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## Information and communication technology (ICT) in education

### BRIEF 4

#### ICT in education

#### **Information and Communications Technology (ICT) can impact student learning when teachers are digitally literate and understand how to integrate it into curriculum.**

Schools use a diverse set of ICT tools to communicate, create, disseminate, store, and manage information.(6) In some contexts, ICT has also become integral to the teaching-learning interaction, through such approaches as replacing chalkboards with interactive digital whiteboards, using students' own smartphones or other devices for learning during class time, and the "flipped classroom" model where students watch lectures at home on the computer and use classroom time for more interactive exercises.

When teachers are digitally literate and trained to use ICT, these approaches can lead to higher order thinking skills, provide creative and individualized options for students to express their understandings, and leave students better prepared to deal with ongoing technological change in society and the workplace.(18)

ICT issues planners must consider include: considering the total cost-benefit equation, supplying and maintaining the requisite infrastructure, and ensuring investments are matched with teacher support and other policies aimed at effective ICT use.(16)

#### **Issues and Discussion**

Digital culture and digital literacy: Computer technologies and other aspects of digital culture have changed the ways people live, work, play, and learn, impacting the construction and distribution of knowledge and power around the world.(14) Graduates who are less familiar with digital culture are increasingly at a disadvantage in the national and global economy. Digital literacy—the skills of searching for, discerning, and producing information, as well as the critical use of new media for full participation in society—has thus become an important consideration for curriculum frameworks.(8)

In many countries, digital literacy is being built through the incorporation of information and communication technology (ICT) into schools. Some common educational applications of ICT include:

- *One laptop per child*: Less expensive laptops have been designed for use in school on a 1:1 basis with features like lower power consumption, a low cost operating system, and special re-programming and mesh network functions.(42) Despite efforts to reduce costs, however,

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providing one laptop per child may be too costly for some developing countries.(41)

- *Tablets*: Tablets are small personal computers with a touch screen, allowing input without a keyboard or mouse. Inexpensive learning software (“apps”) can be downloaded onto tablets, making them a versatile tool for learning.(7)(25) The most effective apps develop higher order thinking skills and provide creative and individualized options for students to express their understandings.(18)
- *Interactive White Boards or Smart Boards*: Interactive white boards allow projected computer images to be displayed, manipulated, dragged, clicked, or copied.(3) Simultaneously, handwritten notes can be taken on the board and saved for later use. Interactive white boards are associated with whole-class instruction rather than student-centred activities.(38) Student engagement is generally higher when ICT is available for student use throughout the classroom.(4)
- *E-readers*: E-readers are electronic devices that can hold hundreds of books in digital form, and they are increasingly utilized in the delivery of reading material.(19) Students—both skilled readers and reluctant readers—have had positive responses to the use of e-readers for independent reading.(22) Features of e-readers that can contribute to positive use include their portability and long battery life, response to text, and the ability to define unknown words.(22) Additionally, many classic book titles are [available for free](#) in e-book form.
- *Flipped Classrooms*: The flipped classroom model, involving lecture and practice at home via computer-guided instruction and interactive learning activities in class, can allow for an expanded curriculum. There is little investigation on the student learning outcomes of flipped classrooms.(5) Student perceptions about flipped classrooms are mixed, but generally positive, as they prefer the cooperative learning activities in class over lecture.(5)(35)

ICT and Teacher Professional Development: Teachers need specific professional development opportunities in order to increase their ability to use ICT for formative learning assessments, individualized instruction, accessing online resources, and for fostering student interaction and collaboration.(15) Such training in ICT should positively impact teachers’ general attitudes towards ICT in the classroom, but it should also provide specific guidance on ICT teaching and learning within each discipline. Without this support, teachers tend to use ICT for skill-based applications, limiting student academic thinking.(32) To support teachers as they change their teaching, it is also essential for education managers, supervisors, teacher educators, and decision makers to be trained in ICT use.(11)

Ensuring benefits of ICT investments: To ensure the investments made in ICT benefit students, additional conditions must be met. School policies need to provide schools with the minimum acceptable infrastructure for ICT, including stable and affordable internet connectivity and security measures such as filters and site blockers. Teacher policies need to target basic ICT literacy skills, ICT use in pedagogical settings, and discipline-specific uses.(21) Successful implementation of ICT requires integration of ICT in the curriculum. Finally, digital content needs to be developed in local languages and reflect local culture.(40) Ongoing technical, human, and organizational supports on all of these issues are needed to ensure access and effective use of ICT.(21)

Resource Constrained Contexts: The total cost of ICT ownership is considerable: training of teachers and administrators, connectivity, technical support, and software, amongst others.(42) When bringing ICT into classrooms, policies should use an incremental pathway, establishing infrastructure and bringing in sustainable and easily upgradable ICT.(16) Schools in some countries have begun allowing students to bring their own mobile technology (such as laptop, tablet, or smartphone) into class rather than providing such tools to all students—an approach called Bring Your Own Device.(1)(27)(34) However, not all families can afford devices or service plans for their children.(30)

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Schools must ensure all students have equitable access to ICT devices for learning.

## Inclusiveness Considerations

Digital Divide: The digital divide refers to disparities of digital media and internet access both within and across countries, as well as the gap between people with and without the digital literacy and skills to utilize media and internet.(23)(26)(31) The digital divide both creates and reinforces socio-economic inequalities of the world's poorest people. Policies need to intentionally bridge this divide to bring media, internet, and digital literacy to all students, not just those who are easiest to reach.

Minority language groups: Students whose mother tongue is different from the official language of instruction are less likely to have computers and internet connections at home than students from the majority. There is also less material available to them online in their own language, putting them at a disadvantage in comparison to their majority peers who gather information, prepare talks and papers, and communicate more using ICT.(39) Yet ICT tools can also help improve the skills of minority language students—especially in learning the official language of instruction—through features such as automatic speech recognition, the availability of authentic audio-visual materials, and chat functions.(2)(17)

Students with different styles of learning: ICT can provide diverse options for taking in and processing information, making sense of ideas, and expressing learning. Over 87% of students learn best through visual and tactile modalities, and ICT can help these students 'experience' the information instead of just reading and hearing it.(20)(37) Mobile devices can also offer programmes ("apps") that provide extra support to students with special needs, with features such as simplified screens and instructions, consistent placement of menus and control features, graphics combined with text, audio feedback, ability to set pace and level of difficulty, appropriate and unambiguous feedback, and easy error correction.(24)(29)

## Policy Examples

- India [[PDF](#)]
- Detroit, USA [[PDF](#)]
- Finland [[PDF](#)]

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