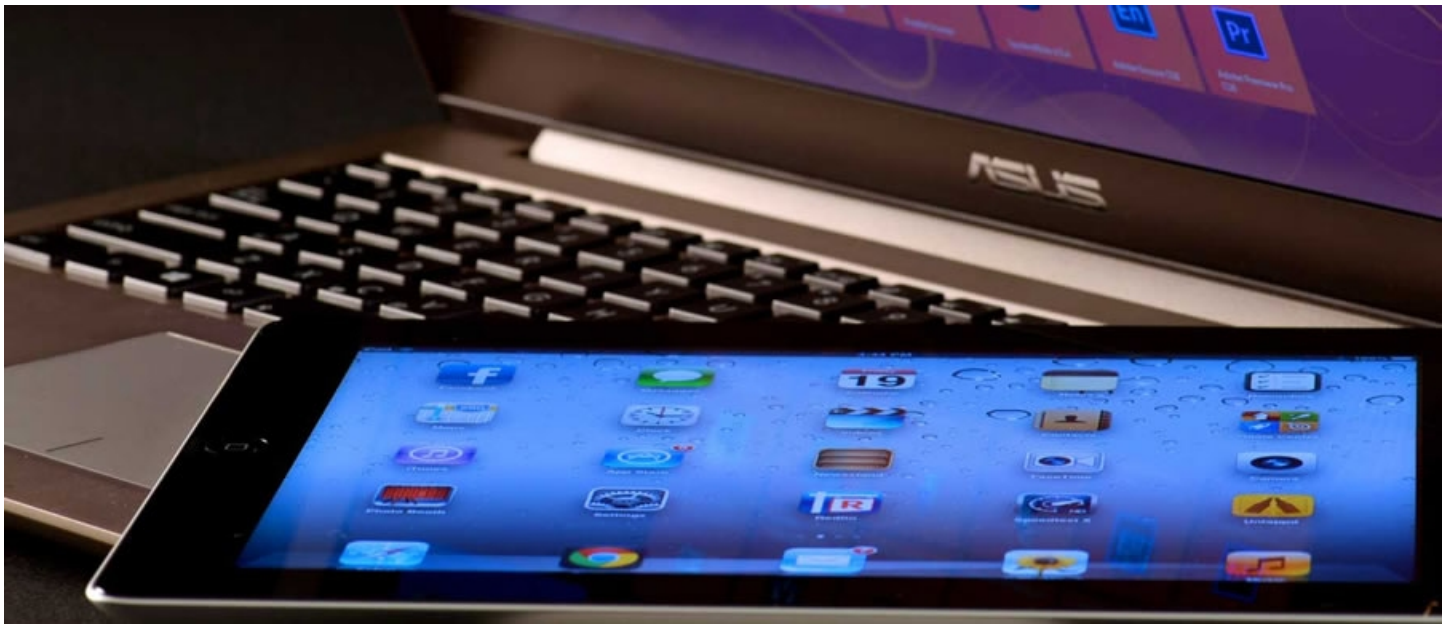
Australia’s heavy investment in computers in schools has not paid off



Australia’s heavy investment in computer-based technology in schools has failed to improve student performance in reading, mathematics and science according to a new report published by the OECD last week. Australian students are very high users of computer technology at school and at home, but this has not translated into learning improvements. The high expectations for new technology in schools have not been realised.

Australia has one of the highest expenditures per student on computers in school in the OECD and its students have the best access to computers at school in the OECD. On average, every 15 year-old student in Australia should have access to a computer at school. The number of students per school computer in Australia is the lowest in the OECD at 0.9. The average number of students per computer for the OECD is 4.7.

Australian students make the greatest use of computers at school in the OECD ? 94 per cent of 15 year-olds use a computer at school (equal with the Netherlands) compared to 72 per cent of students across the OECD.

Australia has by far the largest proportion of 15 year-old students using the Internet for school work at school at least once a week of any country in the OECD ? 81 per cent (equal with Denmark), compared to an average of 42 per cent. It also has the largest percentage using the Internet for school work outside of school – 76 per cent compared with the average for the OECD of 55 per cent.

Australia has the highest daily usage of the Internet at school in the OECD. On average, Australian students spend 58 minutes a day on the Internet at school which is more than twice the average of 25 minutes for the OECD. Denmark and Greece are the only other countries where students spend more than 40 minutes a day in class using the Internet.

Despite the heavy financial investment in computers in school and their high use in the classroom, there has been no improvement in Australia’s international test results. Reading, mathematics and science performance have all declined over the last decade.

It appears, then, that Australia may have over-invested in computers in schools both in financial terms and their use in the classroom. At the very least, Australian schools are failing to use computers effectively to improve learning.

One upside of Australia’s high use of computers in school is that students perform quite well on digital reading tests.

Australia is ranked equal 8th out of 31 countries participating in the tests. However, Australian students are nearly a year behind the top performing countries and average performance declined between 2009 and 2012 by 16 points on the PISA scale. This was the largest decline of any country except Hungary. Australia ranked 12th on computer- based assessment of mathematics.

The report shows that Australia is not alone in the failure of its investment in computers at school to improve education outcomes. The report found no evidence of any positive relationship between investment in technology and student achievement across OECD and other countries:

> The results also show no appreciable improvements in student achievement in reading, mathematics or science in the countries that had invested heavily in ICT for education. [p.3]
>
> Despite considerable investments in computers, Internet connections and software for educational use, there is little solid evidence that greater computer use among students leads to better scores in mathematics and reading. [p.145]

In fact, the data show that countries that have invested less in introducing computers in school have improved test scores faster, on average, than countries that have invested more. Results are similar across reading, mathematics and science. For example, between 2003 and 2012, students' performance in mathematics deteriorated in most countries that had reduced the number of students per computer.

One possibility is that such school resources were not used for learning. However, overall, measures of information and communication technology (ICT) use in classrooms and schools show often negative associations with student performance. Average reading proficiency, for instance, is not higher in countries where students more frequently browse the Internet for schoolwork at school. Indeed, student performance declined in countries where it is more common for students to use the Internet at school for schoolwork. In countries where it is less common, students' performance in reading improved more rapidly than in countries where such use is more common, on average. Similarly, mathematics proficiency tends to be lower in countries/economies where the share of students who use computers in mathematics lessons is larger.

The report states that these findings suggest that extensive use of computers may in fact have a negative effect on achievement:

> ....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. [p.16]

The report also found that the majority of other studies that have assessed the impact of allocating more resources for ICT in schools have few positive effects on education outcomes, even when the new resources did not displace other investments. It concludes:

> Overall, the evidence from PISA, as well as from more rigorously designed evaluations, suggests that solely increasing access to computers for students, at home or at school, is unlikely to result in significant improvements in education outcomes. [p.163]

The OECD report also found that greater use of computers in schools has not reduced achievement gaps between advantaged and disadvantaged students:

> ...perhaps the most disappointing finding of the report is that technology is of little help in bridging the skills divide between advantaged and disadvantaged students. Put simply, ensuring that every child attains a baseline level of proficiency in reading and mathematics seems to do more to create equal opportunities in a digital world than can be achieved by expanding or subsidising access to high-tech devices and services. [p.3]

In Australia, achievement gaps between advantaged and disadvantaged students have increased or remain unchanged for over a decade while differences in computer access have shrunk. There is now little difference, on average, in the number of students per computer in advantaged and disadvantaged schools in Australia. Australia has the smallest gap in the student-computer ratio at school between socio-economically advantaged and disadvantaged schools in the OECD.

The report also looks at what students most commonly do with computers and found that they generally engage in nine activities: chat on line; use e-mail; browse the Internet for schoolwork; download, upload or browse material from the school's website; post work on the school's website; play simulations; practice and repeat lessons, such as for learning a foreign language or mathematics; do individual homework; and use school computers for group work and to communicate with other students.

Across the OECD, students' use of computers at school is dominated by browsing the internet, with 42 per cent of students doing this once a week or more. When students did schoolwork at home, once again browsing was the most popular

activity. Little use appears to be made of computers for project-based, experiential learning.

The report found that the decline in student performance associated with high computer usage at school is associated greater frequency of certain activities, such as chatting on line at school and practicing and drilling, is particularly large. For example, using drilling and practice software products tends to lead to lower performance in mathematics and languages.

The report says that students who frequently engage in these activities may be missing out on other more effective learning activities. In contrast, students who never or only very rarely engage in these activities have the highest performance. Similarly, daily browsing of the Internet at school is generally associated with lower performance.

Positive findings on the use of computers in the classroom are limited to certain contexts and uses of ICT. These include when computer software and Internet connections are used to provide optimal learning opportunities by allowing students to assume greater control over the learning situation, individualising the pace at which new material is introduced, increasing study time, and opportunities for learning collaboratively.

The report concludes that schools and education systems across the OECD have generally failed to develop the potential of technology in learning:

> Gaps in the digital skills of both teachers and students, difficulties in locating high- quality digital learning resources from among a plethora of poor-quality ones, a lack of clarity on the learning goals, and insufficient pedagogical preparation for blending technology meaningfully into lessons and curricula, create a wedge between expectations and reality. If these challenges are not addressed as part of the technology plans of schools and education ministries, technology may do more harm than good to the teacher/student interactions that underpin deep conceptual understanding and higher-order thinking. [p.190]

Despite this, many schools around the world have managed to effectively integrate technology into teaching and learning and support quality teaching and student engagement. Many teachers use new technologies in the classroom for inquiry-based, project-based, problem-based or co-operative pedagogies. Good teaching, whether using the old technology of pens, paper and books or computer-based technology, remains the key factor in student learning in the classroom. New technology is not a substitute for good teaching. As the report states:

> Technology can amplify great teaching but great technology cannot replace poor teaching. [p.190]

> What this shows is that the successful integration of technology in education is not so much a matter of choosing the right device, the right amount of time to spend with it, the best software or the right digital textbook. The key elements for success are the teachers, school leaders and other decision makers who have the vision, and the ability, to make the connection between students, computers and learning. [p.191]

The failure of the huge investment in computer technology in schools to improve student results does not mean that schools can turn back the clock. Children are growing up in the digital age. It has revolutionised almost every aspect of life and work and children have to be able to become full participants in it. This in itself is sufficient justification for the use of computer technology in the classroom.

But, new technology has also facilitated new ways of teaching and learning. It has vastly expanded the range of information and resources available to teachers and students. It allows teachers and students to access specialised materials well beyond textbooks, in multiple formats, with little time and space constraints. It allows students to be active participants in their own learning through inquiry-based and collaborative teaching strategies. It also provides for greater collaboration in teaching where teachers can share and enrich teaching materials.

However, the OECD report shows most countries, including Australia, have so far failed to effectively integrate computer technology in the learning process. It suggests that more judicious choice of software products and continued emphasis on good teaching are fundamental to using computers more effectively in the classroom.

Many corporate vendors of computer-based products for the classroom have a simplistic view of teaching and learning and their products tend to be designed for practicing and drilling rather than problem-based, project-based and collaborative learning. Widespread use of such products has the effect of de-skilling teachers, standardising learning and little, often negative, effect on education outcomes.

The failure of heavy use of computers in the classroom to impact on learning outcomes also raises issues of teacher training in the use digital technology. It seems that many teachers are not confident in using new technology to create classroom situations for higher order learning. The adequacy of in-service training courses, the extent of funding for decent in- service training programs and the availability of release time in schools for teachers to attend courses are all matters that need to be addressed if Australia is to make more effective use of computer-based technology in the classroom. As the Director of Education and Skills in the OECD, Andreas Schleicher, says in the introduction to the report:

> 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.....We need to invest in capacity development and change-management skills, develop sound evidence and feed this evidence back to institutions, and back all that up with sustainable financing. Last but not least, it is vital that teachers become active agents for change, not just in implementing technological innovations, but in designing them too. [p.4]

This is quite an agenda for the new Federal Education Minister, Simon Birmingham.

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