CHAPTER 2:

The Contexts for Education on Computer and Information Literacy

Introduction

The contextual framework for ICILS (Fraillon, Schulz, & Ainley, 2013) emphasizes the importance of establishing students' learning environment when examining outcomes related to computer and information literacy (CIL). The framework distinguishes different levels of influence:

- *Individual*, including the learner's characteristics, learning process, and level of CIL;
- *Home environment*, including student background characteristics associated with family, home, and other proximal out-of-school contexts;
- *School and classroom*, encompassing in-school factors; and
- *Wider community*, encompassing broader contextual factors such as geographical remoteness and access to internet facilities.

In this chapter, we explore the national contexts for CIL education in the 21 ICILS countries. We primarily address Research Question 2 from the ICILS assessment framework: "*What aspects of schools and education systems are related to student achievement in computer and information literacy?*" Most of the emphasis with regard to this question is on its first subquestion concerning countries' "*general approach to computer and information literacy*."

Our main purpose in this chapter is to describe the similarities and differences in CIL-related contexts across countries in order to provide information that can be used to aid interpretation of variations identified in the data gathered via the student, teacher, and school questionnaires. We begin the chapter by discussing the two data sources we use in it. We then describe the characteristics of the education systems of the participating ICILS countries and consider data relating to the infrastructure of and resources for CIL education. We conclude the chapter with a discussion of the different approaches to CIL education observed across and within the ICILS countries.

Collecting data on contexts for CIL education

In 2009 and 2010, the U.S. Department of Education conducted a study of international experiences with information and communication technology (ICT) in education (U.S. Department of Education, 2011). The study reviewed available data on government initiatives to integrate ICT into teaching and learning and conducted a survey that included interviews with officials of 21 governments[1] across the world. The study also covered such issues as providing infrastructure, improving student learning through the use of ICT, building capacity through ICT, and using ICT to support school improvement. In addition to generating an overview of practice and policy, the study profiled each of the 21 education systems (countries).

1 The countries were Australia, Austria, Belgium (Flemish Community), Canada (Alberta), Chile, Denmark, England, Estonia, France, Finland, Hong Kong (SAR, China), Iceland, Israel, Japan, Netherlands, New Zealand, Norway, Portugal, Republic of Korea, Singapore, and Sweden.

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The study's report pointed to ongoing investment in ICT for education, especially in terms of improved connectivity and student and teacher access to computers. It noted moves to integrate mobile technologies in learning environments and to adopt cloud computing. The report's authors observed that several countries had adopted learning management systems and even online instruction for students.

According to the report, most of the 21 countries regarded the development of teachers' capacities to use ICT in education as a priority. In many countries, there was evidence of teachers being provided with digital resources. Just under half of the countries were using online methods to provide professional development opportunities for teachers. Fewer than half of the countries (8 of the 21) had introduced online delivery of national assessments. The report also noted that the majority of countries (15 of the 21) had established standards for ICT competences among students. Most countries had also articulated in national documents visions "for integrating ICT into primary and secondary education."

As part of a 2011 report on learning and innovation through ICT at schools in Europe, the Eurydice network published a document reporting progress in ICT infrastructure provision across countries (Eurydice, 2011). The network explored how ICT was being used in educational processes and incorporated into curricula. It also looked at ICT's role in the development of innovative teaching methods. The network furthermore found that most European countries had comprehensive national strategies for using ICT in education. However, while these countries referred to the part that ICT can play in assessing competencies, they rarely indicated how such assessment should be implemented in practice. The study also identified within countries a gap between promoting ICT use in teaching and learning in official documents and actually implementing this practice.

A key feature of IEA studies is examination of links between the intended curriculum (what policy requires), the implemented curriculum (what is taught in schools), and the achieved curriculum (what students learn). IEA's Second Information Technology in Education Study (SITES) 2006 gathered information across 22 countries (education systems) on the intended curriculum with respect to ICT use in education (Plomp, Anderson, Law, & Quale, 2009).

The instrument used to collect this information was a questionnaire that asked each country to provide details about its national education system and structure, teacher preparation, change in pedagogical practices in the past five years, and system-wide policies and practice pertaining to ICT use in schools. The survey results identified differences across the countries in how ICT was being used in educational practice. The results also highlighted a lack of centralized policy in many countries for ensuring that teachers and students could actually use ICT-related technologies in their teaching and learning (Anderson & Plomp, 2010).

The main source of information in this chapter came from the data collected by the ICILS national context survey (NCS), which was designed to capture information about the intended curriculum for developing students' CIL capacity. The study by the U.S. Department of Education Office of Technology (2011) and the Second Information Technology in Education Study (SITES) 2006 (Plomp et al., 2009) informed development of the NCS. This work was conducted in consultation with ICILS national research coordinators and other experts. National research centers were asked

to coordinate responses to the NCS and, where appropriate, to consult local experts. The latter included education ministry or department of education staff, relevant nongovernmental organizations, specialist organizations concerned with supporting the application of educational technologies, and teacher associations.

The information that the NCS collected was divided into five broad sections:

- Education system;
- Plans and policies for using ICT in education;
- ICT and student learning at lower-secondary level (ISCED 2);
- ICT and teacher development; and
- ICT-based learning and administrative management systems.

Because respondents from the respective participating countries provided much of the NCS data presented in this chapter, the information may not necessarily reflect the content of official published national documentation. Also, because the NCS specified that respondents answer questions in relation to what was occurring during the reference year in which the ICILS main survey took place in participating countries (the 2012/2013 school year for Northern Hemisphere countries, and the 2013 school year for Southern Hemisphere countries), the responses provided in this chapter may not reflect changes in countries that have happened since the time of data collection.

The second type of information used in this chapter focuses on antecedent variables sourced from established international databases. These enabled us to illustrate the relative global standing of each country in terms of economic indices and ICT infrastructure.

Characteristics of the education systems in participating ICILS countries

The first question in the NCS asked respondents to characterize who had responsibility for school-based education in their country and whether this responsibility resided primarily at a national ministry or department of education level, a state or provincial jurisdiction level, or some combination of authorities across levels. Table 2.1 provides a summary of the responses to this question.

Table 2.1 shows substantial variation in the characteristics of education systems at the national level. In a large proportion of these countries, a national ministry of education or other division of central government provides primary direction for planning and implementing educational policy at the school level. Often, aspects of management and administration are carried out at the local level but with the general direction for schools being defined nationally. In several countries, namely Australia, Germany, Switzerland, and the two participating Canadian provinces (Newfoundland and Labrador, and Ontario), the different states or provinces are largely autonomous in setting their own direction for education. This is also the case for Hong Kong SAR, which has autonomy with regard to its education policy. In the third group of education systems (Chile, the City of Buenos Aires, the Czech Republic, Denmark, Lithuania, and the Russian Federation), responsibilities are evenly balanced between national and state and provincial authorities. It is important when reading this report to note these differences across the participating countries' education systems.

Table 2.1: Levels of responsibility for school-based education

Country	Characterization of responsiblity for school education system
Australia	Each of the eight state and territory governments has authority for delivering school education, but must do so on the basis of some national guidance.
Chile	In this decentralized system, national agencies define policies, standards, and regulation, but municipalities and/or private entities administer them.
Croatia	The Croatian Ministry of Science, Education, and Sports is primarily responsible for school education.
Czech Republic	Responsibility for education is distributed across the central government, regions, and communities.
Denmark	The Danish Ministry of Education and the local municipalities share responsibility.
Germany	Each of the 16 federal states has sole responsibility for school education.
Hong Kong SAR	As a special administrative region of China, Hong Kong has total autonomy for delivery of school education.
Korea, Republic of	The national Ministry of Education has primary responsibility for the planning, operation and management of school-based education.
Lithuania	There is a balance in responsibilities between the national level and the state level (municipal council).
Netherlands	Responsibility for school education rests primarily with the National Ministry of Education, Culture, and Science.
Norway	The Ministry of Education and Research shares responsibility for administration and implementation of national educational policy with the National Directorate for Education and local municipalities.
Poland	The Minister of National Education has overall responsibility for setting national standards while local government units (*gmina*) are responsible for administering lower-secondary schools.
Russian Federation	Federal and regional authorities equally share responsibilities for school education.
Slovak Republic	The Ministry of Education, Science, Research, and Sport has primary responsibility for school education.
Slovenia	Responsibility for school education rests primarily with the Ministry of Education, Science, and Sport.
Switzerland	Responsibility for school education rests primarily with the 26 cantons.
Thailand	Responsibility for school education rests primarily with the Ministry of Education, Science, and Sport.
Turkey	The Ministry of National Education has primary responsibility for school education.
Benchmarking participants	
City of Buenos Aires, Argentina	The city of Buenos Aires shares responsibility for school education with the Argentinian National Ministry of Education.
Newfoundland and Labrador, Canada	There is no Canadian ministry or department of education. The province has full responsibility for education.
Ontario, Canada	There is no Canadian ministry or department of education. The province has full responsibility for education.

Note: Data collected from ICILS 2013 national contexts survey.

For those countries with more decentralized systems, the NCS responses, which form the basis for most of the remaining tables in this chapter, are represented as a summary or composite reflection of the national picture. Alternatively, the responses may represent the plans and policies of a particular populous region within the country, such as the North-Rhine-Westphalia state of Germany. Because it is beyond the scope of this report to explore and examine the fine detail of within-country differences in educational policies, interpretation of the country differences presented here needs to take into account the aggregated or selective nature of the NCS responses represented in the tables.

Table 2.2 illustrates the structures of the education systems in the participating countries. In most of the countries (16 out of the 21), the compulsory age for commencing school (not including compulsory pre-primary education) is six. Children in the Russian Federation cannot begin school until they are six and a half years of age. Students from the two Latin American participants (Chile and the City of Buenos Aires) and the Netherlands commence compulsory schooling at age five, whereas students in Lithuania and Poland commence schooling at seven. The number of years of compulsory schooling ranges from eight years in Croatia, up to 13 years in Chile.

Table 2.2 also includes information on the structure of school-based education in each country. The columns show the number of years typically spent at three levels of educational provision, classified according to the International Standard Classification of Education (ISCED) (UNESCO, 2006). ISCED 1 refers to primary education, ISCED 2 to lower-secondary education, and ISCED 3 to upper-secondary education.

Primary education across the 21 countries ranges in duration from between four and seven years, lower-secondary education between two and six years, and upper-secondary education between two and four years. In four countries, lower-secondary education is the second stage of basic education programs (indicated by an asterisk). Table 2.2 does not take into account differences within countries in the number of years of schooling across states and provinces. Nor does it take into account differences according to educational track (e.g., academic, vocational), particularly at the upper-secondary level.

Table 2.2 also shows the percentage of lower-secondary students attending public or government schools and the percentage attending private or other nongovernment schools. Note, however, that the definition of what constitutes a public or private school varies across countries in terms of the proportion of government funding received, school management, and degree of autonomy. In the majority of countries, greater proportions of students at the lower-secondary level attend government schools. Exceptions are the Netherlands and Chile, where the majority of students at this level attend private or other schools, and also the City of Buenos Aires, where the proportions attending the two school types are approximately equal.

The NCS asked the study's national centers to provide information on how much autonomy schools had over the following: school governance, acquisition and purchase of ICT equipment and software, provision of ICT-based inservice opportunities for staff, ICT curriculum planning and delivery, teacher recruitment, student assessment, and technical support for ICT. Table 2.3 summarizes the responses.

Table 2.2: Characteristics of education systems participating in ICILS: compulsory schooling, years of education by levels, and percentage lower-secondary students in private/public schools

Country	School Age		Typical Years of Education at Education Levels			Percentage of Lower-Secondary Students	
	Starting age	Years of compulsory schooling	ISCED 1 (primary)	ISCED 2 (lower secondary)	ISCED 3 (upper secondary)	Public or government schools	Private or other nongovernment schools
Australia	6	11	6	3	3	59	41
Chile	5	13	6	2*	4	42	58
Croatia	6	8	4	4	4	98	2
Czech Republic	6	9	5	4*	4	97	3
Denmark	6	10	7	2	3	80	20
Germany	6	10	4	6	3	98	2
Hong Kong SAR	6	9	6	3	3	81	19
Korea, Republic of	6	9	6	3	3	82	18
Lithuania	7	10	4	6	2	98	2
Netherlands	5	10–12	6	3	1–3	30	70
Norway	6	10	7	3	3	97	3
Poland	7	9	6	3	3	97	3
Russian Federation	6	11	4	5	2	99	1
Slovak Republic	6	10	4	5*	4	93	7
Slovenia	6	9	6	3*	4	100	0
Switzerland	6	9	6	3	3	94	6
Thailand	6	9	6	3	3	87	13
Turkey	6	12	6	2	4	95	5
Benchmarking participants							
City of Buenos Aires, Argentina	5	12	6	3	3	51	49
Newfoundland and Labrador, Canada	6	12	6	3	3	94	6
Ontario, Canada	6	12	6	2	4	95	5

Notes:

*ISCED 2 offered as second stage of combined ISCED 1+2 program.

Data on beginning age and years of compulsory schooling and percentage of students at public or private schools collected through ICILS 2013 national contexts survey.

Table 2.3: Degree of school autonomy regarding different aspects of school policies

Country	School Governance (e.g., School Governing Bodies/ Elected School Boards)	Acquisition/Purchase of ICT Equipment and Software	Provision of Opportunities for Staff to Participate in Inservice Education on Using ICT	ICT Curriculum Planning and Delivery	Teacher Recruitment	Student Assessment	Technical Support for ICT
Australia	◒	◒	●	●	◒	◒	◒
Chile	●	◒	●	◒	◒	●	●
Croatia	◒	●	●	●	●	●	●
Czech Republic	●	◒	●	◒	●	●	●
Denmark	◒	◒	◒	◒	◒	◒	◒
Germany	◒	◒	◒	◒	◒	◒	◒
Hong Kong SAR	●	●	●	◒	●	●	●
Korea, Republic of	◒	◒	●	○	◒	●	◒
Lithuania	◒	●	●	◒	●	◒	●
Netherlands	●	●	●	●	●	●	●
Norway	◒	◒	◒	◒	●	◒	◒
Poland	●	●	●	◒	●	◒	●
Russian Federation	●	●	◒	○	●	◒	●
Slovak Republic	◒	●	●	◒	●	●	●
Slovenia	◒	●	●	◒	●	◒	◒
Switzerland	○	◒	◒	○	○	●	◒
Thailand	◒	◒	●	◒	◒	●	◒
Turkey	○	○	○	○	○	○	○
Benchmarking participants							
City of Buenos Aires, Argentina	◒	○	◒	◒	○	●	○
Newfoundland and Labrador, Canada	◒	◒	●	○	◒	◒	◒
Ontario, Canada	○	◒	◒	◒	◒	◒	◒

● Complete autonomy
◒ Some autonomy
○ No autonomy

Note: Data collected from ICILS 2013 national contexts survey.

In nearly all 21 countries, schools had at least some autonomy for each of these aspects of school management. The high proportion of "some autonomy" indicated in this table most commonly reflects national, state, or provincial policies or recommendations that individual schools have to follow, but within which they have autonomy to decide the most appropriate means of implementing them (e.g., with regard to purchasing equipment and conducting student assessment).

In every country but one, schools had some or complete autonomy over the types and frequency of inservice education on ICT use and student assessment offered to staff. Sixteen of the 21 participating countries indicated that schools had some autonomy with respect to ICT curriculum planning and delivery. In Turkey, where schools have no autonomy for these aspects of school policies, the Ministry of National Education centrally administers all such matters.

Infrastructure and resources for education in CIL

The countries participating in ICILS are diverse in terms of their ICT infrastructure and the ICT resources they have available for their respective populations. Table 2.4 presents data relating to ICT infrastructure (i.e., fixed broadband subscriptions per 100 people and ICT Development Index score[2] and ranking) and economic development (gross domestic product, income Gini coefficient,[3] and the percentage of public expenditure apportioned to education).

The number of fixed broadband subscriptions per 100 people provides an indicator of how widespread internet usage is in a country. Considerable variation with respect to this measure is evident in Table 2.4, with the range extending from 8 subscriptions per 100 people to 40 subscriptions per 100 people. The Netherlands, Switzerland, Korea, Denmark, and Norway each have more than 35 fixed broadband subscriptions per 100 people, whereas Chile, Thailand, and Turkey each have fewer than 15 subscriptions per 100 people.

Large variations can also be seen across countries for the selected economic statistics. Gross domestic product (GDP) per capita (expressed in 2005 international dollars using purchasing power parity rates and divided by the total population during the same period) is relatively higher for Norway, Switzerland, and the Netherlands than for the Russian Federation, Turkey, and Thailand.

Table 2.4 shows that on the basis of the ICT Development Index, the countries participating in ICILS are overall relatively well resourced. Eighteen of the 21 participating countries (or 20 if the two Canadian provinces are considered as one entity for the purpose of the index) had ICT Development Index rankings below 52, thus placing them in the upper third of all countries included in the rankings.

We can see from Table 2.4 that the values of the Gini income coefficient (a measure of the extent of variation in income across households) are relatively low for Denmark, the Czech Republic, and Norway, thus indicating a relatively equal income distribution.

2 The ICT Development Index (IDI) is a composite index that incorporates 11 different indicators relating to ICT readiness (infrastructure, access), ICT usage (individuals using the internet), and proxy indicators of ICT skills (adult literacy, secondary and tertiary enrolment). Each country is given a score out of 10 that can be used to provide a benchmarking measure to compare ICT development levels with other countries and within countries over time. Countries are ranked according to their IDI score.

3 The Gini income coefficient is a measure of the deviation of the distribution of income (or consumption) among individuals or households within a country from a perfectly equal distribution. A value of 0 represents absolute equality. A value of 100 represents absolute inequality (see United Nations Development Programme, 2010).

Table 2.4: Data on ICT infrastructure and economic characteristics in ICILS countries

Country	Fixed Broadband Subscriptions per 100 Inhabitants	ICT Development Index Score (and Country Rank)	Gross Domestic Product (GDP) per Capita (2005 PPP $)	Income Gini Coefficient	Public Expenditure on Education (% of GDP)
Australia	24.3	7.90 (11)	34,548	30.3[3]	5.1
Chile	12.3	5.46 (51)	15,272	52.1	4.5
Croatia	20.7	6.31 (38)	16,162	33.7	4.3
Czech Republic	16.4	6.40 (34)	23,967	24.9[3]	4.5
Denmark	38.8	8.35 (4)	32,399	24.8[3]	8.7
Germany	33.7	7.46 (19)	34,437	28.3	4.6
Hong Kong SAR	31.2	7.92 (10)	43,844	53.7[3]	3.6
Korea, Republic of	37.2	8.57 (1)	27,541	31.1[3]	5.0
Lithuania	21.1	5.88 (44)	16,877	37.6	5.7
Netherlands	39.8	8.00 (7)	37,251	30.9[3]	5.9
Norway	36.3	8.13 (6)	46,982	25.8	7.3
Poland	15.6	6.31 (37)	18,087	34.1	5.1
Russian Federation	14.5	6.19 (40)	14,808	40.1	4.1
Slovak Republic	14.7	6.05 (43)	20,757	26.0	4.1
Slovenia	24.3	6.76 (28)	24,967	31.2	5.7
Switzerland	40.1	7.78 (13)	37,979	33.7	5.4
Thailand	6.5	3.54 (95)	7,633	40.0	3.8
Turkey	10.6	4.64 (69)	13,466	39.0	2.9
Benchmarking participants					
City of Buenos Aires, Argentina	10.9[1]	5.36 (53)[1]	15,501[1]	44.5[1]	6.0[1]
Newfoundland and Labrador, Canada	32.5[2]	7.38 (20)[2]	35,716[2]	32.6[2]	4.8[2]
Ontario, Canada	32.5[2]	7.38 (20)[2]	35,716[2]	32.6[2]	4.8[2]

Notes:

Fixed broadband subscriptions, ICT Development Index Score, and country rank data relate to 2012 and were collected from the International Telecommunications Union. Source: http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx [27/02/14].

Data on gross domestic product per capita, income gini coefficient, and public expenditure on education sourced from the *Human Development Report 2013* unless otherwise stated. Source: http://hdr.undp.org/sites/default/files/reports/14/hdr2013_en_complete.pdf [15/08/14].

Data on gross domestic product per capita relate to 2011.

Data for income Gini coefficients relate to the years 2000–2012.

Data for public expenditure on education relate to the years 2005–2010.

[1] Data relate to Argentina.

[2] Data relate to Canada.

[3] Data sourced from *CIA World Factbook*. Source: https://www.cia.gov/library/publications/the-world-factbook/ [15/08/14].

The relatively high values for Hong Kong SAR, Chile, and the City of Buenos Aires indicate unequal income distributions.

Table 2.4 furthermore includes each country's expenditure on education as a proportion of its GDP. Denmark, which spends almost nine percent of its GDP on education, has the highest proportion. The country with the lowest proportion is Turkey. It spends less than three percent of its GDP on education.

Approaches to CIL education in ICILS countries

In countries worldwide, ICT-related education policies are most likely to be defined at the central administrative level of the education system, with the relevant agencies either taking sole responsibility or working in cooperation with different bodies, including civil society organizations and educational institutions (Eurydice, 2011). The ICILS national context survey asked the national centers to indicate whether their countries had plans or policies from ministries or departments of education specifying support for ICT in education (see Table 2.5).

Only the national centers from the Netherlands, Korea, and Newfoundland and Labrador stated that their systems had no such plans or policies at the national, state, or provincial level. In the Netherlands, however, support is provided through Knowledge Net (*Kennisnet*), which although a nongovernment organization is government funded. While Korea had plans or policies regarding the use of ICT in education, these had been abolished by the time of the ICILS reference year.

All other 18 national centers indicated the presence of plans or policies regarding the use of ICT in education at either the national, state, or provincial level. Fourteen of these countries indicated support at both levels, whereas Switzerland and Ontario (Canada) stated that this support is evident only at the provincial level. In Slovenia and Thailand, support is available only at the national level.

All countries with existing plans and policies for using ICT stated that these include references to improving student learning of specific subject-matter content. Qualitative responses from countries indicated differences in what these references focus on. Some national centers, for example, mentioned ICT-related content within the context of specific subjects such as mathematics, sciences, and humanities; others mentioned crosscurricular themes or capabilities across several subjects.

Nearly all national centers identified the following as important aspects of educational policies and plans: preparing students to use ICT as a learning tool, development of information literacy, and development of ICT-based skills in critical thinking, collaboration, and communication. Between one and three countries indicated that one or more of these aspects are not referenced in educational policies and plans.

There was less support reported for increasing access to online courses of study for the benefit of particular groups of students (e.g., rural students). Only 11 countries said this type of support appears in their plans or policies. Qualitative comments helped explain the reason for the lack of such support in the policies and plans of the other countries. Slovenia, for example, stated that all school students have access to transport to school, and that the distances students needed to travel within the country are relatively small. This type of support is not applicable in the City of Buenos Aires because it is an urban jurisdiction.

Table 2.5: Support for ICT at schools by national and/or subnational authorities

Country	Plans or Policies Supporting the Use of ICT in Education	Inclusion in Plans and Policies of Reference to Aspects of Improving Student Learning				
		Subject-matter content (mathematics, science, etc)	Preparing students for ICT in their future work	Developing information literacy	ICT-based skills in critical thinking, collaboration and communication	Increasing access to online courses of study (e.g., for rural students)
Australia	▲	●	●	●	●	●
Chile	▲	●	○	●	●	●
Croatia	▲	●	●	●	○	○
Czech Republic	▲	●	●	●	●	○
Denmark	▲	●	●	●	●	○
Germany	▲	●	●	●	●	○
Hong Kong SAR	▲	●	●	●	●	●
Korea, Republic of	◇	N/A	N/A	N/A	N/A	N/A
Lithuania	▲	●	●	●	●	●
Netherlands	◇	N/A	N/A	N/A	N/A	N/A
Norway	▲	●	●	●	●	●
Poland	▲	●	●	●	●	○
Russian Federation	▲	●	○	○	○	●
Slovak Republic	▲	●	●	●	●	●
Slovenia	■	●	●	●	●	○
Switzerland	◆	●	●	●	●	○
Thailand	■	●	●	●	●	●
Turkey	▲	●	●	●	●	●
Benchmarking participants						
City of Buenos Aires, Argentina	▲	●	●	●	●	○
Newfoundland and Labrador, Canada	◇	N/A	N/A	N/A	N/A	N/A
Ontario, Canada	◆	●	●	●	●	●

Note: Data collected from ICILS 2013 national contexts survey.

▲ Support at national and state/provincial level
■ Support only at national level
◆ Support only at state/provincial level
◇ No support at national or state/provincial level

● Reference in plans or policies to using ICT in education
○ No reference in plans or policies to using ICT in education

The NCS also asked national centers if plans or policies for using ICT in education referenced seven different items regarding provision, maintenance, accessibility, and support of ICT resources. These data are shown in Table 2.6. Most of these items are referenced in 17 of the 18 countries with national and/or provincial plans. No such references are evident in Norway's plans or policies. In Norway, the local authorities (e.g., counties, municipalities, or schools) are responsible for these resources. Seventeen countries reported provision of computer equipment and other ICT resources, support for teachers when using such equipment, and teacher and student access to digital education resources. Sixteen countries reported internet connectivity, while 14 identified maintenance as well as renewal, updating, and replacement of computer equipment and other ICT resources. Fewer than half of the countries (nine) provided students and teachers with home-based access to school-based digital resources.

Table 2.7 summarizes information from the national centers about the extent to which their countries' plans or policies for using ICT included references to the following: methods of supporting student learning, providing computing in schools, and developing digital resources. With respect to ICT-related methods of supporting student learning, all 18 countries with existing plans and policies said these contained references to inservice teacher education in ICT use. Seventeen countries specified that this provision extended to preservice teacher education. Learning management systems and reporting to parents were referenced in the plans and policies of 11 and 12 countries respectively. Eleven of the 21 countries said there were references to using ICT to provide feedback to students.

Of the countries investing heavily in ICT infrastructure for educational purposes, many have implemented policies directed toward providing each child with access to his or her "own" computer for scholastic purposes. Research in this area suggests a link between this policy and increased academic performance (Bebell, Kay, Suhr, Hernandez, Grimes, & Warschauer, 2010) and that the policy encourages students to be more engaged in their learning, better behaved at school, and more motivated to learn (Sauers & McLeod, 2012).

Table 2.7 includes data showing which countries specify a 1:1 school-based computer–student ratio in their ICT-related education policies and plans. National centers in 11 countries reported this ratio. The information provided by the national centers showed considerable variation in how countries implement this policy, however. Some have implemented it only at a specific level (e.g., in upper-secondary education) or in a specific state or province, whereas others have carried out implementation only on a trial basis in order to evaluate benefit. Variation also exists in the type of computers provided (tablets, notebooks) and the ownership model (i.e., purchased by schools, purchased by students, leased by students, or use of external student-owned computers).

The qualitative responses from the national centers also revealed differences in countries' use and interpretation of the term 1:1 computing. Most countries interpreted 1:1 computing as meaning that every student had access to a computer for all of their studies. However, in Poland, for example, the 1:1 computing policy signifies that each student has access to a computer in a computer laboratory but only for specific instruction in computing and not for other subjects. More than one national center emphasized that despite the country having an official 1:1 computing policy, it had not been implemented in practice.

Table 2.6: References in plans or policies to provision of ICT resources

Country	Inclusion in Plans and Policies of Reference to ICT Resources						
	Provision of computer equipment and other ICT resources	Maintenance of computer equipment and other ICT resources	Renewal, updating, and replacement of computer equipment and other ICT resources	Support for teachers for using computer equipment and other ICT resources in their work	Access to digital educational resources	Internet connectivity	Home access to school-based digital education resources
Australia	●	●	●	●	●	●	●
Chile	●	●	●	●	●	●	○
Croatia	●	○	●	●	●	●	○
Czech Republic	●	●	○	●	●	●	●
Denmark	●	●	●	●	●	●	●
Germany	●	●	●	●	●	○	○
Hong Kong SAR	●	●	●	●	●	●	●
Korea, Republic of	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lithuania	●	○	○	●	●	●	●
Netherlands	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Norway	○	○	○	○	○	○	○
Poland	●	○	○	●	●	●	○
Russian Federation	●	○	○	●	●	●	○
Slovak Republic	●	●	●	●	●	●	●
Slovenia	●	●	●	●	●	●	●
Switzerland	●	●	●	●	●	●	○
Thailand	●	●	●	●	●	●	○
Turkey	●	●	●	●	●	●	●
Benchmarking participants							
City of Buenos Aires, Argentina	●	●	●	●	●	●	○
Newfoundland and Labrador, Canada	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ontario, Canada	●	●	●	●	●	●	●

Note: Data collected from ICILS 2013 national contexts survey.

● Reference in plans or policies to using ICT in education ○ No reference in plans or policies to using ICT in education

Table 2.7: References in plans or policies to using ICT to support student learning, provide computing in schools, and develop digital resources

Country	Inclusion in Plans and Policies of Reference to ICT Resources					Reference to Providing 1:1 Computing in Schools	Formal Support for Development of Digital Resources
	Preservice teacher education in the use of ICT	Inservice teacher education in the use of ICT	The use of learning management systems	Reporting to parents	Providing feedback to students		
Australia	●	●	●	●	●	●	●
Chile	●	●	●	●	●	●	●
Croatia	●	●	○	●	●	○	●
Czech Republic	●	●	○	●	○	●	●
Denmark	●	●	○	●	○	●	●
Germany	●	●	○	○	●	○	●
Hong Kong SAR	○	●	●	●	●	○	●
Korea, Republic of	N/A	N/A	N/A	N/A	N/A	N/A	●
Lithuania	●	●	●	○	○	●	●
Netherlands	N/A	N/A	N/A	N/A	N/A	N/A	●
Norway	●	●	●	●	●	●	●
Poland	●	●	○	○	○	●	●
Russian Federation	●	●	●	●	●	○	●
Slovak Republic	●	●	●	●	●	○	●
Slovenia	●	●	●	●	●	●	●
Switzerland	●	●	○	○	○	○	○
Thailand	●	●	●	○	○	●	●
Turkey	●	●	●	●	●	●	●
Benchmarking participants							
City of Buenos Aires, Argentina	●	●	○	○	○	●	○
Newfoundland and Labrador, Canada	N/A	N/A	N/A	N/A	N/A	N/A	●
Ontario, Canada	●	●	●	●	●	○	●

Note: Data collected from ICILS 2013 national contexts survey.

● Reference in plans or policies to using ICT in education ○ No reference in plans or policies to using ICT in education

Table 2.7 also presents data generated by a question that asked national centers if their countries' policies and plans specified formal support for the development of digital resources. Responses showed that 19 countries have policies or plans that include this support. Of the two countries that indicated no such support, Switzerland said that while some of its cantons provide it, governmental agencies generally encourage publishers to produce digital resources. In the City of Buenos Aires, educational authorities produce these resources or outsource this work to external agencies. The Eurydice report on learning and innovation through ICT at school (Eurydice, 2011) found that some countries teach ICT as a separate subject largely at the secondary level. In addition, some of these countries, along with a number of other countries, use ICT in a crosscurricular manner, thereby helping students develop various ICT skills during the learning of other subjects as well as aiding students' learning of those subjects. The NCS therefore asked respondents to provide information about the types of ICT-related subjects their countries offer at different stages of school education. Table 2.8 presents a summary of this information.

Nine of the 21 ICILS countries reported having a separate ICT-related subject at the primary level (ISCED 1). Eight of the national centers stated that this subject is compulsory in their countries. One national center (Hong Kong SAR) stated that although this subject is not compulsory, schools are required to meet the mandatory ICT curriculum requirements. Schools can address this mandate either by establishing a separate ICT subject or by integrating ICT into their teaching of existing school subjects.

At the lower-secondary level (ISCED 2), 18 of the 21 national centers said that their countries have an ICT-related subject. This subject is compulsory in 11 of these countries and noncompulsory in the remaining seven. The names given to this subject, also included in Table 2.8, are fairly diverse, although some commonalities are apparent given terms such as "informatics," "computer science," and "technology." Many countries reported considerable within-country variation in this regard, and stated that the name and characteristics of the subject could vary at state, provincial, or even individual school level.

Table 2.8 shows that while 13 of the ICILS countries require assessment of students' ICT capabilities, the assessments are defined at school level. Each of these 13 countries had an ICT-related subject, but the subject was compulsory in only nine. In some of the eight countries where there is no requirement to assess ICT capabilities, such capabilities are assessed as part of broader assessments in other subjects. Eight countries reported having a program designed to monitor ICT competences, with the program established at either the national, state, or provincial level.

Five countries reported having diagnostic assessment; six reported having formative assessment. Eight countries said their ministries or departments of education provide support for conducting summative assessments, and nine indicated that these agencies provide support for digital resources, such as e-portfolios.

Links have been found between teachers' capacity to utilize ICT effectively and increased student engagement with these technologies (European Commission, 2013). Of the 22 education systems that participated in SITES 2006, only seven had ICT-related requirements for teacher certification and only nine had formal requirements for key types of ICT-related professional development (Law, Pelgrum, & Plomp 2008). The

Table 2.8: ICT-related subjects at different levels of schooling and ICT assessment policies

Country	ICT-Related Subjects				Requirement at School Level Regarding Assessment and Monitoring of ICT and Computing Skills of Target Grade Students	ICT Student Assessments Used or Supported by Ministries or Departments of Education				
	ISCED 1 (primary)	ISCED 2 (lower secondary)	ISCED 3 (upper secondary)	Subject name at lower-secondary level		Diagnostic assessments	Formative assessments	Summative assessments	National or state/ provincial monitoring programs	Digital work products (e.g., e-portfolio)
Australia	◆[1]	◆[1]	▲[1]	Defined at state/ territory or school level	●	●	●	●	●	●
Chile	◆	◆		Technological education	●	○	○	○	●	○
Croatia		▲	▲	Information science	●	○	○	○	○	○
Czech Republic	◆	◆	◆	Defined at school level (e.g., informatics, basics of informatics)	●	○	○	○	●	○
Denmark			▲		○	○	○	○	○	●
Germany		▲	▲	Applied computer science (*informatik*)	○	○	○	○	○	○
Hong Kong SAR	▲[2]	▲[2]	▲	Defined at school level (e.g., information technology, computer studies, computer literacy)	●	●	●	●	○	●
Korea, Republic of		▲	▲	Informatics	○	○	●	●	○	○
Lithuania		◆	▲	Information technologies	●	○	○	●	○	○
Netherlands			▲		○	●	●	●	○	○
Norway			▲		○	●	●	●	●	●
Poland	◆	◆	◆	Computer science	●	○	○	○	●	●
Russian Federation		◆	◆	Informatics and ICT	○	○	○	●	○	○
Slovak Republic	◆	◆	◆	Informatics	●	○	○	○	○	○
Slovenia		▲	◆	Computer studies (word-processing, networks and multimedia)	●	○	○	○	○	●
Switzerland		▲	◆	Defined at canton level (e.g., informatics, *dactylo*, media formation)	○	○	○	○	●	○
Thailand	◆	◆	◆	Information and communication technology (ICT)	●	○	○	○	○	●
Turkey	◆	◆	▲	Information technologies and programming	●	○	○	○	○	○

Table 2.8: ICT-related subjects at different levels of schooling and ICT assessment policies (contd.)

Country	ICT-Related Subjects				Requirement at School Level Regarding Assessment and Monitoring of ICT and Computing Skills of Target Grade Students	ICT Student Assessments Used or Supported by Ministries or Departments of Education				
	ISCED 1 (primary)	ISCED 2 (lower secondary)	ISCED 3 (upper secondary)	Subject name at lower-secondary level		Diagnostic assessments	Formative assessments	Summative assessments	National or state/ provincial monitoring programs	Digital work products (e.g., e-portfolio)
Benchmarking participants										
City of Buenos Aires, Argentina	◆	◆		Technology, computer studies/ informatics	○	○	○	○	○	○
Newfoundland and Labrador, Canada		◆	▲		●	○	○	○	●	●
Ontario, Canada		▲	▲		●	●	●	●	●	●

Notes:

Data collected from ICILS 2013 national contexts survey.

[1] Variation across states/provinces as to whether subject is compulsory/noncompulsory.

[2] Schools have autonomy as to whether ICT curriculum requirements are met in ICT subject or integrated into existing subjects.

◆ Compulsory subject

▲ Noncompulsory subject

● Reference in plans or policies on using ICT in education

○ No reference in plans or policies on using ICT in education

2011 Eurydice study on learning and innovation through ICT in European schools reported that teachers were more likely to acquire their ICT teaching skills during their preservice education than in schools (Eurydice, 2011).

The NCS asked national centers to indicate if their countries refer to ability to use ICT in their teacher registration requirements. Centers were also asked if teachers' preservice and inservice education help teachers acquire this ability. In addition to technical capacity to use ICT, the aspects of ability specified included using ICT for pedagogical purposes, using ICT for collaboration and communication, and using ICT for student assessment. The data in Table 2.9 show that most of the ICILS countries help teachers acquire various aspects of ICT proficiency during their preservice and inservice education. The only countries where the above aspects of ICT proficiency are required for teacher registration are Australia and Turkey. In Thailand, knowing how to use ICT for pedagogical purposes is a teacher registration requirement.

Fifteen of the 21 national centers in the participating countries said that national, state, or provincial documentation pertaining to preservice teacher education specifies technical capacity in using ICT. Several of the remaining six centers said that in their countries preservice teacher education institutions can autonomously determine the ICT-related content of their curricula.

Most national centers said their countries provide teacher education (both preservice and inservice) focused on using ICT in pedagogy. Seventeen countries provide this support at the preservice level (with support varying across the different states of Germany), and 18 countries at the inservice level. There is less support for collaboration and communication using ICT and for using ICT for student assessment at the preservice level (12 and 10 countries respectively), but greater support for these two aspects at the inservice level (18 and 15 countries respectively).

The data presented in Table 2.10 show the extent to which ministries or departments of education at the national, state, or provincial level support teacher access to and participation in ICT-based professional development for a range of purposes. All countries, with the exception of the Netherlands, indicated at least some support for three of the five. In the Netherlands, it appears that although professional development activities are available (through *Kennisnet*), they are not explicitly supported.

Improvement of ICT/technical skills and the integration of ICT in teaching and learning activities were the two most common purposes and were reported in 20 out of the 21 countries. According to these data, 19 countries supported improvement of content knowledge, improvement of teaching skills, and integration of ICT in teaching and learning activities. The national centers from 18 countries indicated at least some degree of ministerial or departmental support for development of digital resources. Australia and Turkey accord a large degree of support for each of the five listed purposes of ICT-based professional development. The Chilean, Czech Republic, Slovenian, and Thai national centers indicated a large measure of support for at least some of these purposes. Although, in the Netherlands, teachers can access professional development activities relating to these purposes, there is no documented support at the ministry level for them.

Table 2.9: Support and requirements for developing teachers' capacity to use ICT

Country	Technical Capacity in Using ICT			Using ICT in Pedagogy			Collaboration and Communication in Using ICT			Using ICT for Student Assessment		
Australia	●	▲	■	●	▲	■	●	▲	■	●	▲	■
Chile	●		■	●		■			■			■
Croatia			■	●		■	●		■			■
Czech Republic	●		■	●		■	●		■	●		■
Denmark			■	●					■			■
Germany				●		■						
Hong Kong SAR	●		■	●		■	●		■	●		■
Korea, Republic of	●		■	●					■			■
Lithuania	●		■			■			■			■
Netherlands	●		■	●		■	●		■	●		■
Norway	●			●			●			●		
Poland	●		■	●		■			■			■
Russian Federation	●			●		■	●		■	●		■
Slovak Republic	●		■	●		■	●		■	●		■
Slovenia			■	●		■			■			
Switzerland	●		■			■						
Thailand				●	▲	■	●		■	●		■
Turkey	●	▲	■	●	▲	■	●	▲	■	●	▲	■
Benchmarking participants												
City of Buenos Aires, Argentina			■			■			■			
Newfoundland and Labrador, Canada	●		■	●		■	●		■			■
Ontario, Canada			■			■			■			■

Note: Data collected from ICILS 2013 national contexts survey.

● Supported in preservice teacher education

▲ Requirement for registration as a teacher

■ Supported in inservice teacher education or training

Table 2.10: Level of support for teacher access to and participation in ICT-based professional development

Country	To Improve ICT/Technical Skills	To Improve Content Knowledge	To Improve Teaching Skills	To Develop Digital Resources	To Integrate ICT in Teaching and Learning Activities
Australia	●	●	●	●	●
Chile	●	●	●	◒	●
Croatia	◒	◒	◒	◒	◒
Czech Republic	◒	◒	◒	●	●
Denmark	◒	◒	◒	◒	◒
Germany	◒	◒	◒	◒	◒
Hong Kong SAR	◒	◒	◒	◒	◒
Korea, Republic of	◒	◒	◒	◒	◒
Lithuania	◒	◒	◒	◒	◒
Netherlands	○	○	○	○	○
Norway	◒	◒	◒	◒	◒
Poland	◒	◒	◒	◒	◒
Russian Federation	◒	◒	◒	◒	◒
Slovak Republic	◒	◒	◒	◒	◒
Slovenia	◒	○	●	●	●
Switzerland	◒	◒	○	○	◒
Thailand	●	●	●	◒	●
Turkey	●	●	●	●	●
Benchmarking participants					
City of Buenos Aires, Argentina	◒	◒	◒	◒	◒
Newfoundland and Labrador, Canada	◒	◒	◒	◒	◒
Ontario, Canada	◒	◒	◒	◒	◒

Note: Data collected from ICILS 2013 national contexts survey.

● To a large extent
◒ To some extent
○ Not at all

Conclusion

This chapter highlighted differences across countries in terms of the characteristics of their education systems, ICT infrastructure, and approaches to ICT in education (as set down in national policies and plans). In some countries, responsibility for school education is centralized through the national ministry or department of education. In other countries, states or provinces have an equal or greater share of the responsibility. The differences in education systems extend to the number of years students spend at the different school levels, and the relative percentages of public and private schools. In most countries, schools have at least some level of autonomy for decision-making, but less so for aspects such as teacher recruitment.

Antecedent data sourced from international databases show large differences across countries with respect to ICT infrastructure and economic indices. Data from the ICILS national context survey brought to light countries' plans or policies relating to ICT use in education. This information shows that, in most countries, there is support for this use at the national, state, or provincial level. Policies and plans mostly include strategies for improving and supporting student learning via ICT and providing ICT resources.

Differences across countries also exist in relation to inclusion of an ICT-related subject in schools, particularly at the primary and lower-secondary levels of education. The name given to this subject and whether or not it is compulsory varies both across and within countries. Fewer than half of the participating countries reported ministerial or departmental support for using ICT in order to conduct a range of student assessments.

Responses to NCS questions on teacher capacity to use ICT showed this ability is rarely a requirement for teacher registration. However, in most countries support was provided for teacher acquisition of ICT expertise and knowledge during preservice and inservice education. In general, ICILS countries provide teachers with opportunities to access and participate in different areas of ICT-based professional development.

Although this chapter described differences in how countries approach ICT use in education, we can see evidence of a common theme across countries—that of wanting to educate and engage students in ICT use. However, countries differ in terms of the priority they accord this goal and in what they are doing to achieve it.

Overall, the information provided in this chapter should provide readers with an understanding of the contexts in which ICT-related education in the participating ICILS countries plays out. It should also aid interpretation of data pertaining to the student, teacher, and school levels presented in subsequent chapters.