# What Works Clearinghouse™



# Peer-Assisted Learning Strategies

## Report Contents



## Program Description[1]

*Peer-Assisted Learning Strategies* is a peer-tutoring program for grades K–6 that aims to improve student proficiency in math and other disciplines. This report focuses on *Peer-Assisted Learning Strategies* for math. The math program supplements students' existing math curriculum and is based on peer-mediated instruction, a process whereby students work in pairs or small groups to tutor each other. During tutoring sessions, students work together on worksheets that target specific math skills, with one student designated to correct his or her partner's errors, award points for correct responses, and provide consistent encouragement and feedback. The program uses videos and teacher-provided scripted instruction to train students to engage in peer tutoring. Developers recommend that students participate in peer-tutoring sessions two to three times a week for approximately 30 minutes per session.

## Research[2]

The What Works Clearinghouse (WWC) identified one study of *Peer-Assisted Learning Strategies* that both falls within the scope of the Elementary School Mathematics topic area and meets WWC evidence standards. This study meets WWC evidence standards without reservations and included 328 elementary school students in the first grade in five schools in the southeastern United States.

The WWC considers the extent of evidence for *Peer-Assisted Learning Strategies* on the math performance of elementary school students to be small for the mathematics achievement domain, the only outcome domain examined for studies reviewed under the Elementary School Mathematics topic area.

## Effectiveness

*Peer-Assisted Learning Strategies* was found to have no discernible effects on mathematics achievement for elementary school students.

### Table 1. Summary of findings[3]

| Outcome domain | Rating of effectiveness | Improvement index (percentile points) Average | Improvement index (percentile points) Range | Number of studies | Number of students | Extent of evidence |
|---|---|---|---|---|---|---|
| **Mathematics achievement** | No discernible effects | +2 | –1 to +6 | 1 | 328 | Small |

# Program Information

## Background

Developed by Doug and Lynn Fuchs, *Peer-Assisted Learning Strategies* is distributed by the Vanderbilt Kennedy Center and the Department of Special Education, Peabody College, Vanderbilt University. Address: PALS Outreach, Vanderbilt University, Peabody Box 228, 110 Magnolia Circle, Nashville, TN 37203-5701. Email: PALS@vanderbilt.edu. Web: http://kc.vanderbilt.edu/pals. Telephone: (615) 343-4782.

## Program details

*Peer-Assisted Learning Strategies* uses two peer-tutoring procedures, referred to as coaching and practice. During coaching, students work on problems in the skill area (e.g., adding, subtracting with regrouping, number concepts, charts, and graphs) to which they have been assigned. One of the students serves as the coach (peer tutor) and one serves as the tutee. The tutoring sessions are organized around completion of student worksheets that contain a series of questions, differing by problem type (e.g., addition or subtraction). Coaches correct errors when the tutee gets an answer wrong. Coaching usually lasts 15–20 minutes. Materials are available for students in grades K–6.

During the practice portion of peer-tutoring, students work independently on a mixed-problem worksheet containing problems of the type just completed, then exchange papers and score each other's practice sheets. Practice lasts 5–10 minutes.

Teachers select student groups by identifying student's strengths and weaknesses and put students together who will best learn from each other. Groups are changed regularly, and as students work on a variety of skills over time, all students have the opportunity to serve as coaches (i.e., the students charged with asking questions and correcting errors).

## Cost

*Peer-Assisted Learning Strategies* materials range from $15 to $40. The Kindergarten Math Manual ($40) includes training scripts and other materials for 16 *Peer-Assisted Learning Strategies* lessons. The First Grade Math Manual ($40) includes training scripts and student game boards for 18 *Peer-Assisted Learning Strategies* lessons. The Grades 2–6 Math Manual ($40) includes training scripts and sample student materials. Student materials for grades 2–6 must be purchased separately ($30 for each grade). The cost of a one-day training workshop is estimated at $1,500 plus travel expenses for the presenter.

## Research Summary

The WWC identified 13 studies that investigated the effects of *Peer-Assisted Learning Strategies* on the math performance of elementary school students.

The WWC reviewed all of those studies against group design evidence standards. One study (Fuchs, Fuchs, Yazdian, & Powell, 2002) is a randomized controlled trial that meets WWC evidence standards without reservations. The study is summarized in this report. Four studies do not meet WWC evidence standards. The remaining eight studies do not meet WWC eligibility screens for review in this topic area. Citations for all 13 studies are in the References section, which begins on p. 5.

**Table 2. Scope of reviewed research[4]**

| | |
|---|---|
| **Grade** | 1 |
| **Delivery method** | Small group |
| **Program type** | Supplement |
| **Studies reviewed** | 13 studies |
| **Group design studies that meet WWC evidence standards** | |
| • **without reservations** | 1 study |
| • **with reservations** | 0 studies |

### Summary of study meeting WWC evidence standards without reservations

Fuchs et al. (2002) conducted a randomized controlled trial in which 20 first-grade classrooms in five schools from a metropolitan public school district in the southeastern United States were randomly assigned to either the *Peer-Assisted Learning Strategies* intervention condition or a comparison condition. The 10 teachers assigned to the intervention condition implemented *Peer-Assisted Learning Strategies* as a supplement to the district's core curriculum, *Math Advantage*. The program was implemented in 30-minute sessions, three times a week, for 16 weeks. The study authors wanted to ensure that students in the intervention and comparison groups received the same amount of mathematics instruction during the 16 weeks when *Peer-Assisted Learning Strategies* was used with the intervention group. Therefore, the study's implementation of *Peer-Assisted Learning Strategies* replaced some mathematics instruction activities that intervention teachers would otherwise have used. The 10 teachers in the comparison condition used *Math Advantage Grade 1* in their classrooms, which includes teacher-directed instruction and student work with manipulatives and worksheets. The final analysis sample included 328 first-grade students (162 *Peer-Assisted Learning Strategies* students and 166 comparison students).

### Summary of studies meeting WWC evidence standards with reservations

No studies of *Peer-Assisted Learning Strategies* meet WWC evidence standards with reservations.

## Effectiveness Summary

The WWC review of *Peer-Assisted Learning Strategies* for the Elementary School Mathematics topic includes student outcomes in one domain: mathematics achievement. The findings below present the authors' estimates and WWC-calculated estimates of the size and statistical significance of the effects of *Peer-Assisted Learning Strategies* on the math performance of elementary school students. For a more detailed description of the rating of effectiveness and extent of evidence criteria, see the WWC Rating Criteria on p. 13.

### Summary of effectiveness for the mathematics achievement domain

One study reported findings in the mathematics achievement domain.

Fuchs et al. (2002) reported statistically significant effects of *Peer-Assisted Learning Strategies* on mathematics achievement based on the items of the Stanford Achievement Test (SAT) aligned with *Peer-Assisted Learning Strategies* and no significant effects of the program on mathematics achievement based on the items of the SAT unaligned with *Peer-Assisted Learning Strategies*. After accounting for clustering and multiple comparisons, the WWC determined that none of the findings were statistically significant or large enough to be considered substantively important according to WWC criteria. The WWC characterizes these study findings as an indeterminate effect.

Thus, for the mathematics achievement domain, one study had an indeterminate effect. This results in a rating of no discernible effects, with a small extent of evidence.

### Table 3. Rating of effectiveness and extent of evidence for the mathematics achievement domain

| Rating of effectiveness | Criteria met |
|---|---|
| **No discernible effects**<br>*No affirmative evidence of effects.* | In the one study that reported findings, the estimated impact of the intervention on outcomes in the *mathematics achievement domain* was neither statistically significant nor large enough to be substantively important. |
| **Extent of evidence** | **Criteria met** |
| **Small** | One study that included 328 students in five schools reported evidence of effectiveness in the *mathematics achievement domain.* |

## References

### Study that meets WWC evidence standards without reservations

Fuchs, L. S., Fuchs, D., Yazdian, L., & Powell, S. R. (2002). Enhancing first-grade children's mathematical development with Peer-Assisted Learning Strategies. *School Psychology Review, 31*(4), 569–583.

### Studies that meets WWC evidence standards with reservations

None

### Studies that do not meet WWC evidence standards

Codding, R. S., Chan-Iannetta, L., George, S., Ferreira, K., & Volpe, R. (2011). Early number skills: Examining the effects of class-wide interventions on kindergarten performance. *School Psychology Quarterly, 26*(1), 85–96. The study does not meet WWC evidence standards because the measures of effectiveness cannot be attributed solely to the intervention—there was only one unit assigned to one or both conditions.

Fuchs, L. S., Fuchs, D., Hamlett, C. L., Phillips, N. B., Karns, K., & Dutka, S. (1997). Enhancing students' helping behavior during peer-mediated instruction with conceptual mathematical explanations. *The Elementary School Journal, 97*(3), 223–249. The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

Fuchs, L. S., Fuchs, D., & Karns, K. (2001). Enhancing kindergartners' mathematical development: Effects of peer-assisted learning strategies. *The Elementary School Journal, 101*(5), 495–510. The study does not meet WWC evidence standards because the measures of effectiveness cannot be attributed solely to the intervention—the intervention was combined with another intervention.

Fuchs, L. S., Fuchs, D., Phillips, N. B., Hamlett, C. L., & Karns, K. (1995). Acquisition and transfer effects of class-wide peer-assisted learning strategies in mathematics for students with varying learning histories. *School Psychology Review, 24*(4), 604–620. The study does not meet WWC evidence standards because it uses a quasi-experimental design in which the analytic intervention and comparison groups are not shown to be equivalent.

### Studies that are ineligible for review using the Elementary School Mathematics Evidence Review Protocol

Calhoon, M. B., & Fuchs, L. S. (2003). The effects of peer-assisted learning strategies and curriculum-based measurement on the mathematics performance of secondary students with disabilities. *Remedial and Special Education, 24*(4), 235–245. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample includes more than 60% learning disabled students.

Fuchs, L. S., Fuchs, D., Hamlett, C. L., Phillips, N. B., & Karns, K. (1995). General educators' specialized adaptation for students with learning disabilities. *Exceptional Children, 61*(5), 440–459. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample includes more than 60% learning disabled students.

Ginsburg-Block, M. D., Rohrbeck, C. A., & Fantuzzo, J. W. (2006). A meta-analytic review of social, self-concept, and behavioral outcomes of peer-assisted learning. *Journal of Educational Psychology, 98*(4), 732–749. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Harris, A. A. (2009). Comparing effects of two grouping conditions to teach algebraic problem-solving to students with mild disabilities in inclusive settings. *Dissertation Abstracts International, 70*(05A), 113-1618. (AAI3356479) The study is ineligible for review because it does not use a sample aligned with the protocol—the sample includes more than 60% learning disabled students.

Rutherford, L. E., Dupaul, G. J., & Jitendra, A. K. (2008). Examining the relationship between treatment outcomes for academic achievement and social skills in school-age children with attention-deficit hyperactivity disorder.

*Psychology in the Schools, 45*(2), 145–157. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample includes more than 60% learning disabled students.

Ryan, J. B., Pierce, C. D., & Mooney, P. (2008). Evidence-based teaching strategies for students with EBD. *Beyond Behavior, 17*(3), 22–29. The study is ineligible for review because it does not use a sample aligned with the protocol—the sample includes more than 60% learning disabled students.

Stecker, P. M., Fuchs, L. S., & Fuchs, D. (2005). Using curriculum-based measurement to improve student achievement: Review of research. *Psychology in the Schools, 42*(8), 795–819. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

Webb, N. M. (2009). The teacher's role in promoting collaborative dialogue in the classroom. *British Journal of Educational Psychology, 79*(1), 1–28. The study is ineligible for review because it is a secondary analysis of the effectiveness of an intervention, such as a meta-analysis or research literature review.

## Appendix A: Research details for Fuchs et al. (2002)

**Fuchs, L. S., Fuchs, D., Yazdian, L., & Powell, S. R. (2002). Enhancing first-grade children's mathematical development with Peer-Assisted Learning Strategies. *School Psychology Review, 31*(4), 569–583.**

### Table A. Summary of findings

**Meets WWC evidence standards without reservations**

| Outcome domain | Sample size | Study findings | |
|---|---|---|---|
| | | Average improvement index *(percentile points)* | Statistically significant |
| **Mathematics achievement** | 20 classes/328 students | +2 | No |

**Setting**

The study took place in five elementary schools in a metropolitan public school system in the southeastern United States.

**Study sample**

The study authors randomly assigned 20 female first-grade teachers to use either *Peer-Assisted Learning Strategies* or the standard math curriculum. Within each school, equal numbers of teachers were randomly assigned to each of the research conditions. The total sample included 10 teachers in each condition. The analysis sample size was 162 students in the intervention condition and 166 students in the comparison condition.

**Intervention group**

In this study, *Peer-Assisted Learning Strategies* supplemented the district's core curriculum, *Math Advantage*. The study authors wanted to ensure that students in the intervention and comparison groups received the same amount of mathematics instruction during the 16 weeks when *Peer-Assisted Learning Strategies* was used with the intervention group. Therefore, the study's implementation of *Peer-Assisted Learning Strategies* replaced some mathematics instruction activities that intervention teachers would otherwise have used. Specifically, *Peer-Assisted Learning Strategies* was implemented in intervention classrooms for 30-minute sessions, three times a week, for 16 weeks. The study authors asked teachers to classify their students' mathematics achievement at the beginning of the study. These classifications were used to pair low achieving students with high achieving students for the tutoring sessions. During the first part of each session, the stronger performing student was the coach (tutor); midway through each session, the stronger performing student switched to the tutee role. Every three weeks, teachers reassigned student pairs to increase exposure to different students and, after every third three-week cycle, teachers paired high achievers together.

**Comparison group**

Teachers assigned to the comparison condition used only *Math Advantage Grade 1* in their classrooms. The curriculum includes teacher-directed lessons, student work with manipulatives, and worksheets. According to the study authors, teachers in the comparison classrooms used the *Math Advantage* program for at least 90% of their mathematics instruction. Peer-tutoring activities (like those that are a central component of *Peer-Assisted Learning Strategies*) were rarely used in the comparison classrooms.

## Outcomes and measurement

Student mathematics achievement was assessed using the Primary 1 and 2 levels of the SAT. The test administered included 94 of the test's 106 total items. These 94 items were selected to reflect the *Peer-Assisted Learning Strategies* curriculum and the district's larger core curriculum. The study authors divided the items into those aligned with the *Peer-Assisted Learning Strategies* curriculum (72 items) and those unaligned with the *Peer-Assisted Learning Strategies* curriculum (22 items). Results were presented separately for the aligned and unaligned portions of the test. For a more detailed description of these outcome measures, see Appendix B.

## Support for implementation

Teachers attended a two-hour after-school workshop where they learned about *Peer-Assisted Learning Strategies* and practiced implementing the program. Teachers used *Peer-Assisted Learning Strategies* in their classrooms within one week after the workshop. Research assistants observed all intervention sessions and delivered *Peer-Assisted Learning Strategies* program materials for the upcoming weeks.

## Appendix B: Outcome measures for each domain

| Mathematics achievement | |
|---|---|
| *Stanford Achievement Test (SAT): Aligned Items* | The SAT (Gardner, Rudman, Karlsen, & Merwin, 1987) measures mathematical knowledge and skills for grades K–3. The Primary 1 level measures knowledge and skills for K.5–1.9, while the Primary 2 level measures knowledge and skills for 1.5–2.9. There are 106 items across Primary 1 and 2. The study authors asked four first-grade teachers to characterize each SAT item as aligned or unaligned with the *Peer-Assisted Learning Strategies* curriculum. They identified 72 items as aligned with the *Peer-Assisted Learning Strategies* curriculum. The reported test–retest reliability of the aligned items was 0.93 (as cited in Fuchs et al., 2002). |
| *SAT: Unaligned Items* | The study authors asked four first-grade teachers to characterize each SAT item as aligned or unaligned with the *Peer-Assisted Learning Strategies* curriculum. They identified 22 items of the SAT as unaligned with the *Peer-Assisted Learning Strategies* curriculum. The reported test–retest reliability of the unaligned items was 0.78 (as cited in Fuchs et al., 2002). |

## Appendix C: Findings included in the rating for the mathematics achievement domain

| Outcome measure | Study sample | Sample size | Mean (standard deviation) | | WWC calculations | | | *p*-value |
|---|---|---|---|---|---|---|---|---|
| | | | Intervention group | Comparison group | Mean difference | Effect size | Improvement index | |
| **Fuchs et al., 2002[a]** | | | | | | | | |
| *Stanford Achievement Test (SAT): Aligned Items* | Grade 1 | 20 classes/ 328 students | 47.56 (16.98) | 45.07 (18.43) | 2.49 | 0.14 | +6 | < 0.02 |
| *SAT: Unaligned Items* | Grade 1 | 20 classes/ 328 students | 16.55 (3.19) | 16.65 (3.65) | –0.10 | –0.03 | –1 | 0.76 |
| **Domain average for mathematics achievement (Fuchs et al., 2002)** | | | | | | **0.06** | **+2** | **Not statistically significant** |
| **Domain average for mathematics achievement across all studies** | | | | | | **0.06** | **+2** | **na** |

**Table Notes:** For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the average change expected for all students who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average student's percentile rank that can be expected if the student is given the intervention. The WWC-computed average effect size is a simple average rounded to two decimal places; the average improvement index is calculated from the average effect size. The statistical significance of the study's domain average was determined by the WWC. na = not applicable.

[a] The *p*-values presented here were reported in the original study. For Fuchs et al. (2002), a correction for clustering was needed and resulted in significance levels that differ from those in the original study. The WWC finds that the results for the *SAT: Aligned Items* outcome are not statistically significant after corrections. The intervention group means were adjusted for baseline differences using a difference-in-differences adjustment.

## Appendix D: Description of supplemental findings for the mathematics achievement domain

| Outcome measure | Study sample | Sample size | Mean (standard deviation) | | WWC calculations | | | *p*-value |
|---|---|---|---|---|---|---|---|---|
| | | | Intervention group | Comparison group | Mean difference | Effect size | Improvement index | |
| **Fuchs et al., 2002[a]** | | | | | | | | |
| *Stanford Achievement Test (SAT): Aligned Items* | High-achieving | 20 classes/ 93 students | 55.38 (13.48) | 52.19 (15.22) | 3.19 | 0.22 | +9 | nr |
| *SAT: Unaligned Items* | High-achieving | 20 classes/ 93 students | 18.69 (1.70) | 18.78 (2.03) | –0.09 | –0.05 | –2 | nr |
| *SAT: Aligned Items* | Average-achieving | 20 classes/ 152 students | 48.78 (14.84) | 46.14 (17.14) | 2.64 | 0.16 | +7 | nr |
| *SAT: Unaligned Items* | Average-achieving | 20 classes/ 152 students | 17.24 (2.74) | 17.43 (2.78) | –0.19 | –0.07 | –3 | nr |
| *SAT: Aligned Items* | Low-achieving | 20 classes/ 83 students | 38.89 (17.81) | 35.51 (17.16) | 3.38 | 0.19 | +8 | nr |
| *SAT: Unaligned Items* | Low-achieving | 20 classes/ 83 students | 13.03 (3.50) | 12.98 (3.75) | 0.05 | 0.01 | +1 | nr |

**Table Notes:** The supplemental findings presented in this table are additional findings from the study in this report that do not factor into the determination of the intervention rating. For mean difference, effect size, and improvement index values reported in the table, a positive number favors the intervention group and a negative number favors the comparison group. The effect size is a standardized measure of the effect of an intervention on student outcomes, representing the average change expected for all students who are given the intervention (measured in standard deviations of the outcome measure). The improvement index is an alternate presentation of the effect size, reflecting the change in an average student's percentile rank that can be expected if the student is given the intervention. nr = not reported.

[a] For Fuchs et al. (2002), corrections for clustering and multiple comparisons were needed. The intervention group means were adjusted for baseline differences using a difference-in-differences adjustment. The *p*-values are not provided for the specific contrasts of interest to the WWC.

## Endnotes

[1] The descriptive information for this program was obtained from a publicly-available source: the program's website (http://kc.vanderbilt.edu/pals, downloaded August 2011). The WWC requests distributors review the program description sections for accuracy from their perspective. The program description was provided to the distributor in August 2011; however, the WWC received no response. Further verification of the accuracy of the descriptive information for this program is beyond the scope of this review. The literature search reflects documents publicly available by December 2011.

[2] The studies in this report were reviewed using the Evidence Standards from the WWC Procedures and Standards Handbook (version 2.1), along with those described in the Elementary School Mathematics review protocol (version 2.0). The evidence presented in this report is based on available research. Findings and conclusions may change as new research becomes available.

[3] For criteria used in the determination of the rating of effectiveness and extent of evidence, see the WWC Rating Criteria on p. 13. These improvement index numbers show the average and range of student-level improvement indices for all findings across the studies.

[4] Grade, delivery method, and program type refer to the studies that meet WWC evidence standards without or with reservations.

## Recommended Citation

U.S. Department of Education, Institute of Education Sciences, What Works Clearinghouse. (2013, January). *Elementary School Mathematics intervention report: Peer-Assisted Learning Strategies*. Retrieved from http://www.whatworks.ed.gov.

# WWC Rating Criteria

## Criteria used to determine the rating of a study

| Study rating | Criteria |
|---|---|
| **Meets WWC evidence standards without reservations** | A study that provides strong evidence for an intervention's effectiveness, such as a well-implemented RCT. |
| **Meets WWC evidence standards with reservations** | A study that provides weaker evidence for an intervention's effectiveness, such as a QED or an RCT with high attrition that has established equivalence of the analytic samples. |

## Criteria used to determine the rating of effectiveness for an intervention

| Rating of effectiveness | Criteria |
|---|---|
| **Positive effects** | Two or more studies show statistically significant positive effects, at least one of which met WWC evidence standards for a strong design, AND<br>No studies show statistically significant or substantively important negative effects. |
| **Potentially positive effects** | At least one study shows a statistically significant or substantively important positive effect, AND<br>No studies show a statistically significant or substantively important negative effect AND fewer or the same number of studies show indeterminate effects than show statistically significant or substantively important positive effects. |
| **Mixed effects** | At least one study shows a statistically significant or substantively important positive effect AND at least one study shows 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, OR<br>At least one study shows a statistically significant or substantively important effect AND more studies show an indeterminate effect than show a statistically significant or substantively important effect. |
| **Potentially negative effects** | One study shows a statistically significant or substantively important negative effect and no studies show a statistically significant or substantively important positive effect, OR<br>Two or more studies show statistically significant or substantively important negative effects, at least one study shows a statistically significant or substantively important positive effect, and more studies show statistically significant or substantively important negative effects than show statistically significant or substantively important positive effects. |
| **Negative effects** | Two or more studies show statistically significant negative effects, at least one of which met WWC evidence standards for a strong design, AND<br>No studies show statistically significant or substantively important positive effects. |
| **No discernible effects** | None of the studies shows a statistically significant or substantively important effect, either positive or negative. |

## Criteria used to determine the extent of evidence for an intervention

| Extent of evidence | Criteria |
|---|---|
| **Medium to large** | The domain includes more than one study, AND<br>The domain includes more than one school, AND<br>The domain findings are based on a total sample size of at least 350 students, OR, assuming 25 students in a class, a total of at least 14 classrooms across studies. |
| **Small** | The domain includes only one study, OR<br>The domain includes only one school, OR<br>The domain findings are based on a total sample size of fewer than 350 students, AND, assuming 25 students in a class, a total of fewer than 14 classrooms across studies. |

## Glossary of Terms

**Attrition** Attrition occurs when an outcome variable is not available for all participants initially assigned to the intervention and comparison groups. The WWC considers the total attrition rate and the difference in attrition rates across groups within a study.

**Clustering adjustment** If intervention assignment is made at a cluster level and the analysis is conducted at the student level, the WWC will adjust the statistical significance to account for this mismatch, if necessary.

**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 design of a study is the method by which intervention and comparison groups were assigned.

**Domain** A domain is a group of closely related outcomes.

**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 supports the findings. The criteria for the extent of evidence levels are given in the WWC Rating Criteria on p. 13.

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

**Multiple comparison adjustment** When a study includes multiple outcomes or comparison groups, the WWC will adjust the statistical significance to account for the multiple comparisons, if necessary.

**Quasi-experimental design (QED)** A quasi-experimental design (QED) is a research design in which subjects 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 investigators randomly assign eligible participants into intervention and comparison groups.

**Rating of effectiveness** The WWC rates the effects of an intervention in each domain based on the quality of the research design and the magnitude, statistical significance, and consistency in findings. The criteria for the ratings of effectiveness are given in the WWC Rating Criteria on p. 13`.

**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% ($p < 0.05$).

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

Please see the WWC Procedures and Standards Handbook (version 2.1) for additional details.