



***Ready* and *i-Ready* Blended Core Mathematics Efficacy:**

ESSA Evidence of the Impact of the Curriculum Associates Blended Core Mathematics Program on Student Achievement

Overview

Curriculum Associates conducted a research study to examine the impact of the *Ready* and *i-Ready* Blended Core Mathematics Program, which consists of *i-Ready Mathematics*, a digital assessment and instructional system, and *Ready Mathematics*, a print-based program that can serve as a core curriculum that covers the full academic year. This research focused on the relationship between the Blended Core Mathematics Program and student outcomes using a methodology designed to meet the criteria for Every Student Succeeds Act (ESSA) Level 3 by controlling for selection bias. Our research team analyzed *i-Ready Diagnostic* data from nearly 30,000 students from the 2016–2017 school year in grades K–8 using an ANCOVA to control for prior achievement. Results were statistically significant across all grades ($p < .0001$). Students in the Blended Core Mathematics Program experienced greater spring *i-Ready Diagnostic* scores than students who do not use the program, when controlling for selection bias using prior achievement data. These results serve as evidence that the Blended Core Mathematics Program meets the criteria for ESSA Level 3, Promising Evidence.

***Ready* and *i-Ready* Blended Core Mathematics**

The Blended Core Mathematics Program provides educators with print and online resources that create a truly blended classroom. Designed to work together as a complete core mathematics program, *Ready* and *i-Ready* combine effective standards-based classroom instruction with easy-to-use assessment data, online resources, and digital instruction.

Research to Meet ESSA’s Evidence Requirements

ESSA defines four categories of research evidence for an effective intervention. Under ESSA, for an intervention or program to be in the third category, known as “Promising Evidence,” it must have at least one correlational study with statistically significant results that controls for selection bias. What Works Clearinghouse (WWC) considers results to be statistically significant if the p -value is less than 0.05.

To meet the ESSA criteria for Level 3: Promising Evidence, Curriculum Associates conducted a research study to examine the impact of the Blended Core Mathematics Program on student outcomes as measured by the *i-Ready Diagnostic*. There is already extensive evidence of the strong relationship between *i-Ready* and state summative assessments. For example, correlational studies between the *i-Ready Diagnostic* and state summative scale scores for PARCC, Smarter Balanced, the New York State Assessment, Florida Standards Assessments, and seven other large state testing programs have yielded correlations at or exceeding 0.70, the benchmark set by the Center on Response to Intervention for screening tools.

This study examined the effectiveness of the Blended Core Mathematics Program while controlling for selection bias using an ANCOVA. Researchers compared the *i-Ready Diagnostic* spring scores of students in districts with the Blended Core Mathematics Program to students in districts that did not use the program, controlling for their *i-Ready Diagnostic* fall scores.

Defining the Sample

The Blended Core Mathematics Program as the Treatment

To qualify as a district using the Blended Core Mathematics Program, a district must have been using *Ready Mathematics* books as their core mathematics textbook for instruction during the 2016–2017 school year. A district must also have used the *i-Ready Diagnostic* to identify their students' specific needs for additional instruction and *i-Ready Instruction* to complement the print materials with students when necessary. Students included in the final analysis of this study must have used the *i-Ready Diagnostic* and *i-Ready Instruction* with fidelity. These students had a valid *i-Ready Diagnostic* score at both the beginning and the end of the academic year (between 25 and 35 weeks apart), received *i-Ready Instruction* for at least 18 unique weeks of the academic year, and received an average of 45 minutes of *i-Ready Instruction* per unique week of instruction.

i-Ready Diagnostic–Only Districts as the Control Group

To qualify for the control group in this study, a district must not have been using *Ready Mathematics* or *i-Ready Instruction* as a mathematics curriculum. At the same time, control group districts must have been using the *i-Ready Diagnostic* for mathematics to identify students' specific needs. Students included in the final analysis must have used *i-Ready Diagnostic* with fidelity, meaning these students had a valid *i-Ready Diagnostic* score at both the beginning and the end of the academic year (between 25 and 35 weeks apart).

For additional details regarding the selection criteria for the Blended Core Mathematics Program (treatment) and *i-Ready Diagnostic*–Only (control) groups, please see Appendix A.

Sample Sizes

Based on the above characteristics, the following tables show the sample sizes of students included in the ANCOVA analysis.

Grade	K	1	2	3	4	5	6	7	8
Treatment Group	736	1,022	1,699	1,700	1,645	1,130	620	540	369
Control Group	2,158	2,241	2,285	3,237	3,322	2,953	1,117	1,513	1,272

Results

This analysis is based on data from nearly 30,000 students and yielded results that were statistically significant across all grades, K–8, at the $p < .0001$ level, far exceeding What Works Clearinghouse's requirement of $p < .05$.

Based on these findings, students in districts using the Blended Core Mathematics Program can be expected to grow more in one academic year than students with the same starting fall *i-Ready Diagnostic* scores who are not in districts with the program.

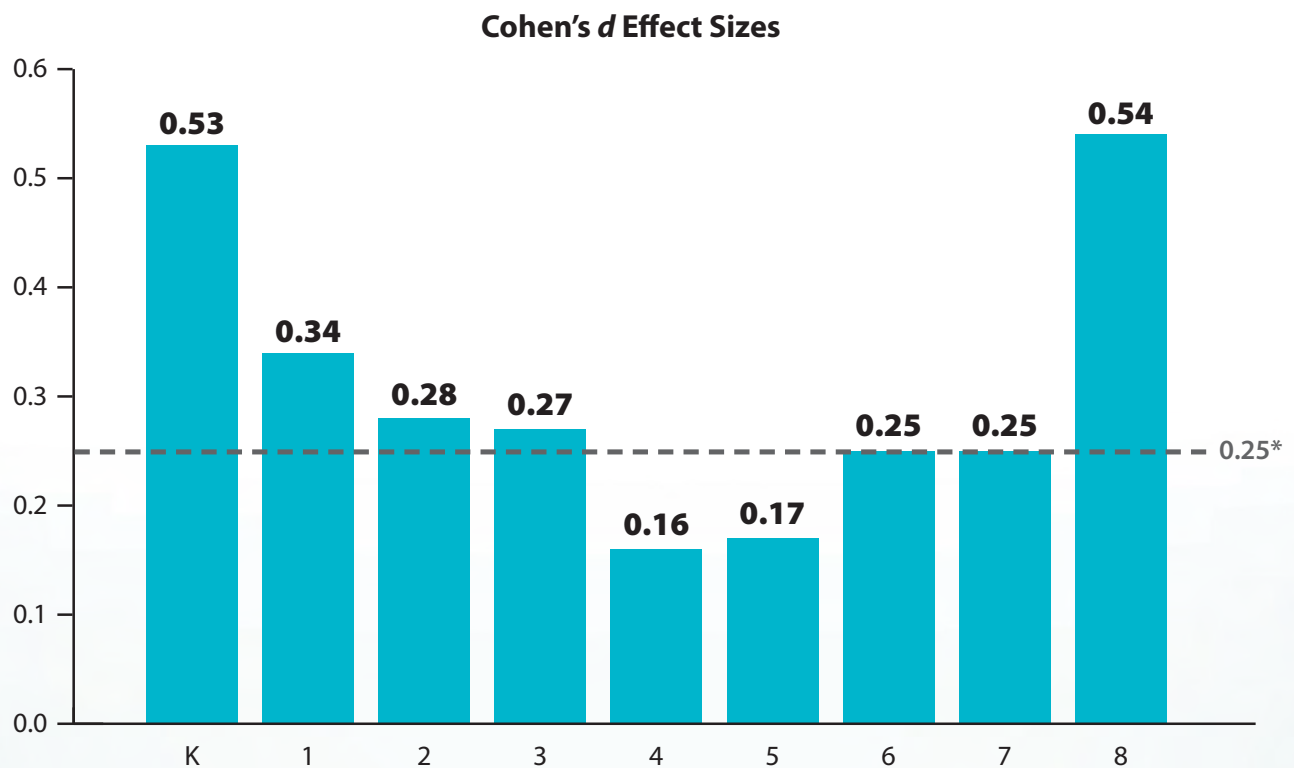


These results support that the Blended Core Mathematics Program meets the criteria for ESSA Level 3: Promising Evidence.

Grade	K	1	2	3	4	5	6	7	8
F Statistic	$F(1,2,891)$ =152.76	$F(1,3,260)$ =81.85	$F(1,3,981)$ =75.86	$F(1,4,934)$ =79.28	$F(1,4,964)$ =28.17	$F(1,4,080)$ =23.11	$F(1,1,734)$ =23.44	$F(1,2,050)$ =23.43	$F(1,1,638)$ =82.29
p-value	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$	$p < .0001$

To understand the magnitude of the significant findings, Cohen’s *d* effect sizes using the conditional means and the ANCOVA Mean Square Error of the groups were calculated for each grade.

Students in the Blended Core Mathematics Program during the 2016–2017 school year had greater *i-Ready Diagnostic* spring scores than students who were not using this program. The effect sizes for these differences when controlling for prior achievement ranged from $d = 0.16$ to 0.54 , meeting or exceeding the standard for “large” for grades K–3 and 6–8 (Cohen’s *d* greater than 0.25).



Effect Sizes in Education Research

Effect sizes are a common way of measuring the strength of an educational program. While there are many ways to quantify effect sizes, Cohen’s *d* is a widely used method for quantifying the differences in the means or averages between two groups, measured in standard deviations. Larger effect sizes indicate a greater effect. The average effect sizes in research fields such as education, medicine, and economics are smaller than in other fields of research, as their outcomes are more challenging to influence. Specifically, effect sizes of 0.25 or greater are considered “large” in education research (Lipsey et al., 2012).

Conclusion

Using *i-Ready Diagnostic* data from nearly 30,000 K–8 students in the 2016–2017 school year, our research team examined the relationship between the Blended Core Mathematics Program and student achievement when controlling for prior achievement. Our research found evidence that students using the Blended Core Mathematics Program tend to grow more than students who do not use the Blended Core Mathematics Program. The differences in students' spring *i-Ready Diagnostic* scores for grades K–8 were statistically significant after controlling for selection bias, with students in districts using the Blended Core Mathematics Program as their core experiencing higher spring *i-Ready Diagnostic* scores than students not using the program. Students in districts with the Blended Core Mathematics Program as their core mathematics program can expect to grow more in one academic year compared to students not using the program who started with the same fall scores. Effect sizes across grades were positive and generally large for educational programs.

These findings indicate that the Blended Core Mathematics Program is an effective blended system for accelerating student growth and progress toward proficiency. Furthermore, the statistically significant favorable results when controlling for prior achievement provide evidence that the Blended Core Mathematics Program meets the criteria for Every Student Succeeds Act (or ESSA) Level 3: Promising Evidence, with positive effects.



Appendix A: Criteria for Treatment and Control Groups

The Blended Core Mathematics Program as the Treatment

This research report defined students in districts using *Ready Mathematics* and *i-Ready* Blended as a core program if they met the following:

- Attended a school in a district that purchased enough *Ready Mathematics* books for at least 75% of students in each grade of that student's grade band (K–2, 3–5, 6–8).
- Attended a school in a district where at least 75% of students in each grade of a grade band (K–2, 3–5, 6–8) had at least one *i-Ready Mathematics* lesson.
- Attended a school in a district where at least 75% of students in each grade of a grade band (K–2, 3–5, 6–8) took a fall *i-Ready Diagnostic* and at least 75% of students in each grade of a grade band took a spring *i-Ready Diagnostic*.
- Completed the *i-Ready Diagnostic* at both the beginning and the end of the academic year (between 25 and 35 weeks apart).
- Received *i-Ready Instruction* for at least 18 unique weeks of the academic year.
- Received an average of 45 minutes of *i-Ready Instruction* per unique week of instruction.

i-Ready Diagnostic–Only Districts as the Control Group

This research report defined students in districts not using *Ready Mathematics* and *i-Ready* Blended if they met the following:

- Attended a school in a district that did not have any *i-Ready Instruction* usage for that student's grade band (K–2, 3–5, 6–8).
- Attended a school in a district that did not have any *Ready Mathematics* instruction purchases for that student's grade band (K–2, 3–5, 6–8).
- Attended a school in a district where at least 75% of students in each grade of a grade band (K–2, 3–5, 6–8) took a fall *i-Ready Diagnostic* and 75% of students in each grade of a grade band took a spring *i-Ready Diagnostic*.
- Completed the *i-Ready Diagnostic* at both the beginning and the end of the academic year (between 25 and 35 weeks apart).

References

Lipsey, M. W., Puzio, K., Yun, C., Hebert, M. A., Steinka-Fry, K., Cole, M. W., et al. (2012). Translating the Statistical Representation of the Effects of Education Interventions into More Readily Interpretable Forms. (NCSE 2013-3000). Washington, DC: National Center for Special Education Research, Institute of Education Sciences, U.S. Department of Education. This report is available on the IES website at <http://ies.ed.gov/ncser/>.

© Curriculum Associates, LLC. (2018, April). *Ready and i-Ready Blended Core Mathematics Efficacy: ESSA Evidence of the Impact of the Curriculum Associates Blended Core Mathematics Program on Student Achievement* (Curriculum Associates Research Report No. RR 2018-21). North Billerica, MA: Author. Prepared 4/30/2018.