



DIGITAL TECHNOLOGY / OVERVIEW

Technology in education: What the research says



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Summary

In a time when so many of our activities and interactions are influenced by technology, it is tempting to hail technology as the solution to many educational challenges. While numerous schools have substantially increased their technology use, the research base informing technology use in and for education remains limited. Furthermore, the use of technology in schools may be underpinned by assumptions about students' digital fluency which are not always borne out by the evidence base.

Digital natives v. digital immigrants

It is a common perception that there are generational differences in people's ability to engage with technology, with those who are comfortable with technology labelled 'digital natives' and those who are less comfortable using technology labelled 'digital immigrants.' More specifically, young people and students who have been around digital technology all their lives are positioned digital natives, while their parents and teachers are considered to be digital immigrants. While on one level this makes instinctive sense, a growing body of research indicates that this distinction is problematic: generational differences are not the only reason for the gap in the ability to use technology, and the distinction does not take into consideration effective use.

It is a generalisation to assume that all young people are digital natives and know how to use all forms of technology. Research demonstrates that young people vary in their skills to use new technologies, and use technologies in different ways. In fact, research suggests that many young people's actual uses of digital technologies are limited in scope and less empowering than the rhetoric suggests. It therefore is important not to conflate engagement with technology with meaningful engagement with technology that develops and increases agency among young people.

The myth of the digital native is so persistent that it is important for educators to reframe thinking in this area to support young people in their engagement with technology and digital information. Rather than looking to technology use as an innate ability in young people, it is more helpful to view young people's use of technology as it relates to the contexts of young people's lives at school and in the home. If young people are to continue growing up in a world where interactions and educational experiences are mediated by technology, educators must ensure that young people are equipped with the skills and tools necessary to do so, and technology use in schools must be based on empirical evidence, not on political pressure or 'digital native' rhetoric.

The use of technology in teaching

Currently, there is a lack of rigorous, robust research evidence on educational technology. The research base is characterised by several challenges:

- the domination by small-scale studies, which focus on a discrete aspect of educational technology
- a lack of replication, which leaves findings vulnerable to 'false positives'
- a focus primarily on the higher and further education sectors
- bias due to the role of technology companies in funding studies

Despite these challenges, there are some areas of educational technology research where there is a growing evidence base for schools and teachers to draw upon in their decision-making. There is evidence emerging from meta-analysis studies to suggest that technology has a moderate effect on learning. However, this effect is not consistent across all subject areas or types of technology use. The evidence suggests that learning effects are greater for learning other languages, mathematics, and science and technology, and lower in social studies and English.

Overall, the evidence suggests that technology should be used to supplement rather than replace more traditional teaching approaches. That is, in most cases, it is unlikely that the technologies directly influence changes in learning. Rather, technologies facilitate changes in teaching and learning interactions. Alongside these more general findings, education technology research has also identified some more specific findings.

It is pedagogy, not technology, that makes the difference

One of the most consistent findings in the educational technology research is that what makes the difference to students' learning is the pedagogy being employed rather than the technology itself. In other words, it is teachers, their decision-making and what they do that matters most.

What works when using educational technology is largely what works in non-digital learning

The emerging evidence base on educational technology reinforces the evidence about what works best in non-digital learning. This suggests that it is the employment of effective teaching practices that matter most, rather than the presence or absence of a particular tool.

The processes of reading and writing digitally are not the same

There is growing evidence to suggest that digital and non-digital reading and writing methods are not analogous and that non-digital reading and writing methods have benefits that digital methods do not. The research on reading suggests that readers may not comprehend material as well when they read it digitally. This is because, when reading online, we are more likely to get distracted, which detracts from deep reading. The research on writing suggests that the physical movements involved in writing by hand are part of the thinking process in writing, and therefore writing by hand is a particularly effective medium for learning.

Screen-time in the early years should be minimised

There is a growing body of research focused on the impact of screen-time in children from birth to five years. The research consistently finds that increased screen-time is linked to developmental delays, reduced sleep, a reduction in the time parents spend reading to their children, and a reduction in children's ability to self-regulate.

Technology can increase students' engagement, but increased engagement does not necessarily mean increased learning

Research regularly determines a positive relationship between technology use and student engagement and motivation to learn. Engagement and motivation are important factors underpinning learning. However, it is important for educators to remember that engagement does not automatically lead to learning, nor can it be used as a proxy for learning occurring (and more particularly for achieving desired learning outcomes).

Providing hardware to students can improve computer skills but will not necessarily improve learning outcomes

Interventions that focus on providing hardware – computers, tablets, mobiles – to students tend to be effective in increasing the use of computers and computer skills. However, the impact on learning outcomes is more mixed. The evidence suggests that, when combined with additional learning software and professional development support for teachers, the impact on learning is more promising. However, in many studies, simply providing students with devices does not lead to learning gains.

Computer assisted learning can lead to gains in mathematics

Findings from studies on computer-assisted learning suggest that there is substantial variation in outcomes among subjects. The subject where computer assisted learning most regularly improves learning is mathematics. Researchers postulate that this might be because of the ability to more readily personalise content in mathematics to individual needs and levels, and to provide immediate feedback to both students and teachers.

Technology can support teacher learning and connections

There is a growing body of research that suggests that technology, in particular online networks and communities, can support teacher learning and connections. It is important to note, however, that a majority of this research focuses on teacher self-reports and is not necessarily connected to improvements in student outcomes or observed changes to teachers' practices.

Some engagement with technology is good, but students can easily become over-connected

Evidence suggests that students who are unconnected, that is not utilising technology at all, achieve on average at lower levels than students who are connected. However, there is a growing body of research focused on the issues associated with over-connection. Research findings indicate that students who spend substantial amounts of time on the internet are more likely to feel disconnected and lonely at school. Furthermore, use of digital devices can impair sleep, which in the long term interferes with memory processes and learning.

There are mixed findings on the impact of phones in school

The majority of studies have found a small negative impact of phone use in schools on student achievement. What is more, the negative effect of phones on learning and achievement seems to be higher among lower-ability students. However, there is some research that suggests that, if students and teachers know how to effectively integrate mobile devices into the classroom as educational tools, some of the negative effects of normal mobile phone use can be ameliorated.

Conclusion

Teachers must take into consideration the evidence when using technology or introducing new, technology-based approaches in the classroom. The theory of the digital native is not borne out in the literature, so schools should take care not to assume that all students have equal access to technology and can use it proficiently and skillfully. Teachers should also be wary that, while technology use may improve engagement, this does not necessarily lead to meaningful or empowering learning experiences. Furthermore, the evidence on the benefits of using technology in teaching and learning is inconsistent and far from compelling. As a general principle, technology should be used to supplement rather than replace more traditional teaching methods, and teachers should always consider the relationship between technology use and desired learning outcomes. Teachers should be particularly careful not to assume that different modes of certain learning activities, such as reading and writing, are analogous. For more information, see our guide on the role of technology in reading, writing and mathematics.

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