STUDENTS, COMPUTERS AND LEARNING
MAKING THE CONNECTION
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Presentation

Are there computers in the classroom? Does it matter? Students, Computers and Learning: Making the Connection examines how students’ access to and use of information and communication technology (ICT) devices has evolved in recent years, and explores how education systems and schools are integrating ICT into students’ learning experiences.

Based on results from PISA 2012, the report discusses differences in access to and use of ICT – what are collectively known as the “digital divide” – that are related to students’ socio-economic status, gender, geographic location, and the school a child attends. The report highlights the importance of bolstering students’ ability to navigate through digital texts. It also examines the relationship among computer access in schools, computer use in classrooms, and performance in the PISA assessment. As the report makes clear, all students first need to be equipped with basic literacy and numeracy skills so that they can participate fully in the hyper-connected, digitised societies of the 21st century.
Summary

Information and communication technology (ICT) has revolutionised virtually every aspect of our life and work. Students unable to navigate through a complex digital landscape will no longer be able to participate fully in the economic, social and cultural life around them. We need to get this right in order to provide educators with learning environments that support 21st-century pedagogies and provide children with the 21st-century skills they need to succeed in tomorrow’s world.

Results of the report suggest that students who use computers moderately at school tend to have somewhat better learning outcomes than students who use computers rarely. But students who use computers very frequently at school do a lot worse in most learning outcomes. These findings tell that, despite the pervasiveness of information and communication technologies (ICT) in our daily lives, these technologies have not yet been as widely adopted in formal education.

One interpretation of all this is that building deep, conceptual understanding and higher-order thinking requires intensive teacher-student interactions, and technology sometimes distracts from this valuable human engagement. Another interpretation is that we have not yet become good enough at the kind of pedagogies that make the most of technology. Adding 21st-century technologies to 20th-century teaching practices will just dilute the effectiveness of teaching.

The impact of technology on education delivery remains sub-optimal mainly because:

- we may overestimate the digital skills of both teachers and students,
- of naïve policy design and implementation strategies,
- of a poor understanding of pedagogy,
- of the generally poor quality of educational software and courseware.

The real contributions ICT can make to teaching and learning have yet to be fully realised and exploited. Technology is the only way to dramatically expand access to knowledge:

- It allows teachers and students to access specialised materials well beyond textbooks, in multiple formats, with little time and space constraints.
- It provides great platforms for collaboration in knowledge creation where teachers can share and enrich teaching materials.
- It can support new pedagogies that focus on learners as active participants with tools for inquiry-based pedagogies and collaborative workspaces.

To deliver on the promises technology holds, countries will need a convincing strategy to build teachers’ capacity. And policy-makers need to become better at building support for this agenda. Given the uncertainties that accompany all change, educators will always opt to maintain the status quo. If we want to mobilise support for more technology-rich schools, we need to become better at communicating the need and building support for change. It is vital that teachers become active agents for change, not just in implementing technological innovations, but in designing them too.
Main Observations

The connections among students, computers and learning are neither simple nor hard-wired; and the real contributions ICT can make to teaching and learning have yet to be fully realised and exploited. But as long as computers and the Internet continue to have a central role in our personal and professional lives, students who have not acquired basic skills in reading, writing and navigating through a digital landscape will find themselves unable to participate fully in the economic, social and cultural life around them. Amidst the decidedly mixed messages that are drawn from the PISA data, a few critical observations emerge.

The foundation skills required in a digital environment can and should be taught.

- Reading on line requires the same skills as reading a printed page – with the important addition of being able to navigate through and among pages/screens of text, and filtering the relevant and trustworthy sources from among a large amount of information.
- Korea and Singapore being in the top performer in digital reading without an extensive exposure to technologies at school suggest that many of the evaluation and task-management skills that are essential for online navigation may also be taught and learned with conventional, analogue pedagogies and tools.

Improve equity in education first.

- Ensuring that every child attains a baseline level of proficiency in reading and mathematics will do more to create equal opportunities in a digital world than what can be achieved by expanding or subsidising access to high-tech devices and services.

Teachers, parents and students should be alerted to the possible harmful aspects of Internet use.

- Schools can educate students to become critical consumers of Internet services and electronic media, helping them to make informed choices and avoid harmful behaviours.
- Parents can help children to balance the use of ICT for entertainment and leisure with time for other recreational activities that do not involve screens, such as sports and, equally important, sleep.

To improve the effectiveness of investments in technology, learn from experience.

- While PISA results suggest that limited use of computers at school may be better than not using computers at all, using them more intensively than the current OECD average tends to be associated with significantly poorer student performance.
- It takes educators time and effort to learn how to use technology in education while staying firmly focused on student learning. Technology can amplify great teaching, but great technology cannot replace poor teaching.
Report Structure

Data in the report were drawn from the 2012 Programme for International Student Assessment (PISA) from the OECD. PISA is a triennial international survey which aims to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students. Analyses in the report are based on several indices:

- The index of ICT use at school
- The index of ICT use outside of school for leisure
- The index of ICT use outside of school for schoolwork
- The Index of computer use in mathematics lessons
- Four indices of mathematics teachers’ behaviour (student orientation, formative assessment, structuring practices, cognitive activation strategies)
- The Index of disciplinary climate in mathematics lessons
- The PISA index of economic, social and cultural status

The report is divided in 8 chapters each addressing a different side of the connection between students, computers and learning:

- Chapter 1. How students’ use of computers has evolved in recent years
- Chapter 2. Integrating information and communication technology in teaching and learning
- Chapter 3. Main results from the PISA 2012 computer-based assessments
- Chapter 4. The importance of navigation in online reading: Think, then click
- Chapter 5. Inequalities in digital proficiency: Bridging the divide
- Chapter 6. How computers are related to students’ performance
- Chapter 7. Using log-file data to understand what drives performance in PISA (case study)
- Chapter 8. Implications of digital technology for education policy and practice
Illustrations of Findings

The study features data from 64 countries and economies: 34 OECD countries and 30 partner countries or economies. We will present first the index of ICT use in schools in the different countries. Results are adapted from Figure 2.3 of the report:

The previous figure has to be studied in regard of results found for performances in digital reading and computer-based mathematics for each country. Those results are presented in Figure 3.2 and 3.11 of the report and are summarized below:

- The countries with the greatest integration of ICT in schools are Australia, Denmark, the Netherlands and Norway. Rapid increases in the share of students doing school work on computers can often be related to large-scale laptop-acquisition programmes, such as those observed in Australia, Chile, Greece, New Zealand, Sweden and Uruguay.
- Singapore, followed by Korea, Hong Kong-China, Japan, Canada and Shanghai-China were the top-performing countries/economies in digital reading in 2012; Singapore and Shanghai-China, followed by Korea, Hong Kong-China, Macao-China, Japan and Chinese Taipei were top performers in the 2012 computer-based mathematics assessment.
- Students in Australia, Austria, Canada, Japan, Slovenia and the United States, as well as students in partner countries/economies Macao-China and the United Arab Emirates, perform better on mathematics tasks that require the use of computers to solve problems compared to their success on traditional tasks. By contrast, students in Belgium, Chile, France, Ireland, Poland and Spain perform worse than expected on such tasks, given their performance on traditional mathematics tasks.
The two following graphs illustrates the fact that:

- Resources invested in ICT for education are not linked to improved student achievement in reading, mathematics or science.
- In countries where it is less common for students to use the Internet at school for schoolwork, students’ performance in reading improved more rapidly than in countries where such use is more common, on average.
- Overall, the relationship between computer use at school and performance is graphically illustrated by a hill shape, which suggests that limited use of computers at school may be better than no use at all, but levels of computer use above the current OECD average are associated with significantly poorer results. This is particularly clear in Figure 6.5 and 6.7 of the report.
Perspectives

In addition to the results presented here, two announcements were made by Andreas Schleicher (Director, OECD Directorate for Education and Skills) during a webinar session dedicated to the presentation of the “Students, Computers and Learning - Making the Connection” report:

- OECD is working on a report building up on these findings and that will deal with the Innovative Learning Environments that are available to schools.
- OECD is also currently consulting with various Industry stakeholders and Governments to suggest how countries can approach the questions behind the introduction of technologies in schools.

Sources

- PISA Results available at: http://www.oecd.org/pisa/ (in English and French)