

Exploring the Evidence on Virtual and Blended Learning

Prepared by the Research Alliance for New York City Schools in May 2020

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These notes provide an evolving overview of research and practical guidance on strategies to implement remote teaching and learning, as well as strategies that combine virtual learning with in-class instruction. We include links to a variety of articles, resources, and reports. It is important to recognize that this summary is not a complete review of the research literature on the full range of remote and blended learning strategies. Rather, it is intended as a work in progress to help inform planning and the assessment of what has and has not been effective, for whom, and under what conditions. We hope this document helps district and school leaders gather useful information and make decisions about how to organize instruction in the context of the varied reopening conditions that evolve over the course of the 2020-2021 school year.

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Main Takeaways from the Research Alliance's Review

- Eight months into the COVID-19 pandemic, **there is still an enormous need for data and evidence** to understand how the school closures that took place in NYC and around the country—and how the various approaches to reopening—have affected students' academic, social/emotional and health outcomes, particularly for vulnerable populations. Little is known about whether and how specific policies and practices have supported students' well-being and academic success during this difficult time. More evidence is urgently needed to inform policy and practice decisions.

- Past research about online learning is limited, and mostly focused on post-secondary and adult education. The small number of studies that do exist in K-12 education find that students participating in online learning generally perform similarly to or worse than peers who have access to traditional face-to-face instruction (with programs that are 100% online faring worse than blended learning approaches) (e.g., see [Means et al. 2013](#); [CREDO 2015](#); [Ahn and McEachin 2017](#); [Fitzpatrick et al 2020](#)). It is important to note that this research typically compares online learning with regular classroom instruction—rather than comparing it to no instruction at all—and that these studies took place under dramatically different conditions than those resulting from COVID-19.
- Past studies of blended learning, personalized learning, and specific technology-based tools and programs provide hints about successful approaches, but also underscore substantial “fuzziness” around the definition of these terms; major challenges to high-quality implementation; and a lack of rigorous impact research.
- The Education Endowment Foundation’s [Rapid Evidence Assessment](#) from April 2020 highlights several useful **practice- and policy-relevant lessons** from the limited research available on remote learning. These include:
 - *Teaching quality is more important than how lessons are delivered* (e.g., “clear explanations, scaffolding and feedback”; the evidence suggests few differences between what students learn in real time—i.e., “synchronous teaching”—and the “asynchronous” alternatives; as noted below, focusing synchronous time on interaction and small-group discussion may be important).
 - *Ensuring access to technology is key*, particularly for disadvantaged students and families.
 - *Peer interactions can provide motivation and improve learning outcomes* (e.g., “peer marking and feedback, sharing models of good work,” and opportunities for collaboration and live discussions of content).
 - *Supporting students to work independently can improve learning outcomes* (e.g., “prompting pupils to reflect on their work or to consider the strategies they will use if they get stuck”, providing checklists or daily plans).
 - *Different approaches to remote learning suit different tasks and types of content* (e.g., “games for learning were found to have a high impact on vocabulary learning in foreign languages, but there is less evidence related to their use in other subjects”; “self-quizzing can help pupils retain key ideas and knowledge, but is not a replacement for other forms of assessment”).
- In keeping with these lessons, our review of the evidence suggests a number of **remote learning challenges that NYC schools should anticipate** and work to address:
 - *Issues related to technology capacity*, including not only access to a well-functioning device and a high-quality internet connection, but also the need to provide teachers, parents, and students with thorough orientations and training on new tools and basic

“help desk” type support. Related to this challenge is the probability that, in the context of remote learning, the “digital divide” will deepen existing educational inequalities.

- Many studies highlight the risk of *students feeling isolated and disengaged* from peers during remote learning—a problem that seems likely to be aggravated as a result of COVID-19 shutdowns. It will be important to identify practices and structures that help students feel emotionally supported and keep them connected with peers and teachers.
- Studies also indicate that some *students struggle with having to learn relatively independently* in the context of remote instruction. This includes getting distracted by non-educational activities and becoming frustrated by challenging content.
- Research underscores that online and personalized learning approaches may require *teachers to embrace a new role and mindset*, focused less on classroom management and more on individualized coaching and support.

Key Resources

- Since the nation’s schools closed in response to the COVID-19 pandemic, the [Center for Reinventing Public Education](#) has been tracking district responses to the crisis. Their website includes information about the rollout of remote instruction in the spring; fall 2020 reopening plans; supports for vulnerable populations; health and safety protocols; state guidance for schools and districts; and case studies highlighting lessons learned about remote learning in four districts (including Baltimore and Chicago) and two charter networks.
- This August 2020 [brief from Annenberg’s EdResearch for Recovery](#) project draws on a mix of preexisting literature and interviews with practitioners to highlight promising strategies for delivering high-quality distance and blended learning. It includes helpful insights about shifting to new pedagogies, particularly the flipped classroom model; focusing synchronous learning on small-group interaction and direct teacher-to-student feedback; and the importance of providing teachers with the time and training needed to redesign their instructional practice.
- This July 2020 [report from PACE](#) considers various ways in which K-12 instruction has been disrupted by COVID-19 and offers a variety of “research-based strategies to mitigate that impact on students in distance and blended contexts.” The authors provide user-friendly recommendations for both educators and district leaders.
- The Education Endowment Foundation’s [Rapid Evidence Assessment](#) (mentioned above) provides a summary of policy and practice implications from more than 60 studies of remote and blended learning, computer-supported collaborative learning, computer-assisted instruction, and educational games.

- The National Network of Education Research-Practice Partnerships (NNERPP) compiled this [list of resources](#) to help school leaders access online information and guidance related to challenges brought about by COVID-19.
- The What Works Clearinghouse initiated a project to rapidly review studies related to distance learning. This [infographic](#) provides a summary of that effort. A [searchable list of studies](#) is available on the What Works website.
- [Strategies for Implementing Personalized Learning While Evidence and Resources are Underdeveloped](#) (2018), from the RAND Corporation, provides “strategic guidance for designers of personalized learning programs”—drawing on “theory, basic principles from learning science, and the limited research that does exist on personalized learning and its component parts.” Key recommendations are highlighted below.
- The [Handbook of Research on K-12 Online and Blended Learning \(Second Edition\)](#) (2018), published by Carnegie Mellon University, is a lengthy and detailed collection describing the current state of research in K-12 online and blended learning, including chapters on teacher preparation and professional development.

What Does the Research Say About Online K-12 Education?

[Virtual Illusion: Comparing Student Achievement and Teacher and Classroom Characteristics in Online and Brick-and-Mortar Charter Schools](#)

(2020) by Brian R. Fitzpatrick, et al.

- This study examined the achievement effects of virtual charter schools in relation to brick-and-mortar charters and traditional public schools. The findings show that students who switched to virtual charters experienced large, negative effects on math and ELA achievement that persisted over time. Furthermore, these effects could not be explained by observed differences in teacher or classroom characteristics.
- In light of these findings, the authors argue that “both parents and school administrators (should) be extremely wary of virtual charters’ attempts to expand during the (COVID-19) crisis.” In this [post for Brookings’ Brown Center Chalkboard](#), the authors also provide some useful cautions around comparisons between virtual charters and the move to virtual learning during COVID-19.

[Student Enrollment Patterns and Achievement in Ohio’s Online Charter Schools](#)

(2017) by June Ahn and Andrew McEachin

- This study used data from 1.7 million students in Ohio to study “a specific sector of online education: K–12 schools that deliver most, if not all, education online, lack a brick-and-mortar presence, and enroll students full-time.”
- Students in the e-schools performed worse on standardized assessments than their peers in traditional charter and traditional public schools.

- As the authors conclude: “One potential but simplistic interpretation is that online schools are unequivocally negative for K–12 learners and policy should deter these school forms. A more nuanced understanding is that online schools—in its current form as a largely independent learning experience—are not effective for K–12 learners. Instead, learners still need the presence of teachers, mentors, or peers to help them through the learning process.”
- The lit review in this paper is useful. As the authors write:

“Compared to the parallel literature on the effect of various forms of school choice (e.g., traditional charter schools, vouchers, private schools), there is relatively little research on how online learning works for K–12 students ([Barbour & Reeves, 2009](#)). Online learning for K–12 students occurs in a variety of settings such as: students taking an online course or two to supplement offerings at their traditional public school, learners using online courses for credit recovery, students using online tools to complement face-to-face courses, and students fully enrolling in e-schools.... A national evaluation of online charter schools provides the best evidence to date about the impact of online schools on student learning ([CREDO, 2015](#)). The study found that students in online charter schools perform significantly worse than students with similar demographics and prior achievement in traditional public schools, often ranging from $-.10$ *SD* to $-.30$ *SD*. The study also provides detailed information on the programmatic and curricular differences between online and traditional public schools.... Recent studies of online course taking and online learning in higher education also suggest that students in online settings learn less than students in traditional settings ([Hart et al., in press](#); [Heissel, 2016](#)). Furthermore, students in home-based and online charter schools in California in the early 2000s performed worse than their peers in traditional public schools ([Buddin & Zimmer, 2005](#); [Gill, Timpane, Ross, Brewer, & Booker, 2007](#)).

[A Look Inside Online Educational Settings in High School: Promise and Pitfalls for Improving Educational Opportunities and Outcomes](#)

(2019) by Heinrich et al.

- This study highlights some of the challenges of online course-taking in high school—a strategy that has been used frequently for students who have fallen behind in their progress toward graduation. Drawing on data from a large urban district, the authors found mostly negative associations between online course-taking and math and reading scores, although there were some gains in credits earned and grade point averages in the upper grades. Students who were least prepared academically and those with weaker course-taking behaviors fared worse and seem to have been set back by online course-taking. The study found that resource constraints hampered the implementation of district-recommended practices and instructional supports, such as live teacher interactions and individualized content assistance.

What Have the Transitions to Remote Learning, in Response to the COVID-19 Outbreak, Looked Like?

The Center for Reinventing Public Education (CRPE) has collected a great deal of information about school and district responses to COVID-19. The [database](#) they developed includes information about more than 100 districts serving nearly 10 million students (including the NYC DOE), gathered mainly from websites, social media, and press coverage. They also conducted deeper-dive [case studies](#) in two big-city school districts (Baltimore and Chicago), one large suburban district (Aurora, CO), one rural district (Roaring Fork, CO), and two charter networks (Green Dot, which operates in Los Angeles, and LEARN, which manages schools in and around Chicago).

So far, [key insights](#) from CRPE's work include the following:

- The abrupt transition to remote learning in the spring did not go well. “Some districts took months to provide comprehensive learning programs. Others never came through. The impact on students was palpable, but remains largely unmeasured.” Most districts did not require teachers to provide live instruction, track engagement, or monitor academic progress. Affluent districts were twice as likely to require live, in-person lessons.
- This fall, while there were “obvious signs of improvement,” most districts were still not “fully prepared to meaningfully improve remote instruction.”
- At the beginning of the year, about 70% of urban districts in CRPE's sample planned to offer remote-only instruction, 9% planned to offer a hybrid model, and 12% planned to fully reopen for in-person classes (information was “not available” for the other 9%). Rural and suburban districts were much more likely to open in person. Ultimately, more than half of the districts in the sample delayed their reopening.
- The proportion of districts requiring live, in-person instruction increased dramatically between the fall and the spring. Likewise, most districts now have clearer guidelines around tracking attendance and grading.
- CRPE found little evidence of districts prioritizing the needs of vulnerable populations. Few of the reopening plans they reviewed even mentioned homeless, foster youth, or chronically absent students; most offered no concrete steps for helping students catch up from learning loss; and few provided any specifics about how racial equity would be addressed.
- Many districts are seeing huge drops in enrollment (e.g., in Miami-Dade County, 16,000 fewer students enrolled this year; Los Angeles saw a 14% decline in kindergarten enrollment).
- Bright spots described in CRPE's [case studies](#) include the work that many schools have done to address needs for meals and social services; to provide families with devices and internet connections; and to improve the delivery of remote instruction over time.

Among the most important—and as yet unanswered—questions about the school closures that took place last spring is how they affected students' academic trajectories. [This study](#) (May 2020), from the Annenberg Institute at Brown University, offers “a series of projections of

COVID-19-related learning loss and its potential effect on test scores in the 2020-21 school year based on (a) estimates from prior literature [on the effects of missing school due to absenteeism, summer breaks, and school closures] and (b) analyses of typical summer learning patterns of five million students [across the U.S.].” The authors found that students were likely to return in fall 2020 with approximately 63-68% of the learning gains in reading relative to a typical school year and with 37-50% of the learning gains in math. Further, they estimated that “losing ground during the COVID-19 school closures would not be universal, with the top third of students potentially making gains in reading.”

The cancellation of standardized state tests in spring 2020 has complicated efforts to assess students’ academic progress. This [Blueprint](#) from FutureEd provides a helpful framework for how states, school districts, and individual schools might approach student assessment in the 2020-2021 school year. The guide includes ideas for gathering information not only about students’ learning, but also about their experiences with remote instruction, their needs in and outside of the classroom, their social and emotional well being, and their perspectives on school culture and climate.

What Does the Research Say About Personalized Learning?

[Informing Progress: Insights on Personalized Learning Implementation and Effects](#)

(2017) by John F. Pane, Elizabeth D. Steiner, Matthew D. Baird, Laura S. Hamilton, and Joseph D. Pane, RAND Corporation

This study found that 32 “personalized learning schools” (which were part of the Next Generation Learning Challenges initiative) produced small positive affects—about 3 percentile points—on students’ math and reading scores.

The authors acknowledge that, to date, “there is no single definition of” personalized learning. The research team developed their own working definition “based on conversations with practitioners and experts in the field.” As they wrote:

“Personalized learning prioritizes a clear understanding of the needs and goals of each individual student and the tailoring of instruction to address those needs and goals. These needs and goals, and progress toward meeting them, are highly visible and easily accessible to teachers as well as students and their families, are frequently discussed among these parties, and are updated accordingly.

...In a PL classroom, students’ learning objectives, pace, and content are likely to vary to a greater extent than they would in a non-PL school.... Technology can play a role in supporting the complexity of the personalization process. When properly supported by teachers, it can help students learn independently and work at their own pace. Technology can also enable educators to take a more personalized approach in their teaching efforts and other activities they undertake to support student learning and development.”

This useful [brief, also from John Pane at RAND](#), (2018) acknowledges both the “lack of evidence” and “considerable enthusiasm about personalized learning among practitioners and policymakers.” Pane’s brief aims to provide “strategic guidance for designers of personalized learning programs to consider while the evidence base is catching up”—drawing on “theory, basic principles from learning science, and the limited research that does exist on personalized learning and its component parts.” The recommendations include:

- *Embrace rigorous empirical evidence where it exists* (e.g., a large body of research finds that “tutoring does not work due to individualization alone. It works due to individualization plus nurturing and attention.”—Pane argues that these findings underscore “the value of an approach where students regularly engage with educators, even if technology takes responsibility for some individualization of content and pacing.”)
- *Align with principles of learning science* (e.g., see the IES-sponsored [Organizing Instruction to Improve Student Learning](#); also “research gives reason to be wary of some popular ideas in the personalized learning movement, such as the idea that today’s learners are digital natives for whom older methods of teaching no longer work, that learning should be matched to a student’s learning style, or that students should be given maximum control over what they learn and their learning trajectory”).
- *Focus on the productive use of student time and attention.*
- *Maximize the productive use of teacher skill* (“conserve teachers’ time and effort for activities that are most directly helpful to students”).
- *Use rigorous instructional materials* (leverage the “decades of work (that) have gone into developing rigorous academic standards and aligned instructional materials,” including through the Common Core).
- *Monitor implementation and be prepared to adapt*, with a particular focus on equity (e.g., “Careful monitoring... to ensure that students who are working on more-basic material in relation to their grade-level peers are not somehow excluded from learning higher-level material.”)

What Does the Research Say about Specific Technology-Based Tools and Programs?

In a nutshell, there is very little rigorous research on the impact of particular tools and programs. Most of the studies we found explore associations between the amount of time students or schools use the tool and their outcomes. While some of these tools appear to be promising, there is a clear need for more rigorous experimental or quasi-experimental research. Below, we highlight findings from studies of several popular tools and platforms:

Khan Academy

- Khan Academy is a nonprofit online platform that offers “practice exercises, instructional videos, and a personalized learning dashboard that empower learners to study at their

own pace in and outside of the classroom.” Subjects include math, science, computer programming, and history designed for “all grade levels.”

- A [WestEd study](#) of the Elevate Math summer program, which provided 19 days of mathematics instruction, consisting of three hours per day in traditional classroom instruction and one hour per day using Khan Academy, found significant improvements in students’ math achievement and algebra readiness (vs. a control group that did not have access to the program).
- Other studies highlight correlations between students’ use of Khan Academy and positive outcomes, including higher test scores.¹ While some of these studies control for student characteristics and prior achievement, there is a dearth of rigorous experimental evidence about Khan Academy’s impact.
- These studies do provide some valuable lessons about implementation challenges and how they were addressed. For example, a [report by FSG](#) highlighted challenges related to basic technology capacity and know-how, and the need for teachers to “shift from their traditional ‘sage on a stage’ role to act more like coaches, differentiating instruction for each student.” The report emphasized the importance of “starting with a holistic vision of how personalized learning will improve student outcomes, rather than a focus on implementing technology”; “innovating with teachers and administrators to develop context-specific solutions,” rather than trying to mandate a one-size-fits-all approach; and ensuring that administrators and IT departments are engaged.
- Another [study by SRI](#) (2014) found wide variation in how Khan Academy was implemented. Teachers generally found it to be a useful resource, with 91% reporting that Khan Academy “increased their ability to provide students with opportunities to practice new concepts and skills they had recently learned in class.” 80% of teachers reported that Khan Academy “increased their ability to monitor students’ knowledge and ability, thus helping to identify students who were struggling.” The study also found positive relationships between Khan Academy use and “better-than-expected achievement and nonachievement outcomes, including level of math anxiety and confidence in one’s ability to do math.”

¹ See, for example:

https://cdn.kastatic.org/downloads/2018_LBUSD_Efficacy_Study_Research_Brief.pdf

<https://s3.amazonaws.com/KA-share/impact/learning-gets-personal.pdf>

<https://s3.amazonaws.com/KA-share/impact/khan-academy-implementation-report-2014-04-15.pdf>

Zearn

- Zearn is a nonprofit online math program used by 1.5 million elementary students across the U.S.
- Several [studies conducted and published](#) by Zearn show links between usage and improved math scores. This includes a study in NY State that found larger improvements for schools with high proportions of English learners and students receiving free and reduced price lunch.
- This [recent study](#) by researchers at Johns Hopkins examined the use of Zearn in 15 elementary schools in a “large urban school district” in NY State. The study documented positive perceptions of Zearn among teachers and students, but highlighted variation in implementation, including the fact that many schools did not meet weekly usage guidelines. Interviews suggested the need for more consistent and timely teacher PD. Teachers and administrators felt strongly that Zearn had increased students’ engagement and motivation in math. Regression-adjusted test scores were similar for treatment and control group students. Increased usage (i.e., time on Zearn and lessons completed) were associated with better test scores.

School of One / Teach to One

- School of One (SO1)—now known as Teach to One—is an individualized, technology-enhanced math instructional program.
- The [Research Alliance’s 2012 study](#) found that SO1 produced a mix of positive, negative and neutral results across schools and grade levels. Differences in SO1 impacts across subgroups of students did not follow a discernible pattern that would suggest SO1 was reliably more effective for some students and not for others. Exploratory analyses found that, for students who start off at low performance levels, exposure to on-grade-level skills in SO1 was associated with improvements on state test scores.
- A more recent federally funded [evaluation of Teach to One](#) (2018) in Elizabeth, NJ middle schools found a great deal of variation in both program implementation and outcomes, with no overall impacts on student achievement.

Summit Learning Program

- This personalized learning program was developed by a network of charter schools in California and Washington, and has received substantial investment from Facebook and the Chan Zuckerberg Initiative (which has provided funds totaling \$142 million since 2016).
- It is now being used by about 84,000 students in nearly 400 schools, across 40 states.

- It is notable that Summit Learning was designed as a “comprehensive personalized learning approach”—not “a remote learning solution”—although the Hechinger Report has found that many of the “schools that have most deeply embraced the model in their buildings have found it to be surprisingly transferrable.” ([This piece from Hechinger Report](#) provides a lot of interesting information about the Summit model and highlights its varied implementation across schools.)
- While Summit describes the model as “[evidence-based](#),” there appear to be no rigorous studies of the program’s impact. (A 2019 [Chalkbeat article](#) reported that Summit worked with researchers at Harvard to plan an evaluation, but it was never carried out.)
- This [study from Johns Hopkins University](#) found “significant problems in the use of the Summit Learning Platform”:

“When we observed students using Summit, they were not engaged with the software in optimal ways. Instead of watching videos or reading tutorial texts, students went straight to the exam and attempted to answer questions. When they answered incorrectly, corrective text popped up, which students did read; they then tried again with the next question. Even if students progressed according to plan, their learning would be limited to how to answer problems in the format presented by the Summit exam... The lack of teacher surveillance of student progress in some Summit classrooms meant that students worked very slowly through the material.... Off-task student behavior was the same as, or worse than, in the more traditional classrooms, with some students observably working on assignments from other classes, viewing YouTube videos (or similar), queuing songs on playlists, toggling between Summit and entertainment websites, or pausing on work screens while chatting with neighbors.”

Priorities for Future Research

The evidence available about remote and blended learning remains thin. While the studies highlighted here provide some useful insight and direction, we are struck by an overall lack of rigorous impact research, the fact that most of these studies do not reflect current conditions, and the inherent trouble in drawing conclusions for policy and practice on the basis of such limited information.

This past spring, schools in New York City and across the country faced the ultimate “building the plane while flying” situation—as they had to rapidly deploy new ways of delivering instruction, monitoring student needs, and providing academic, emotional, and material support. While this time has been enormously difficult for students, families, and educators, it has also created opportunities to learn. Failing to take advantage of those opportunities would be a disservice to everyone.

In light of the current lack of guidance and coordination at the federal level, the Research Alliance strongly encourages schools and districts—including the NYC Department of

Education—to collect, analyze, and share data that will help fill critical gaps in our knowledge base. This includes information about:

- COVID-19 testing results,
- Professional development aimed at helping teachers implement remote and blended instruction,
- Students' attendance and engagement (online and in person),
- Students' social and emotional wellbeing,
- Students' and families' experiences with remote and blended instruction,
- Teachers' experiences with remote and blended instruction, and—critically—
- What students are learning, over time.

All of this should be done with an eye toward pre-existing inequalities, especially differences linked to race/ethnicity, poverty, home language, and disability. These data are crucial for understanding how COVID-19 has affected the educational trajectories of different groups of students and for developing strong policy and practice responses. Among the questions that will be important to address:

- What kinds of training or other types of PD and support have proved most useful to teachers, and why?
- What practices, structures, or strategies have schools and teachers used to overcome the challenges associated with remote and blended learning? e.g., How have schools ensured that students have access to devices, wifi, and “tech support” needed for remote instruction? How have schools tried to promote student engagement and attendance? (And how are they defining “attendance” under the circumstances?)
- How are teachers differentiating instruction, and are there ways in which remote learning has actually facilitated more personalized support? How are teachers and other school staff working to meet students' social and emotional needs?
- How have parents and students experienced remote and blended learning? How has this varied by grade, neighborhood, race/ethnicity, home language, special education status, etc.?
- Which students and schools have lost the most ground relative to their recent academic trajectories? Which conditions and practices seem to have supported effective remote instruction? For example, did students who received a device early on have greater learning gains—or less learning loss—compared with students who received a device later? Did students who were contacted more frequently by a teacher, social worker, or parent coordinator have greater levels of engagement in online learning or less learning loss than other similar students?
- To what extent were non-core academics (e.g., art, music, gym) included in remote learning? Was greater “coverage” of subjects associated with any differences in student engagement or achievement?

- Was the use of particular online learning tools (e.g., Zearn, Flocabulary) or methods (e.g., live or recorded video of the teacher) associated with better outcomes? How did this vary for different subgroups of students?

Answers to these kinds of questions can inform real-time decisions at the school and district level. They can pinpoint where resources are needed and help schools and community partners provide targeted support for students, families, and teachers. This line of research can also shed light on the short- and long-term effects of the pandemic and raise awareness of policies and practices that helped young people succeed, in spite of the difficult circumstances.

The Research Alliance looks forward to working with the NYC Department of Education—and with other partners, in the City and beyond—to advance this important research and generate evidence that helps students and schools make the most of virtual and blended learning.

For More Information

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