Additional program information

Developer and contact

Developed by Michigan State University, *CMP* is distributed by Pearson Prentice Hall. Address: 145 Mt. Zion Road, P.O. Box 2500, Lebanon, IN 46052. Email: k12cs@custhelp.com. Web: http://connectedmath.msu.edu/. Telephone: (800) 848-9500.

Scope of use

Pilot editions of *CMP* were used from 1991 to 1997 and from 2000 to 2006 by approximately 390 teachers and 45,000 students across the United States. As of September 2004, the program had been implemented in 2,462 school districts, covering all 50 states.

Teaching

The *CMP* curriculum is divided into a sequenced set of units, each organized around different mathematical topics. The four to seven lessons in a unit each contain one to five problems that the teacher and students explore in class. Additional problem sets for each lesson, called Applications, Connections, and Extensions, help students practice, apply, connect, and extend their understanding and skills. Each lesson culminates in a Mathematical Reflections activity. Materials include student units, Teacher Guides, Additional Practice and Skills Workbooks, Assessment Resources, and CD-ROMs for lesson planning, assessment, and student activities.

Cost

For the most recent edition of *CMP*, each student unit costs $8.85, each teacher unit costs $19.97, and the Computer Test Bank for Assessment and Practice CD-ROM costs $129.97. See the publisher website for costs of other resources.

Research

Seventy-nine studies reviewed by the WWC investigated the effects of *CMP*. One study (Schneider, 2000) is a quasi-experimental design that meets WWC evidence standards with reservations. The remaining 78 studies do not meet either WWC evidence standards or eligibility screens.

Meets evidence standards with reservations

Schneider (2000) conducted a quasi-experiment to assess the impact of *CMP* on middle school math achievement in Texas. Twenty-three *CMP* schools were matched with 25 comparison schools that did not implement *CMP*. The analysis sample included three cohorts, but the WWC reports the results for only cohorts 1 and 2 because the study did not establish baseline equivalence for cohort 3. The *CMP* intervention began when students were in the sixth grade. Cohort 1 consisted of more than 3,000 *CMP* students and 2,600 comparison students; cohort 2 consisted of more than 3,400 *CMP* students and 2,900 comparison students.

Extent of evidence

The WWC categorizes the extent of evidence in each domain as small or medium to large (see the WWC Procedures and Standards Handbook, Appendix G). The extent of evidence takes into account the number of studies and the total sample size across the studies that meet WWC evidence standards with or without reservations.[6]

The WWC considers the extent of evidence for *CMP* to be small for math achievement.

6. 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 *CMP* is in Appendix A6.

Effectiveness

Findings

The WWC review of interventions for middle school math addresses student outcomes in the math achievement domain. The findings below present the authors' estimates and WWC-calculated estimates of the size and the statistical significance of the effects of *CMP* on students.[7]

Math achievement

Schneider (2000) reported negative but not statistically significant effects of *CMP* on pass rates for the math portion of the Texas Assessment of Academic Skills (TAAS) for cohorts 1 and 2 separately.[8] After adjusting for differences between the *CMP* and comparison groups at baseline, the WWC determined that these separate effects for cohorts 1 and 2 were neither statistically significant nor substantively important according to WWC criteria (an effect size greater than 0.25 in absolute value). The WWC also calculated the sample-weighted average effect for cohorts 1 and 2.[9] This average effect was neither statistically significant nor substantively important according to WWC criteria.

Rating of effectiveness

The WWC rates the effects of an intervention in a given outcome domain as positive, potentially positive, mixed, no discernible effects, potentially negative, or negative. The rating of effectiveness takes into account four factors: the quality of the research design, the statistical significance of the findings, the size of the difference between participants in the intervention and the comparison conditions, and the consistency in findings across studies (see the WWC Procedures and Standards Handbook, Appendix E).

The WWC found *CMP* to have no discernible effects for math 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 WWC Procedures and Standards Handbook, Appendix F). The improvement index represents the difference between the percentile rank of the average student in the intervention condition and the percentile rank of the average student in the comparison condition. Unlike the rating of effectiveness, the improvement index is entirely based on the size of the effect, regardless of the statistical significance of the effect, the study design, or the analysis. The improvement index can take on values between –50 and +50, with positive numbers denoting favorable results for the intervention group.

The average improvement index for math achievement is 0 percentile points in the study.

Summary

The WWC reviewed 79 studies of *CMP*. One study meets WWC evidence standards with reservations; the remaining 78 studies do not meet either WWC evidence standards or eligibility screens. Based on the one study, the WWC found no discernible effects on math achievement. The conclusions presented in this report may change as new research emerges.

7. The level of statistical significance was reported by the study authors or, when necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation, see the WWC Tutorial on Mismatch. For the formulas the WWC used to calculate the statistical significance, see WWC Procedures and Standards Handbook, Appendix C for clustering and WWC Procedures and Standards Handbook, Appendix D for multiple comparisons. In the case of Schneider (2000), no corrections for clustering or multiple comparisons were needed.
8. Schneider (2000) also included a student-level analysis of Texas Learning Index (TLI) scores, a TAAS statistic designed for comparisons between TAAS administrations and between grades. Because the student-level intervention and comparison groups were not shown to be equivalent at baseline, this analysis was not included in this WWC review.
9. The sample-weighted average of the cohort 1 and 2 effects calculated by the WWC was used in the intervention rating and is reported in Appendix A3. Separate findings for cohorts 1 and 2 are reported in Appendix A4.

References

Meets WWC evidence standards with reservations

Schneider, C. L. (2000). *Connected Mathematics* and the Texas Assessment of Academic Skills (Doctoral dissertation, University of Texas at Austin, 2000). *Dissertation Abstracts International, 62*(02), 503A. (UMI No. 3004373)

Studies that fall outside the Middle School Math review protocol or do not meet WWC evidence standards

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Adams, R. L. (2005). *Standards-based accountability: Improving achievement for all students through standards-based mathematics instruction* (Doctoral dissertation, University of Southern California, 2005). *Dissertation Abstracts International, 66*(06). (UMI No. 3180485) The study is ineligible for review because it does not include an outcome within a domain specified in the protocol.

American Association for the Advancement of Science. (1999). *Middle grades mathematics textbooks: A benchmarks-based evaluation.* Washington, DC: Author. The study is ineligible for review because it does not examine an intervention implemented in a way that falls within the scope of the review.

Anderson, N. C. (2008). Walk the line: Making sense of y = mx +b. In C. E. Greenes, & R. Rubenstein (Eds.), 2008 yearbook of the National Council of Teachers of Mathematics, *Algebra and algebraic thinking in school mathematics* (pp. 233–246). Reston, VA: National Council of Teachers of Mathematics. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Asquith, P., Stephens, A., Knuth, E., & Alibali, M. (2007). Middle school mathematics teachers' knowledge of students' understanding of core algebraic concepts: Equal sign and variable. *Mathematical Thinking and Learning, 9*(3), 249–272. The study is ineligible for review because it does not include an outcome within a domain specified in the protocol.

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Additional source:

Ben-Chaim, D., Fey, J. T., Fitzgerald, W. M., Benedetto, C., & Miller, J. (1997b). *A study of proportional reasoning among seventh and eighth grade students.* Paper presented at the Annual Meeting of the American Educational Research Association, Chicago, IL.

Ben-Chaim, D., Fey, J. T., Fitzgerald, W. M., Benedetto, C., & Miller, J. (1998). Proportional reasoning among seventh grade students with different curricular experiences. *Educational Studies in Mathematics, 36*(3), 247–273. The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

Bennett, C. L. (2007). *A curriculum project of vocabulary development in the* Connected Math *program Moving Straight Ahead.* Unpublished master's thesis. State University of New York College at Brockport. The study is ineligible for review because it does not include an outcome within a domain specified in the protocol.

Bledsoe, A. M. (2002). Implementing the *Connected Mathematics Project*: The interaction between student rational number understanding and classroom mathematical practices (Doctoral dissertation, University of Missouri–Columbia, 2002). *Dissertation Abstracts International, 63*(12). The study is ineligible for review because it does not examine an intervention implemented in a way that falls within the scope of the review.

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Folsom, M. L. (2002). Empowering girls in math: The influence of curriculum on female beliefs about mathematics (Master's thesis, Pacific Lutheran University, 2002). *Masters Abstracts International, 41*(2). The study is ineligible for review because it does not examine an intervention implemented in a way that falls within the scope of the review.

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Additional source:

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Winking, D. (2000b). *Minneapolis data: Excerpts from the year one evaluation report*. *Connected Mathematics Project*, East Lansing, MI. The study does not meet WWC evidence standards because the intervention and comparison groups are not shown to be equivalent at baseline.

Woodward, J., & Brown, C. (2006). Meeting the curricular needs of academically low-achieving students in middle grade mathematics. *The Journal of Special Education, 40*(3), 151. 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.

Zawojewski, J. S., Robinson, M., & Hoover, M. (1999). Reflections on developing formal mathematics and the *Connected Mathematics Project*. *Mathematics Teaching in the Middle School, 4*(5), 324–330. The study is ineligible for review because it does not examine the effectiveness of an intervention.

Zvoch, K., & Stevens, J. (2006). Longitudinal effects of school context and practice on middle school mathematics achievement. *The Journal of Educational Research, 99*(6), 347–357. 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.

Appendix

Appendix A1 Study characteristics: Schneider, 2000 (quasi-experimental design)

Characteristic	Description
Study citation	Schneider, C. L. (2000). *Connected Mathematics* and the Texas Assessment of Academic Skills (Doctoral dissertation, University of Texas at Austin, 2000). *Dissertation Abstracts International, 61*(12), 4709A. (UMI No. 9997642)
Participants	The study included three cohorts from 23 *CMP* schools and 25 matched comparison schools overall. However, because baseline equivalence was established only for cohorts 1 and 2 through 1998, the WWC excluded cohort 3 from this review.[1] Cohort 1 included more than 3,000 *CMP* students and 2,600 comparison students. Cohort 2 included more than 3,400 *CMP* students and 2,900 comparison students.
Setting	The participating schools were located in rural, suburban, and urban, as well as both low and high socioeconomic, areas of Texas. The schools varied in the English language learner status of the student populations that they served. Many of the schools had predominantly minority student populations.
Intervention	Schools in the treatment group used *CMP*, starting with grade 6 in 1996–97, adding grade 7 in 1997–98, and adding grade 8 in 1998–99. Cohorts in the school-level analysis represented all students in grades using *CMP*, regardless of whether the students were enrolled every year of implementation. By 1998, students in cohort 1 had received the intervention for up to two years (grades 6 and 7), and students in cohort 2 had received the intervention for one year (grade 6). There was substantial variation in the extent to which the curriculum was used at each grade level and each year across these schools.
Comparison	Schools in the comparison group did not use *CMP*. The author did not report the mathematics curricula used by comparison schools. The 25 comparison schools were matched to treatment schools using a regression analysis of variables that predicted 1996 Texas Assessment of Academic Skills (TAAS) passing rates.
Primary outcomes and measurement	The primary outcome measure included in this review was the school-level passing rate on the mathematics portion of the TAAS. For a more detailed description of this outcome measure, see Appendix A2.
Staff/teacher training	In the summer prior to implementation, teachers in the *CMP* schools participated in a six-day summer professional development provided by the Texas Statewide System Initiative. The training discussed units and emphasized mathematical understanding and pedagogy. Many teachers also participated in a two-day follow-up professional development in the summer after implementation.

1. The author conducted both student-level and school-level analyses. However, baseline equivalence was established only for the school-level analysis. In addition, the sample of students for whom achievement scores were reported changed over time—special education students were included in 1999 achievement data but were excluded in prior years. Because baseline equivalence was established only for regular education students, the WWC excluded the 1999 data from this review. This exclusion of the 1999 data also resulted in the exclusion of cohort 3 because 1999 is the only year for which posttest data were reported for cohort 3.

Appendix A2 Outcome measure for the math achievement domain

Outcome measure	Description
Texas Assessment of Academic Skills (TAAS) pass rate	The TAAS is a criterion-referenced test that measures problem-solving and critical-thinking skills. The measure used is the percentage of students that passed the math portion of the TAAS (as cited in Schneider, 2000).

Appendix A3 Summary of study findings included in the rating for the math achievement domain[1]

			Author's findings from the study					
			Mean outcome (standard deviation)[2]		WWC calculations			
Outcome measure	Study sample	Sample size (schools/ students)	*CMP* group	Comparison group	Mean difference[3] (*CMP* – comparison)	Effect size[4]	Statistical significance[5] (at $\alpha = 0.05$)	Improvement index[6]
Schneider, 2000 (quasi-experimental design)[7]								
TAAS pass rate	Grades 6 & 7 (Cohorts 1 & 2)[7]	96/>12,162	82%[8] of students (na)	82%[9] of students (na)	0.00	0.00	ns	0
Average for math achievement (Schneider, 2000)[9]						**0.00[10]**	**ns**	**0**
Domain average for math achievement across all studies[9]						**0.00**	**na**	**0**

ns = not statistically significant
na = not applicable
TAAS = Texas Assessment of Academic Skills

1. This appendix reports findings considered for the effectiveness rating and the average improvement indices for the math achievement domain. Separate cohort findings from Schneider (2000) are not included in these ratings, but are reported in Appendix A4.
2. The standard deviation across all students in each group shows how dispersed the participants' outcomes are: a smaller standard deviation on a given measure would indicate that participants had more similar outcomes.
3. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
4. For an explanation of the effect size calculation, see WWC Procedures and Standards Handbook, Appendix B.
5. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
6. The improvement index represents the difference between the percentile rank of the average student in the intervention condition and that of the average student in the comparison condition. The improvement index can take on values between –50 and +50, with positive numbers denoting results favorable to the intervention group.
7. The WWC calculated a sample-weighted average of the cohort 1 and 2 effects to use in the intervention rating. Cohort 1, the 7th grade cohort, had the intervention for two years and cohort 2, the 6th grade cohort, had the intervention for one year. Separate findings for cohorts 1 and 2 are reported in Appendix A4.
8. The intervention group value from Schneider (2000) is the unadjusted comparison group mean plus the difference in mean gains between the intervention (*CMP*) and comparison groups.
9. The comparison group mean from Schneider (2000) is unadjusted.
10. The WWC used school-level pass rates to calculate the effect size because student-level pass rates were not available. In general, the school-level figures should serve as a reasonable approximation of the individual figures if there are not large differences in pass rates between schools of substantially different enrollments. Based on prior pass rates (1996) provided by the author in the appendix, the WWC concluded that the pass rates computed using school-level data and student-level data were not substantially different. As a result, based on the available school-level pass rates, the WWC estimated that the mean difference of 0 percentage points resulted in an effect size of 0.

Appendix A4 Summary of cohort findings for the math achievement domain[1]

Outcome measure	Study sample	Sample size (schools/ students)	Author's findings from the study: Mean outcome (standard deviation)[2] *CMP* group[3]	Author's findings from the study: Mean outcome (standard deviation)[2] Comparison group[4]	WWC calculations: Mean difference[5] (*CMP* – comparison)	WWC calculations: Effect size[6]	WWC calculations: Statistical significance[7] (at $\alpha = 0.05$)	WWC calculations: Improvement index[8]
Schneider, 2000 (quasi-experimental design)[9]								
TAAS pass rate	Grade 7 (Cohort 1)	48/>5,701	0.80 (na)	0.80 (na)	0.00 (na)	0.00	ns	0
TAAS pass rate	Grade 6 (Cohort 2)	48/>6,461	0.84 (na)	0.83 (na)	0.01 (na)	0.06	ns	+2

ns = not statistically significant

na = not applicable

TAAS = Texas Assessment of Academic Skills

1. This appendix presents separate cohort findings for measures that fall in math achievement. A sample-weighted average of the cohort effects was used for rating purposes and is presented in Appendix A3.
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. The intervention group value from Schneider (2000) is the unadjusted comparison group mean plus the difference in mean gains between the intervention (*CMP*) and comparison groups.
4. The comparison group mean from Schneider (2000) is unadjusted.
5. Positive differences and effect sizes favor the intervention group; negative differences and effect sizes favor the comparison group.
6. For an explanation of the effect size calculation, see WWC Procedures and Standards Handbook, Appendix B.
7. Statistical significance is the probability that the difference between groups is a result of chance rather than a real difference between the groups.
8. 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.
9. The level of statistical significance was reported by the study authors or, when necessary, calculated by the WWC to correct for clustering within classrooms or schools and for multiple comparisons. For an explanation about the clustering correction, see the WWC Tutorial on Mismatch. For the formulas the WWC used to calculate statistical significance, see WWC Procedures and Standards Handbook, Appendix C for clustering and WWC Procedures and Standards Handbook, Appendix D for multiple comparisons. In the case of Schneider (2000), no corrections for clustering or multiple comparisons were needed.

Appendix A5 *CMP* rating for the math 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.[1]

For the outcome domain of math achievement, the WWC rated *CMP* as having no discernible effects.

Rating received

No discernible effects: No affirmative evidence of effects.

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

  Met. None of the studies showed statistically significant or substantively important positive or negative effects.

Other ratings considered

Positive effects: Strong evidence of a positive effect with no overriding contrary evidence.

- Criterion 1: Two or more studies showing statistically significant *positive* effects, at least one of which met WWC evidence standards for a *strong* design.

  Not met. No studies showed statistically significant positive effects.

AND

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

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

Potentially positive effects: Evidence of a positive effect with no overriding contrary evidence.

- Criterion 1: At least one study showing a statistically significant or substantively important *positive* effect.

  Not met. No studies showed statistically significant or substantively important positive effects.

AND

- Criterion 2: No studies showing a statistically significant or substantively important *negative* effect and fewer or the same number of studies showing *indeterminate* effects than showing statistically significant or substantively important *positive* effects.

  Not met. The one study that evaluated math achievement and met WWC standards showed indeterminate effects.

Mixed effects: Evidence of inconsistent effects as demonstrated through either of the following criteria.

- Criterion 1: At least one study showing a statistically significant or substantively important *positive* effect, and at least one study showing a statistically significant or substantively important *negative* effect, but no more such studies than the number showing a statistically significant or substantively important *positive* effect.

  Not met. No studies showed statistically significant or substantively important effects, either positive or negative.

OR

- Criterion 2: At least one study showing a statistically significant or substantively important effect, and more studies showing an *indeterminate* effect than showing a statistically significant or substantively important effect.

  Not met. No studies showed statistically significant or substantively important effects, either positive or negative.

1. For rating purposes, the WWC considers the statistical significance of individual outcomes and the domain-level effect. The WWC also considers the size of the domain-level effect for ratings of potentially positive or potentially negative effects. For a complete description, see the WWC Procedures and Standards Handbook, Appendix E.

Potentially negative effects: Evidence of a negative effect with no overriding contrary evidence.

- Criterion 1: At least one study showing a statistically significant or substantively important *negative* effect.

  Not met. No studies showed statistically significant or substantively important negative effects.

AND

- Criterion 2: No studies showing a statistically significant or substantively important *positive* effect, or more studies showing statistically significant or substantively important *negative* effects than showing statistically significant or substantively important *positive* effects.

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

Negative effects: Strong evidence of a negative effect with no overriding contrary evidence.

- Criterion 1: Two or more studies showing statistically significant *negative* effects, at least one of which met WWC evidence standards for a *strong* design.

  Not met. No studies showed statistically significant negative effects.

AND

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

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

Appendix A6 Extent of evidence by domain

		Sample size		
Outcome domain	Number of studies	Schools	Students	Extent of evidence[1]
Math achievement	1	96	>12,162[2]	Small

1. A rating of "medium to large" requires at least two studies and two schools across studies in one domain and a total sample size across studies of at least 350 students or 14 classrooms. Otherwise, the rating is "small." For more details on the extent of evidence categorization, see the WWC Procedures and Standards Handbook, Appendix G.
2. Schneider (2000) reported the number of students only for the student-level analysis. The student-level analysis included only students who were at the same school every year of implementation, whereas the school-level analysis reviewed in this report includes all students in the schools, regardless of whether they were enrolled every year. The WWC used the number of students in the student-level analysis as the minimum for the number of students in the school-level analysis: 5,701 students in cohort 1 and 6,461 students in cohort 2.