

A What Works Clearinghouse Rapid Evidence Review of Distance Learning Programs

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Due to the COVID-19 global pandemic, educators and school administrators need to understand the available distance learning models and programs that may assist students who attend school from a remote location. To meet this need, this rapid evidence review sought to identify and report on what works in distance learning educational programming. After an extensive search and screening process, the What Works Clearinghouse (WWC) reviewed 36 studies spanning kindergarten through postsecondary education. Fifteen studies met the WWC Group Design Standards; of those, four met the Every Student Succeeds Act (ESSA) Tier 1 requirements. An analysis of where research has been conducted revealed that several distance learning programs for K–8 students met WWC Group Design Standards but only one study of distance learning program for high school students met WWC Group Design Standards. In addition, a meta-analysis of studies with similar design characteristics (nine in total) found that, on average, students in the distance learning programs improved in the English language arts (ELA) outcome domain but not in the mathematics domain. Although the results are promising, continued research using rigorous, randomized designs should be a priority.

Why this study?

On March 11, 2020, the World Health Organization declared the spread of COVID-19 a global pandemic (World Health Organization, 2020), and the ongoing public health crisis has affected all aspects of daily life worldwide. Policies to mitigate the spread of the virus prompted school closures in all 50 United States and the four U.S. territories, disrupting the learning of approximately 50.8 million public school students in the 2019/20 academic year (EdWeek, 2020a). The 2020/21 academic year is now underway, and 74 of the 100 largest school districts started the school year fully remote, affecting more than 9 million students (EdWeek, 2020b).

To continue to educate American students, educators and school administrators are working to understand the variety of available distance learning models and programs, defined broadly to include any digital educational material designed to be accessed outside the traditional in-person school setting. Existing distance learning programs encompass a wide range of models: fully online schools, individual courses offered to high school or postsecondary students entirely online, hybrid courses that offer a mix of in-person and remote instruction, and programs that supplement existing curricula with online instruction or offer additional online practice for a specific academic area (Digital Learning Collaborative, 2020).

In order to quickly and adeptly make use of the variety of available digital programming, educators and administrators need resources to help understand the effectiveness of these programs. They also need information about programming characteristics to ensure that programs are suitable for specific settings. Educators may wonder if a program offers a full curriculum or is intended to be supplemental. Does it require synchronous or asynchronous interaction with a teacher, or is it fully automated? What kind of personalization or adaptive capabilities does the program have? Unfortunately, educators and administrators lack information about the critical characteristics of distance learning programs, their quality and effectiveness, and the supporting evidence (Tosh, Doan, Woo, & Henry, 2020).

With the goals of better understanding what works in distance learning and providing relevant information to educators and administrators, the Institute of Education Sciences (IES) put out a call for studies that evaluated the effects of distance education practices and programs on student academic outcomes (National Center for Education Evaluation and Regional Assistance, 2020). The WWC teams worked with the Education Resources Information Center (ERIC), IES’s digital library of education research, to screen and prioritize studies for WWC Group Design Standards review (WWC, 2020a). Citations and abstracts were screened in accordance with standard WWC eligibility criteria, as well as supplemental criteria identified specifically for this review (these supplemental criteria are described in box 2 and the technical appendix). Of the 932 studies found in the initial search, 266 were retained for full-text screening (see box 2 for a full description of the screening process and criteria). Because a primary goal of this review was to provide practitioners with rigorous evidence on effective distance learning programs as quickly as possible, only randomized controlled trials (RCTs) of programs with at least one positive and statistically significant finding were retained following the screening (definitions of key terms, such as RCT, are provided in box 1). More information on the search and screen, as well as the number of studies screened out due to various criteria, is provided in figure A–1 in the technical appendix. Thirty-six studies were identified for review.¹ Five of these studies had been previously reviewed by the WWC, and the remaining studies were reviewed by WWC contractors under the review of individual studies version 4.0 protocol and underwent a thorough peer review. This report summarizes the results of the WWC review process.

Throughout the process, the WWC was guided by the four research questions listed below. This report was structured around the answers to those questions. The report ends with a characterization of the state of the distance learning field, based on the studies reviewed, and some potential future steps.

Research questions

1. How many distance learning programs have been evaluated in studies that meet *WWC Group Design Standards*? What are the characteristics of these studies (such as design, sample, and outcomes) and the programs’ components (such as program type, content coverage, and teacher-interaction style)?
2. Where is evidence needed to address gaps in the distance learning literature?
3. What is the overall average effect of distance learning programs that meet WWC standards on English Language achievement (ELA) and mathematics achievement?
4. Do any of the programs’ components explain differences in effectiveness?

Box 1. Key terms

Business-as-usual comparison group. A group in which students receive the same instruction as would be expected in the absence of the intervention.

Distance learning. Digital educational material designed to be accessed outside the traditional, in-person school setting.

Effect size. The extent of an intervention’s impact on students who receive distance learning relative to the comparison group.

ESSA Tier 1. A measure of the effectiveness of an intervention based on the Every Student Succeeds Act (ESSA) definition. To achieve Tier 1 status, a study must have at least one finding that (a) meets WWC Group Design Standards Without Reservations, (b) has a sample of at least 350 students from multiple schools, and (c) is statistically significant and positive.

Evidence gap map. A visualization method that depicts the number of studies on a matrix with thematically important dimensions represented on each axis and by study markers. An evidence gap map is a concise and user-friendly figure that illustrates the types of studies that have and have not been conducted.

¹ The search and screen procedure originally identified 35 citations for review by the WWC. WWC contractors could not identify full text for one of the citations and substituted two recently released publications from the same study team for the citation. Separately, during the review process, the WWC determined that there were two instances of multiple publications describing the same study; in these instances, citations were combined for a single review. Two additional publications described multiple treatment conditions, so separate reviews were conducted for each treatment-comparison contrast within those publications. This resulted in a total of 36 WWC reviews. The full list of citations and final WWC dispositions is provided in table A–5.

Meeting WWC Group Design Standards Without Reservations. A descriptor that applies to a study that met the highest quality design standards, such as an RCT with low attrition.

Meeting WWC Group Design Standards With Reservations. A descriptor that applies to a study that has high-quality design standards, such as an RCT with high attrition or a quasi-experimental design, both with baseline equivalence between the intervention and comparison conditions.

Meta-analysis. The process and statistical technique of combining effect sizes from multiple independent studies.

Randomized controlled trial (RCT) design. A design that assigns students participating in a study to either an intervention or comparison group condition using a random process.

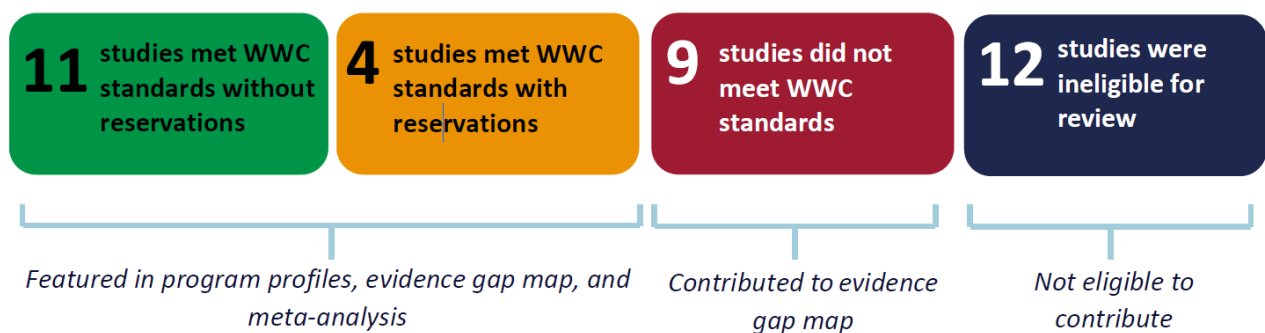
WWC Group Design Standards. Methodological guidelines that dictate how the WWC determines the quality of an evaluation.

Findings

The search and screen procedure identified 36 studies that were potentially eligible for WWC Group Design review (figure 1). The WWC’s review process provides a rating of a study’s methodological quality. The highest methodological quality rating a study can receive is *Meets WWC Standards Without Reservations*; this rating is reserved for studies that meet the highest threshold for quality, and conveys the most confidence that the intervention caused changes in the intervention group’s academic performance. The second highest methodological quality rating a study can receive is *Meets WWC Group Design Standards With Reservations*; this rating indicates that the intervention most likely contributed to changes in academic performance, but some caution may be required. Studies that *Met WWC Group Design Standards With or Without Reservations* are featured in the program profiles, evidence gap map, and meta-analysis. Studies that were reviewed by the WWC but fall short of quality standards received a rating of *Does Not Meet WWC Group Design Standards* and are included in the evidence gap map designed to illustrate where research has previously been conducted. Finally, studies that did not meet basic design criteria—for example, not measuring a relevant outcome or lacking a comparison group—are not eligible to be reviewed by the WWC.

Of the 36 studies that were identified as potentially eligible for WWC review, 11 *Met WWC Group Design Standards Without Reservations*, four *Met WWC Group Design Standards With Reservations*, nine did not meet *WWC Group Design Standards*, and 12 were not eligible for WWC review. The full methodology is described in the technical appendix.

Figure 1. Studies included in the rapid evidence review of distance learning programs



Note: Initially, 35 citations were identified for review by WWC reviewers. Due to difficulties retrieving full text, the combination of citations describing a single study, and studies including multiple treatment conditions, the total number of WWC reviews included in this review is 36. The full list of citations and final WWC dispositions is provided in table A-3 in the technical appendix.

Source: What Works Clearinghouse review of distance learning programs.

Of the 15 studies that *Met WWC Group Design Standards With or Without Reservations*, 11 were conducted with K–8 students, one with high school students, and the remaining three with postsecondary students. Four programs were free of cost, and eight programs had associated costs (programs ranged substantially in their estimated costs, from \$15 per student to several thousand dollars per student). For the remaining three programs,

the WWC could not identify any information about program cost in publications or through an Internet search. Eight of the 15 studies measured outcomes in the ELA domain, four measured outcomes in the mathematics domain, and the remaining studies measured general achievement or progress at the postsecondary level. Nine of the 15 studies used a business-as-usual comparison group in which students received traditional, in-person instruction. In the other six studies, treatment students received an enhanced or optimized version of a distance learning program, while students in the comparison condition received a base version of the program. A list of the studies' characteristics can be found in table A–1 of the technical appendix.

Box 2. Data sources, sample, and methods

Data sources. Studies that Met WWC Group Design Standards With and Without Reservations contributed to the program profiles, evidence gap map, and meta-analysis. Studies that did not meet WWC Group Design Standards contributed only to the evidence gap map.

Sample. A total of 36 studies were identified for WWC review; 24 of these studies were eligible for WWC review, 15 of which Met WWC Group Design Standards With or Without Reservations.

Methodology. The WWC conducted a systematic review using a rapid evidence review technique, relying on two methods to identify potential studies. The first method was a call to education researchers and stakeholders to submit studies that evaluated distance learning programming (National Center for Education Evaluation and Regional Assistance, 2020). The second method was a traditional search of the ERIC database using key terms. These methods yielded 932 citations, which are available on the WWC's [Studies of Distance Learning webpage](#). Titles and abstracts for all citations were screened for the following: a sample of students in grades K–16, a location in the United States, publication in 2010 or after, a measure of a student outcome, and availability in the ERIC database. After this first screening, 266 citations of the 932 studies found in the initial search were retained and attempts were made to retrieve the article PDFs. The studies then underwent two rounds of full-text screening. The first round sought to identify studies using criteria specifically designed to facilitate a rapid evidence review process: (a) the study had been peer reviewed, (b) the study used an RCT design, (c) the study reported at least one positive and statistically significant finding, and (d) programs were fully online.² Next a second, full-text eligibility screening was conducted using the Review of Individual Studies Protocol (RISP), version 4.0. This yielded 36 RCTs that were potentially eligible for WWC review (see figure 1). All 36 studies then underwent the usual WWC review process eligible studies (n = 24) were reviewed using WWC Group Design Standards, Version 2.1 or later.³ In addition to the typical review process and effect size estimation, the WWC also coded components of the programs.

Analysis. Studies that were eligible for review were used to create an evidence gap map. Studies that met WWC Group Design Standards were synthesized using a fixed-effects, meta-analytic model, weighting the effect sizes by the inverse of the effect size variance (WWC, 2020b). Moderator analyses of the program components were also conducted.

The WWC also extracted information on key components (box 3) of each distance learning program. The components were determined through a discussion with content experts and included whether the program provided a complete course or was supplemental, whether it covered broad or narrow content, the type of interaction (teacher-led synchronous, teacher-led asynchronous, or automated/not teacher directed), whether the program was personalized or differentiated based on student performance (adaptive or non-adaptive), and whether the program was gamified (was interactive, had goals, and followed a story arc). The distribution of these components across the studies that *Met WWC Group Design Standards* is described in figure 2. Most of the programs included in the review were supplemental (87 percent), covered a broad content area (67 percent), and were not gamified (93 percent). A slight majority had no teacher-directed interaction (53 percent)

² Note that eligibility criteria required studies to have at least one significant, positive student finding, but the eligibility of the outcome was not assessed at the screening stage. As a result, some studies that received full reviews did not have any eligible significant positive findings. Similarly, studies were required to examine fully online programming. After eligible studies received a full review, it was determined that several of the programs included in this review did include in-person instruction in addition to remote instruction.

³ Two studies that were previously reviewed by the WWC were reviewed prior to the release of version 4.0 of the Group Design Standards. Roschelle et al. (2016) was reviewed under version 3.0 of the WWC Group Design Standards, and Heppen et al. (2011) was reviewed under version 2.1 of the WWC Group Design Standards.

and were adaptive (53 percent). A full description of the program components, how they were operationalized, and additional information can be found in table A–2 in the technical appendix.

Box 3. Description of program components

Program type. Full curricula cover an entire course or a semester’s worth of content. Supplemental curriculum programs are used in conjunction with a full curriculum.

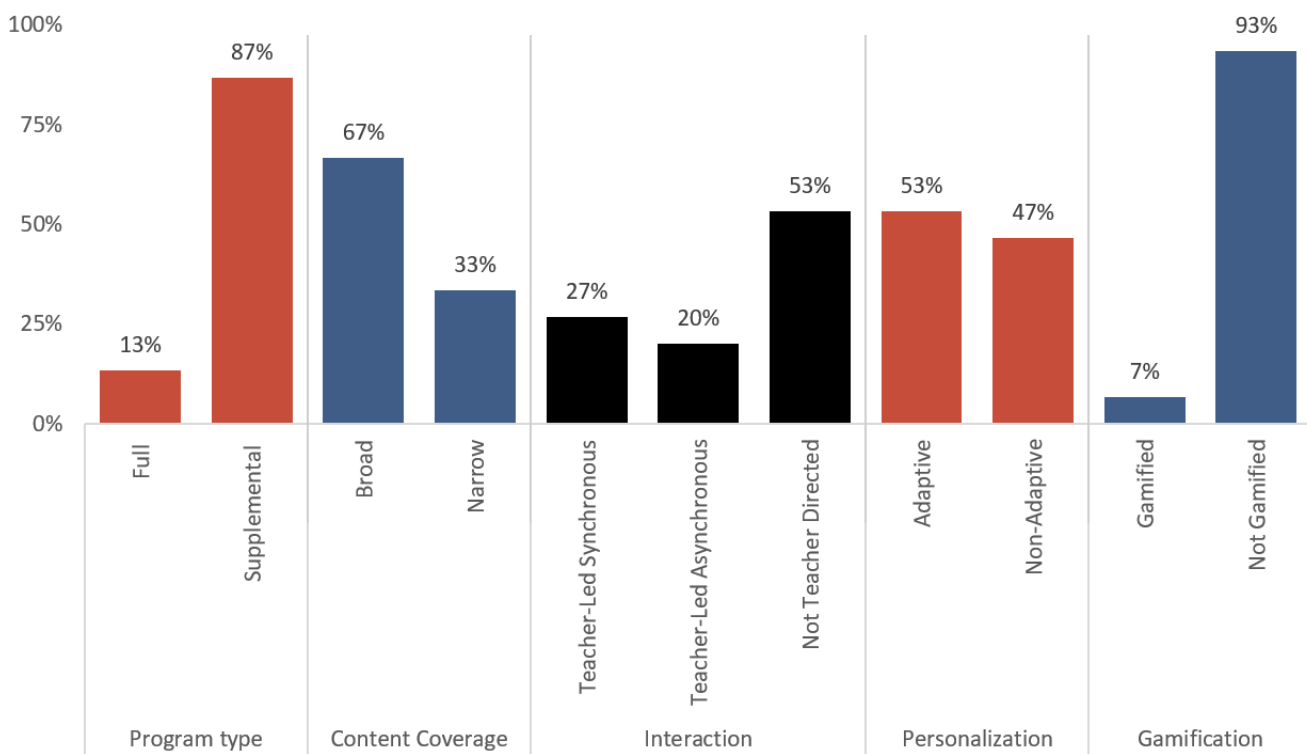
Content coverage. Programming with narrow content coverage is limited to a few substantive topics or focuses on a specific skill or strategy. Programming with broad content coverage includes a range of topics or skills.

Teacher-student interaction. Programs with teacher-led synchronous instruction include an educator who is physically distanced from students but is engaging in real-time, live instruction. Teacher-led asynchronous instruction may occur via recorded interactions or through an interactive program that does not require the instructor and students to be engaged at the same time. Other programs may be fully automated, may follow a pre-programmed set of activities or modules, and may not require interaction from any live instructor.

Personalization. Adaptive programs are personalized and specific to the performance of the participant. Adaptive programming can be fully automated by a program or implemented by a teacher.

Gamification. Gamified programs are interactive, include specific goals, and often include a story arc.

Figure 2. Program component characteristics of studies that Met WWC Group Design Standards



Note: Program components are at the study level.
 Source: What Works Clearinghouse review of distance learning programs.




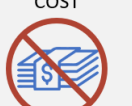

Profiles of distance learning programs that met ESSA Tier 1

The following section presents profiles of each of the four programs with studies that *Met WWC Group Design Standards Without Reservations* and ESSA Tier 1 rating requirements. The profiles include a brief program description; program components; program cost; duration; and relevant information for any positive, statistically significant findings, including the WWC’s Improvement Index. Profiles of the remaining eight studies that *Met*






WWC Group Design Standards but did not meet ESSA Tier 1 rating requirements can be found in the technical appendix. Please consult the WWC’s [Review of Individual Studies database](#) for full study review details.






ESSA
TIER
1







ASSISTMENTS

PROGRAM DESCRIPTION		PROGRAM FEATURES			
<p><i>ASSISTments</i> is an online platform for mathematics homework and related teacher training. Students use the platform to complete their mathematics homework and are provided with immediate feedback via the platform while they solve assigned problem sets. The platform provides teachers with reports on student performance and commonly missed questions. For this study, the <i>ASSISTments</i> software was loaded with all homework problems from all textbooks in use among intervention schools, as well as mathematics extension activities called “skill builders,” covering more than 300 topics appropriate for grade 7.</p>		<p>PROGRAM TYPE</p>  <p><i>Supplemental</i></p>	<p>DELIVERY METHOD</p>  <p><i>Hybrid</i></p>		
<ul style="list-style-type: none"> • Content Coverage: Broad • Participant Grade Level: Grade 7 		<p>TEACHER-STUDENT INTERACTION</p>  <p><i>Teacher-led synchronous</i></p>	<p>COST</p>  <p><i>Free</i></p>		
<ul style="list-style-type: none"> • Gamification: No • Adaptive: Yes 		<p>Duration: Schools implemented <i>ASSISTments</i> for two academic years. Student cohorts used the program for one academic year each.</p>			
<p><i>This study Met WWC Group Design Standards Without Reservations and has at least one statistically significant finding.</i></p>					
Outcome measure	Comparison	Sample	Significant?	Improvement index	
General Mathematics Achievement	<i>ASSISTments</i> versus business as usual	2,728 students	Yes		
CITATION					
<p>Roschelle, J., Feng, M., Murphy, R. F., & Mason, C. A. (2016). Online mathematics homework increases student achievement. <i>AERA Open</i>, 2(4), 1–12. https://eric.ed.gov/?id=ED575159</p>					

INTELLIGENT TUTORING FOR THE STRUCTURE STRATEGY

PROGRAM DESCRIPTION		PROGRAM FEATURES			
<p><i>Intelligent Tutoring for the Structure Strategy</i> (ITSS) is a supplemental, online program for students in grades K–8 to develop literacy skills and understand factual texts used in everyday settings. Students learn how to use text structure, key words, and logical structure to better understand and recall information. In particular, ITSS highlights five main text structures that (a) make comparisons; (b) present problems and solutions; (c) link causes and effects; (d) present sequences; and (e) describe things, people, creatures, places, and events. The WWC intervention report on ITSS can be retrieved from: https://ies.ed.gov/ncee/wwc/InterventionReport/703. The WWC reviews on ITSS can be retrieved from: https://ies.ed.gov/ncee/wwc/Study/77453, https://ies.ed.gov/ncee/wwc/Study/86126, https://ies.ed.gov/ncee/wwc/study/86233, and https://ies.ed.gov/ncee/wwc/study/89695.</p>		<p>PROGRAM TYPE</p>  <p>Supplemental</p>	<p>DELIVERY METHOD</p>  <p>Fully online</p>		
		<p>TEACHER-STUDENT INTERACTION</p>  <p>Automated/Not teacher directed</p>	<p>COST</p>  <p>Some cost</p>		
<ul style="list-style-type: none"> • Content Coverage: Narrow • Participant Grade Level: Grades 4, 5, and 7 	<ul style="list-style-type: none"> • Gamification: No • Adaptive: Yes 	<p>Duration: Students use the program throughout the academic year, for 30–45 minutes per session, one to three times a week.</p>			
<p>FINDINGS <i>The following studies Met WWC Group Design Standards Without Reservations and has at least one statistically significant positive finding.</i></p>					
Outcome measure	Comparison	Sample	Significant?	Improvement index	
Comprehension	ITSS versus business as usual	5,933 students	Yes		
<p>CITATIONS</p>					
<p>Wijekumar, K. K., Meyer, B. J. F., & Lei, P. (2012). Large-scale randomized controlled trial with 4th graders using intelligent tutoring of the structure strategy to improve nonfiction reading comprehension. <i>Educational Technology Research and Development</i>, 60(6), 987–1013. https://eric.ed.gov/?id=EJ986753</p>					
<p>Wijekumar, K., Meyer, B. J., Lei, P. W., Lin, Y. C., Johnson, L. A., Spielvogel, J. A., Shurmatz, K.M., Ray, M., Cook, M. (2014). Multisite randomized controlled trial examining intelligent tutoring of structure strategy for fifth-grade readers. <i>Journal of Research on Educational Effectiveness</i>, 7(4), 331–357. https://eric.ed.gov/?id=EJ1041354</p>					
<p>Wijekumar, K., Meyer, B. J. F., & Lei, P. (2017). Web-based text structure strategy instruction improves seventh graders’ content area reading comprehension. <i>Journal of Educational Psychology</i>, 109(6), 741–760. https://eric.ed.gov/?id=EJ1149967</p>					
<p>CITATIONS <i>The following studies Met WWC Standards Without Reservations and have no statistically significant findings.</i></p>					
<p>Meyer, B. J., Wijekumar, K., Middlemiss, W., Higley, K., Lei, P. W., Meier, C., & Spielvogel, J. (2010). Web-based tutoring of the structure strategy with or without elaborated feedback or choice for fifth- and seventh-grade readers. <i>Reading Research Quarterly</i>, 45(1), 62–92. https://eric.ed.gov/?id=EJ871741</p>					
<p>Meyer, B. J. F., Wijekumar, K. K., & Lin, Y. (2011). Individualizing a web-based structure strategy intervention for fifth graders’ comprehension of nonfiction. <i>Journal of Educational Psychology</i>, 103(1), 140–168. https://eric.ed.gov/?id=ej914858</p>					

PROGRAM DESCRIPTION		PROGRAM FEATURES		
<p>The <i>Math Snacks</i> program is available online and is comprised of six animations and five games. Supporting materials include instructional materials, teacher and learner guides, how-to videos, and comic book transcripts. The students in this study played four of the five games: Monster School Bus, Gate, Ratio Rumble, and Game Over Gopher. The games covered instruction on ratios, coordinate plane, number systems, fractions, and decimals. In addition to using the four games, teachers engaged with students in guided discussions and led students in additional inquiry-based activities related to gameplay.</p>		<p>PROGRAM TYPE</p>  <p>Supplemental</p>	<p>DELIVERY METHOD</p>  <p>Hybrid</p>	
		<p>TEACHER-STUDENT INTERACTION</p>  <p>Teacher-led synchronous</p>	<p>COST</p>  <p>Free</p>	
<ul style="list-style-type: none"> • Content Coverage: Broad • Participant Grade Level: Grade 5 	<ul style="list-style-type: none"> • Gamification: Yes • Adaptive: No 	<p>Duration: Students received <i>Math Snacks</i> for a total of six to eight hours of classroom instruction during the five weeks of intervention.</p>		
<p>FINDINGS This study Met WWC Group Design Standards Without Reservations and has at least one statistically significant positive finding.</p>				
Outcome measure	Comparison	Sample	Significant?	Improvement index
Numbers and Operations	Math Snacks versus business as usual	741 students	Yes	
<p>CITATION</p> <p>Wiburg, K., Chamberlin, B., Valdez, A., Trujillo, K., & Stanford, T. (2016). Impact of Math Snacks games on students' conceptual understanding. <i>Journal of Computers in Mathematics and Science Teaching</i>, 35(2), 173–193. https://eric.ed.gov/?id=EJ1095367</p>				

PROGRAM DESCRIPTION		PROGRAM FEATURES			
<p>The Online Algebra I curriculum used electronic textbooks with interactive features such as computerized direct instruction and practice problem sets with automated feedback. Students were provided a variety of multimedia materials and a discussion board, and communicated with teachers using a messaging feature. Online teachers graded homework, monitored student understanding, promoted student engagement, conducted online discussions, and monitored student performance. Students used the software in schools, where an on-site proctor supported students. Implementation data showed that online teachers spent less time working directly with students, and that on-site proctors spent more time communicating with students about mathematics than planned.</p>		<p>PROGRAM TYPE</p>  <p>Full curriculum</p>	<p>DELIVERY METHOD</p>  <p>Fully online</p>		
		<p>TEACHER-STUDENT INTERACTION</p>  <p>Teacher-led asynchronous</p>	<p>COST</p>  <p>Some cost</p>		
		<ul style="list-style-type: none"> • Content Coverage: Broad • Participant Grade Level: Grade 8 	<ul style="list-style-type: none"> • Gamification: No • Adaptive: No 	<p>Duration: Students used the curriculum for one full academic year.</p>	
		<p><i>This study Met WWC Group Design Standards Without Reservations and has at least one statistically significant finding.</i></p>			
Outcome measure	Comparison	Sample	Significant?	Improvement index	
Advanced Coursetaking	Online Algebra I versus business as usual	440 students	Yes		
General Mathematics Achievement	Online Algebra I versus business as usual	440 students	Yes		
CITATION					
<p>Heppen, J. B., Walters, K., Clements, M., Faria, A. M., Tobey, C., Sorensen, N., & Culp, K. (2011). <i>Access to Algebra I: The effects of online mathematics for grade 8 students</i> [NCEE 2012-402]. Washington, DC: National Center for Education Evaluation and Regional Assistance. https://eric.ed.gov/?id=ED527394</p>					

Findings from evidence gap maps of studies eligible for WWC review

To understand where more evidence is needed – and to address gaps in studies of distance learning programs – the WWC created an evidence gap map of all 24 studies eligible for WWC review (figure 3) and a separate gap map of the 15 studies that *Met WWC Group Design Standards* (figure 4). These maps allow users to separately understand what types of distance learning programs and outcomes are being studied (figure 3), as well at what types of programs have an existing evidence base (figure 4). The evidence gap map of studies of all studies eligible for WWC review is particularly informative for researchers; it will inform what programs require additional rigorous study. The evidence gap map of studies that *Met WWC Group Design standards* is especially informative for administrators and practitioners who may be looking for studies of effective programs that meet their specific needs and context.

It is important to note that only RCTs with at least one positive, statistically significant finding were retained for a WWC review; unlike other WWC reviews, quasi-experimental designs and RCTs without positive findings were not eligible for WWC review. As a result, this gap map clarifies gaps among RCTs of effective distance learning programs, rather than gaps in the distance learning literature at large.

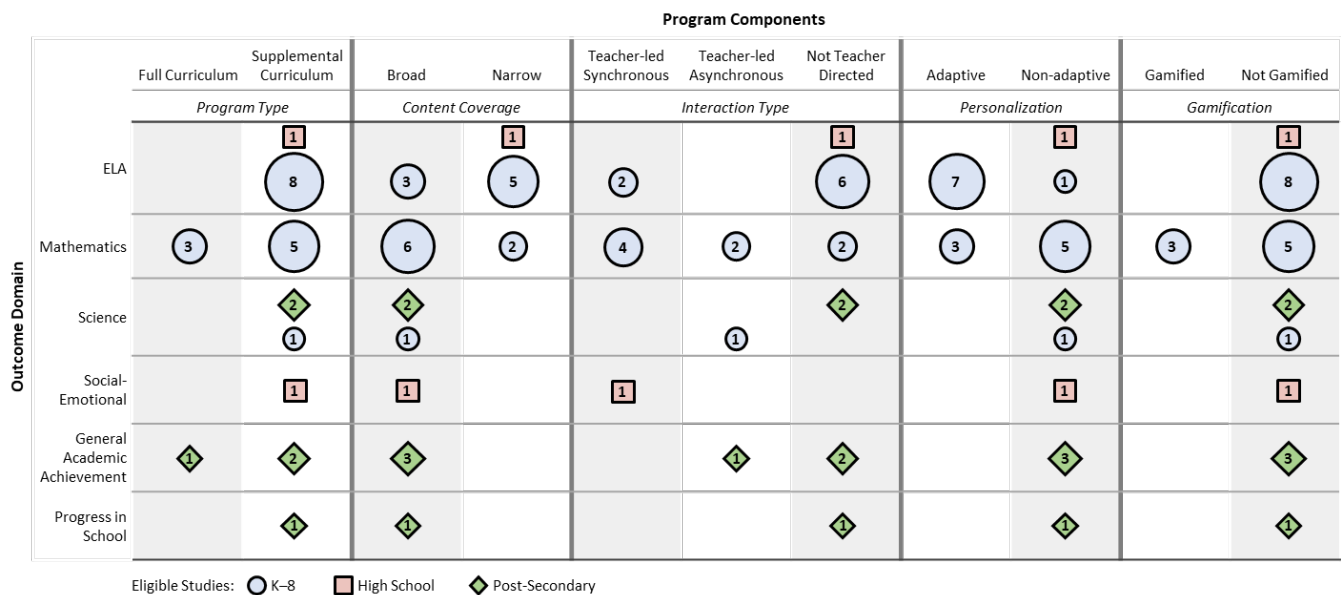
Box 4. Interpreting evidence gap map cells

The top left cell in the evidence gap map of eligible studies (see figure 3) shows the number of eligible studies that evaluate distance learning programs offering full curricula or supplemental curricula and measure ELA outcomes. The small red square in that cell conveys that only one study eligible for WWC review is of a supplemental program for high school students that measures ELA outcomes. The blue circle indicates that eight studies of supplemental programs for K–8 students that measured ELA outcomes were eligible for WWC review. No RCTs, at any grade level, of full curricula that measured ELA

outcomes were eligible for WWC review. The same cell in the evidence gap map in figure 4 shows the number of studies that met WWC Group Design Standards, evaluated full curricula or supplemental curricula, and measured ELA outcomes. Comparing this cell across the two gap maps, we see that of the eight studies of supplemental distance learning programs for K–8 students measuring ELA outcomes, seven of them met WWC Group Design Standards.

Several characteristics were plotted in the evidence gap maps. The rows represent the six outcome domains examined in these studies. One postsecondary study examined outcomes in both general academic achievement and progress in school and is represented in both of the rows. The columns of the evidence gap map represent program components of the interventions studied, such as whether the program provided a full curriculum or is a supplemental program. The levels of each component are mutually exclusive—that is, a program cannot fall into more than one component category. The shape of the marker corresponds to the grade level, and the size of the marker and the numeral inside it correspond to the number of studies. An example of how to interpret each cell is provided in box 4. The map revealed several interesting findings, which we describe below by dimension.

Figure 3. Evidence gap map of distance learning RCTs eligible for current WWC review (n = 24)



Source: What Works Clearinghouse review of distance learning programs.

Grade level. The majority of the eligible studies examined programming for K–8 students (70 percent), and more than half of those (11 of 17) *Met WWC Group Design Standards*. The distance learning programs for students in grades K–8 are diverse in the program components, and there are at least two studies in each component level. Of the K–8 programs that *Met WWC Group Design Standards*, only one provided a full curriculum.

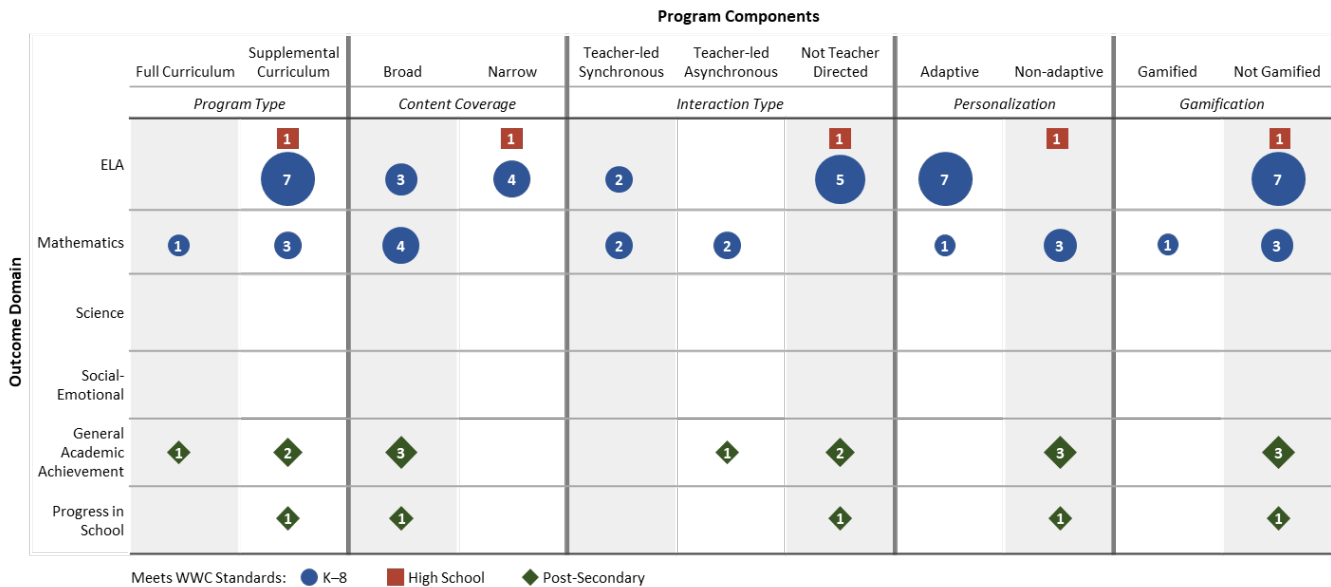
One of the most pronounced gaps in the map arises from the fact that only two eligible studies of programs for high school students in grades 9–12, and only one *Met WWC Group Design Standards*. These two were the only studies identified for WWC review during the screening stage. The two programs were both supplemental programs, one with broad academic content coverage and one with more narrow coverage. Neither program was adaptive or gamified.

Five postsecondary studies, with six findings, *Met WWC Group Design Standards*. One study examined outcomes in both general academic achievement and progress in school. More studies were identified for WWC review (n = 15), but many of these studies did not include an eligible outcome.⁴ Three of the programs were supplemental

⁴ Several studies of postsecondary distance learning measured outcomes that did not meet the requirement, outlined in RISP Version 4.0, that academic achievement measures must be final course grades, final or mid-term examination scores, or grade point averages (GPAs). Academic achievement assessed via tests, quizzes, or non-final examinations that do not fall in any of the other academic domains are not eligible for review.

distance learning programs covering broad academic content; one was a teacher-led asynchronous program and three were not teacher directed. None of the programs were adaptive or gamified.

Figure 4. Evidence gap map of distance learning RCTs that met WWC Group Design Standards (n = 15)



Source: What Works Clearinghouse review of distance learning programs.

Outcome domain. The studies eligible for WWC review examined ELA and mathematics outcomes (68 percent). Few studies examined science, social-emotional outcomes, general academic achievement, or progress in school, and those that examined science and social-emotional outcomes *Do Not Meet WWC Group Design Standards*. The studies that measured ELA and mathematics outcomes were primarily studies of programs for students in grades K–8 (with the exception of one program for high school students). On the other hand, general academic achievement and progress in school were assessed only by studies of postsecondary programming.

The lack of studies that examined social-emotional outcomes is especially notable, as one concern with distance learning is the social-emotional health of the students (EdWeek, 2020c; Walker, 2020). Students who are taught remotely may not be able to engage with the wider community, and teachers and staff are not able to check in on the social-emotional state of their most vulnerable students.

Distance learning program components. An examination of the components of distance learning programs shows that only 16 percent (four of 24) of the evaluated programs provided a full curriculum, rather than supplemental programs. All programs that *Met WWC Group Design Standards* and used teacher-led synchronous instruction were for students in grades K–8 and high school. The postsecondary programs used asynchronous instruction or had no teacher-led instruction at all. All of the adaptive programs, as well as the three gamified programs—only one of which *Met WWC Group Design Standards*—were for K–8 students. It is unclear whether programs for high school and postsecondary students do not use these innovative approaches of gamification and personalization, or if such programs have not been evaluated by RCTs or have not been found to have positive, statistically significant effects.

Findings from meta-analyses of studies that met WWC Group Design Standards

To answer the third research question—what is the overall average effect of distance learning programs that *Met WWC Group Design Standards*—the WWC sought to summarize studies using the technique of meta-analysis. A total of nine studies contributed to the meta-analysis: five with outcomes in the ELA domain and four with outcomes in the mathematics domain. A full description of the meta-analysis methods is provided in the technical appendix.

The results of the meta-analyses are presented in table 1. For ELA, five studies—which together included 4,923 students—*Met WWC Group Design Standards*. The average effect size for ELA was 0.20 ($SE = 0.03$) and was statistically significant ($p = .03$). This effect size translates to an Improvement Index of +8, meaning the average student participating in one of the eligible distance learning is predicted to score 8 percentile ranks higher in ELA than the average student receiving traditional, in-person instruction. For mathematics, four studies—which together included 5,053 students—*Met WWC Group Design Standards*. The average effect size was 0.07 ($SE = 0.05$) and was not statistically significant ($p = .05$). The effect size translates to an Improvement Index of +2.

To answer the fourth research question—do any of the program components explain differences in effectiveness—we attempted to conduct moderator analyses using the intervention’s components. The analysis of program variation – the extent to which the programs’ effectiveness varied – indicated that program effectiveness was similar. Despite the similarity, and in recognition of the importance of answering the research question, the moderator analyses were conducted. Each moderator analysis was conducted within each of the two outcome domains, but none of the results were statistically significant. The full results of those analyses are provided in tables A–3 and A–4 in the technical appendix.

Table 1. Summary of findings on distance learning programs from nine studies that met WWC Group Design Standards

Outcome domain	Effectiveness		Evidence meeting WWC standards	
	Average effect size (standard error)	Improvement index	Number of studies	Number of students
ELA	0.20 (0.03)*	+8	5	4,923
Mathematics	0.06 (0.05)	+2	4	5,053

Note: * $p < .05$. Heterogeneity statistics for the ELA analysis are as follows: $Q = 7.52$, $df = 4$, $p = 0.11$, $\tau^2 = 0.01$. Heterogeneity statistics for the mathematics analysis are as follows: $Q = 6.53$, $df = 3$, $p = 0.09$, $\tau^2 = 0.02$.

Implications

The results of the rapid evidence review revealed 15 studies that *Met WWC Group Design Standards* and four studies that met ESSA Tier 1 levels of evidence. Some administrators and education stakeholders may, therefore, identify programs from this review that fit their needs. Broadly, however, the implications are clear: There are simply not enough high-quality program evaluations, especially randomized controlled trials, conducted in the field of distance learning. This is true for all the program types, age groups, and outcomes we examined. More evidence is needed overall before any strong conclusions can be drawn regarding the effectiveness of distance learning programs.

The review revealed four effective programs for students in grades K–8 that *Met WWC Group Design Standards Without Reservations* with findings that met ESSA level Tier 1, which education administrators and policymakers might consider. The evidence gap map also revealed that the programs that used more innovative approaches—programs that were adaptive (i.e., Assistments) or gamified (i.e., Math Snacks)—were designed for students in grades K–8. Innovative approaches such as these may offer the best opportunity for success in remote learning, warranting additional research on whether these approaches are effective for older students.

Additional rigorous research on distance learning for high school students is especially needed. Only two studies were eligible for review, only one of these *Met WWC Group Design Standards*, and one of the two included students in grade 9 only. Given the appropriateness of distance learning technology for high school-aged students, an obvious need for greater program evaluation exists across all content areas.

The implications differ slightly for postsecondary education. Although additional research is indeed needed for these students, a review of ineligible studies (see table A–3 in the technical appendix) revealed that most postsecondary studies do not measure an eligible outcome. If alignment with the WWC is preferable, postsecondary researchers should consider measuring outcomes such as final course grades, college-level credits

earned, or degree attainment, in addition to proximal measures of knowledge attainment that are not eligible for WWC review.

Finally, studies examining the effect of distance learning programs on social-emotional outcomes are lacking. The review revealed only one study that examined these outcomes and *Met WWC Group Design Standards*. Given the nature of the pandemic and its resulting challenges, it is more important than ever to assess social-emotional health in students.

Limitations

Perhaps the most profound limitation of this rapid evidence review is the fact that, at the time the programs in this review were evaluated, a global pandemic was not occurring simultaneously. Education stakeholders, in addition to the parents, guardians, teachers, or the students themselves, participated in the program evaluations under much different circumstances. Therefore, should an education administrator adopt one of the promising distance learning programs, some measure of caution must be considered. The results of the program evaluations may not fully translate to the circumstances of the current situation.

Important evidence may have also been excluded because of the necessary constraints of this rapid and streamlined approach. The rapid evidence review only included studies that (a) were peer reviewed, (b) were in the ERIC database, (c) were RCTs, and (d) reported at least one positive and statistically significant result on a student outcome. As a result, rigorous quasi-experimental designs and RCTs with null or negative results and peer-reviewed studies that were not indexed in ERIC were not included in the current review. During the screening stage, screeners identified 22 quasi-experimental designs with significant positive findings, and 24 RCTs and quasi-experimental designs that did not have significant positive findings but would otherwise have been eligible to include in the review. Broadening the scope of the review to include quasi-experimental designs and studies without significant positive findings had the potential to more than double the total number of studies reviewed.

In addition, the review intended to be restricted to studies testing programs that are implemented entirely at a distance; many studies of blended programs that include both distance and in-person components were excluded during the screening stages. However, given that many students will experience a combination of in-person and remote instruction in academic year 2020/21, understanding the efficacy of hybrid approaches could be critical.

The WWC also set out to explain differences in program effectiveness by conducting moderator analyses. The findings indicated that the reviewed programs were similar. As a result of this similarity, the moderator analyses did not reveal that some program characteristics provided greater effectiveness than other characteristics. This may be due to a lack of statistical power. The lack of significant findings may also be partly attributable to the review's eligibility criteria and the resulting studies available to meta-analyze. More than half of the studies used a non-business-as-usual comparison group—in which an enhanced or optimized version of a program was compared with a base version—and so could not be included in the meta-analysis. Whatever the reason, should future syntheses be conducted, moderator analyses should be performed again to test for differences in program effectiveness.

Conclusions

Few education leaders and stakeholders could have possibly been prepared for the pivot to distance learning in March 2020. The resulting sharp transition to remote education created enormous pressure on administrators to provide adequate resources and distance learning programming. Now that education stakeholders have committed to these changes, distance learning may be a solution that districts return to in 2021 and beyond. The New York City Department of Education, for example, decided that distance learning will be used on snow days and other traditional days off like Election Day (Cramer, 2020). If the need arises in the future, educators may pivot back to distance learning to maximize instructional time for students. In other words, regardless of the global pandemic's longevity, distance learning may continue to be used by educators for a variety of reasons.

The review did reveal several distance learning products that education stakeholders should consider, depending on their situation. Equally important, it found that distance learning currently requires much greater investment, study, and rigorous evaluation. Through increased resources and a greater understanding of the existing evidence on effective distance learning programs, the WWC may be able to decrease the burden placed on education practitioners as they grapple with an instructional landscape that is shifting because of the coronavirus pandemic, and may also be better able to support the efforts of students now and in the future.

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