

# Improved information and communication technology infrastructure leads to better math skills, research suggests

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Credit: Radboud University

Students who are more digitally skilled also perform better in math. New research from Renae Loh and others at Radboud University shows that in countries with better availability of information and communication technology (ICT) in schools, math performance benefits greatly. It further suggests that improving the ICT environment in schools can reduce inequality in education between countries. [The paper is published in \*European Educational Research Journal\* today.](#)

For anyone growing up today, ICT skills play a tremendously important role. Today's youth constantly come into contact with technology throughout their life, both in work and leisure. Though previous studies have shown the importance of ICT skills in students' learning outcomes, a new study focuses specifically on its relevance to [math](#) and how that differs between countries.

"Both ICT and math rely on structural and logical thinking, which is why ICT skills overlap with and boosts math learning. But we were also curious to find out how much of that depends on a country's ICT environment," says Renae Loh, primary author of the paper and a sociologist at Radboud University.

## **Benefits of a strong ICT infrastructure**

Loh and her colleagues used data from the 2018 PISA Study and compares 248,720 students aged 15 to 16 across 43 countries. Included in this data is information about the ICT skills of these students. They were asked whether they read new information on [digital devices](#), and if they would try to solve problems with those devices themselves, among other questions. The more positively students responded to these questions, the more skilled in ICT the researchers judged these students to be.

Loh says, "What we found is that students get more educational benefit

out of their digital skills in countries with a strong ICT infrastructure in education. This is likely because the more computers and other [digital tools](#) are available to them in their studies, the more they were able to put those skills to use, and the more valued these skills were. It is not a negligible difference either."

"A strong ICT infrastructure in education could boost what math performance benefits students gain from their digital skills by about 60%. Differences in ICT infrastructure in education accounted for 25% of the differences between countries in how much math benefits students gain from their digital skills. It is also a better indicator than, for example, looking at a more general indicator of country wealth, because it is more pinpointed and more actionable."

## **Reducing inequality**

Especially notable to Loh and her colleagues was the difference that was apparent between countries with a strong ICT infrastructure, and countries without. "It was surprisingly straightforward, in some ways: the higher the computer-to-student ratio in a country, the stronger the math performance. This is consistent with the idea that these skills serve as a learning and signaling resource, at least for math, and students need opportunities to put these resources to use."

Loh points out that there are limits to the insight offered by the data, however. "Our study doesn't look at the process of how math is taught in these schools, specifically. Or how the ICT infrastructure is actually being used. Future research might also puzzle over how important math teachers themselves believe ICT skills to be, and if that belief and their subsequent teaching style influences the development of students, too."

"There is still vast inequality in education around the world," warns Loh. "And now there's an added ICT dimension. Regardless of [family](#)

[background](#), gender, and so on, having limited access to ICT or a lack in digital skills is a disadvantage in schooling. What is clear is that the school environment is important here. More targeted investments in a robust ICT [infrastructure](#) in education would help in bridging the educational gap between countries and may also help to address inequalities in digital skills among [students](#) in those [countries](#)."

**More information:** Renae Sze Ming Loh et al, Do students' ICT skills pay off in math performance? Examining the moderating role of countries' ICT promotive environment, *European Educational Research Journal* (2023). [DOI: 10.1177/14749041231201197](https://doi.org/10.1177/14749041231201197)

Provided by Radboud University

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