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from EVIDENCE to POLICY

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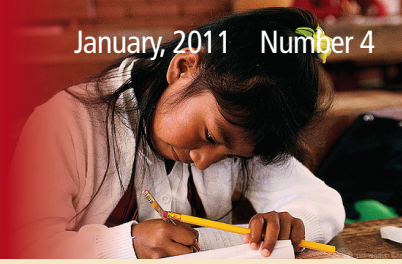

a note series on learning what works, from the Human Development Network

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Can Computers Help Students Learn?

Policymakers and development experts seeking to improve the quality of education are interested in the role technology can play. Not only do they want to use technology to directly aid learning, but they also want to ensure that students in developing countries – and poor communities everywhere – get the same exposure, and same education benefit, from technology as do their counterparts in wealthier parts of the world. Bringing computers into the schoolroom is seen by experts as one way to do this. But just making technology available may not be enough. Policymakers and development experts need to know how to ensure the technology is used effectively.

The World Bank is at the forefront of helping developing countries provide their students with the best educational opportunities, while working to meet the United Nations Millennium Development Goal of ensuring primary education for every child. To assist educators, policymakers and education experts understand how technology may boost the quality of education, the World Bank supported a two-year study of a program in Colombia that places computers in public schools. The study failed to find that the computers led to any measurable increase in student test scores. Researchers suggested this could be because teachers and students mainly used the computers to learn how to use computers, instead of using them as a part of the teaching process. The results do not mean that computers and other information and communications technologies cannot raise educational quality. But it does offer a cautionary note to those seeking to increase the availability of such technology tools: being able to access technology is not always enough – people may also need training in how to use the technology to reach the stated educational goals.

Case Study Colombia

A public-private partnership in Colombia, called Computers for Education, was created in 2002 to increase the availability of computers in public schools for use in education. The national program gives public schools refurbished computers and provides training so teachers learn how to use the computers in class. To be considered, schools must have a separate room that can be refitted to place the computers.

Did You Know…

Ownership of home computers in Colombia more than doubled between 2007 and 2009, reaching 13 percent.

But this is still low compared with Chile (57 percent), Brazil (51 percent) and Mexico (32 percent)

Television is more commonplace. Almost every household has one.

–The Nielson Company

Schools picked are linked to a local university, which designs a teaching strategy and helps implement 20 months of training in the schools for the teachers. Training covers computer installation, classroom management strategies and a separate phase focused on using the computer to strengthen student skills, with a focus on Spanish language reading and writing and math. Teachers are introduced to and taught how to use educational software in classroom teaching. Since starting, the program has installed more than 73,000 computers in over 6,300 public schools in more than

1,000 municipalities. By 2008, over 2 million students and 83,000 teachers had taken part.

To test the effect of the program, researchers randomly assigned 100 schools eligible for the program into either a treatment or a control group. A baseline survey was conducted before the program started, followed by another survey two years later. Researchers collected data from students in grades three to 11, the math and Spanish teachers, and the principal. A follow-up was conducted two years later. In both cases, the survey for students included questions about socioeconomic background, school attendance, study habits and grades, attitude toward school and use of computers. A short version of the national Colombian Saber assessment exam was also given. Researchers focused on students who were in grade three through nine at the baseline period. By focusing on lower grades, they avoided including students who were more likely to drop out or graduate before the study was over. Teachers were asked about their knowledge and use of computers in class, while school heads were asked about the school in general.

A total of 8,216 students began in the study, with an even distribution of students across grades and genders. Two years later, 37 percent of all students in the study had dropped out of school, likely because the schools were in rural areas where migration was high. The drop-out rate did not affect the distribution of students in the treatment and control groups.

The Findings

Students in schools that received the computers and teacher training did not do measurably better on tests than students in the control group. Nor was there a positive effect on other measures of learning.

The program's stated goal was to train teachers to use computers in specific subjects, with a focus on incorporating the computers into classroom teaching of Spanish and math. In Spanish classes, students on average correctly answer about 40 percent of test questions. Among students in the schools that received computers, test scores were 1.7 percent higher than students in the control group, a statistically insignificant result. In math, another subject included in the program, there also was no positive – or negative – difference in test scores between students in the treatment and control groups. This was consistent regardless of grade, subject and type of student.

Researchers did not find any difference in test scores when they looked at specific components of math and language studies, such as algebra and geometry, and grammar and paraphrase ability in Spanish.

There simply was no difference in how well students did, regardless of whether or not they were in a school that had the additional computers. Overall, the study showed that the program had little or no effect on everything ranging from student test scores to the probability that a student liked school.

Part of the reason may be that although computers were available, teachers did not use them very often.

Less than half of language teachers in schools that received computers and training reported that they used a computer

This bulletin summarizes the results of the research paper "The use and misuse of computers in education: Evidence from a randomized experiment in Colombia," by Felipe Barrera-Osorio and Leigh L. Linden. Financial support for the research study also was provided by the Colombia Computers for Education program. Full study can be found at: http://econ.worldbank.org.

in the previous week, compared with 17 percent of teachers in the control group. Math teachers reported similar usage.

And when teachers did use the computer, it generally was not as a teaching aid or for other classroom activities.

Teachers in schools that received computers and training reported using the computers about half a day more a week than those in the control group. But they did not report that they used the computers as teaching aids during math and language classes. Researchers suggested that teachers might be using the computers to help prepare for class activities, instead of for teaching.

The higher computer use by teachers also was concentrated among those teaching grades three through five. By sixth grade, the computer usage in treatment schools declined to the same levels of that in the control group schools.

Schools in the program reported a 20 percent increase in use of computers by 3rd grade Spanish teachers, declining to 16 percent for 4th grade teachers, and further declining in higher grades.

Similarly, students did report using computers more often than those in the control group…

About 66 percent of students in schools in the program reported using a computer in the previous week, compared with 41 percent of students in the control group. Most of the increase was in school, which makes sense because the schools had received additional computers.

…but they used the computers mainly in classes in which they were taught how to use a computer, not in math and Spanish.

Most of the increased usage among students in the treatment group came from using the computers for their computer classes. Only three to four percent of students, in both the treatment and control groups, reported using computers as a learning aid in Spanish classes, for example.

Overall, the program did meet its goal of putting computers in schools, increasing the number in the treatment schools by almost 300 percent.

In the control group, schools had an average of 5.1 computers, compared with 13.4 in schools in the program. (Each school had 80 or more students.)

It also successfully provided special computer training.

Some 95 percent of teachers in the treatment group did receive training, compared with 8 percent in the control group.

But teachers did not implement the final, and key part, of the program, which was to incorporate the technology into their teaching.

Studies on the relationship between using computers in the classroom and improved test scores in developing countries give mixed results: A review of Israel's Tomorrow-98 program in the mid-1990s, which put computers in schools across the country, did not find any impact on math and Hebrew language scores.* But in India, a study of a computer-assisted learning program showed a significant positive impact on math scores.** One thing researchers agree on, more work is needed in this field.

* Angrist, J. and Lavy, V. (2002) "New Evidence on Classroom Computers and Pupil Learning". *Economic Journal,* 112, pp. 735-765.

** Linden, L., Banerjee, A. and Duflo, E. (2003), "Computer-Assisted Learning: Evidence from a Randomized Experiment", Poverty Action Lab Paper No. 5, October.

Conclusion Making policy from evidence

Getting new technology into schools to aid student learning is a key goal of many development organizations, private groups and educators. But as this study to measure the impact of computers in the classroom shows, providing technology and training is not necessarily enough to ensure that the technology is incorporated into the classroom experience.

Policymakers and researchers need to keep this in mind as they pursue programs to create a better educational environment through increased use of technology. Teachers may need more monitoring or training to ensure they use the technology as envisioned by the program. Programs may need to include extra components – such as incentives for teachers who use computers in the classroom, or extra instruction in specifics of computer-assisted teaching – to make sure the technology into the education process.

Technology, and especially computers, may help students learn better and help teachers be more effective. But as this study shows, getting to that point may require policymakers to do more than make technology available. Successful implementation may require a more hands-on approach to following teachers, and students, as they adjust to these new educational tools.

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