Trends Shaping Education 2014 Spotlight 5

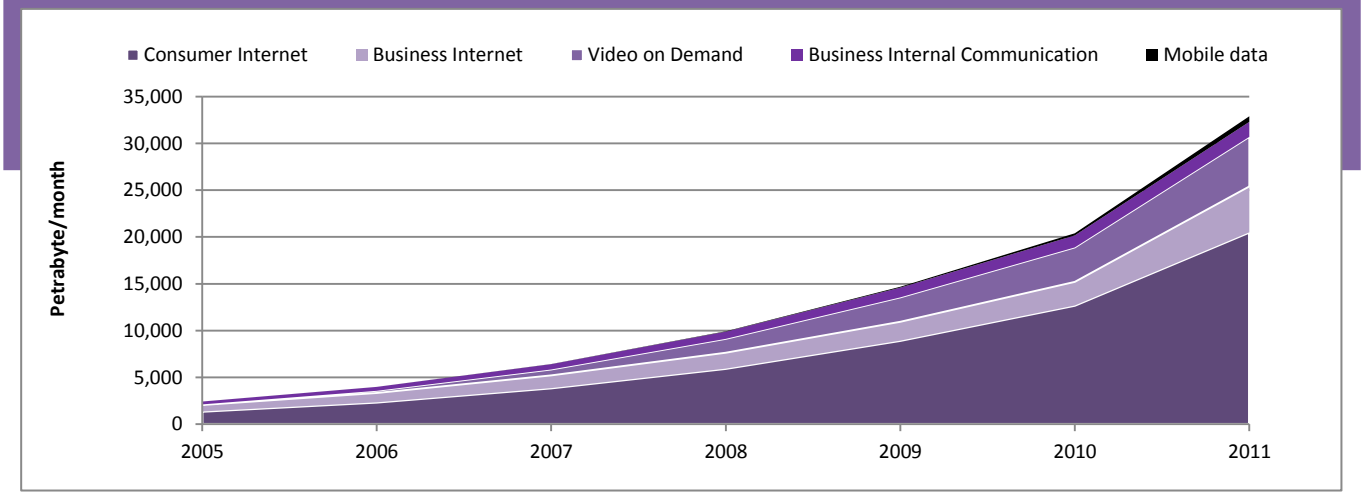
Infinite Connections: Education and new technologies

Information and Communication Technology (ICT) has developed rapidly over the past 40 years. ICT has influenced almost all aspects of our lives and has changed the way we communicate, work and socialize. Education plays a key role in ensuring that everyone can reap the benefits of our technology-rich world, as well as help mitigate some of the risks.

The world in your pocket

ICT refers to a range of different technologies that have access to the internet, such as computers, tablets or smartphones, and the software that runs on them (OECD, 2012a). In the last decade, new technologies have transformed not just our professional lives, but also our private ones. In 2005, the volume of Internet traffic of businesses and customers was of a comparable size (Figure 1). However, by 2011, private individuals accounted for more than four times the Internet traffic of businesses. In particular, mobile phone traffic has grown by more than 15,000% since 2006, as people increasingly access the Internet on the go (OECD, 2013a).

Figure 1: Global IP Traffic, 2005-2011



StatLink http://dx.doi.org/10.1787/ 888932798487

Source: Cisco VNI. OECD Communications Outlook 2013 (OECD, 2013a).

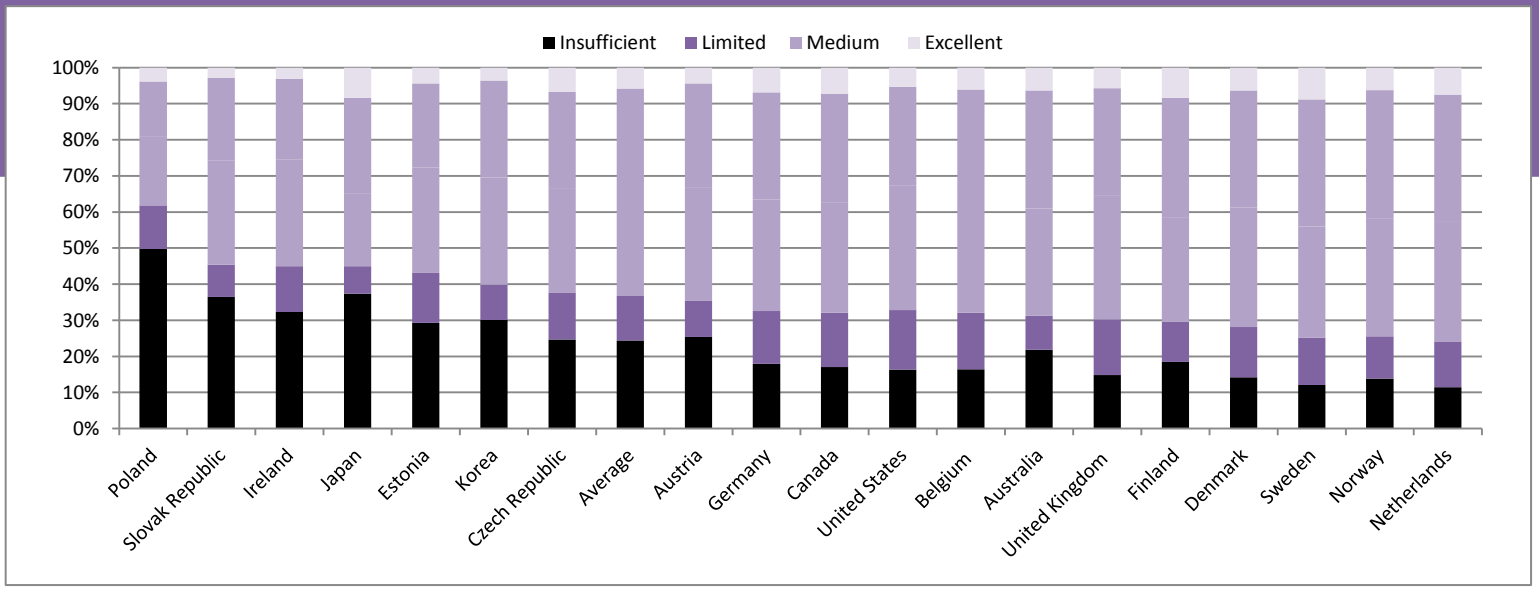
The second digital divide: from access to use

All indicators of ICT use (such as computers per household, global internet traffic and hours spent online) have grown in the last decade, effectively erasing the first digital divide between those who had access to computers and those who did not. However a second "digital divide" has emerged between individuals who moved to embrace a technology-rich world and those who have been left behind.

Part of this divide is generational: the OECD Survey of Adult Skills (PIAAC) shows that on average 16-24 year olds are much more competent at solving problems in technology-rich environments than their older counterparts (OECD, 2013b). Further, as shown in Figure 2, in many countries large parts of the adult population have insufficient ICT problem-solving skills - meaning that they either failed the assessment or were unable to take part because they had never used a computer. Between 30% and 50% of the adult population in Ireland, Poland and the Slovak Republic fall into this category.

Adults with excellent skills were able to complete tasks involving multiple steps and were able to deal with unexpected outcomes. On average, only 5.8% of adults (aged 16-65) in the OECD perform at this level. In Finland, Japan and Sweden, around 8% of the adult population perform at this level.

Figure 2: Proficiency in problem solving in technology-rich environments among adults (16-65)



StatLink http://dx.doi.org/10.1787/888932900612

Source: Survey of Adult Skills (PIAAC) (2012), Table A2.10a.
Note: Adults that opted out of the assessment or failed were grouped into the "insufficient" category. The "limited" category refers to people who perform below level 1, "medium" to level 1 and 2 and the "excellent" to level 3.

However the digital divide is not only generational. Eight percent of young adults aged 16-24 have insufficient ICT skills (OECD, 2013b). Unfortunately, young people from disadvantaged backgrounds are more likely to be less confident and less proficient at using new technologies. There is also a gender gap. Girls use ICTs less intensively and for fewer tasks on average than boys (OECD, 2013b, OECD, 2010).

Given that a significant proportion of jobs now require people to have at least basic ICT skills, it is extremely important to narrow the second digital divide. It is an equity issue as well as an efficiency one: as OECD societies continue to become more knowledge-intensive, they simply cannot afford to have a sizeable proportion of their workforce lacking such basic skills.

Policy makers across the OECD must thus continue to invest in IT skill development. Students from disadvantaged backgrounds and girls must be helped to enhance their digital skills and their comfort in using new technologies. In education, schools and universities can and do make a difference by offering ICT courses for students, teachers and the local community.

New connections, emerging risks

As mobile and handheld devices grow in popularity, children are increasingly using the Internet without adult supervision. Using your own smartphone (as opposed to a shared computer or a family TV) makes it difficult for parents to monitor Internet use and safety (O'Neill, Livingstone and McLaughlin, 2011). Young people need to be aware of the dangers of ICT use and develop their own self-defence tools. Schools can help with this process.

New risks for children that come with technology include *consumer*-related risks (for example, online fraud and marketing), *contact*-related risks (for example online predators and cyber bullying) and *privacy*-related (for example issues related to protection of personal information) risks (OECD, 2012b).

Internet License in France

The French government launched the "Permis Internet", the Internet license, as a voluntary national programme to teach primary school children about some of the dangers of the Internet. In order to receive their Internet License, children need to complete a programme addressing a number of themes such as disclosing private information online, cyber bullying and protecting themselves from predators or false information.

More information: http://www.permisinternet.fr

Advertising and marketing

Advertising on the internet has increased drastically since 2005. It is now the most popular medium for advertisement and under 25 year olds are targeted most intensively (OECD, 2013c). Risks for children include exposure to age-inappropriate advertising (for example for alcohol, tobacco or sexually explicit advertisements). Even age appropriate marketing is a concern, as children, particularly at the youngest ages, are less good at distinguishing commercial content from other content (OECD, 2012b). Indeed, web-based advertising (for example comments by individuals hired to intervene on forums or anonymous users on client feedback websites (e.g., reviews for hotels or restaurants)) can be difficult even for adults to identify.

In addition, children's ability to critically engage with advertising messages is less developed than adults', rendering even standard advertising potentially confusing (OECD, 2012b). Advertisements for fatty foods or snacks high in sugar content aimed at children, for example, are coming under increasing scrutiny. A recent study demonstrated that children incorrectly recalled the presence of unhealthy items (French fries) in ads where that actually featured a healthier option (an apple) instead (Bernhardt et al, 2014).

Children are thus a more vulnerable segment of the audience while being highly sought after as consumers at the same time. Schools, along with government regulators, parents, and communities therefore must play a role in preparing young people to handle the various types of advertisement that are now present in their daily lives.

Cyber Bullying

Cyber bullying includes many different forms of online bullying such as sending threatening emails, copying personal conversations and sending them to others, creating derogatory websites abut a person or humiliating them repeatedly on social networks (Campbell, 2005). Estimates of the prevalence of cyber bullying vary widely but an EU-wide study indicates that on average, 6% to 9% of 16-year-olds are being bullied online (Livingstone et al., 2011).

LGBTI youth are four times more likely to be sexually harassed online than non-LGBTI youth.

Some groups of young people are particularly affected by cyber bulling. A US-based survey showed that 41% of LGBTI (Lesbian, Gay, Bisexual, Transgender, and Intersexed) teenagers experience cyber bullying, and are more than three times as likely to be bullied online as non-LGBTI youth (GLSEN, 2013). Furthermore, one in five LGBTI teenagers reported that they were being bullied online specifically because of their gender or sexual orientation.

Even though cyber bullying is not physical, it can be extremely powerful. Cyber bullying can be witnessed by a much larger audience than face-to-face bullying. Cyber bullying is also not confined to school hours and can happen anywhere, anytime.

Cyber bullying can be fought with many of the same means as traditional bullying. Adult supervision on playgrounds decreased incidents of face-to-face bullying (Smith & Shu, 2000), which suggests that parents and teachers can and should intervene in suspect online incidents. However, as is the case with all bullying, an important role is played by bystanders that silently condone the practice. Schools can therefore take action both by raising awareness and by educating students about their role and responsibility in its prevention.

Privacy

Although social networking sites such as Facebook, Snapchat, and Instagram all have minimum ages of 13, much younger children regularly use the services (Livingstone et al, 2011). Many children also download applications that require them to enter personal information in order to access new content, not always with parental consent.

Young people need to be made aware of the risks of posting personal information online, whether in the form of pictures, videos or messages. First, they must understand that such information can be bought and sold. In addition, it can reveal much more about themselves and their friends and family than intended, and it remains stored on servers, even when deleted. Prospective employers can use this information to assess suitability for a job, which many young adults fail to understand. This information can also be used for much more sinister purposes, for example the luring of children by sexual predators.

Children are particularly vulnerable to these privacy risks as they are often unaware of the potential consequences and lack the capacity to foresee associated dangers (OECD, 2012b). Schools can play an important role in addressing these issues, but the speed of technological change makes it difficult to keep abreast of the latest issues. It is thus important to partner with government, NGOs, and private sector representatives to provide a shared response to these issues (OECD, 2012b). Microsoft, for example, supports an initiative through its corporate social responsibility programme that brings their technical experts to classrooms to give special seminars on internet safety and privacy issues. These kinds of initiatives allow schools to address these important themes with the confidence that they are harnessing the most up-to-date expertise available.

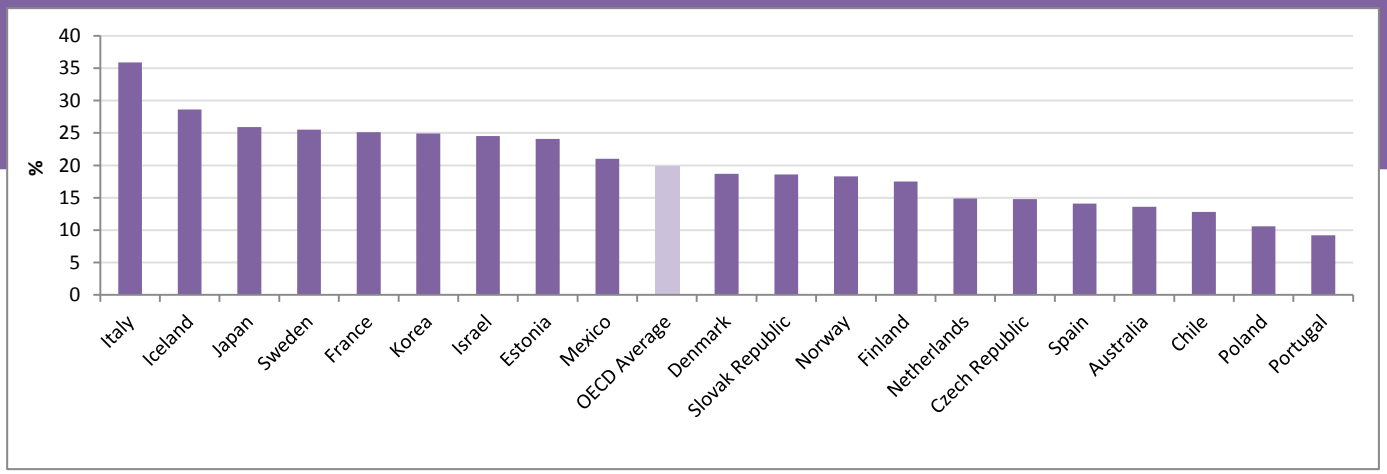
What do teachers know about new technologies?

Teachers play a critically important role in providing a new generation of students with the relevant ICT skills. But how prepared do they feel for this challenging task?

The results from the 2013 Teaching and Learning Survey (TALIS) show that teachers rank skill development related to ICT as their second and third most pressing development need, after teaching for students with special needs. In Italy, over 35% of teachers reported a high level of need in ICT skill development (see Figure 3).

Interestingly, there is no relationship between average teacher age and how highly they rank their need for IT skills development, indicating that teachers of all ages report a need to improve their ICT skills.

Figure 3: Teachers who report a high level of need to develop their ICT skills for teaching (percentage)



Source: OECD (2013), OECD Stat (TALIS database). Available at: http://stats.oecd.org/Index.aspx?datasetcode=talis_2013

A recent European survey revealed that students taught by teachers who are confident in their own ICT competence but encounter obstacles to using it at school (for example, low access) report more frequent use of ICT during lessons when compared to students taught by teachers with few obstacles but low confidence in their own digital competence (European Schoolnet, 2013). These data demonstrate that teachers are able to work around poor ICT learning environments if they must, as long as they have the confidence in their digital skills.

In addition, research shows that teachers do use ICT for some professional activities (such as preparation of their lessons). The challenge is thus not simply a lack of capacity and/or confidence per se, but also a question of perceived utility. Teachers need to be convinced of what works in the classroom, and how they could use the technology to achieve those goals (European Schoolnet, 2013).

Are ICTs changing the way we learn?

ICTs have undeniably changed many aspects of our lives. One key question for education policy makers is whether they have also changed the way we learn.

How do students, who have instant access to thousands of articles on any topic via search engines, assess the quality of the material they find online?

ICTs present numerous opportunities for innovative and collaborative learning. Social networks, often considered an impediment to learning in traditional classrooms, can be used creatively. Facebook, for example, has been used by some teachers to bring characters from literature to life (TPT, 2014).

Virtual schools

Since the late 1990s, virtual secondary schools started to emerge across North America and rapidly expanded to other countries like China, Korea and Germany (Zucker & Kozma, 2003). In the US, this trend has been driven by home-schooling. In Asian countries, virtual schools tend to be coupled with traditional ones to provide additional school exposure. Virtual schools offer all or some credit courses through distance learning methods including internet-based delivery. There is a great deal of variety in how virtual schools operate. Some schools resemble traditional correspondence schools, where students access reading materials online and return written responses. Others are much more interactive: in some virtual schools, teachers give real time lectures online and students can participate via instant messages or audio responses.

The Khan Academy provides free education online

The Khan Academy is a non-profit organisation (NGO) that seeks to provide "free, world-class education for everyone, anywhere". The NGO was founded in 2006 by Salman Khan, a Bengali-American.

On the website, anyone can access educational resources (100,000 practical problems and 6,000 short lectures) in a large range of subjects. Furthermore, parents and teachers can very easily access statistics about the progress of each student. All resources are available entirely free of charge and in 2013; 10 million students accessed the website each month.

More information:
https://www.khanacademy.org/about

Online tertiary education

Secondary schools are not the only education institutions that have expanded into online-based teaching methods. Most universities are using online databases, online journals and subject specific search engines for their research (Dogruer et al., 2011). One of the biggest markets is the virtualisation of traditional universities, particularly for continuous professional development courses.

Some universities have taken their use of ICT a step further with the creation of entirely virtual universities, for example, the Open University of Catalonia. The transformation of old-fashioned distance universities (such as the Open University in the UK) is also a major trend. In addition, Instruments like Massive Open Online Courses (MOOCs) provide complete, open-access university courses online. These internet-based programmes can handle thousands of students at the same time by using some of the tactics of social networking sites (Waldorp et al., 2013). Learning does not happen only via video lectures but also via questions, comments and discussions. Participants can even mark one another's work.

In March 2013, 2.8 million people had registered for classes with the MOOC provider Coursera alone (Waldrop et al., 2013).

Open Educational Resources (OER) are another instrument of online-based learning. As opposed to MOOCs, which are not necessarily free of charge, OERs can be accessed at no cost and often use an open file format which allows users to access, edit, and

redistribute learning materials (OECD, 2007). Traditional universities have been embracing OER to further their academic offerings. The MIT OpenCourseWare platform is one of the most remarkable OERs and provides free web-based content from 2150 courses taught at the Massachusetts Institute of Technology (MIT OpenCourseWare, 2014).

However the online teaching and learning sector is a field that changes rapidly. Similar to early technology investments in schools, which were often led more by passion and promises than evidence-based policy, universities face the risk that large investments in online learning are not necessarily matched by increased student performance. They must therefore carefully weigh investments and the impacts of such new initiatives in terms of an overall strategic vision for their institution. Instead of simply following the market and the possibilities offered by the newest digital technology, universities should use ICT to enhance their educational and research missions within well a defined academic strategy (Mapstone et al., 2014).

Managing expectations about technology

In 1995, less than one third of schools had access to a computer. Five years later, access had become virtually universal.

In the 1990s huge investments were made across the OECD to provide schools with computers (OECD, 1999; OECD, 2006). These large-scale investments were made for three reasons.

First, policy makers assumed that schools would be the best place for students to learn how to make use of new technologies. Secondly, they assumed that providing computers in schools would narrow the digital divide and allow children from disadvantaged groups easier access to what was then expensive technology. Lastly, investors assumed that providing technology in schools would lead to large productivity gains and increased student performance due to increased student engagement and a reduced administrative burden on teachers (OECD, 1999). In fact, technology was seen by many as a "quick and easy fix" for poor student performance, and investments in technology were often prioritised over other strategies aimed at improving educational outcomes. Notably, these large investments were made without clear evidence which demonstrated that increasing available technology would improve student achievement.

In recent years, scepticism about these initial assumptions has started to emerge. It became apparent that students do not need to be taught how to use technology in school, because they learn it by trial and error outside of school (OECD, 2006). Similarly, as digital access has broadened, households, rather than schools, have become the main access point for computers. Lastly, the performance gains that computers had promised, in terms of increased education achievement, do not seem to have materialised.

Imagining education of the future

Although the presence of ICT cannot be equated with increased learning gains, it has the potential to open a window of opportunity for doing things differently in education. On the systems level, schools and classrooms in different European countries have been brought together by e-Twinning[1], an initiative of the European Commission to promote collaboration across schools. In the classroom, ICT facilitates personalised learning through adaptive technologies. The flipped classroom[2], for example, attempts to invert the traditional model of teaching and learning by using technology to deliver lectures in the evenings, thus freeing teachers to work on assignments with students during the day. The "homework" in this case is the video lecture, not the exercises. ICTs also can expand educational access to disadvantaged students and to those living in remote communities, and can offer unique opportunities for cultural exchange. And lastly, the use of big data, both for instruction and management in education, has the potential to revolutionise systems and processes.

However, in spite of their revolutionary potential they have thus far remained a niche phenomenon. What are the barriers to their adoption? One concern is that secondary students are not ready for the kind of flexible and individualised learning that might be appropriate for adults (Barbour & Reeves, 2009). It also appears that many students are more reluctant to adopt online learning methods than their level of digital media exposure would suggest (Lam and Ritzen, 2008; Margaryan et al., 2010).

The perception that online education is of poorer quality that face to face education might also be playing a role. Certainly online higher education suffers from poorer retention rates than traditional education: a 2012 survey of US higher education institutions found that nearly three-quarters of respondents rated lower retention rates for online courses as an important barrier to the growth of online instruction (Allan and Seaman, 2013). Similarly, the question of how online learning would be regulated in order to ensure consistency and quality, especially in an international marketplace, remains unanswered.

Concerns about the lack of acceptance of online education degrees by employers could be limiting their growth.

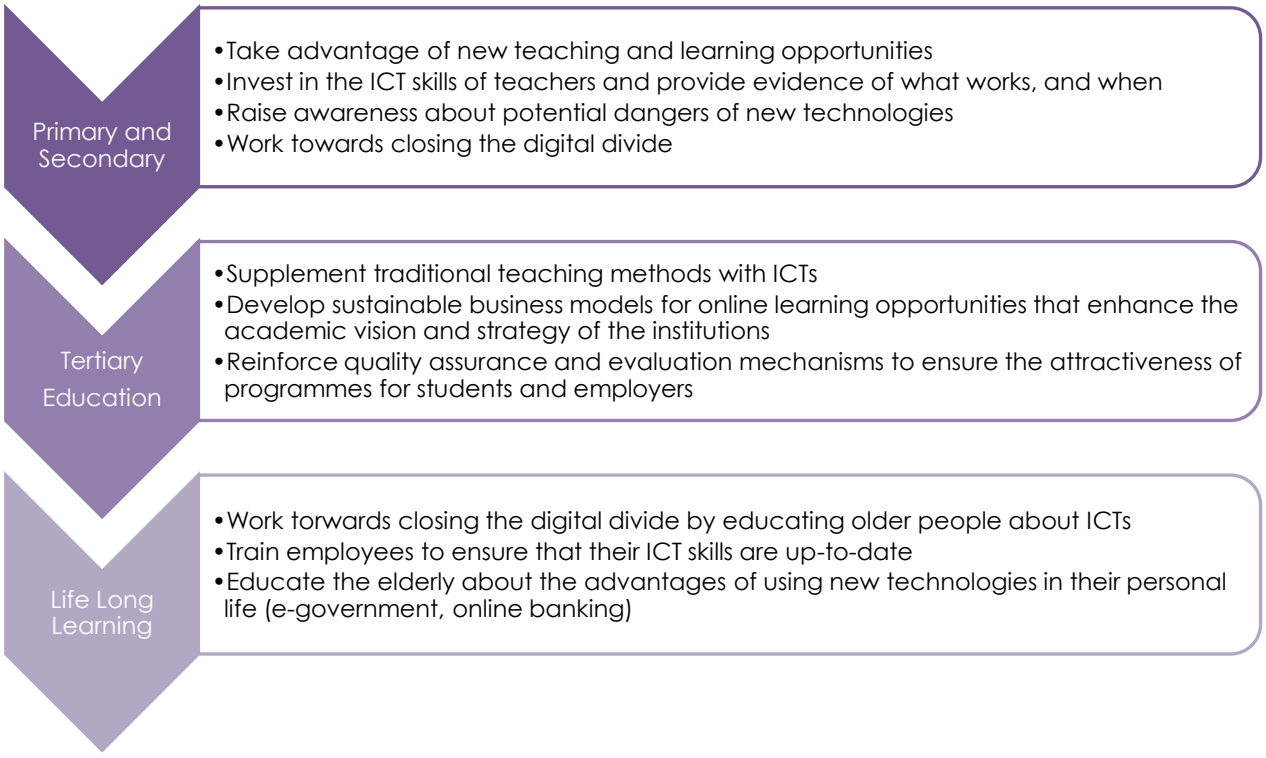
[1] http://www.etwinning.net/en/pub/discover/what_is_etwinning.htm
[2] http://www.knewton.com/flipped-classroom/

So what can be done to reap the benefits of new technologies while still focusing on excellence in teaching and learning? Barriers to access must be addressed, as well as lingering concerns about quality and status. In order to do this however, the quality of educational resources and software must continue to be improved. Examples of local excellence must be scaled up and sustained across systems. And work must still be done to reinforce the quality assurance of virtual schools, both secondary and tertiary, to increase their attractiveness to students and employers alike. How far our schools of the future will be revolutionised by new technologies, as opposed to just adapted to them, remains to be seen.

In sum

New technologies have transformed many aspects of our lives and present a number of new opportunities and challenges for education. Schools, universities and lifelong learning institutions need to make sure that students, teachers, and adults have the ICT skills that are vital for working and living in our technology-rich world. One key priority is narrowing the digital divide which still exists, particularly for disadvantaged students and girls.

Schools and universities should also ensure that they fully reap the benefits of ICTs. New technologies have the potential to expand educational access and choice and make learning more participatory and individualised. However, in spite of these new opportunities, policymakers in the OECD also need to ensure that they live up to its challenges.



References

Allan, I. and E. Seaman, J. (2013), *Changing Course: Ten years of tracking online education in the United States,* Babson Survey Research Group and Quahog Research Group, LLC. www.onlinelearningsurvey.com/reports/changingcourse.pdf (accessed 11 September 2014).

Barbour, M. and K. T. C. Reeves (2009), "The reality of virtual schools: A review of the literature", Computers & Education, 52(2):402-416.

Bernhardt, A. M., Wilking, C., Gottlieb, M., Emond, J., Sargent, J. (2014), "Children's Reaction to Depictions of Healthy Foods in Fast-Food Television Advertisements", JAMA Pediatrics, DOI:10.1001/jamapediatrics.2014.140

Campbell, M. A. (2005), "Cyber bullying: An old problem in a new guise?", Australian Journal of Guidance and Counselling, 15(1):68-76.

Dogruer, N. et al. (2011), "The use of the internet for educational purposes", Procedia – Social and Behavioural Sciences, Volume 28, p. 606-611.

European Schoolnet (2013), Survey of Schools: ICT in education. Benchmarking access, use, and attitudes to technology in Europe's schools. www.eun.org/c/document_library/get_file?uuid=9be81a75-c868-4558-a777-862ecc8162a4&groupId=43887, accessed 12 September 2014.

Facebook (2014), "Company Info", www.newsroom.fb.com/company-info/ accessed July 1 2014).

GLSEN, CiPHR, & CCRC (2013), Out online: The experiences of lesbian, gay, bisexual and transgender youth on the Internet, GLSEN, New York.

Lam, I. and M. Ritzen (2008), "The ne(x)t generation students: needs and expectations", Utrecht University, IVLOS – Institute of Education, Centre for ICT in Education, Bremen.

Livingstone, S., L. Haddon, A. Gorzig, and K. Olafsson (2011), EU Kids Online September 2011, London School of Economics and Policial Science, co-funded by the European Union. www2.lse.ac.uk/media@lse/research/EUKidsOnline/Home.aspx

Mapstone, S., Buitendijk and S. Wiberg, E. (2010), "Online Learning at Research-Intensive Universities", www.leru.org/files/publications/LERU_AP16__Online_Learning_at_RIUs_final.pdf (accessed 15th of July, 2014).

Margaryan, A., A. Littlejohn and G. Vojt (2010), "Are digital natives a myth or reality? University students' use of digital Technologies", Computers and Education, Vol. 56(2), pp. 429-440.

MIT OpenCourseWare (2014), "About OCW", www.ocw.mit.edu/about/, (accessed 15 July 2014).

OCDE (1999), Education at a Glance 1998 : OECD Indicators, OECD Publishing, Paris. DOI: 10.1787/eag-1998-en

OECD (2006), Are Students Ready for a Technology-Rich World? What PISA Studies Tell Us, OECD Publishing, Paris.

OECD (2007), "Giving Knowledge for free", www.oecd.org/edu/ceri/38654317.pdf, (accessed 15 July, 2014).

OECD (2010), Are the New Millennium Learners Making the Grade? Technology Use and Educational Performance in PISA 2006. DOI: 10.1787/9789264076044-en

OECD (2012a), Connected Minds: Technology and Today's Learners, Educational Research and Innovation, OECD Publishing. DOI: 10.1787/9789264111011-en

OECD (2012b), The Protection of Children Online, Recommendation of the OECD Council, OECD Publishing.www.oecd.org/sti/ieconomy/childrenonline_with_cover.pdf (accessed 4 September 2014).

OECD (2013a), OECD Communications Outlook 2013, OECD Publishing. DOI: 10.1787/comms_outlook-2013-en

OECD (2013b), OECD Skills Outlook 2013: First Results from the Survey of Adult Skills, OECD Publishing. DOI: 10.1787/9789264204256-en

OECD (2013c), Trends Shaping Education 2013, OECD Publishing. DOI: 10.1787/trends_edu-2013-en

OECD (2014), TALIS 2013 Results: An International Perspective on Teaching and Learning, TALIS, OECD Publishing. DOI: 10.1787/9789264196261-en

O'Neill, B., Livingstone, S. and McLaughlin, S. (2011), Final recommendations for policy, methodology and research. www.eprints.lse.ac.uk/39410/

Smith, P.K. and Shu, (2000), "What good schools can do about bullying: Findings from a survey in English schools after a decade of research and action". Childhood, 7, 193-212.

TPT (TeachersPayTeachers), (2014), "Facebook Profile Character Sketch", www.teacherspayteachers.com/Product/Facebook-Profile-Character-Sketch-Any-Novel-Activity-54085, (accessed 15th of July 2014).

Waldrop et al. 2013, "Massive Open Online Courses, aka MOOCs, Transform Higher Education and Science",www.scientificamerican.com/article/massive-open-online-courses-transform-higher-

education-and-science/ (accessed June 27 2014).
Zucker, A. and R. Kozma (2003), "The virtual high school: Teaching generation V." New York, NY: Teachers College Press.

For more information

Contact **Tracey Burns** (tracey.burns@oecd.org)

See **OECD (2013), *Trends shaping education 2013*, OECD Publishing**

Visit www.oecd.org/edu/ceri/trendsshapingeducation2013.htm

www.oecd-ilibrary.org/education/trends-shaping-education-2013_trends_edu-2013-en

www.oecd.org/edu/ceri