i-Ready®

Based on data from the **2017–2018** academic year

i-Ready Efficacy: Research on *i-Ready Instruction* Program Impact

Research Support for i-Ready and ESSA

i-Ready Efficacy: Research on *i-Ready Instruction* Program Impact

Curriculum Associates Research Brief | April 2019

Research Overview

Under the Every Student Succeeds Act (ESSA), a promising intervention should be supported by at least one correlational study that controls for selection bias. A goal of this research was to understand the impact of *i-Ready Instruction*, while controlling for selection bias, and provide evidence that *i-Ready* meets ESSA Level 3 criteria. To achieve this goal, the Curriculum Associates Research team conducted an ANCOVA analysis controlling for selection bias using students' prior spring *i-Ready Diagnostic* scores. Researchers studied *i-Ready* data from more than one million students from the 2017–2018 school year. Using a resulting sample of more than 440,000 English Language Arts (ELA) students and more than 420,000 Mathematics students, the research showed that under statistical controls for prior test scores, students receiving *i-Ready Instruction* demonstrated greater gains on the spring *i-Ready Diagnostic* than students who did not receive *i-Ready Instruction*. The significance of the findings and the rigorous study design provide support for *i-Ready Instruction* as a program that meets the criteria for ESSA Level 3: Promising Evidence.

The Impact of *i-Ready*

In fall 2018 Curriculum Associates conducted comprehensive research into the impact of *i-Ready Instruction* on student learning gains as measured by the *i-Ready Diagnostic*. Using *i-Ready Diagnostic* data from more than one million students who took the *i-Ready Diagnostic* in the 2017–2018 academic year, our Research team found that students using *i-Ready Instruction* experienced greater learning gains than students who did not use the program.

Learning gains for those students receiving *i-Ready Instruction* were substantial. Students receiving *i-Ready Instruction* experienced overall gains of 46% for ELA and 38% for Mathematics relative to students who did not receive *i-Ready Instruction* across Grades K–8. Effect sizes were positive and generally strong, with the majority exceeding the standard for *large* for an educational intervention (Cohen's *d* of greater than .25).

An additional analysis was performed to control for selection bias for Grades 1–8. Again, the research found that students receiving *i-Ready Instruction* showed greater learning gains than students who did not receive *i-Ready Instruction*. The results of this study were statistically significant at the $p<.05$ level for all grades and subjects, and all but one of the results were significant at the $p<.0001$ level (the exception being Grade 2 ELA, which was significant at the $p=.0004$ level).

Our research also evaluated the impact for subgroups and found similar results, with Students with Disabilities, English Learners, Non-Caucasian students, and Economically Disadvantaged students demonstrating greater gains than students in these subgroups who did not receive *i-Ready Instruction*.

These results indicate that *i-Ready Instruction* is an effective intervention and an effective system for accelerating student growth and progress toward proficiency. Furthermore, because this study yielded favorable results controlling for selection bias for Grades 1–8, it provides evidence that *i-Ready Instruction* meets the criteria for ESSA Level 3: Promising Evidence, with favorable effects.

i-Ready Instruction as Treatment

For the purposes of the research in this report, a student was defined as having received *i-Ready Instruction* if the student:

- Completed the *i-Ready Diagnostic* at both the beginning and the end of the academic year
- Received *i-Ready Instruction* for at least 18 weeks of the academic year
- Received an average of 45 minutes of *i-Ready Instruction* per subject per week

These criteria for inclusion are consistent with guidance provided to educators as they implement the *i-Ready* program in their schools and districts.

i-Ready Control Group

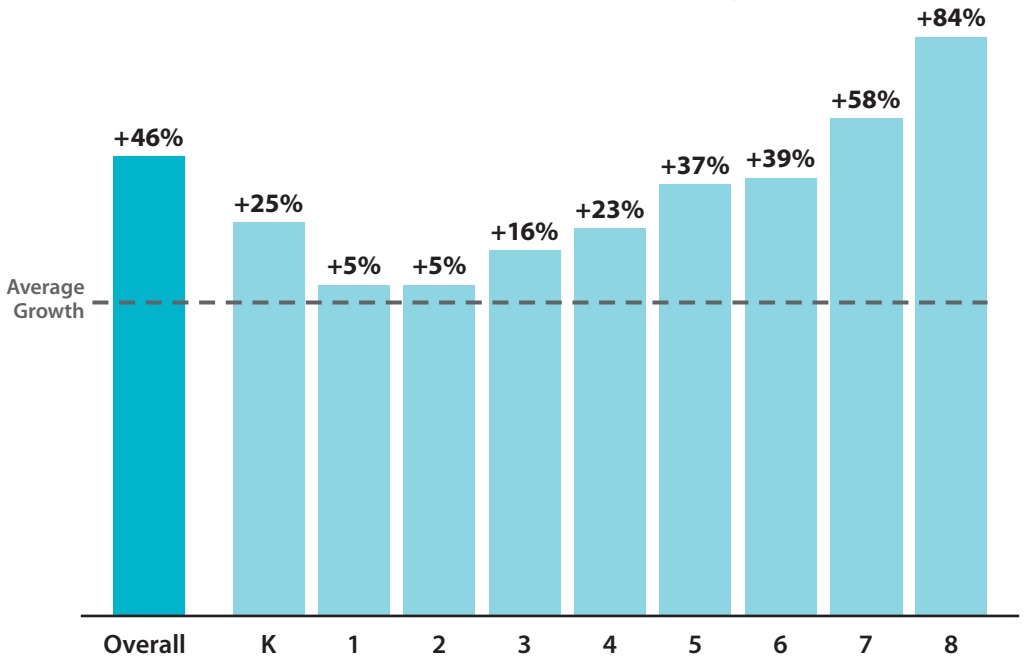
For the purposes of the research in this report, a student was defined as not having received *i-Ready Instruction* if the student:

- Completed the *i-Ready Diagnostic* at both the beginning and the end of the academic year
- Did not receive *i-Ready Instruction*

Students Receiving *i-Ready Instruction* Experienced Greater Gains

In both ELA and Mathematics, students receiving *i-Ready Instruction* experienced, on average, greater learning gains than students who did not receive *i-Ready Instruction*, meaning those students who received instruction through *i-Ready* tended to grow more than those who did not.

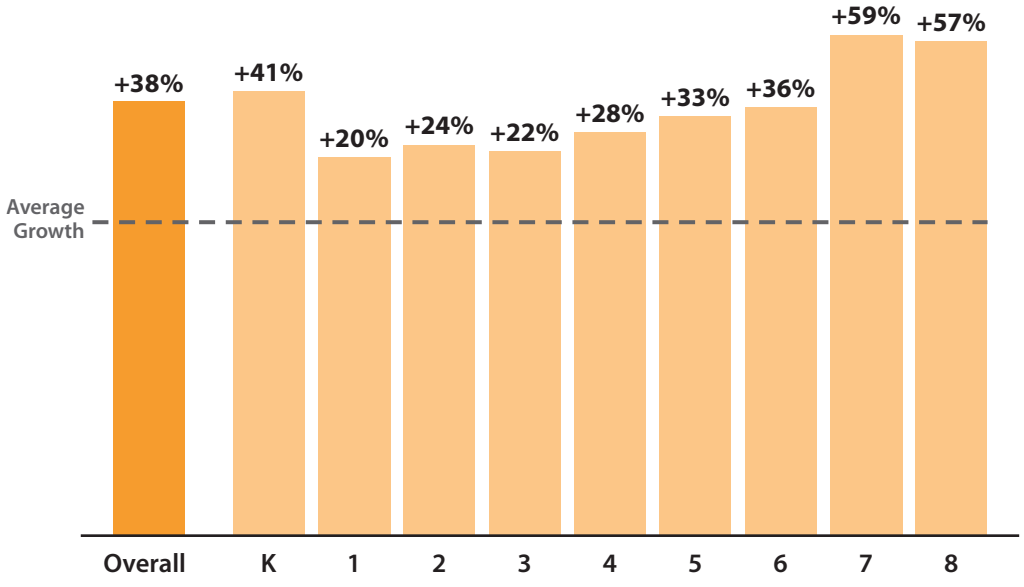
ELA Score Gains for Students Receiving *i-Ready Instruction* Relative to Students Not Receiving *i-Ready Instruction*



Overall, ELA students receiving *i-Ready Instruction* experienced score gains 46% greater than those not receiving *i-Ready Instruction*.

Students across all grades showed greater growth, with grade-level results ranging from 5% to 84% greater.

Mathematics Score Gains for Students Receiving *i-Ready Instruction* Relative to Students Not Receiving *i-Ready Instruction*



Overall, Mathematics students receiving *i-Ready Instruction* experienced score gains 38% greater than those not receiving *i-Ready Instruction*.

Students across all grades showed greater growth, with grade-level results ranging from 20% to 59% greater.

Effect Sizes

Students who received *i-Ready Instruction* during the 2017–2018 school year tended to experience greater learning gains than students who did not receive *i-Ready Instruction*. In the majority of cases the effect sizes from the research exceeded the standard for *large* in the education field, with an overall effect size of .33 in ELA and an overall effect size of .39 in Mathematics.[1]

Comparison of Effect Sizes for Differences in Means Using Cohen's *d* by Grade (ELA)

Effect Size: Cohen's *d*	K	1	2	3	4	5	6	7	8	Overall
AY 2017–2018	.39*	.09	.07	.16	.17	.21	.15	.17	.21	.33*

Comparison of Effect Sizes for Differences in Means Using Cohen's *d* by Grade (Mathematics)

Effect Size: Cohen's *d*	K	1	2	3	4	5	6	7	8	Overall
AY 2017–2018	.59*	.33*	.37*	.34*	.36*	.32*	.26*	.29*	.25*	.39*

*Effect size met or exceeded Lipsey's (2012) criteria for being considered *large*.

[1]***Effect Sizes in Education Research***

Effect sizes are a common way of measuring the strength of an educational intervention. 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. Because the outcomes are more challenging to influence with interventions, typical effect sizes in research fields such as education, medicine, and economics are smaller than in other fields of research. Specifically, interventions in education research with an effect size of .25 or greater are considered *large*. (Lipsey et al., 2012).

Aggregated effect sizes are calculated using two methods. The "overall" method calculates the effect size across all grades using the pooled standard deviation for students regardless of the student's grade. The "average" method simply takes a straight average of the unrounded grade-specific effect sizes in which the pooled standard deviation only reflects students within each grade. The "overall" method can be higher or lower than the grade-specific "average" approach due to group variation and the method for pooling standard deviations. Overall effect sizes are listed in the tables above. The average effect size for ELA is .18 and the average effect size for Mathematics is .35.

i-Ready and ESSA

ESSA defines four categories of research evidence for an effective intervention. Under ESSA, a promising intervention should be supported by at least one correlational study that controls for selection bias. Hence, a goal of this research study was to meet ESSA Level 3 criteria through investigation of the impact of *i-Ready Instruction* while controlling for selection bias.

To examine the impact of *i-Ready Instruction*, the Curriculum Associates Research team conducted an ANCOVA analysis controlling for selection bias using students' prior spring *i-Ready Diagnostic* scores. As kindergarteners did not have scores prior to the 2017–2018 school year, they were excluded from the analysis. The analysis on a final sample of more than 440,000 ELA students and more than 420,000 Mathematics students showed that students receiving *i-Ready Instruction* demonstrated greater learning gains for the 2017–2018 academic year compared to students who did not receive *i-Ready Instruction*, when controlling for selection bias.

The results of this study were statistically significant at the $p<.05$ level for all grades and subjects, and all but one of the results—Grade 2 ELA, which was significant at the $p=.0004$ level—were significant at the $p<.0001$ level. The results of this analysis provide evidence of a relationship between use of *i-Ready Instruction* and greater student learning gains. The significance of the findings and the inclusion of statistical controls in this study meet the criteria for ESSA Level 3: Promising Evidence.

ELA	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
F-Statistic	$F(1,43470)=162.27$	$F(1,56531)=12.35$	$F(1,59624)=256.54$	$F(1,61899)=272.47$	$F(1,61016)=429.54$	$F(1,44705)=140.83$	$F(1,53667)=172.14$	$F(1,53927)=227.07$
p-value	$p<.0001$	$p=.0004$	$p<.0001$	$p<.0001$	$p<.0001$	$p<.0001$	$p<.0001$	$p<.0001$

Mathematics	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
F-Statistic	$F(1,35947)=924.14$	$F(1,51075)=1357.62$	$F(1,55351)=1719.29$	$F(1,60592)=1637.66$	$F(1,63129)=1166.11$	$F(1,53996)=181.29$	$F(1,52076)=485.29$	$F(1,49880)=290.37$
p-value	$p<.0001$	$p<.0001$	$p<.0001$	$p<.0001$	$p<.0001$	$p<.0001$	$p<.0001$	$p<.0001$

Understanding p-values

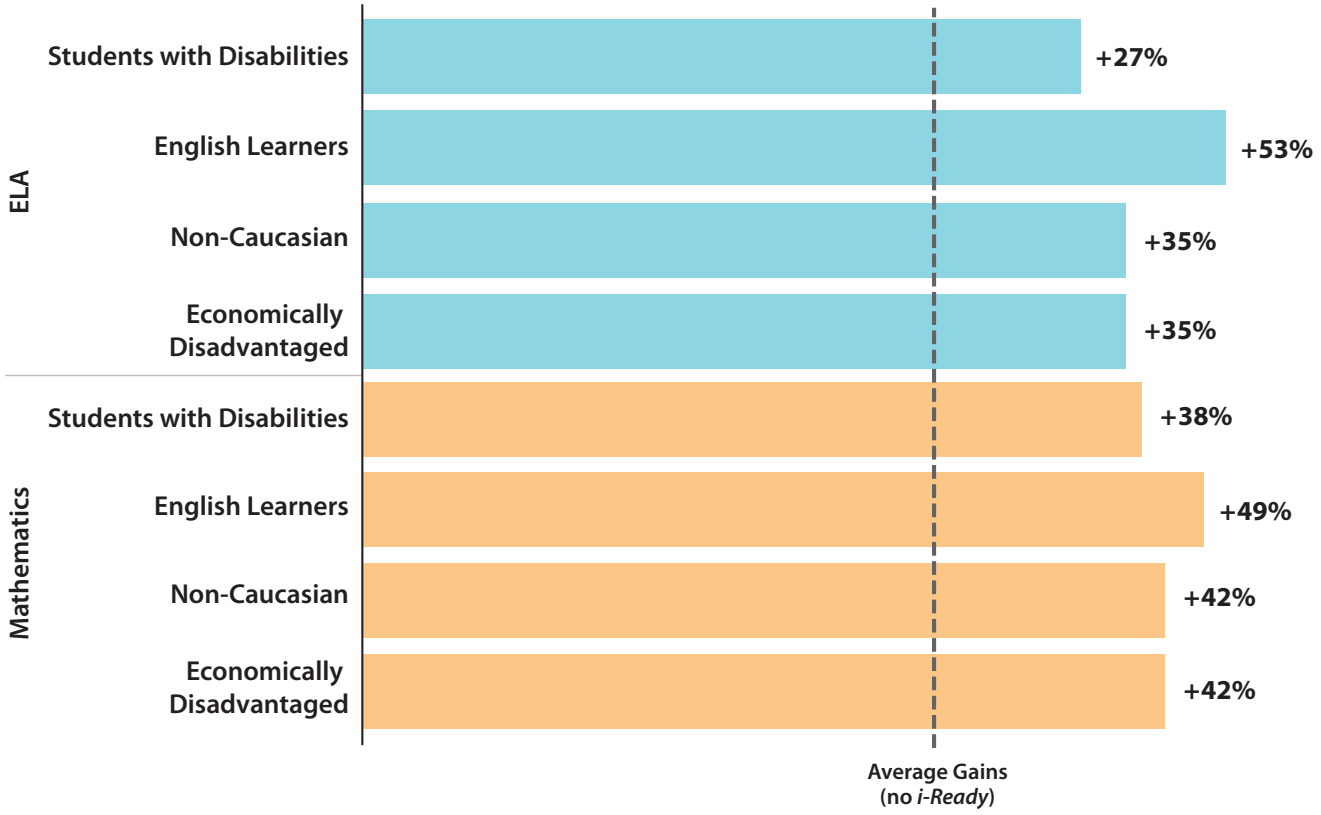
p-values help support interpretation of the significance of a research result. Here *p*-values indicate the probability that the differences in average score gains between students receiving *i-Ready Instruction* and not receiving *i-Ready Instruction* were due to chance. A *p*-value of less than .0001 can also be understood as a .01% chance or a 1 in 10,000 chance.

Subgroup Analysis

The impact of *i-Ready Instruction* was also analyzed using four subgroups: Students with Disabilities, English Learners, Non-Caucasian students, and Economically Disadvantaged students. On average, the students in these subgroups receiving *i-Ready Instruction* experienced greater learning gains than students in the same subgroup who did not receive *i-Ready Instruction*. This indicates that in general, *i-Ready Instruction* can enhance learning gains for students in these subgroups.

Due to sample limitations, the ANCOVA analyses were not performed for the subgroup analysis. These analyses will be performed and expanded upon in future research.

Score Gains for Students in Subgroups Receiving *i-Ready Instruction* Compared to Students in Subgroups Not Receiving *i-Ready Instruction*



Effect Sizes

The analysis included a calculation of effect sizes by subgroup.

Effect Sizes (Cohen's *d*) for Student Subgroups

Effect Size: Cohen's *d*	ELA	Mathematics
Students with Disabilities	.15	.30
English Learners	.31	.44
Non-Caucasian	.19	.38
Economically Disadvantaged	.18	.38

Sample Sizes

Sample sizes for these analyses were based on assessment data collected through *i-Ready Diagnostic* and student demographic data collected from participating schools and districts. The tables below show the sample sizes for the overall effect, ANCOVA, and subgroup analyses.

Overall Sample Sizes

The following tables show the number of students included in the overall effect analysis.

Number of Students Receiving and Not Receiving *i-Ready* Online Instruction (ELA)

	Grade K	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
No Instruction	62,721	73,754	78,903	83,845	89,753	89,202	92,202	86,325	90,151
Received Instruction	29,256	35,889	39,245	40,050	29,155	24,277	19,166	13,108	9,845

Number of Students Receiving and Not Receiving *i-Ready* Online Instruction (Mathematics)

	Grade K	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
No Instruction	59,922	79,911	83,080	81,187	86,035	90,086	87,084	82,942	81,450
Received Instruction	14,680	20,970	26,503	33,744	30,767	29,041	22,191	14,920	11,680

ANCOVA Sample Sizes

The following tables show the sample sizes of students included in the ANCOVA analysis. The sample sizes for this analysis are smaller than the sample sizes of the overall effect analysis presented earlier, and exclude kindergarten. This is because only students who had an *i-Ready Diagnostic* score from the spring of their prior year were included in the analysis.

Number of Students Included in ANCOVA Analysis Receiving and Not Receiving *i-Ready Instruction* (ELA)

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
No Instruction	22,676	32,650	37,004	44,573	47,001	44,705	46,192	48,669
Received Instruction	21,111	24,218	22,978	17,701	14,398	9,807	7,881	5,673

Number of Students Included in ANCOVA Analysis Receiving and Not Receiving *i-Ready Instruction* (Mathematics)

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6	Grade 7	Grade 8
No Instruction	23,894	35,408	35,882	42,521	45,878	43,005	43,802	43,873
Received Instruction	12,264	15,894	19,710	18,321	17,508	11,257	8,557	6,301

Subgroup Sample Sizes

Samples for the subgroup analyses were based on assessment data collected through the *i-Ready Diagnostic* and student demographic data collected from participating schools and districts. Study sample sizes for the subgroup analysis are smaller than the sample size for the overall analysis due to differences in available demographic and categorical data.

Number of Students Receiving and Not Receiving *i-Ready Instruction* by Grade and Subgroup (ELA)*

Subgroup	K	1	2	3	4	5	6	7	8
Students with Disabilities									
No Instruction	3,038	3,890	4,649	5,030	5,763	6,245	5,755	5,162	5,437
Received Instruction	1,309	2,148	2,765	2,982	2,621	2,293	1,733	1,224	926
English Learners									
No Instruction	9,717	10,187	10,171	7,685	7,633	6,106	5,741	3,182	3,109
Received Instruction	3,478	4,105	4,492	3,753	2,892	1,953	1,230	745	576
Non-Caucasian									
No Instruction	12,987	14,947	15,428	20,103	21,190	21,125	20,853	21,246	22,632
Received Instruction	14,735	16,631	18,162	17,651	13,500	10,646	7,656	5,486	4,078
Economically Disadvantaged									
No Instruction	3,965	4,438	5,223	7,297	8,962	8,976	10,201	11,357	11,363
Received Instruction	5,864	7,972	8,333	7,494	6,931	5,532	4,364	3,198	2,641

Number of Students Receiving and Not Receiving *i-Ready Instruction* by Grade and Subgroup (Mathematics)*

Subgroup	K	1	2	3	4	5	6	7	8
Students with Disabilities									
No Instruction	3,017	4,112	4,971	5,493	5,814	6,406	5,635	5,106	5,074
Received Instruction	659	1,307	2,131	2,839	2,767	2,612	1,650	1,194	961
English Learners									
No Instruction	9,124	10,235	10,847	8,239	7,845	6,133	5,276	3,196	3,243
Received Instruction	1,726	2,634	3,177	3,670	3,076	2,308	1,073	773	586
Non-Caucasian									
No Instruction	13,460	18,373	18,396	20,171	21,245	22,279	21,418	22,154	22,362
Received Instruction	7,403	9,645	12,216	15,107	13,312	11,982	7,906	5,459	4,097
Economically Disadvantaged									
No Instruction	6,058	6,760	7,708	9,080	9,915	10,469	10,039	10,902	10,443
Received Instruction	2,975	5,607	6,567	8,647	7,650	7,121	4,172	2,775	2,183

*Providing demographic data to Curriculum Associates is optional for educators, so the number of students listed in the rows for "Students with Disabilities," "English Learners," "Non-Caucasian," and "Economically Disadvantaged" does not add up to the number of students listed in the "Overall Sample" section on the prior page.

Findings from the Research

The research was undertaken with the goal of answering three key research questions:

- How does annual score growth for students receiving *i-Ready Instruction* compare to students who did not receive *i-Ready Instruction*?
- Are the differences in score growth statistically significant after controlling for selection bias?
- How does annual score growth for students in key subgroups receiving *i-Ready Instruction* compare to students in the same subgroups who did not receive *i-Ready Instruction*?

Curriculum Associates' Research team conducted three analyses using data from the 2017–2018 academic year to answer the above questions. In the first analysis, descriptive statistics and effect sizes were analyzed. Mean score gains were calculated for the treatment (students receiving *i-Ready Instruction*) and control groups (students who did not receive *i-Ready Instruction*) and were then compared. To show the magnitude of the differences, the Cohen's *d* effect size using the pooled standard deviation of the groups was calculated for each grade. In the majority of cases the effect sizes from the research exceeded the standard for *large* in the education field, with an overall effect size of .33 in ELA and an overall effect size of .39 in Mathematics.

The second analysis involved evaluating the score gains while controlling for selection bias to meet ESSA Level 3 criteria. An ANCOVA analysis was performed for each grade (1–8) and subject (ELA and Mathematics) to examine the effect of *i-Ready Instruction* on student score gains. Prior test scores (i.e., *i-Ready Diagnostic* spring scores from the prior year) were included as the covariate to control for selection bias. Because kindergarten students do not have a prior spring test score, those students were removed from the analysis. Results are considered statistically significant by What Works Clearinghouse if the *p*-value is less than 5% ($p<.05$).

In the third analysis, score gains and Cohen's *d* effect sizes were calculated for the following subgroups of students: Students with Disabilities, English Learners, Non-Caucasian students, and Economically Disadvantaged students.

Findings from these analyses support positive answers to the three research questions:

- Students receiving *i-Ready Instruction* showed greater learning gains than students who did not receive *i-Ready Instruction*. Effect sizes across subjects and grades were positive and generally strong.
- The differences in student score growth at Grades 1–8 were statistically significant after controlling for selection bias.
- On average, the students in key subgroups receiving *i-Ready Instruction* experienced greater learning gains than students in the same subgroup who did not receive *i-Ready Instruction*. Effect sizes across both subjects were positive and generally strong.

About the *i-Ready* Program

Curriculum Associates' *i-Ready Assessments* and *i-Ready Instruction* combine valid and reliable assessments with sophisticated instructional resources targeted to each student's specific academic needs. The program also provides a system of comprehensive, actionable reports to guide decision-making at the student, class, school, and district levels.

The *i-Ready Diagnostic* uses advanced technology to provide a detailed, customized evaluation of every student and to track student growth and performance consistently and continuously over a student's K–8 experience. By dynamically adapting based on student response patterns, adaptive assessments are able to derive large amounts of information from a limited number of test items. This allows the *i-Ready Diagnostic* to more accurately and more efficiently pinpoint students' needs than traditional fixed-form tests. Instantly available reports based on Diagnostic results help teachers better understand their students' individual needs and adjust instruction accordingly.

Based on the results of *i-Ready Diagnostic*, students are automatically placed into personalized learning paths in *i-Ready Instruction*. Once placed in *i-Ready Instruction*, students receive a unique lesson plan consisting of digital lessons designed to fill knowledge gaps and help all learners access grade-level content.

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. (NCSER 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/.

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