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# Policy Brief

***Is the "Net Generation" Ready for Digital Citizenship?***

***Perspectives from the IEA International Computer and Information Literacy Study 2013***

## Contents



## Summary


The rise of digital information and communication technologies (ICT) has made the acquisition of computer and information literacy (CIL) a leading factor in creating an engaged, informed, and employable citizenry. However, are young people, often described as "digital natives" or the "net generation," developing the necessary CIL skills? The International Association for the Evaluation of Educational Achievement (IEA) explored this question in its recently conducted study of the CIL acquisition of lower-secondary students in 21 countries worldwide. Our exploration of findings from this study, titled the International Computer and Information Literacy Study (ICILS), led to us making three policy recommendations:


## Policy Recommendations

1. *Make acquisition of CIL skills a core education initiative*

   Findings from ICILS support the notion that we should not assume students are "digital natives"—young people who naturally acquire CIL skills (Prensky, 2001). Instead, the findings suggest that young people require targeted educational initiatives and strategies to develop effective CIL skills.

2. *Promote strategies for aligning CIL acquisition inside and outside of schools*

   ICILS findings suggest that policies directed toward increasing CIL skills have to recognize the importance of linking ICT use inside and outside of schools.

3. *Invest in CIL-related teacher education and professional development*

   Many schools have invested heavily in ICT hardware and software. ICILS findings suggest that commensurate investments are warranted in teacher education and professional development.

# Introduction

The increasing use of information and communication technologies (ICT), such as mobile phones, computers, and the internet, demands that young people develop skills to effectively participate as citizens in the digital age. A citizenry that possesses these skills, referred to as computer and information literacy (CIL), is relevant in all countries regardless of economic development.

Whether transferring money using mobile banking tools in Korea, completing a SMS-text household survey in Argentina, driving a car for Uber in Turkey, or buying shoes online from Alibaba.com in Hong Kong SAR, people worldwide increasingly use CIL skills to be active, informed, and employable members of the communities in which they live. These realities raise important questions: How prepared are young people to use these technologies effectively? How can we better prepare them to develop CIL skills?

Whereas technology literacy is not commonly expected of older generations, it is often assumed that young people are naturally fluent in using ICT in deep and meaningful ways. As Cameron, Bennett, and Agostinho (2011, p. 3392), for example, stated:

*Today's learners are described as proficient in multitasking, active experiential learners, and dependent on communications technologies for accessing information and for interacting with others ... It is claimed that these attributes are based on the premise that constant exposure to technology since birth means young people have an in-depth grasp and almost intuitive knowledge of how to use technology.*

However, such assumptions may be mistaken according to findings from the 2013 International Computer and Information Literacy Study (ICILS 2013) conducted by the International Association for the Evaluation of Educational Achievement (IEA) (Fraillon, Ainley, Schulz, Friedman, & Gebhardt, 2014). While the majority of young people might be able to use Google to search for internet content, the ICILS findings indicate that most do not have the critical analysis skills required to identify which search results will best help them solve problems. Nor do they necessarily have the ability to identify the signs of an untrustworthy email. Yet these types of competences are characteristic of CIL, which ICILS defines as "an individual's ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in society" (Fraillon, Schulz, & Ainley, 2013, p. 17).

Although schools remain the leading institutions responsible for preparing students as digital citizens, young people use ICT outside of school as well as in. However, access to these technologies inside and outside school varies considerably across populations. Also, even when access is sufficient, it alone may not guarantee CIL skills development. According to a recent Organisation for Economic Co-operation and Development (OECD) (2010) report, "… it is important to realise that the fact that students appear to be technologically 'savvy' does not mean that they have developed the skills and competences that will make them responsible, critical and creative users of technology" (p. 15).

## Data

ICILS focused on Grade 8 students' development of the knowledge, understanding, attitudes, dispositions, and skills associated with CIL.[1] The study also provided essential information about the broader contexts within and outside school in which CIL proficiency among students tends to develop. ICILS's four-part assessment framework focused on the individual learner and his or her home, in-school, and wider community contexts. Just under 60,000 Grade 8 (or equivalent) students from more than 3,300 schools across 21 education systems participated in the study.[2] To further supplement the student data, contextual data were collected from around 35,000 teachers as well as from school staff working in the area of ICT, school principals, and staff in the ICILS national research centers.

1 Funding for the study was from the IEA, participating countries, and the European Commission Directorate-General for Education and Culture grant to participating European countries.

2 The 21 participating education systems in ICILS included Australia, the City of Buenos Aires (Argentina), Chile, Croatia, the Czech Republic, Denmark, Germany, Hong Kong SAR, Korea, Lithuania, the Netherlands, Norway (Grade 9), Newfoundland and Labrador (Canada), Ontario (Canada), Poland, the Russian Federation, the Slovak Republic, Slovenia, Switzerland, Thailand, and Turkey.

## Challenges to developing students' CIL

For older generations, the development of CIL skills (such as effectively searching the internet to find information or setting up basic security in a home Wi-Fi network) has occurred slowly as new technologies have been introduced. However, young people have not had the benefit of this slow transition. As a UNESCO policy brief affirms, they have to quickly master and critically appreciate the core concepts, tools, and competences that make full engagement in today's digital society possible (Cornu, 2011). Also, educational initiatives tend to have paid considerably more heed to supporting the acquisition of advanced technology skills (e.g., computer programming) than the acquisition of the basic skills (e.g., searching the internet and using email) now required in most sectors of the economy (OECD, 2012).

The findings of ICILS and other studies indicate that the role schools can play in helping young people develop these skills is being compromised for several reasons. First, although international access to technology in schools has increased since the 1990s and thus decreased the divide between those with access to digital technologies and those without, a second digital divide is forming between those who have skills to use these technologies and those who do not (Acilar, 2011).

This divide appears to be due, in part, to variation among schools and education systems in how technology is used. For example, the IEA Second Information Technology in Education Study (SITES), conducted in 2006, showed that despite reports from the participating countries of system-wide policies related to technology use in education and widespread classroom access to computers and the internet, teachers tended to report minimal use of ICT in their teaching (Law, Pelgrum, & Plomp, 2008). Furthermore, despite the generally greater presence of ICT infrastructure in schools, the study highlighted considerable variation in its extent in schools within many of the participating education systems.

Second, young people who use ICT are not always taught to use these technologies in meaningful ways. For example, findings from the OECD's 2013 Programme for the International Assessment of Adult Competencies (PIAAC) showed that "millennials" (the cohort born after 1980) were unexpectedly weak at problem solving in technology-rich environments. While 56 percent of millennials from the United States scored below the minimum proficiency level, even top-performing systems, such as Japan (33% below) and Finland (32% below) were still struggling to develop the technology skills their societies require for future economic and social wellbeing (Goodman, Sands, & Coley, 2015). Given the importance of CIL skills in the digital age, leaving a third or more of a generation without the skills to effectively use even ubiquitous internet and mobile technologies is not an option.

## Developing CIL skills: Findings from ICILS

To help us better understand the extent and nature of the CIL skills of today's so-called digital natives/net generation and what education systems appear to be doing to enhance these skills among young people, we turned to ICILS 2013. Here we found several findings pertinent to our investigation. Accounts and discussion of these follow.



## CIL skills of digital natives

Despite the widespread assumptions made about digital natives, ICILS found that, on average across the participating countries, current educational practice does not appear to be preparing the net generation with the necessary CIL skills. For example, on average across the participating countries, only 25 percent of young people (Australia 60%, Germany 28%, Czech Republic 21%, Thailand 7%) were able to identify the characteristics of an untrustworthy email. Similarly, on average, only 23 percent of young people across the countries (Korea 35%, Norway 30%, Chile 13%, Turkey 1%) were able to demonstrate awareness that the information they access might be biased, inaccurate, or unreliable.

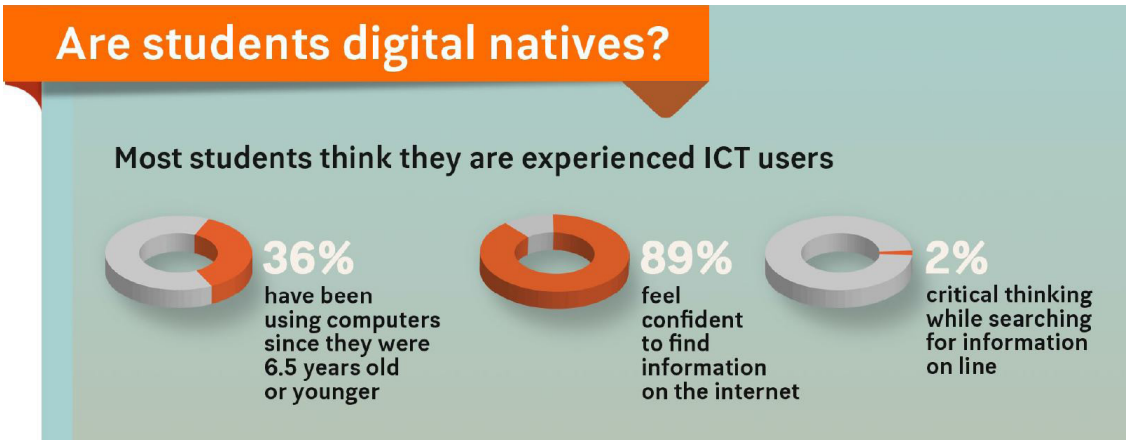
Students' exposure to technology varied across and within countries. Of the participating students, only 36% reported using computers since the time they entered school (when about six years old). While the majority of students were confident in their abilities to search the internet, only two percent were using critical thinking skills when searching for information online (see Selwyn, 2009, for additional insights and associated challenges). These findings suggest a clear divide between *extent* of use and *critical* use of digital information.

## ICT use outside school

The development of CIL skills naturally extends beyond classroom activity. ICILS findings suggest that helping students use technology in ways that support their learning not only inside but also outside school improves their overall CIL skills. The study found that, on average, young people without internet access at home scored 72 points lower on the international scale of CIL achievement than those with home-based access.

ICILS also found, however, considerable variation in computer and internet access across the participating countries. While the majority of young people in countries such as Australia and Norway had access to three or more computers in the home, only 1 in 10 students in Turkey had a computer at home. And whereas 98 percent of young people in Chile reported internet access at home, only 57 percent of students in Thailand did so. This variation was typically associated with household income and parents' attained level of education. Although mobile technologies are reducing this digital "access" divide, it is still not clear if this situation is translating to more *meaningful* use of these technologies at home.

As the ICILS researchers expected, students' use of technology outside of school tended to be primarily for entertainment purposes, including



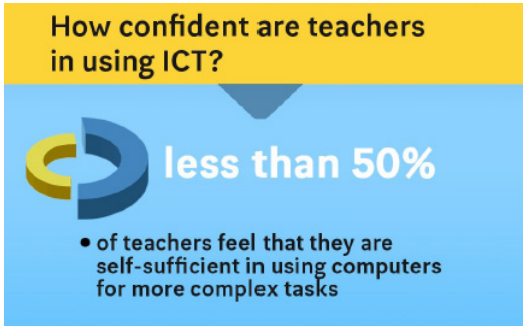
downloading music or videos, using social media, or playing games. In countries with higher average scores on the CIL achievement scale, such as Australia and Poland, students were using technology to access information for their school work to a greater extent than were their peers in countries with lower scores on the scale.

Being able to access computers outside of school hours was also associated with higher CIL scores, although few countries allowed students to take computer hardware and software home. In four of the five countries with the highest CIL scores (Australia, Czech Republic, Korea, and Norway), schools were far more likely than schools in the other ICILS countries to have policies on student access to computers outside school hours. Despite these policies, only one of these countries (Australia) was providing students with their own laptop computer or other mobile learning device to use at home. This apparent disconnect may reflect a situation where after-school, but not home, use of technology is focused more on school-based learning than on simply playing games or engaging in social interactions.

## CIL skills in school and the role of teachers

In general, most countries that participated in ICILS supported the use of technology in their schools and had relevant policies and plans in place at both national and school levels. In addition, schools in most countries tended to be generally well equipped with computer hardware and software. For instance, 99% of participating ICILS schools reported having internet access. However, use of these resources and the way they were being used tended to be relatively limited. For example, although 87 percent of students internationally said they used computers at home, only 54 percent reported using computers at school. At the same time, the ratio of students to computers in schools did not appear to have substantially influenced the technology literacy of students.

ICILS findings also showed that the teachers surveyed often felt unprepared to use ICT as part of their teaching practice, thus limiting how and the extent to which different forms of technology were being utilized in their schools. Cross-nationally, just under 50 percent of the teachers said they felt confident using computers in the classroom for tasks beyond basic ones (e.g., projecting slides), while no more than five percent reported using tools such as digital learning games, simulation and modeling software, and social media to promote meaningful learning for their students (e.g., building critical thinking skills). When teachers were asked how they were obtaining technology skills, around 33 percent said they had enrolled in an introductory course on general applications, and 46 percent said they had acquired skills by observing peers.




It is equally important to consider the role of teachers in promoting the development of technology literacy outside of schools. Creating assignments, for instance, that encourage students to use computers outside of school hours (at home when available, in community computer labs, through mobile technologies, etc.) may increase the meaningful use of these resources for learning—beyond just the social and gaming applications that students are already typically using. Unfortunately, from ICILS findings, it seems that few teachers are prepared for this level of ICT integration.

# Conclusions

1. ***Make acquisition of CIL skills a core education initiative***

   It is important not to assume students naturally possess the ICT skills they require to participate effectively in today's digital age, as is often presumed through use of the term digital natives. Rather, CIL skills appear to develop through targeted initiatives and strategies. Despite the increase in available technology within schools, education policies are necessary to further emphasize the teaching of valuable CIL skills. Initiatives should focus not only on providing increased access to ICT, but also on teaching students how they can use these technologies in meaningful ways.

2. ***Promote strategies for aligning CIL acquisition inside and outside of schools***

   Policies designed to increase CIL skills should also recognize the importance of linking how students use ICT inside and outside of school. For example, greater access to computers after school hours could be provided or school-based programs could be integrated with those that support home access to technology (including the internet). The role teachers can play in promoting the development of CIL outside of schools is of course highly pertinent. Creating assignments, for instance, that encourage students to use computers at home (when available), in community computer labs, through mobile technologies, and the like may increase the meaningful use of these resources for learning beyond the social and gaming applications that students typically use outside school hours. However, as the ICILS findings suggest, no one-size-fits-all policy will improve access and meaningful use of technologies inside and outside of schools. Instead, policies must reflect the economic, social, and educational challenges of the communities they serve.

3. ***Invest in CIL-related teacher education and professional development***

   Given the substantial investment in technological equipment in many schools, it is time to balance the ratio of expenditure on computer hardware and software with expenditure on preparing teachers to use that equipment in meaningful ways. Simply equipping schools with different forms of technology (computers, tablets, smartboards, software, etc.) does not necessarily lead to new and innovative learning environments. For example, the 2006 IEA SITES found that "teachers were more likely to use ICT if they were confident users of these tools [and] if they participated in ICT-related professional development" (Fraillon, Ainley, Schulz, Friedman, & Gebhardt, 2014, p. 196). Moreover, as findings from ICILS show, teachers' use of computers continues to mostly encompass traditional tasks previously the province of typewriters, overhead projectors, and libraries. Innovative use that promotes analytical and critical thinking and learning, such as learning games, simulations, and student peer collaboration, is rare. Accordingly, teachers have to know how to integrate and utilize the technology in these ways.

   Teacher education and professional development programs must go beyond just providing technical training on how the technologies work to providing guidance on utilizing them in the ways just mentioned. These programs also have to help teachers use ICT resources to develop appropriate lessons plans, integrate assessments, and build teacher peer learning networks. Policies and practices directed toward these aims should help teachers equip their students with the skills they require to sustain meaningful use of ICT now and on into a future likely to be characterized by ongoing rapidly evolving development and use of digital technologies.



# Acronyms Dictionary (in order of initial appearance)

CIL -- Computer and Information Literacy

IEA -- International Association for the Evaluation of Educational Achievement

ICILS -- International Computer and Information Literacy Study

SMS -- Short Message Service

OECD -- Organisation for Economic Co-operation and Development

UNESCO -- The United Nations Educational, Scientific and Cultural Organization

SITES -- Second Information Technology in Education Study

PIAAC -- Programme for the International Assessment of Adult Competencies

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**About the IEA**

The International Association for the Evaluation of Educational Achievement, known as IEA, is an independent, international consortium of national research institutions and governmental agencies, with headquarters in Amsterdam. Its primary purpose is to conduct large-scale comparative studies of educational achievement with the aim of gaining more in-depth understanding of the effects of policies and practices within and across systems of education.



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