Peggy Clements and Jessica Heppen

Making the Case for Online Education: Eighth-Grade Algebra

A better question than "Does online learning work?" might be "Under what circumstances and conditions does it have a positive impact on educational outcomes?"

SCHOOLS AND DISTRICTS are increasingly turning to online courses to expand learning opportunities for students, even though the research base supporting their effectiveness has been lacking. A 2009 US Department of Education review found only five studies in K-12 settings with research designs that provided enough evidence to suggest that online instruction yields positive effects. Meanwhile, a number of recent news stories have raised concerns about whether online learning—particularly full-time virtual schools—is fulfilling promises to support students' academic achievement. As a result, many are still asking whether online learning works.

Because we have conducted one of the first rigorous research studies of K-12 online learning, we think a better question than "Does online learning work?" is "What are the circumstances and conditions under which online learning can have a positive impact on educational outcomes?"

With our colleagues at the American Institutes for Research and Education Development Center, we recently published results of a study examining whether an online course is an effective way to expand eighth-graders' access to Algebra I. The study, *Access to Algebra I: The Effects of Online Mathematics for Grade 8 Students*, focused on mostly rural middle schools that did not offer Algebra I.

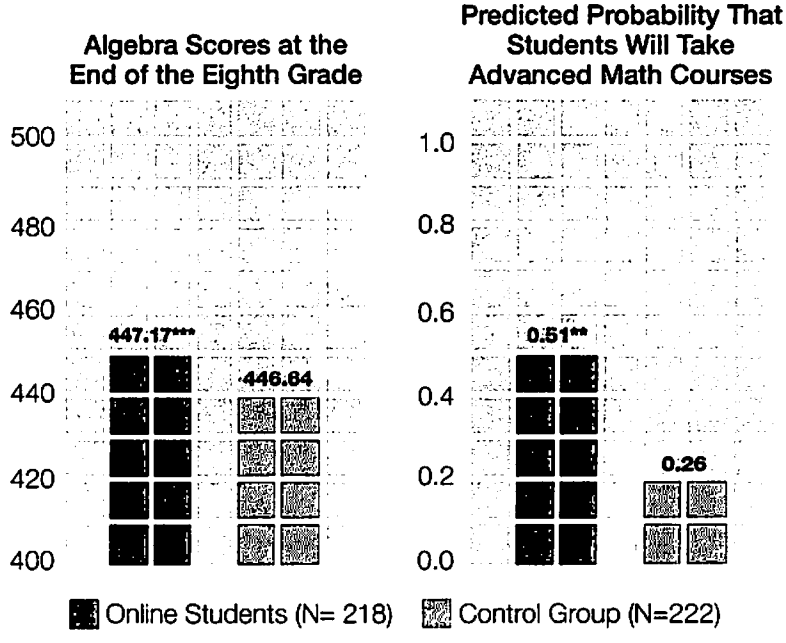
From the beginning, we knew that all of the schools provided algebraic content to students as part of their eighth-grade mathematics curriculum, and that a few of the schools offered a full Algebra I course to some of their "algebra-ready" students. The issue across the board was that none of the schools offered full access to Algebra I to all of their algebra-ready students. To evaluate the effects of using an online course, half of the schools (by random assignment) offered an online Algebra I course to their eligible students, while the other half offered their usual curriculum.

What we didn't know at the outset of the study was how—or even whether—schools chosen to implement the online course (which we call treatment schools) would do so over an entire academic year. Nor did we know whether students would stick with the course and how much they would learn.

We found that the schools could and did implement the online course as intended and that student persistence rates were high: 96 percent of them stayed in the course the entire year. We also found that students who took the online course *knew more algebra at the end of eighth grade* than did students who took the usual curriculum (in what we call control schools), with an effect roughly equivalent to moving from the 50th to the 66th percentile in algebra achievement.

They also were almost *twice as likely to participate in advanced math courses in high school*. Specifically, algebra-ready students from treatment schools had a 51-percent chance of participating in an advanced course sequence, compared with a 26-percent chance for students from the control schools that participated.

Impact of Online Learning on Math Scores



Note: ***score is statistically higher at the .001 level; **predicted probability is significantly higher at the .01 level.

In considering these findings, it's important to understand how the online course was implemented in this study. Students in the online course had access to an online teacher and an on-site proctor. The course was asynchronous, meaning teachers and students were not online at the same time, and all communication between them took place through messages within the learning management system.

The online course provider hired, trained, and supervised the online teachers, all of whom were experienced algebra teachers but new to online teaching. The primary information online teachers had about students' progress and performance was limited to the units students were working on and the percentage of correct answers on quizzes and exams.

Each participating school identified a school staff member to serve as the on-site proctor and assigned students to a regularly scheduled class period. The proctor did not have to be a math teacher and was not expected to provide instruction.

We wanted the context for the study to be a "real-world" setting, so we left it up to schools to determine how to assign students to class periods and proctors. In 80 percent of the schools, the eighth-grade math teacher served as the proctor and, in most of these schools, students taking the online course sat in the general eighth-grade math class while they accessed the online course.

Interactions between students and their online teachers and proctors didn't match what we expected to see. Online teachers spent less time communicating with students about course content than we expected. Proctors provided more content support than we anticipated—on average, they reported spending 50 minutes per week answering students' questions about algebra. Nonetheless, under these circumstances we found that for students considered ready for Algebra I, offering it online was an effective way to broaden access.

Based on what we learned, here are some recommendations we have come up with for your school or district as you consider providing students with access to online learning opportunities.

Be clear about your goals for online courses. In our study, the percentage of students who completed the online course across the schools varied. While there are likely many reasons for why these rates varied dramatically across schools, our conversations with teachers suggested that having students finish the course wasn't a top priority for everyone.

Therefore, we recommend clarifying the reasons for offering the online course and the associated goals so that teachers, online course providers, students, and parents are on the same page.

Think about the type and frequency of communication and direct instruction you expect from online teachers. Our study can't determine whether more frequent communications with the online teacher would have resulted in more students finishing the online course or learning more algebra, but the fact that on-site proctors report spending an average of 50 minutes per week answering students' questions about algebra suggests that some students needed—or at least wanted—either more instruction or a different kind of instruction.

Schools should consider what type of instructional support they anticipate students will need to be successful, and should investigate whether and how this support will be available. Schools should ensure that online courses they use are taught by teachers who have been trained to be attuned to signs that a student needs help. In our study, more than half of the online algebra students went on to take more advanced courses in high school, but it's possible this percentage would have been higher had students had more instructional support.

Clarify the role of the on-site proctor. The proctor played an important role in many of the schools. Most schools placed the online Algebra I students with the math teacher as proctor, so it's not surprising that students turned to their proctors for help. Students are socialized to ask their teachers questions, and teachers typically want to help.

If the goal is for the online teacher to be the instructor to whom students turn with course content questions, students will need support to make this transition. This may begin with helping students learn how to identify when they need help, as it can be more difficult for an online teacher to see when a student is struggling.

Given that many students already communicate effectively online with people they don't know very well, making this transition in their educational life may require only a shift in the focus and tone of their online communications.

Our study showed that the online course effectively expanded eighth-graders' access to Algebra I, albeit in a context in which online teachers and students interacted less than anticipated and proctors provided more content support than expected. We don't know whether or how these factors made a difference. The best ways to implement online courses in secondary schools are still emerging, but these are the types of questions that further the research. the

Peggy Clements, research scientist at Education Development Center, and **Jessica Heppen**, principal research analyst at the American Institutes for Research, were coprincipal investigators of the study *Access to Algebra I: The Effects of Online Mathematics for Grade 8 Students*, published by the US Department of Education in December 2011.

LINKS

- **Understanding the Implications of Online Learning for Educational Productivity**
  ed.gov/about/offices/list/os/technology/implications-online-learning.pdf
- **Transforming American Learning: Learning Powered by Technology**
  ed.gov/technology/netp-2010
- **Distance Education Courses for Public Elementary and Secondary School Students: 2009-10**
  nces.ed.gov/pubs2012/2012008.pdf