Study shows program improves teaching skills, students' word problem–solving

June 14 2022, by Mike Krings

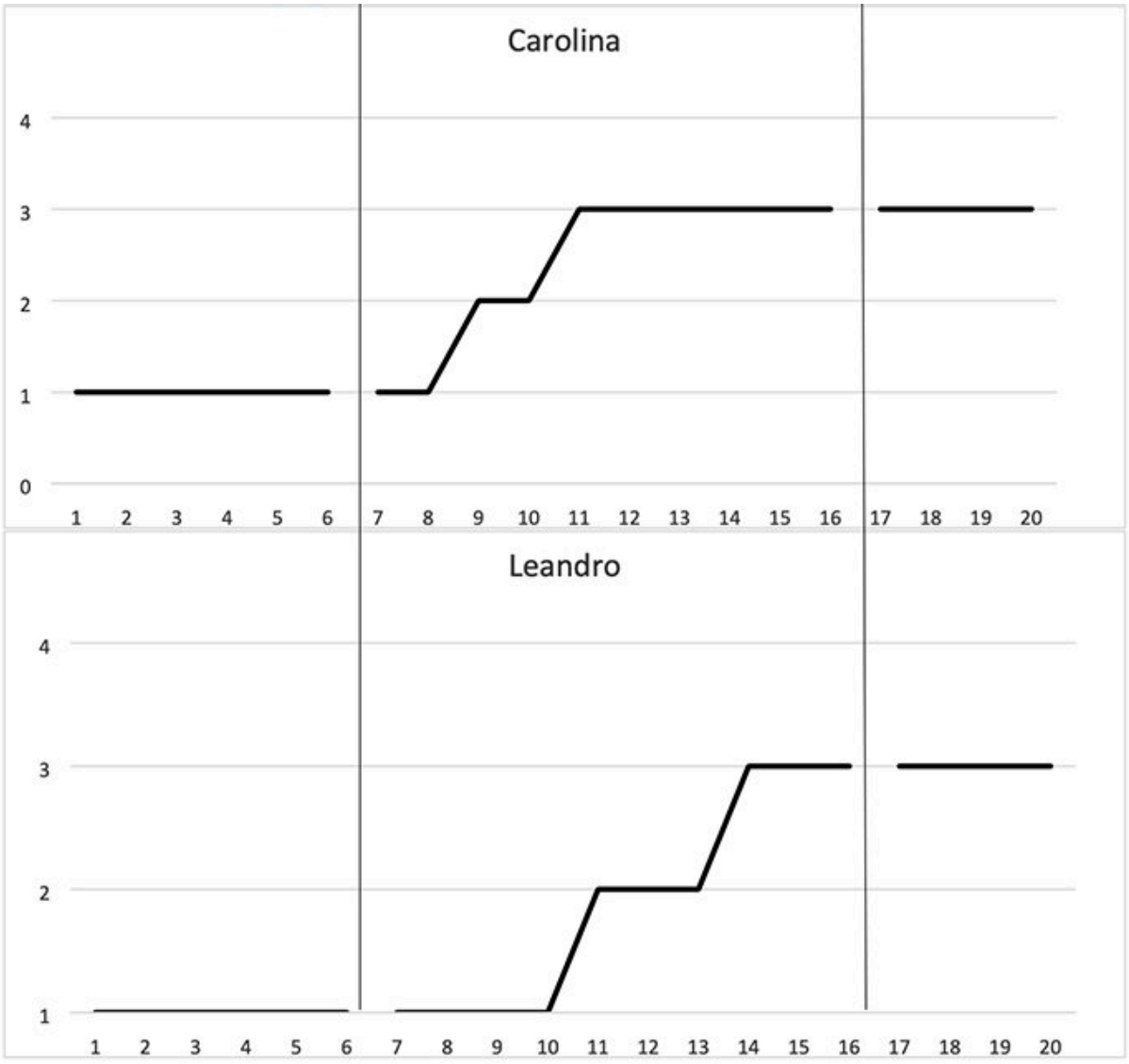

Figure 1. Students' performance across the baseline, intervention, and maintenance phases.

Credit: Michael J. Orosco et al

Students learning to solve math word problems can struggle to combine mathematical and language skills. For English language learners, the fastest-growing minority in U.S. schools, that challenge can be even greater as they attempt to learn math concepts in a second language. Published in the *Journal of Learning Disabilities*, a new study from the University of Kansas has found that a professional development intervention with evidence-based practices helped an educator improve her teaching skills and boosted students' abilities to solve word problems and maintain their improvement.

Michael Orosco, associate professor of educational psychology at KU, co-wrote a study in which he provided a professional development intervention to help a third grade special education teacher model concepts for students in solving word problems as well as help them understand difficult vocabulary. The teacher then used those skills in teaching nine Hispanic English-learning students with math learning disabilities. Each of the students progressed from the level at which they started into solving more difficult problems and maintained the improvement after the intervention.

The study is an example of how professional development can be viewed as implementation science, a practice in which research is transferred effectively into practice. In the case of professional development for a teacher, it can be a more effective way to apply what is learned in research to what teachers practice in the classroom.

"Professional development is one of the biggest next steps we're going to have to think about in education," Orosco said. "Especially with teachers who have high levels of diversity and English learners in their classes. In

this case we were able to apply it to word problems, which are a precursor to algebra."

The study, which Orosco co-wrote with Deborah Reed, professor of special education at the University of Iowa, was published in the *Journal of Learning Disabilities*, a special educational journal by Google Scholar. For the study, Orosco worked with a teacher who wanted further training on how to teach math concepts to English learners with math learning difficulties. The intervention, based on evidence-based practices, took a baseline measure of the students' abilities, trained the teacher in instructional scaffolding—or how to better model word problem-solving skills, contextualize questions and teach math vocabulary to the population—and then retested their abilities after implementation.

The success of both the teacher and students are evidence that individualized professional development interventions are a valuable alternative to randomized, controlled trials, in which interventions are tested with dozens or even hundreds of students and multiple teachers.

"In public education, you can't control for all variables, because there are always unique characteristics with different students, different communities and many other factors," Orosco said. "Single case research is ideal in this case. If one teacher needs help, let's give it to them. If one school needs help, let's give it to them. And if one teacher needs additional help, we can give it to them."

The intervention trained the teacher not only to help contextualize ideas in a second language for the students, but helped the teacher and students communicate, and the students showed they were able to reflect on their experiences. It also helped develop a "feedback loop" between educator and students, in which the former offered instruction and encouragement, the latter could ask questions, and if a student did not understand, they could pause the lesson and focus more on the concept

in question. Following the intervention, the students took a standardized test to gauge their word problem-solving ability, and all nine had maintained their improvements and abilities to solve more difficult problems, indicating what Orosco calls a "transfer effect" of the research to the teacher and in turn to the students.

Orosco, who has published research in both randomized clinical trials and single-case experimental design for word problem-solving for English learners and tools to help educators reach the same population, said the current study with a single-case design is ideal for translating evidence-based research directly to classrooms and helping teachers, who often do not have the time to find published research and attempt to translate it into their own work.

"Our teacher in this study was able to get these kids to solve word problems at higher levels, which is not only addressing math skills, but language skills as well," Orosco said. "We do this to show that this is solid, practical implementation science. This is doable, and schools can build it into their practices. We have a lot more work to do in professional development to help teachers."

More information: Michael J. Orosco et al, The Effects of Professional Development on English Learners' Problem Solving, *Journal of Learning Disabilities* (2022). DOI: 10.1177/00222194221099671

Provided by University of Kansas