention schools from the way the curriculum should be implemented.
Outcome Measures	●●	Although Schneider reports both school-level and student-level achievement outcome measures of the Texas Assessment of Academic Skills (TAAS), only the school-level outcome measure is reviewed in this report because the CMP curriculum was implemented at the school level. The primary outcome measure shows evidence of face validity and reliability and is properly aligned.
People, Settings, and Timing	●	Although Schneider reports that the schools in the sample represent rural, suburban, and urban settings, other variations in people and settings that WWC deems important, such as sex, tracking, and class size, are not reported. The outcome measure was given some time in April, just before the end of the school year.
Testing within Subgroups	●	The intervention’s effect was tested across the entire sample but not within important subgroups.
Analysis	●	Schneider’s analysis is at the school level, which is the same level as the unit of intervention delivery. The sample sizes are too small at the school level to allow for sufficiently precise estimates of the effect size.
Statistical Reporting	●●	The statistical tests are adequately reported. Sufficient details such as means and standard deviations are provided so that effect sizes can be estimated for the outcome measure of interest.

Note. ●● Fully meets criteria; ● Meets minimum criteria; ✕ Does not meet criteria.

<sup>a</sup> For more information on the criteria used to rate this study, see the WWC Evidence Standards: [Middle School Math](#).