CHAPTER 7:

# Teaching with and about Information and Communication Technologies

## Introduction

This chapter focuses not only on the extent to which the teachers who participated in ICILS 2013 were using information and communication technology (ICT) in their classrooms but also on the classroom contexts for acquisition of computer and information literacy (CIL). The chapter's content pertains to ICILS Research Question 2: *What aspects of schools and education systems are related to student achievement in computer and information literacy with respect to (a) school and teaching practices, (b) teacher attitudes to and proficiency in using computers, (c) access to ICT in schools, and (d) teacher professional development?*

We begin the chapter by exploring the integration of technology into classroom practice (i.e., teaching with ICT). We review how often teachers were using ICT in their pedagogical practice, look at the characteristics of teachers who were frequently using ICT when teaching, and consider how teachers were actually using ICT in their classrooms. We then focus on the emphasis that the ICILS teachers placed on developing student computer and information literacy (CIL). From there, we look at the extent to which the participating teachers emphasized the development of CIL and the factors that were seemingly associated with them placing strong emphasis on CIL. Finally, we investigate several other details about pedagogical use of ICT. These include the tools that the teachers were using, the learning activities through which ICT was being integrated into classroom practice, and ICT-based teaching practices.

## Background

As we have emphasized in earlier chapters, ensuring that school students can use computers and other forms of ICT has become an increasingly important aspect of preparing them for adult life. Many countries have adopted policies directed toward helping schools and teachers use ICT for pedagogical purposes (Bakia, Murphy, Anderson, & Trinidad, 2011; Plomp, Anderson, Law, & Quale, 2009). Many of those policies are predicated on the belief that ICT use facilitates changes in approaches to teaching, especially changes that result in a more collaborative, student-centered and student-shaped pedagogy. However, research shows that teachers' uptake of ICT varies greatly within as well as across countries (European Commission, 2013; Law, Pelgrum, & Plomp, 2008).

Although ICILS 2013 did not investigate the relationship between ICT use in schools or classrooms and achievement in academic learning areas such as language, mathematics, and science, a recent meta-analysis conducted by Tamin, Bernard, Borokhovski, Abrami, and Schmid (2011) points to positive associations between pedagogical use of ICT and achievement in various learning areas. Findings such as these doubtless also prompt the growing emphasis on ICT use in educational contexts.

A considerable body of research has looked at the benefits of integrating ICT in teaching, but some research has also considered barriers to using ICT in teaching. Ertmer (1999),



J. Fraillon et al., *Preparing for Life in a Digital Age*, DOI 10.1007/978-3-319-14222-7_8

for example, proposed a distinction between first-order and second-order barriers. First-order barriers include factors such as resources (both hardware and software) and ICT-related training and support. Second-order factors are those that relate to teachers' expertise and interest, such as confidence in using ICT, beliefs about student learning, and perceptions about the value of ICT in education.

When conducting their study of computer integration in the classrooms of 185 primary and 204 secondary school teachers, Mueller, Wood, Willoughby, Ross, and Specht (2008) used discriminant function analysis to identify factors that distinguished between teachers who integrated computers in their classroom teaching and teachers who did not. The major distinguishing factors the authors identified were teachers' previous positive teaching experience with computers, how comfortable teachers were with computers, the beliefs they held about the value of computers in education (in terms of both instruction and motivation), and the support they received with respect to using computers. The authors also identified several general factors, such as teachers' sense of efficacy, beliefs about teaching, and attitudes to work. Participation in professional development workshops was identified as a relevant factor for primary school but not for secondary school teachers.

The European Commission (2013) concluded from its survey of schools, teachers, and students in 31 countries that although most of the participating teachers were familiar with ICT for teaching and learning, they used these technologies mainly for preparing lessons and only to a limited extent during their classroom work with students. The authors of the European Commission report also concluded that student use of ICT in lessons is most likely to occur and be successful when teachers are confident about using ICT, view ICT use in education positively, and are in school environments that support pedagogical ICT use. The authors furthermore emphasized that although teachers had become more confident users of ICT between 2008 and 2013, and computer resources were more abundant than in 2008, active use of ICT in lessons had barely increased.

The Second International Technology in Education Study (SITES) 2006, conducted by the International Association for the Evaluation of Educational Achievement (IEA), also concluded that teachers were more likely to use ICT if they were confident users of these tools, if they had participated in ICT-related professional development, and if there were relatively few contextual obstacles (infrastructure, digital learning resources, ICT access) to that use (Law et al., 2008). In addition, the results from SITES 2006 showed that the percentage of teachers reporting ICT use was significantly higher among science teachers than among mathematics teachers. Other studies have reported similar findings (Jones, 2004; Kozma & McGhee, 2003). One inference we can draw from these results is that the subject (or discipline) context may be an important aspect determining uptake of ICT in teaching.

An earlier iteration of SITES highlighted ways in which ICT can support pedagogical innovation. This international study, known as SITES Module 2 (SITES-M2), involved a detailed examination of various pedagogical practices that, according to expert opinion, used ICT in innovative ways (Kozma, 2003b). Twenty-eight education systems took part in the study, which generated a set of 174 qualitative case studies of innovative pedagogical practices. The SITES researchers then used qualitative and quantitative methods based on a common framework to conduct an intensive analysis of each case. The results identified seven patterns of innovation involving ICT use: tool use, student collaboration, information management, teacher collaboration, communication with outside authorities, product creation, and tutorial practice (Kozma, 2003b).

Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, and Sendurur (2012) conducted an indepth study focused on a small number of teachers recognized as notable users of technology. Findings indicated that the teachers' general beliefs about teaching influenced how they used the technology as did their interest in the technology itself. According to Aubusson, Burke, Schuck, and Kearney (2014), learning technologies can influence how teachers adopt "rich tasks" (extended project work) in their classes. The authors argue that engagement with learning technologies "moderates teachers' perceptions about the use of rich tasks" (p. 219). Aubusson and colleagues (2014), however, point to the complexity of factors mediating pedagogical use of technology, as well as to the range of factors that influence teachers' decisions to adopt technology in the first place.

## Teachers' familiarity with ICT

In this section, we look at several aspects relevant to how and why the ICILS teachers were using ICT as part of their teaching practice. Of particular interest is the extent to which teachers' pedagogical use of ICT was associated with their use of computers in other settings and their experience of using computers in general.

### Experience with and use of computers

The ICILS teacher questionnaire asked teachers to use the following response categories to indicate how much experience they had in using computers for teaching purposes: "never," "less than two years," and "two years or more." The questionnaire also asked teachers how frequently they used computers in various settings: at school when teaching, at school for other purposes, and outside of school. The response categories for each place were "never," "less than once a month," "at least once a month but not every week," "at least once a week but not every day," and "every day." In the discussion of computer use based on Table 7.1, we defined frequent computer use as at least once a week (i.e., the last two response categories indicating the highest frequencies).

Table 7.1 presents the data for teacher experience with computers in terms of the percentages of teachers who said they were using computers in each of the categories. The table also records the percentages of teachers who said they frequently used computers at school when teaching, at school for other work-related purposes, and outside school for any purpose.

The majority of teachers in all countries (an ICILS 2013 average of 84%) reported having at least two years of experience using computers. The national percentages ranged from a high of 94 percent in the Canadian province of Newfoundland and Labrador to a low of 71 percent in Croatia. Eleven percent of teachers crossnationally had less than two years' experience; only five percent of teachers had no experience using computers. Teacher experience in using computers for teaching purposes was, on average, moderately strongly associated with frequency of use ($r = 0.34$).

According to the survey data, teachers were most frequently using computers outside of school (the ICILS 2013 average was 90%), followed by use at school for work-related purposes other than teaching (84%), and finally use at school when teaching (62%). Teachers from the Canadian province of Newfoundland and Labrador were the most frequent users of ICT in all three settings.

The percentage of teachers who said they frequently used computers when teaching is of particular interest in the context of ICILS. In Newfoundland and Labrador as well as

*Table 7.1: National percentages of teachers' computer experience and use in different settings (at school teaching, at school for other purposes, outside school)*

| Country | Teacher Experience in Using Computers | | | Teachers Using a Computer at Least Once a Week | | |
|---|---|---|---|---|---|---|
| | Never | Less than two years | Two years or more | At school when teaching | At school for other work-related purposes | Outside school for any purpose |
| Australia | 0 (0.1) | 7 (0.7) | 92 (0.7) | 90 (0.8) ▲ | 98 (0.4) ▲ | 97 (0.3) △ |
| Chile | 3 (0.6) | 12 (1.0) | 86 (1.2) | 62 (2.0) | 83 (1.8) | 93 (1.2) △ |
| Croatia | 15 (0.8) | 14 (0.9) | 71 (1.1) | 41 (1.5) ▼ | 72 (1.3) ▼ | 91 (1.0) |
| Czech Republic | 4 (0.5) | 11 (0.9) | 85 (1.0) | 66 (1.7) △ | 92 (0.8) △ | 96 (0.5) △ |
| Korea, Republic of | 3 (0.9) | 10 (1.0) | 88 (0.7) | 76 (1.7) ▲ | 94 (0.8) ▲ | 83 (1.3) ▽ |
| Lithuania | 3 (0.4) | 7 (0.8) | 91 (0.9) | 66 (1.7) △ | 89 (1.1) △ | 93 (0.7) △ |
| Poland | 7 (0.8) | 8 (0.7) | 86 (1.0) | 41 (1.5) ▼ | 77 (1.7) ▽ | 98 (0.4) △ |
| Russian Federation[1] | 3 (0.4) | 10 (1.1) | 87 (1.1) | 76 (1.6) ▲ | 86 (1.1) | 84 (1.6) ▽ |
| Slovak Republic | 7 (0.8) | 14 (0.8) | 78 (1.1) | 58 (1.7) ▽ | 84 (1.0) | 93 (0.7) △ |
| Slovenia | 8 (0.7) | 12 (1.0) | 80 (1.3) | 66 (1.4) △ | 93 (0.7) △ | 96 (0.5) △ |
| Thailand | 8 (1.6) | 14 (1.9) | 78 (2.6) | 50 (2.5) ▼ | 74 (2.8) ▼ | 71 (2.8) ▼ |
| Turkey | 5 (0.7) | 13 (1.4) | 82 (1.7) | 47 (3.4) ▼ | 65 (1.9) ▼ | 91 (1.1) |
| **ICILS 2013 average** | 5 (0.2) | 11 (0.3) | 84 (0.4) | 62 (0.5) | 84 (0.4) | 90 (0.3) |
| **Countries not meeting sample requirements** | | | | | | |
| Denmark | 0 (0.1) | 4 (0.9) | 95 (0.9) | 79 (2.3) | 99 (0.4) | 98 (0.8) |
| Germany | 6 (0.8) | 9 (1.0) | 85 (1.2) | 34 (2.3) | 65 (2.2) | 97 (0.5) |
| Hong Kong SAR | 1 (0.3) | 8 (0.9) | 91 (1.0) | 79 (1.6) | 95 (0.9) | 94 (0.7) |
| Netherlands | 2 (0.3) | 9 (1.1) | 88 (1.1) | 77 (1.7) | 97 (0.5) | 99 (0.4) |
| Norway (Grade 9) | 1 (0.2) | 7 (0.9) | 92 (0.9) | 78 (1.7) | 98 (0.6) | 98 (0.4) |
| **Benchmarking participant** | | | | | | |
| Newfoundland and Labrador, Canada | 0 (0.0) | 6 (1.3) | 94 (1.3) | 93 (1.4) | 99 (0.4) | 99 (0.4) |
| **Benchmarking participant not meeting sample requirements** | | | | | | |
| Ontario, Canada | 0 (0.0) | 4 (1.1) | 95 (1.1) | 89 (1.4) | 98 (0.9) | 100 (0.2) |

Notes:

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

▲ More than 10 percentage points above ICILS 2013 average
△ Significantly above ICILS 2013 average
▽ Significantly below ICILS 2013 average
▼ More than 10 percentage points below ICILS 2013 average

in Australia, the two percentages (93% and 90% respectively) were much higher than the ICILS 2013 average. Fewer than half of all teachers in Croatia (41%), Poland (41%), and Turkey (47%) reported using a computer at least once a week at school when teaching. We found only moderate correlations between frequent computer use when teaching and frequent computer use for other school-related purposes and frequent computer use outside school. The associations tended to be strongest when computer use for teaching was less extensive.

The ICILS 2013 average for the percentage of teachers frequently using computers (62%) was similar to the ICILS 2013 average for the percentage of students frequently using computers (56%). However, when we compare the data in Table 7.1 with those in Table 5.2, we can see that teachers in some countries were more likely than their students to report more frequent use of computers.[1] The correlations between school averages for teachers' weekly computer use and school averages for students' weekly computer use were relatively weak. Across countries, the school-level correlation coefficients between the aggregated data of these indicators averaged about 0.2.

There are several possible reasons why teachers' and students' use of computers in classrooms might differ. One is that teachers use computers as part of their teaching practice even though their students do not use them during class time. This occurrence could be due to scarce resources or teacher-centered pedagogy. A second reason is that teachers and students undertake different activities in classrooms so that, for example, students use ICT for activities while teachers do not. A third reason may have to do with the correspondence between questions eliciting data. The ICILS student questionnaire asked students if they used computers at school whereas the teacher questionnaire asked teachers if they used computers when teaching. Thus, the ICILS students may have been using computers at school but outside of lessons (classroom time). The point being made here is that recorded teacher use of ICT may not necessarily correspond with recorded student use of ICT.

## Teachers' views about ICT

In this section, we report the ICILS teachers' perceptions of the benefits of using ICT in school education. We also record the teachers' self-expressed confidence in using ICT and their views on how well their school environments supported pedagogical use of ICT.

### Benefits of ICT in school education

Debates about the benefits of widespread adoption of ICT by schools tend to be characterized by different and often strongly held views. Various stakeholders maintain that these technologies develop, among other attributes, 21st-century skills (including CIL) that are central to life in modern societies, facilitate access to resources, provide rich learning materials that engage student interest, and support more effective curriculum design and planning (Kozma & McGhee, 2003). Others, however, argue that these technologies draw attention away from the traditional core educational tasks of reading and mathematics, limit the time spent on the direct contact with materials that is essential for concept formation, provide artificial views of the real/natural world, and encourage uncritical acceptance of views that may not be based in evidence (Cuban,

1 This discrepancy was greatest in Korea (57 percentage points), Slovenia (40 percentage points), Newfoundland and Labrador (39 percentage points), and Poland (38 percentage points).

2001). We were interested in determining if the ICILS teachers' views on the advantages and disadvantages of ICT in school education had any association with the extent to which they were using computers in their classrooms.

The ICILS teacher questionnaire asked teachers to rate their level of agreement ("strongly agree," "agree," "disagree," "strongly disagree") with a series of statements that presented both positive and negative aspects of using ICT for teaching and learning at school. Table 7.2 shows the national percentages of teachers expressing agreement (i.e., either strongly agree or agree) with each of these statements. It also shows whether each national percentage was significantly above or below the ICILS 2013 average for the item.

With regard to the statements reflecting positive aspects of ICT use for teaching and learning, almost all teachers across participating countries (an ICILS 2013 average of 96%) agreed that ICT use enables students to access better sources of information. The

*Table 7.2: National percentages of teachers agreeing with statements about ICT teaching and learning in schools*

| Country | Enables Students to Access Better Sources of Information | Results in Poorer Writing Skills among Students | Helps Students to Consolidate and Process Information More Effectively | Only Introduces Organizational Problems for Schools | Helps Students Learn to Collaborate With Other Students | Impedes Concept Formation Better Done with Real Objects than Computer Images |
|---|---|---|---|---|---|---|
| Australia | 95 (0.6) | 64 (1.4) | 78 (1.0) ▼ | 18 (1.1) | 72 (1.2) ▽ | 32 (1.1) ▽ |
| Chile | 97 (0.5) △ | 55 (2.1) ▼ | 94 (0.8) △ | 11 (1.1) ▽ | 90 (1.0) ▲ | 24 (1.7) ▼ |
| Croatia | 95 (0.7) | 65 (1.0) | 86 (0.8) ▽ | 15 (0.9) ▽ | 79 (0.9) | 42 (1.0) △ |
| Czech Republic | 97 (0.5) | 75 (1.2) △ | 92 (0.8) | 7 (0.6) ▽ | 62 (1.4) ▼ | 48 (1.2) △ |
| Korea, Republic of | 95 (0.6) | 76 (1.6) △ | 90 (1.1) | 42 (1.3) ▲ | 69 (1.3) ▽ | 51 (2.1) ▲ |
| Lithuania | 97 (0.4) △ | 73 (1.4) △ | 94 (0.5) △ | 16 (1.0) | 80 (1.0) | 37 (1.3) ▽ |
| Poland | 96 (0.4) | 68 (1.7) | 93 (0.7) △ | 7 (0.8) ▼ | 85 (1.1) △ | 33 (1.2) ▽ |
| Russian Federation[1] | 89 (1.1) ▽ | 63 (1.9) | 95 (0.7) △ | 15 (1.3) | 84 (1.2) △ | 46 (2.4) △ |
| Slovak Republic | 98 (0.3) △ | 71 (1.4) △ | 87 (1.0) ▽ | 12 (1.0) ▽ | 77 (1.3) | 29 (1.1) ▼ |
| Slovenia | 93 (0.6) ▽ | 79 (1.0) ▲ | 94 (0.7) △ | 10 (0.8) ▽ | 67 (1.0) ▼ | 55 (1.1) ▲ |
| Thailand | 99 (0.6) △ | 52 (3.7) ▼ | 93 (1.2) | 32 (2.9) ▲ | 90 (2.1) ▲ | 42 (3.0) |
| Turkey | 98 (0.3) △ | 59 (1.7) ▽ | 94 (0.8) △ | 20 (1.4) | 79 (1.4) | 38 (1.6) |
| **ICILS 2013 average** | 96 (0.2) | 67 (0.5) | 91 (0.3) | 17 (0.4) | 78 (0.4) | 40 (0.5) |
| **Countries not meeting sample requirements** | | | | | | |
| Denmark | 98 (0.8) | 23 (2.4) | 91 (1.6) | 20 (2.8) | 70 (1.7) | 21 (2.0) |
| Germany | 90 (0.9) | 52 (1.7) | 65 (1.3) | 34 (1.7) | 50 (1.9) | 38 (1.7) |
| Hong Kong SAR | 97 (0.5) | 62 (1.6) | 86 (1.1) | 19 (1.4) | 85 (1.0) | 71 (1.4) |
| Netherlands | 91 (0.9) | 62 (1.5) | 79 (1.4) | 13 (1.5) | 52 (1.8) | 30 (1.5) |
| Norway (Grade 9) | 97 (0.5) | 30 (1.6) | 92 (1.1) | 17 (1.9) | 61 (1.8) | 23 (1.5) |
| **Benchmarking participant** | | | | | | |
| Newfoundland and Labrador, Canada | 98 (0.8) | 39 (2.8) | 91 (1.9) | 13 (1.9) | 85 (2.3) | 20 (2.2) |
| **Benchmarking participant not meeting sample requirements** | | | | | | |
| Ontario, Canada | 98 (0.7) | 29 (2.1) | 92 (1.9) | 12 (1.9) | 82 (2.5) | 20 (2.9) |

Notes:

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

lowest rate of agreement was found in Russia (89%) and the highest rate in Thailand (99%). Similarly, more than 90 percent of teachers, on average crossnationally, indicated that using ICT helped students consolidate and process information more effectively. National percentages of agreement ranged from 78 percent in Australia to 95 percent in the Russian Federation.

On average across the participating countries, 78 percent of teachers agreed that ICT helps students learn to collaborate with one another, and 68 percent believed that ICT helps students communicate more effectively with others. Percentages of agreement for countries ranged from 62 percent to 90 percent for the former statement, and from 57 percent to 88 percent for the latter.

Almost 80 percent of teachers on average across participating countries agreed that ICT helps students develop greater interest in learning. The national percentages ranged from 66 percent in the Czech Republic to 92 percent in Thailand. Across countries, four

*Table 7.2: National percentages of teachers agreeing with statements about ICT teaching and learning in schools (contd.)*

| Enables Students to Communicate More Effectively with Others | Only Encourages Copying Material from Published Internet Sources | Helps Students Develop Greater Interest in Learning | Helps Students Work at a Level Appropriate to Their Learning Needs | Limits the Amount of Personal Communication among Students | Helps Students Develop Skills in Planning and Self-Regulating Their Work | Results in Poorer Calculation and Estimation Skills among Students | Improves Academic Performance of Students | Only Distracts Students from Learning |
|---|---|---|---|---|---|---|---|---|
| 57 (1.0) ▼ | 46 (1.3) ▽ | 86 (0.9) △ | 80 (1.0) | 43 (1.1) ▼ | 60 (1.3) ▽ | 41 (1.6) ▽ | 61 (1.2) ▽ | 23 (1.5) |
| 78 (1.3) △ | 40 (1.7) ▽ | 86 (1.4) △ | 86 (1.3) △ | 46 (1.7) ▼ | 78 (1.3) ▲ | 35 (1.9) ▼ | 82 (1.6) ▲ | 13 (0.9) ▼ |
| 57 (1.1) ▼ | 51 (1.2) | 72 (1.0) ▽ | 69 (1.4) ▼ | 63 (1.2) △ | 54 (1.2) ▼ | 49 (1.1) | 53 (2.1) ▼ | 25 (1.0) |
| 58 (1.2) ▼ | 59 (1.5) △ | 66 (1.3) ▼ | 74 (1.4) ▽ | 71 (1.2) ▲ | 41 (1.4) ▼ | 46 (1.3) | 53 (1.6) ▼ | 28 (1.4) △ |
| 63 (2.2) ▽ | 48 (1.8) | 90 (0.7) ▲ | 79 (2.1) | 56 (1.2) | 62 (1.6) | 64 (1.1) ▲ | 64 (1.7) ▽ | 31 (1.2) △ |
| 71 (1.2) △ | 56 (1.3) △ | 79 (1.0) | 83 (0.9) △ | 57 (1.3) | 55 (1.5) ▼ | 46 (1.3) | 72 (1.0) △ | 27 (1.4) |
| 83 (0.9) ▲ | 31 (1.3) ▼ | 65 (1.6) ▼ | 75 (1.3) ▽ | 59 (1.3) | 64 (1.4) | 46 (1.3) | 72 (1.2) △ | 16 (0.9) ▽ |
| 73 (1.6) △ | 40 (1.9) ▽ | 80 (1.6) | 87 (1.4) △ | 57 (2.0) | 67 (2.1) | 61 (2.0) ▲ | 64 (1.6) ▽ | 18 (1.5) ▽ |
| 70 (1.3) | 46 (1.4) ▽ | 70 (1.6) ▽ | 79 (1.6) | 60 (1.6) | 67 (1.6) | 44 (1.4) ▽ | 58 (1.6) ▽ | 26 (1.2) |
| 59 (1.1) ▽ | 46 (1.3) ▽ | 68 (1.5) ▼ | 69 (1.4) ▼ | 68 (1.3) △ | 69 (1.3) △ | 49 (1.2) | 56 (1.2) ▼ | 11 (0.8) ▼ |
| 88 (1.6) ▲ | 68 (2.4) ▲ | 92 (2.0) ▲ | 93 (1.3) ▲ | 56 (3.1) | 88 (1.9) ▲ | 46 (3.9) | 93 (1.4) ▲ | 48 (2.5) ▲ |
| 64 (1.4) ▽ | 61 (1.5) ▲ | 91 (0.8) ▲ | 87 (1.4) △ | 61 (1.8) | 81 (1.4) ▲ | 51 (1.5) | 85 (1.4) ▲ | 19 (1.3) ▽ |
| 68 (0.4) | 49 (0.5) | 79 (0.4) | 80 (0.4) | 58 (0.5) | 65 (0.4) | 48 (0.5) | 68 (0.4) | 24 (0.4) |
| | | | | | | | | |
| 82 (1.7) | 36 (2.7) | 87 (1.7) | 82 (1.2) | 24 (2.6) | 75 (2.2) | 17 (1.7) | 83 (1.5) | 14 (1.7) |
| 34 (1.7) | 76 (1.7) | 64 (1.3) | 57 (1.6) | 52 (1.6) | 48 (1.8) | 41 (1.6) | 39 (1.6) | 29 (1.5) |
| 69 (1.7) | 45 (2.0) | 86 (0.9) | 83 (1.3) | 25 (1.7) | 66 (1.9) | 40 (1.6) | 59 (1.8) | 35 (1.8) |
| 53 (2.7) | 64 (1.7) | 82 (1.4) | 83 (1.3) | 52 (1.9) | 60 (2.0) | 33 (1.9) | 59 (2.1) | 19 (1.5) |
| 77 (1.6) | 31 (1.7) | 89 (1.2) | 76 (1.8) | 32 (1.8) | 64 (1.7) | 22 (1.4) | 75 (1.6) | 15 (1.5) |
| | | | | | | | | |
| 75 (2.6) | 38 (2.6) | 94 (1.5) | 86 (2.1) | 34 (3.0) | 73 (3.1) | 30 (2.8) | 81 (2.6) | 14 (1.6) |
| | | | | | | | | |
| 71 (2.6) | 33 (2.9) | 95 (0.9) | 88 (1.9) | 35 (3.3) | 76 (2.7) | 33 (2.9) | 82 (2.9) | 11 (1.5) |

▲ More than 10 percentage points above ICILS 2013 average
△ Significantly above ICILS 2013 average
▽ Significantly below ICILS 2013 average
▼ More than 10 percentage points below ICILS 2013 average

out of five teachers agreed or strongly agreed that ICT helps students work at a level appropriate to their learning. The lowest levels of teacher agreement with this statement were recorded in Croatia and Slovenia (69%), and the highest in Thailand (93%).

There was less support for statements concerned with the impact of ICT on academic performance, planning, and self-regulation. Approximately two thirds of teachers (the ICILS 2013 average was 68%) agreed with the proposition that ICT improves students' academic performance. The level of agreement was highest in Thailand and Turkey (93% and 85% respectively) and lowest in the Czech Republic and Croatia (53% each). A similar percentage of teachers (65%) believed, on average, that ICT helps students plan and self-regulate their work. Agreement was less extensive among teachers from the Czech Republic, where less than half of the teachers agreed with this statement (41%). In contrast, 88 percent of teachers from Thailand either strongly agreed or agreed with this statement.

Teachers' views of statements reflecting negative aspects of the use of ICT in teaching and learning generally attracted less support than statements reflecting positive aspects. However, the statement that ICT use results in poorer writing skills amongst students attracted agreement from two thirds of teachers. A majority of teachers in each country indicated that they believed this to be the case. An exception was in Newfoundland and Labrador (Canada), where only 39 percent of teachers expressed agreement with the statement. Slovenia had the highest percentage of teachers expressing agreement with this statement (79%). Similarly, almost half of teachers internationally (the ICILS 2013 average was 48%) endorsed the view that using ICT results in poorer calculation and estimation skills among students. The national percentages of agreement ranged from 30 percent in Newfoundland and Labrador (Canada) to 64 percent in Korea.

On average across the ICILS countries, teachers rejected the statement that ICT "only introduces organizational problems for schools" (the ICILS 2013 average was 17%). Only seven percent of teachers in both the Czech Republic and Poland agreed with this assertion whereas 42 percent of teachers in Korea endorsed this view.

Across the ICILS countries, 40 percent of teachers, on average, said they agreed with the view that "ICT impedes concept formation better done with real objects than computer images." Percentages of agreement ranged from 20 percent in Newfoundland and Labrador (Canada) to 55 percent in Slovenia.

Internationally, almost half of all teachers (the ICILS 2013 average was 49%) thought that ICT "only encourages copying material from published internet sources." Poland recorded the lowest rate of agreement with this statement (31%); two thirds of teachers in Thailand (66%) endorsed this view.

With the exception of teachers in Australia (43%), Chile (46%), and Newfoundland and Labrador (34%), majorities of teachers in each country believed that ICT "limits the amount of personal communication among students" (an ICILS 2013 average of 58%). The highest percentage of agreement with this statement was recorded in the Czech Republic (71%).

Majorities of teachers in all participating countries rejected the notion that ICT only distracts students from learning (on average 76% of teachers disagreed with this statement). Thailand had the highest percentage of teachers believing that ICT is a distraction (46%); Slovenia had the lowest such percentage (11%).

We found that the items in the question about possible consequences of using ICT in teaching and learning at school actually represented two separate dimensions (see Fraillon, Schulz, Friedman, Ainley, & Gebhardt, forthcoming)—one reflecting the positive aspects of using ICT in teaching and learning at school and the other reflecting negative perceptions.[2] We accordingly formed two scales reflecting teachers' views on ICT use in schools. The first contained positively worded items. The second contained negatively worded items.

We used the Rasch partial credit model to construct the *positive views on using ICT in teaching and learning scale*. This scale was standardized to have an ICILS 2013 average score of 50 points and a standard deviation of 10 points, and it had an average reliability (coefficient alpha) of 0.83.[3] Table 7.3 presents the average scale scores, with the higher values reflecting more positive views, by country and age group (teachers under 40 years of age and those over).

Teachers from Chile, Thailand, and Turkey had average scale scores that were more than three points higher than the ICILS 2013 average for the scale, a finding which suggests that the teachers in these countries held a relatively more positive opinion of the value that ICT offers teaching and learning. Teachers in Slovenia scored three points lower than the average, suggesting that they held less positive views on the value of ICT for teaching and learning than their colleagues in the other ICILS countries. Overall, there were no differences in views between the two age groups. However, older teachers from the Czech Republic and Slovak Republic had slightly more positive views than the younger teachers of the value of using ICT; the scale score differences between the two were statistically significant.

The second scale, *negative views of using ICT in teaching and learning*,[4] was constructed in the same way as the other scales described in this report. It had an average reliability (coefficient alpha) of 0.80 and was standardized to have an ICILS 2013 average score of 50 points and a standard deviation of 10 points. The higher scores on the scale reflect more negative views of ICT use at school. Table 7.4 shows the national average scores for all teachers and within the two age groups for each participating country.

We observed little variation among countries in the extent to which teachers held negative views about ICT use in teaching and learning. Teachers in Chile, whose mean scale score was more than five points lower than the ICILS 2013 average scale score, were the least negative of all teachers across the participating countries. No country recorded an average scale score more than three points higher than the ICILS 2013 average.

2 It is possible, and our analyses confirmed this, for individuals to simultaneously hold both positive and negative views of the use of ICT in school given they are not necessarily polar opposites.

3 The items making up this scale were:
- Enables students to access better sources of information;
- Helps students to consolidate and process information more effectively;
- Helps students learn to collaborate with other students;
- Enables students to communicate more effectively with others;
- Helps students develop greater interest in learning;
- Helps students work at a level appropriate to their learning needs;
- Helps students develop skills in planning and self-regulation of their work; and
- Improves academic performance of students.

4 The items making up this scale were:
- Results in poorer writing skills among students;
- Only introduces organizational problems for schools;
- Impedes concept formation better done with real objects than computer images;
- Only encourages copying material from published internet sources;
- Limits the amount of personal communication among students;
- Results in poorer calculation and estimation skills among students; and
- Only distracts students from learning.

*Table 7.3: National averages for teachers with positive views on using ICT in teaching and learning overall and by age group*

| Country | Positive Views on Using ICT in Teaching and Learning by Age Group | | | | | | | | Score Distribution by Age Group |
|---|---|---|---|---|---|---|---|---|---|
| | All teachers | | Under 40 | | 40 and over | | Differences (40 and over – under 40)* | | 30 40 50 60 70 |
| Australia | 48 | (0.3) ▽ | 48 | (0.3) | 48 | (0.4) | 0 | (0.5) | |
| Chile | 55 | (0.5) ▲ | 56 | (0.7) | 55 | (0.6) | -1 | (0.9) | |
| Croatia | 47 | (0.3) ▽ | 47 | (0.3) | 47 | (0.3) | 0 | (0.4) | |
| Czech Republic | 47 | (0.3) ▽ | 46 | (0.3) | 48 | (0.4) | **1** | (0.4) | |
| Korea, Republic of | 48 | (0.3) ▽ | 49 | (0.5) | 48 | (0.5) | -1 | (0.9) | |
| Lithuania | 49 | (0.2) ▽ | 49 | (0.5) | 49 | (0.2) | 0 | (0.5) | |
| Poland | 50 | (0.3) | 49 | (0.3) | 50 | (0.4) | 0 | (0.4) | |
| Russian Federation[1] | 50 | (0.4) | 50 | (0.5) | 50 | (0.4) | 0 | (0.5) | |
| Slovak Republic | 48 | (0.3) ▽ | 47 | (0.4) | 48 | (0.3) | **1** | (0.4) | |
| Slovenia | 47 | (0.3) ▼ | 46 | (0.4) | 47 | (0.3) | 1 | (0.5) | |
| Thailand | 56 | (0.7) ▲ | 56 | (0.7) | 57 | (0.9) | 0 | (0.7) | |
| Turkey | 54 | (0.4) ▲ | 54 | (0.4) | 54 | (0.8) | 0 | (0.9) | |
| **ICILS 2013 average** | 50 | (0.1) | 50 | (0.1) | 50 | (0.1) | 0 | (0.2) | |
| **Countries not meeting sample requirements** | | | | | | | | | |
| Denmark | 51 | (0.4) | 51 | (0.6) | 51 | (0.5) | 0 | (0.7) | |
| Germany | 43 | (0.3) | 43 | (0.5) | 43 | (0.3) | 0 | (0.6) | |
| Hong Kong SAR | 48 | (0.2) | 48 | (0.3) | 48 | (0.4) | 0 | (0.5) | |
| Netherlands | 46 | (0.3) | 46 | (0.4) | 45 | (0.4) | **-1** | (0.3) | |
| Norway (Grade 9) | 49 | (0.3) | 50 | (0.5) | 49 | (0.3) | -1 | (0.5) | |
| **Benchmarking participant** | | | | | | | | | |
| Newfoundland and Labrador, Canada | 53 | (0.7) | 52 | (0.9) | 54 | (1.0) | 2 | (1.2) | |
| **Benchmarking participant not meeting sample requirements** | | | | | | | | | |
| Ontario, Canada | 54 | (0.9) | 55 | (1.1) | 53 | (1.4) | -2 | (1.6) | |

**Notes:**

* Statistically significant ($p$<0.05) coefficients in **bold.**

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

▲ More than three score points above ICILS 2013 average

△ Significantly above ICILS 2013 average

▽ Significantly below ICILS 2013 average

▼ More than three score points below ICILS 2013 average

Under 40 average score +/–confidence interval

Over 40 average score +/– confidence interval

On average, teachers with a score in the range indicated by this color have more than a 50% probability of responding to the statements about positive views on using ICT in teaching and learning with:

| | |
|---|---|
| | Disagreement to positive, agreement to negative statements |
| | Agreement to positive, disagreement to negative items |

*Table 7.4: National averages for teachers with negative views on using ICT in teaching and learning overall and by age group*

| Country | Negative Views on Using ICT in Teaching and Learning by Age Group | | | | | | | | Score Distribution by Age Group 30 40 50 60 70 |
|---|---|---|---|---|---|---|---|---|---|
| | All teachers | | Under 40 | | 40 and over | | Differences (40 and over — under 40)* | | |
| Australia | 49 | (0.3) ▽ | 49 | (0.4) | 48 | (0.4) | -1 | (0.5) | |
| Chile | 45 | (0.5) ▼ | 44 | (0.8) | 46 | (0.6) | **2** | (0.9) | |
| Croatia | 51 | (0.2) △ | 49 | (0.3) | 52 | (0.3) | **2** | (0.4) | |
| Czech Republic | 50 | (0.3) | 49 | (0.4) | 51 | (0.4) | **2** | (0.5) | |
| Korea, Republic of | 53 | (0.3) △ | 51 | (0.6) | 53 | (0.6) | **2** | (1.1) | |
| Lithuania | 51 | (0.3) △ | 49 | (0.7) | 51 | (0.3) | **2** | (0.7) | |
| Poland | 49 | (0.3) ▽ | 48 | (0.4) | 49 | (0.4) | 1 | (0.4) | |
| Russian Federation[1] | 50 | (0.4) | 49 | (0.6) | 51 | (0.4) | **1** | (0.5) | |
| Slovak Republic | 50 | (0.3) | 50 | (0.5) | 50 | (0.3) | 0 | (0.5) | |
| Slovenia | 51 | (0.3) △ | 50 | (0.4) | 51 | (0.3) | **1** | (0.4) | |
| Thailand | 51 | (1.2) | 51 | (1.1) | 51 | (1.5) | -1 | (1.1) | |
| Turkey | 51 | (0.4) | 50 | (0.3) | 53 | (0.8) | **3** | (0.7) | |
| **ICILS 2013 average** | 50 | (0.1) | 49 | (0.2) | 51 | (0.2) | **1** | (0.2) | |
| **Countries not meeting sample requirements** | | | | | | | | | |
| Denmark | 42 | (0.6) | 42 | (0.8) | 42 | (0.7) | 0 | (0.8) | |
| Germany | 50 | (0.4) | 52 | (1.0) | 49 | (0.7) | -3 | (1.5) | |
| Hong Kong SAR | 50 | (0.3) | 50 | (0.4) | 51 | (0.3) | **1** | (0.5) | |
| Netherlands | 49 | (0.3) | 49 | (0.4) | 49 | (0.3) | -1 | (0.5) | |
| Norway (Grade 9) | 44 | (0.4) | 44 | (0.4) | 44 | (0.5) | 0 | (0.6) | |
| **Benchmarking participant** | | | | | | | | | |
| Newfoundland and Labrador, Canada | 45 | (0.7) | 46 | (0.8) | 44 | (1.0) | **-2** | (1.2) | |
| **Benchmarking participant not meeting sample requirements** | | | | | | | | | |
| Ontario, Canada | 43 | (0.9) | 43 | (1.2) | 43 | (1.1) | 0 | (1.6) | |

Notes:

* Statistically significant ($p$<0.05) coefficients in **bold.**

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

▲ More than three score points above ICILS 2013 average

△ Significantly above ICILS 2013 average

▽ Significantly below ICILS 2013 average

▼ More than three score points below ICILS 2013 average

Under 40 average score +/— confidence interval

Over 40 average score +/— confidence interval

On average, teachers with a score in the range indicated by this color have more than a 50% probability of responding to the statements about negative views on using ICT in teaching and learning with:

Disagreement to positive, agreement to negative statements

Agreement to positive, disagreement to negative items

Teachers over 40 years of age tended to report significantly more negative attitudes toward ICT use than did their colleagues under 40 years of age. This finding featured in eight of the 13 countries that met sampling requirements. The only teachers under the age of 40 who held more negative views than their older colleagues about pedagogical use of ICT were those in Newfoundland and Labrador (Canada).

## Confidence in using ICT

As studies such as SITES 2006 (Law et al., 2008) and the School Net 2013 survey (European Commission, 2013) indicate, teachers who are confident users of ICT are more likely than unconfident teachers to adopt ICT as part of their teaching. The ICILS teacher questionnaire invited teachers to rate their confidence ("I know how to do this," "I could work out how to do this," or "I do not think I could do this") in their ability to complete various tasks on a computer by themselves. The tasks listed were ones further developed from an item set used in SITES 2006 (Law et al., 2008).

Table 7.5 reports the percentages of teachers who said they knew how to do each of these tasks. The tasks that teachers felt most comfortable with were finding useful resources on the internet (92% of teachers crossnationally), producing a letter using a word

*Table 7.5: National percentages of teachers expressing confidence in doing different computer tasks*

| Country | Producing a Letter Using a Wordprocessing Program | Emailing a File as an Attachment | Storing Digital Photos on a Computer | Filing Digital Documents in Folders and Subfolders | Monitoring Students' Progress | Using a Spreadsheet Program (e.g., [Lotus 1 2 3 ®, Microsoft Excel ®]) for Keeping Records or Analyzing Data |
|---|---|---|---|---|---|---|
| Australia | 98 (0.3) △ | 98 (0.3) △ | 93 (0.5) ▲ | 94 (0.6) △ | 86 (0.8) ▲ | 74 (1.2) ▲ |
| Chile | 90 (1.2) | 92 (1.2) | 84 (1.5) | 89 (1.3) △ | 62 (1.9) | 57 (1.7) |
| Croatia | 90 (0.7) | 86 (0.8) ▽ | 77 (0.8) ▽ | 79 (0.8) ▽ | 54 (1.5) ▼ | 45 (1.4) ▼ |
| Czech Republic | 97 (0.4) △ | 96 (0.5) △ | 79 (1.3) ▽ | 90 (0.7) △ | 49 (1.5) ▼ | 58 (1.3) |
| Korea, Republic of | 95 (0.8) △ | 97 (0.9) △ | 96 (0.9) ▲ | 94 (0.7) △ | 62 (1.7) | 69 (1.1) △ |
| Lithuania | 92 (0.8) △ | 91 (1.1) | 82 (1.1) | 81 (1.2) ▽ | 83 (1.6) ▲ | 53 (1.3) ▽ |
| Poland | 97 (0.5) △ | 95 (0.7) △ | 80 (1.0) ▽ | 82 (1.2) | 66 (1.9) | 66 (1.4) △ |
| Russian Federation[1] | 90 (1.0) | 76 (1.9) ▼ | 81 (1.3) | 88 (1.4) △ | 68 (2.1) | 64 (1.4) △ |
| Slovak Republic | 95 (0.6) △ | 93 (0.8) △ | 78 (1.1) ▽ | 71 (1.1) ▼ | 59 (1.1) ▽ | 68 (1.1) △ |
| Slovenia | 97 (0.6) △ | 97 (0.5) △ | 82 (1.0) | 84 (1.0) | 67 (1.0) | 55 (1.5) ▽ |
| Thailand | 46 (3.1) ▼ | 69 (1.8) ▼ | 72 (1.8) ▼ | 73 (1.9) ▼ | 50 (2.6) ▼ | 55 (2.7) |
| Turkey | 76 (1.5) ▼ | 81 (1.8) ▽ | 84 (1.5) | 83 (1.6) | 73 (1.3) △ | 43 (1.8) ▼ |
| **ICILS 2013 average** | 89 (0.3) | 89 (0.3) | 82 (0.3) | 84 (0.3) | 65 (0.5) | 59 (0.4) |
| **Countries not meeting sample requirements** | | | | | | |
| Denmark | 99 (0.4) | 99 (0.4) | 90 (1.4) | 92 (1.6) | 84 (2.2) | 55 (2.4) |
| Germany | 99 (0.3) | 94 (0.9) | 87 (1.4) | 93 (0.9) | 51 (1.5) | 52 (1.9) |
| Hong Kong SAR | 94 (1.1) | 97 (0.6) | 93 (1.0) | 92 (0.9) | 52 (1.5) | 74 (1.5) |
| Netherlands | 99 (0.4) | 98 (0.4) | 93 (0.7) | 95 (0.7) | 96 (0.7) | 58 (1.4) |
| Norway (Grade 9) | 98 (0.4) | 97 (0.7) | 90 (1.1) | 92 (0.7) | 71 (2.0) | 52 (1.7) |
| **Benchmarking participant** | | | | | | |
| Newfoundland and Labrador, Canada | 99 (0.4) | 98 (0.8) | 92 (1.7) | 92 (1.7) | 89 (1.5) | 56 (2.7) |
| **Benchmarking participant not meeting sample requirements** | | | | | | |
| Ontario, Canada | 99 (0.5) | 98 (0.8) | 90 (1.8) | 88 (1.9) | 77 (2.8) | 60 (2.8) |

Notes:

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

processing program (89%), and emailing a file as an attachment (89%). More than 80 percent of teachers across the participating countries were confident of their ability to file digital documents in folders and subfolders (84%) and to store their digital photos on a computer (82%).

On average internationally, more than half, but under four fifths, of the teachers expressed confidence in carrying out a series of other tasks. These were using the internet for online purchases and payments (77%), producing presentations with simple animation functions (76%), preparing lessons involving student use of ICT (73%), using a spreadsheet for keeping records or analyzing data (59%), and contributing to a discussion forum/user group on the internet (58%).

Approximately two thirds of teachers across participating countries were confident about their ability to use computers for the following two aspects of teaching. Seventy-one percent expressed confidence in their ability to use ICT for assessing student learning, and 65 percent were confident that they could use a computer for monitoring students' progress. Less than half of the teachers (on average across participating countries) felt confident about installing software (47%) and collaborating with others using shared resources (44%).

*Table 7.5: National percentages of teachers expressing confidence in doing different computer tasks (contd.)*

| Contributing to a Discussion Forum/ User Group on the Internet (e.g., a Wiki or Blog) | Producing Presentations (e.g., [Microsoft PowerPoint®] or a Similar Program), with Simple Animation Functions | Using the Internet for Online Purchases and Payments | Preparing Lessons That Involve the Use of ICT by Students | Finding Useful Teaching Resources on the Internet | Assessing Student Learning | Collaborating With Others Using Shared Resources such as [Google Docs®] | Installing Software |
|---|---|---|---|---|---|---|---|
| 60 (1.1) | 87 (0.6) ▲ | 95 (0.5) ▲ | 90 (0.7) ▲ | 96 (0.5) △ | 83 (0.9) ▲ | 48 (1.8) △ | 69 (1.1) ▲ |
| 55 (1.7) | 87 (1.2) ▲ | 76 (1.9) | 83 (1.6) △ | 95 (0.8) △ | 75 (1.7) △ | 54 (2.0) △ | 57 (2.2) ▲ |
| 49 (1.6) ▽ | 73 (1.1) ▽ | 66 (1.3) ▼ | 52 (1.8) ▼ | 92 (0.8) | 59 (1.2) ▼ | 39 (1.6) ▽ | 42 (1.2) ▽ |
| 56 (1.4) | 78 (1.2) △ | 89 (0.8) ▲ | 81 (1.2) △ | 97 (0.4) △ | 66 (1.3) ▽ | 29 (1.2) ▼ | 43 (1.4) ▽ |
| 66 (1.5) △ | 68 (2.0) ▽ | 94 (0.8) ▲ | 84 (1.2) ▲ | 95 (1.8) | 82 (2.0) ▲ | 35 (1.1) ▽ | 66 (1.8) ▲ |
| 64 (1.3) △ | 70 (1.1) ▽ | 81 (1.0) △ | 85 (1.2) ▲ | 94 (0.8) △ | 84 (1.7) ▲ | 47 (1.6) | 24 (1.2) ▼ |
| 68 (1.6) △ | 72 (1.5) ▽ | 88 (1.1) ▲ | 73 (1.6) | 98 (0.3) △ | 67 (1.7) ▽ | 60 (1.9) ▲ | 54 (1.2) △ |
| 46 (2.0) ▼ | 79 (1.3) △ | 57 (2.0) ▼ | 82 (1.2) △ | 92 (0.6) | 69 (1.9) | 43 (1.9) | 32 (1.2) ▼ |
| 63 (1.5) △ | 85 (0.9) △ | 85 (0.9) △ | 81 (1.0) △ | 94 (0.6) △ | 75 (1.1) △ | 38 (1.2) ▽ | 38 (1.4) ▽ |
| 63 (1.4) △ | 84 (0.9) △ | 75 (1.5) | 78 (1.1) △ | 93 (0.7) | 65 (1.2) ▽ | 45 (1.6) | 39 (1.1) ▽ |
| 51 (2.5) ▽ | 60 (2.3) ▼ | 47 (2.1) ▼ | 41 (2.5) ▼ | 72 (1.9) ▼ | 55 (2.4) ▼ | 45 (3.0) | 33 (2.0) ▼ |
| 58 (1.9) | 63 (1.9) ▼ | 73 (2.2) | 52 (1.6) ▼ | 87 (1.1) ▽ | 72 (1.7) | 41 (2.4) | 62 (2.0) ▲ |
| 58 (0.5) | 76 (0.4) | 77 (0.4) | 73 (0.4) | 92 (0.3) | 71 (0.5) | 44 (0.5) | 47 (0.4) |
| | | | | | | | |
| 55 (2.3) | 84 (2.0) | 98 (0.8) | 93 (1.4) | 98 (0.6) | 75 (2.6) | 49 (2.7) | 66 (2.4) |
| 47 (1.5) | 74 (1.8) | 92 (1.0) | 67 (1.7) | 97 (0.5) | 51 (1.7) | 24 (1.6) | 70 (1.6) |
| 66 (1.6) | 92 (0.8) | 80 (1.2) | 74 (1.2) | 94 (0.6) | 58 (1.4) | 45 (1.5) | 69 (1.5) |
| 55 (1.5) | 87 (1.3) | 97 (0.5) | 78 (1.6) | 95 (0.5) | 47 (1.8) | 34 (2.1) | 69 (1.4) |
| 53 (2.1) | 83 (1.5) | 96 (0.6) | 91 (1.1) | 96 (0.9) | 78 (1.6) | 34 (1.7) | 59 (2.4) |
| | | | | | | | |
| 71 (3.0) | 86 (2.0) | 96 (1.0) | 72 (2.7) | 98 (0.6) | 85 (2.2) | 69 (2.0) | 75 (2.1) |
| | | | | | | | |
| 64 (3.2) | 87 (2.1) | 96 (1.2) | 72 (3.1) | 97 (0.6) | 80 (2.6) | 64 (2.5) | 75 (2.3) |

▲ More than 10 percentage points above ICILS 2013 average
△ Significantly above ICILS 2013 average
▽ Significantly below ICILS 2013 average
▼ More than 10 percentage points below ICILS 2013 average

We used the 14 items[5] on teachers' confidence in performing these ICT tasks to derive a scale called the *ICT self-efficacy scale*. It had an average reliability (coefficient alpha) of 0.87 and scores set to an ICILS 2013 average of 50 with a standard deviation of 10 points. The higher values on the scale reflect greater levels of confidence. Table 7.6 records the national averages for the confidence scale overall and by two age groups (teachers under 40 and teachers over 40 years of age).

We noted several differences in the average scale scores across the ICILS countries. Teachers in Australia (55 scale score points) and Korea (53) recorded average scores five and three scale points respectively above the ICILS 2013 average. The national average scores in Chile (52) and Poland (51) were also above the ICILS 2013 average by a statistically significant amount. Teachers in Thailand (45) recorded a national average score that was five points below the ICILS 2013 average. Other countries that had average scores lower than the ICILS 2013 average were Croatia (47), the Russian Federation (49), and Turkey (49).

It was also evident that teachers under the age of 40 years were more confident than those over 40 years of age in carrying out the specified tasks. The score point differences were statistically significant in all countries that satisfied sampling requirements. On average, the difference between the two groups was six scale points across the ICILS countries. The largest difference, eight scale points, was recorded in Croatia.

## Associations between ICT use and teachers' views

We investigated the associations between the frequency with which the teachers were using computers (defined as at least once per week) and the various attitudes teachers held about ICT use in schools. The latter included teachers' confidence (self-efficacy) in using ICT, how positive teachers felt about that use, and how negative. We also included in these investigations two aspects of the ICT environment in schools: the presence or otherwise of resource-related obstacles to using ICT in teaching,[6] and the extent to which teachers were collaborating and following common procedures when using ICT in their teaching.[7] We used the Rasch partial credit model to construct a scale for each

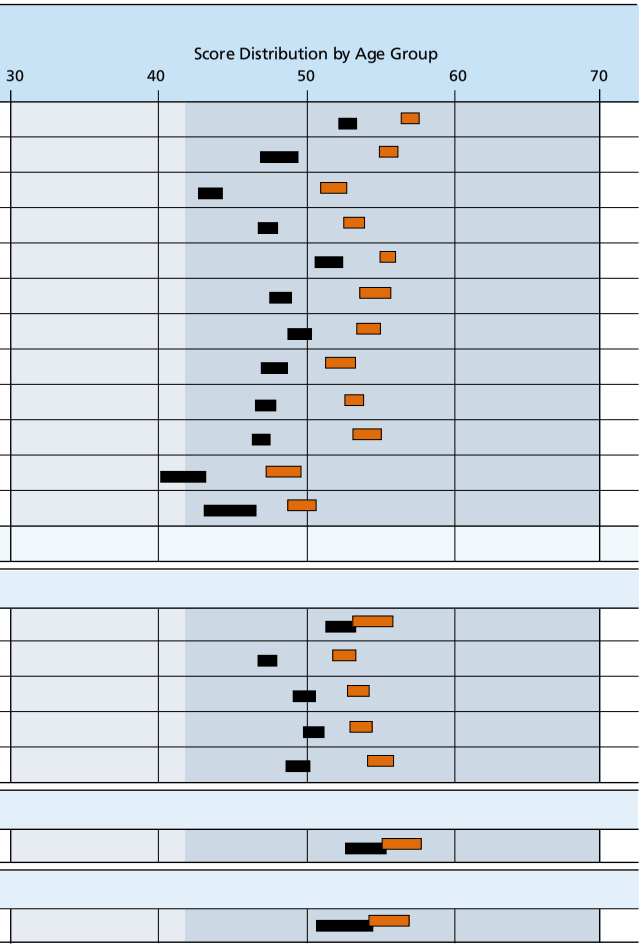
5 The items were:
- Producing a letter using a wordprocessing program;
- Emailing a file as an attachment;
- Storing your [the teacher's] digital photos on a computer;
- Filing digital documents in folders and subfolders;
- Monitoring students' progress;
- Using a spreadsheet program for keeping records or analyzing data;
- Contributing to a discussion forum/user group on the internet (e.g., a wiki or blog);
- Producing presentations (e.g., [Microsoft PowerPoint®] or a similar program), with simple animation functions;
- Using the internet for online purchases and payments;
- Preparing lessons that involve the use of ICT by students;
- Finding useful teaching resources on the internet;
- Assessing student learning;
- Collaborating with others using shared resources such as [Google Docs®]; and
- Installing software.

6 Chapter 6 describes and discusses the responses to the items making up this scale, which had an average reliability (coefficient alpha) across countries of 0.83. The six items were:
- My school does not have sufficient ICT equipment (e.g., computers);
- My school does not have access to digital learning resources;
- My school has limited connectivity (e.g., slow or unstable speed) to the internet;
- The computer equipment in our school is out of date;
- There is not sufficient provision for me to develop expertise in ICT; and
- There is not sufficient technical support to maintain ICT resources.

7 Chapter 5 describes and discusses the responses to the items making up this scale, which had an average reliability (coefficient alpha) across countries of 0.79. The five items were:
- I work together with other teachers on improving the use of ICT in classroom teaching;
- There is a common set of rules in the school about how ICT should be used in classrooms;
- I systematically collaborate with colleagues to develop ICT-based lessons based on the curriculum;
- I observe how other teachers use ICT in teaching; and
- There is a common set of expectations in the school about what students will learn about ICT.

*Table 7.6: National averages for teachers' ICT self-efficacy overall and by age group*

| Country | Teachers' ICT Self-Efficacy by Age Group | | | Score Distribution by Age Group |
|---|---|---|---|---|
| | All teachers | Under 40 | 40 and over | Differences (40 and over - under 40)* |
| Australia | 55 (0.2) ▲ | 57 (0.2) | 53 (0.3) | **-4** (0.3) |
| Chile | 52 (0.4) △ | 55 (0.3) | 48 (0.6) | **-7** (0.7) |
| Croatia | 47 (0.3) ▽ | 52 (0.4) | 43 (0.4) | **-8** (0.6) |
| Czech Republic | 50 (0.3) | 53 (0.3) | 47 (0.3) | **-6** (0.4) |
| Korea, Republic of | 53 (0.3) ▲ | 55 (0.3) | 52 (0.5) | **-4** (0.6) |
| Lithuania | 50 (0.3) | 55 (0.5) | 48 (0.3) | **-6** (0.7) |
| Poland | 51 (0.3) △ | 54 (0.4) | 50 (0.4) | **-5** (0.5) |
| Russian Federation[1] | 49 (0.4) ▽ | 52 (0.5) | 48 (0.4) | **-4** (0.5) |
| Slovak Republic | 50 (0.2) | 53 (0.3) | 47 (0.3) | **-6** (0.4) |
| Slovenia | 50 (0.3) | 54 (0.5) | 47 (0.3) | **-7** (0.5) |
| Thailand | 45 (0.6) ▼ | 48 (0.6) | 42 (0.8) | **-7** (0.7) |
| Turkey | 49 (0.5) ▽ | 50 (0.5) | 45 (1.0) | **-5** (1.0) |
| **ICILS 2013 average** | 50 (0.1) | 53 (0.1) | 47 (0.1) | **-6** (0.2) |
| **Countries not meeting sample requirements** | | | | |
| Denmark | 53 (0.5) | 55 (0.7) | 52 (0.5) | **-2** (0.7) |
| Germany | 49 (0.3) | 53 (0.4) | 47 (0.4) | **-5** (0.6) |
| Hong Kong SAR | 52 (0.3) | 54 (0.3) | 50 (0.4) | **-4** (0.5) |
| Netherlands | 52 (0.2) | 54 (0.3) | 50 (0.3) | **-3** (0.5) |
| Norway (Grade 9) | 52 (0.4) | 55 (0.4) | 49 (0.4) | **-6** (0.5) |
| **Benchmarking participant** | | | | |
| Newfoundland and Labrador, Canada | 55 (0.4) | 56 (0.6) | 54 (0.7) | **-2** (0.9) |
| **Benchmarking participant not meeting sample requirements** | | | | |
| Ontario, Canada | 54 (0.5) | 56 (0.6) | 52 (1.0) | **-3** (1.2) |




Notes:

* Statistically significant ($p$<0.05) coefficients in **bold**.

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

▲ More than three score points above ICILS 2013 average

△ Significantly above ICILS 2013 average

▽ Significantly below ICILS 2013 average

▼ More than three score points below ICILS 2013 average

Under 40 average score +/– confidence interval

Over 40 average score +/– confidence interval

On average, teachers with a score in the range indicated by this color have more than a 50% probability of responding to the statements about ICT self-efficacy with:

| | |
|---|---|
| | Disagreement to positive, agreement to negative statements |
| | Agreement to positive, disagreement to negative items |

of these aspects and standardized their respective IRT (item response theory) scores to have an ICILS 2013 average score of 50 points and a standard deviation of 10 points.

Table 7.7 records the average scale scores for these dimensions for frequent and infrequent computer users in each country. These data reveal a substantial difference between the ICT confidence (self-efficacy) scores of frequent and infrequent users of computers when teaching. On average, the difference between these two groups was six scale points (or 0.6 of a standard deviation). The difference was statistically significant in every country and ranged from 10 scale points (one standard deviation) in the Russian Federation to four scale points in Korea. While it is not possible to infer causality from these cross-sectional data, it is worth noting that the gap is large.

The data in Table 7.7 also present information on the extent to which teachers who frequently used computers and those who infrequently used them differed in their general views about ICT use in school. The frequent users had stronger positive views about the effects of ICT than did the infrequent computer users. On average across countries, the difference was three scale points (or one third of a standard deviation). The difference was statistically significant in every ICILS country that satisfied sampling requirements and ranged from six (Australia) to two (Lithuania) scale points.

Frequent users of computers for teaching also expressed less negative views than infrequent users about the outcomes of using ICT in school. On average, the difference was three scale points (one third of a standard deviation). The difference was statistically significant in most countries and ranged from one scale point (Turkey and Hong Kong SAR) to four scale points (Chile and Croatia).

The data in Table 7.8 show that, compared to infrequent users of computers for teaching, frequent users reported better ICT resourcing (i.e., fewer obstacles) and a stronger sense of shared collaboration regarding ICT use in their schools. On average, the scale score difference between the two groups was three scale points (one third of a standard deviation). The largest differences (four score points) were recorded in Poland, the Russian Federation, and Turkey (as well as in Denmark, one of the countries that did not meet ICILS sampling requirements).

The extent of reported collaboration among teachers also differed between frequent and infrequent pedagogical computer users. The average international difference was three scale points, while the national differences ranged from two scale points in Korea, Lithuania, and Slovenia to five scale points in Australia, Thailand, and Turkey.

## Teaching with and about ICT

Teachers of students enrolled in the ICILS target grade are often, but not always, specialists in a subject area and so teach several different classes, including classes at other grades. The ICILS research team considered that it was important to focus the investigation on one class per teacher, with that class selected from among the classes the teacher was teaching. Teachers were asked to base their responses regarding their teaching practices on their experiences with this particular "reference" class. To help teachers select this class, ICILS provided the following instruction:

> *This is the first [target grade] class that you teach for a regular subject (i.e., other than home room, assembly etc.) on or after Tuesday following the last weekend before you first accessed this questionnaire. You may, of course, teach the class at other times during the week as well. If you did not teach a [target grade] class on that Tuesday, please use the [target grade] class that you taught on the first day after that Tuesday.*

*Table 7.7: National mean scale teacher attitude scores for frequent and infrequent users of ICT when teaching*

| Country | ICT Self-Efficacy | | | Positive ICT Views | | | Negative ICT Views | | |
|---|---|---|---|---|---|---|---|---|---|
| | Frequent user | Infrequent user | Difference (infrequent - frequent users)* | Frequent user | Infrequent user | Difference (infrequent - frequent users)* | Frequent user | Infrequent user | Difference (infrequent - frequent users)* |
| Australia | 55 (0.2) | 49 (0.9) | **-6** (1.0) | 49 (0.3) | 43 (0.7) | **-6** (0.7) | 48 (0.3) | 52 (0.7) | **3** (0.7) |
| Chile | 53 (0.4) | 49 (0.6) | **-4** (0.6) | 56 (0.6) | 54 (0.8) | **-3** (1.0) | 44 (0.6) | 48 (0.8) | **4** (1.0) |
| Croatia | 52 (0.4) | 44 (0.4) | **-8** (0.5) | 50 (0.3) | 45 (0.3) | **-4** (0.4) | 48 (0.3) | 52 (0.3) | **4** (0.4) |
| Czech Republic | 52 (0.3) | 45 (0.5) | **-7** (0.6) | 48 (0.4) | 46 (0.4) | **-3** (0.5) | 49 (0.5) | 53 (0.5) | **3** (0.7) |
| Korea, Republic of | 54 (0.3) | 50 (1.4) | **-4** (1.6) | 49 (0.3) | 46 (0.9) | **-3** (0.9) | 52 (0.3) | 55 (1.1) | **3** (1.2) |
| Lithuania | 52 (0.3) | 46 (0.5) | **-5** (0.6) | 50 (0.3) | 48 (0.3) | **-2** (0.4) | 50 (0.3) | 52 (0.5) | **2** (0.6) |
| Poland | 55 (0.4) | 49 (0.4) | **-6** (0.6) | 51 (0.5) | 48 (0.4) | **-3** (0.7) | 47 (0.5) | 50 (0.4) | **3** (0.7) |
| Russian Federation[1] | 51 (0.4) | 42 (0.8) | **-10** (0.8) | 51 (0.4) | 47 (0.8) | **-4** (0.8) | 49 (0.4) | 53 (0.6) | **3** (0.6) |
| Slovak Republic | 53 (0.3) | 46 (0.4) | **-7** (0.6) | 49 (0.4) | 46 (0.3) | **-3** (0.4) | 49 (0.3) | 52 (0.4) | **3** (0.4) |
| Slovenia | 51 (0.3) | 47 (0.4) | **-5** (0.4) | 48 (0.3) | 45 (0.5) | **-3** (0.5) | 50 (0.3) | 53 (0.3) | **3** (0.4) |
| Thailand | 49 (0.9) | 41 (0.7) | **-8** (1.0) | 59 (0.8) | 54 (0.8) | **-4** (0.8) | 50 (1.5) | 52 (1.0) | **2** (1.0) |
| Turkey | 51 (0.6) | 47 (0.5) | **-5** (0.7) | 56 (0.7) | 53 (0.5) | **-3** (0.9) | 50 (0.6) | 51 (0.5) | 1 (0.8) |
| **ICILS 2013 average** | 52 (0.1) | 46 (0.2) | **-6** (0.2) | 51 (0.1) | 48 (0.2) | **-3** (0.2) | 49 (0.2) | 52 (0.2) | **3** (0.2) |
| **Countries not meeting sample requirements** | | | | | | | | | |
| Denmark | 54 (0.4) | 49 (1.2) | **-5** (1.1) | 52 (0.5) | 49 (0.7) | **-3** (1.0) | 41 (0.6) | 45 (1.3) | **4** (1.4) |
| Germany | 54 (0.4) | 47 (0.3) | **-7** (0.5) | 46 (0.5) | 41 (0.3) | **-4** (0.6) | 47 (0.6) | 51 (0.6) | **4** (0.9) |
| Hong Kong SAR | 53 (0.3) | 49 (0.5) | **-3** (0.6) | 48 (0.3) | 46 (0.4) | **-2** (0.5) | 50 (0.4) | 51 (0.6) | 1 (0.7) |
| Netherlands | 52 (0.3) | 50 (0.7) | **-2** (0.8) | 46 (0.4) | 45 (0.5) | -1 (0.6) | 48 (0.4) | 50 (0.5) | **2** (0.8) |
| Norway | 53 (0.4) | 47 (0.5) | **-5** (0.6) | 50 (0.3) | 47 (0.5) | **-4** (0.6) | 43 (0.4) | 47 (0.8) | **3** (0.8) |
| **Benchmarking participant** | | | | | | | | | |
| Newfoundland & Labrador, Canada | 55 (0.5) | 50 (2.4) | **-5** (2.5) | 54 (0.7) | 47 (1.7) | **-7** (1.6) | 45 (0.7) | 48 (1.6) | **4** (1.5) |
| **Benchmarking participant not meeting sample requirements** | | | | | | | | | |
| Ontario, Canada | 55 (0.5) | 48 (1.1) | **-7** (1.2) | 55 (1.0) | 52 (2.0) | -2 (2.1) | 42 (1.0) | 52 (1.6) | **10** (2.0) |

Notes:

* Statistically significant ($p$<0.05) coefficients in **bold.**

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

*Table 7.8: National mean scale teacher environment scores for frequent and infrequent users of ICT when teaching*

| Country | ICT Resources | | | ICT Collaboration | | |
|---|---|---|---|---|---|---|
| | Frequent user | Infrequent user | Difference (infrequent — frequent users)* | Frequent user | Infrequent user | Difference (infrequent — frequent users)* |
| Australia | 48 (0.4) | 51 (0.7) | **3** (0.7) | 49 (0.5) | 45 (0.9) | **-5** (0.9) |
| Chile | 49 (0.7) | 51 (0.9) | **2** (0.9) | 48 (0.6) | 45 (0.6) | **-4** (0.7) |
| Croatia | 50 (0.6) | 52 (0.4) | **2** (0.5) | 46 (0.4) | 44 (0.2) | **-3** (0.4) |
| Czech Republic | 41 (0.5) | 43 (0.5) | **2** (0.6) | 50 (0.5) | 47 (0.6) | **-4** (0.7) |
| Korea, Republic of | 53 (0.4) | 54 (0.9) | 1 (0.9) | 48 (0.3) | 46 (0.4) | **-2** (0.4) |
| Lithuania | 48 (0.5) | 52 (0.5) | **3** (0.5) | 52 (0.3) | 50 (0.4) | **-2** (0.5) |
| Poland | 47 (0.7) | 51 (0.4) | **4** (0.6) | 50 (0.4) | 47 (0.4) | **-3** (0.5) |
| Russian Federation[1] | 51 (0.5) | 55 (0.4) | **4** (0.6) | 56 (0.4) | 52 (0.7) | **-4** (0.8) |
| Slovak Republic | 46 (0.5) | 49 (0.5) | **3** (0.5) | 54 (0.4) | 51 (0.3) | **-3** (0.5) |
| Slovenia | 45 (0.4) | 48 (0.5) | **3** (0.5) | 46 (0.4) | 44 (0.4) | **-2** (0.5) |
| Thailand | 58 (0.7) | 57 (1.1) | -1 (0.9) | 60 (0.9) | 56 (1.0) | **-5** (0.9) |
| Turkey | 52 (0.9) | 57 (0.6) | **4** (0.9) | 56 (0.9) | 51 (0.4) | **-5** (1.0) |
| **ICILS 2013 average** | 49 (0.2) | 52 (0.2) | 3 (0.2) | 51 (0.2) | 48 (0.2) | -3 (0.2) |
| **Countries not meeting sample requirements** | | | | | | |
| Denmark | 50 (0.7) | 54 (0.7) | **4** (1.0) | 46 (0.4) | 41 (0.7) | **-5** (0.8) |
| Germany | 48 (0.8) | 51 (0.8) | **3** (0.8) | 44 (0.7) | 39 (0.6) | **-5** (0.8) |
| Hong Kong SAR | 49 (0.5) | 51 (0.5) | **1** (0.6) | 47 (0.3) | 46 (0.6) | **-2** (0.6) |
| Netherlands | 50 (0.3) | 52 (0.6) | **2** (0.6) | 44 (0.4) | 43 (0.6) | **-1** (0.7) |
| Norway | 51 (0.6) | 53 (0.7) | **2** (0.6) | 46 (0.3) | 42 (0.6) | **-3** (0.7) |
| **Benchmarking participant** | | | | | | |
| Newfoundland and Labrador, Canada | 51 (0.5) | 51 (4.2) | 0 (4.1) | 47 (0.4) | 43 (1.4) | **-4** (1.5) |
| **Benchmarking participant not meeting sample requirements** | | | | | | |
| Ontario, Canada | 53 (1.3) | 55 (3.0) | 1 (2.1) | 49 (0.8) | 45 (2.6) | -4 (2.5) |

Notes:

* Statistically significant ($p$<.05) coefficients in **bold.**

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

The teacher questionnaire asked teachers to indicate not only whether they had used ICT in their teaching of the reference class during the current year but also what emphasis they had placed on developing the CIL of the students in that class. In addition, the questionnaire asked teachers about the subject they were teaching their reference class, their use of specified ICT tools in that class, the learning activities for which their students were using ICT, and which of their teaching practices featured ICT use.

## Prevalence of ICT use

Table 7.9 shows the national percentages of teachers who said they used ICT in the reference class. On average across the ICILS countries, just over three quarters (76%) of the teachers indicated that they used ICT in the reference class. National percentages in Australia (94%), Chile (83%), the Russian Federation (82%), Slovenia (81%), Korea (81%), and Lithuania (80%) were significantly above the ICILS 2013 average, while those in the Slovak Republic (71%), Poland (71%), Thailand (68%), Croatia (64%), and Turkey (58%) were significantly below the ICILS 2013 average.

Table 7.9 also shows the national percentages of teachers who reported using ICT in the reference class, with that class defined, for the purposes of this question, according to the subject being taught in it. On average crossnationally, the percentage of teachers using ICT was greatest for reference classes focused on information technology or computer studies (95%). However, it was also very high for the (natural) sciences (84%) and for human sciences or humanities (also 84%). Of the teachers teaching the language of the ICILS student assessment or a foreign language in their reference class, 79 percent reported using ICT in their teaching. Across countries, three quarters of teachers whose reference class involved the creative arts, and 71 percent whose class focused on mathematics, were using ICT in their teaching. In practical and vocational education, 69 percent of teachers said they used ICT when teaching their class. The corresponding figure for teachers teaching subjects classified as "other" was 54 percent.

Another perspective on ICT use by subject area can be gained by looking at the national percentages for each area and then comparing them across countries.[8] The data in Table 7.9 show a very high prevalence of ICT use in information technology or computer studies in most countries except for Chile. In the subject area (natural) sciences, ICT was most prevalent in Australia (99%) and Slovenia (95%) and least prevalent in Turkey (72%) and Croatia (73%). Using ICT during teaching was also widespread in the human sciences or humanities. In classes in this subject area, usage was again most prevalent in Australia (100%) and least prevalent in Turkey (62%) and Thailand (68%).

ICT use in teaching language arts was high in Australia (98%), the Russian Federation (91%) and Korea (90%) but low in Croatia (63%), the Slovak Republic (69%), Thailand (67%), and Turkey (52%). Similar patterns across countries were evident in the use of ICT in teaching foreign and other national languages.

With respect to mathematics, ICT use in teaching was relatively low in the Slovak Republic (60%) and Turkey (53%) but high in Australia (94%), Lithuania (84%), and Slovenia (83%). In the creative arts, using ICT when teaching was of relatively low prevalence in Croatia (49%) and Turkey (60%) but high in the Russian Federation

8 There are no data for Denmark or Norway regarding an information technology or computer studies subject. The item was not administered in those countries because such a subject is not offered in schools at the target grade. Similarly, there are no data for Ontario regarding practical or vocational subjects, as these subjects are not provided in Grade 8, which forms part of primary schooling in that province.

*Table 7.9: National percentages of teachers using ICT in teaching and learning by learning areas*

| Country | Is ICT Ever Used in the Teaching and Learning Activities of the Reference Class? | [Language Arts: Test Language] | [Language Arts: Foreign and Other National Languages] | Mathematics | Sciences (General Science and/or Physics, Chemistry, Biology, Geology, Earth Sciences) | Human Sciences/ Humanities (History, Geography, Civic and Citizenship, Law, Economics, etc.) | Creative Arts (Visual Arts, Music, Dance, Drama, etc.) | [Information Technology, Computer Studies, or Similar] | Practical and Vocational Subjects (Preparation for a Specific Occupation) | Other (Morals/ Ethics, Physical Education, Home Economics, Personal and Social Development) |
|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 94 (0.6) | 97 (1.1) ▲ | 98 (1.1) ▲ | 94 (1.7) ▲ | 99 (0.5) ▲ | 100 (0.2) ▲ | 89 (2.1) ▲ | 98 (1.5) △ | 81 (4.0) ▲ | 87 (1.6) ▲ |
| Chile | 83 (1.6) | 88 (3.8) △ | 90 (2.9) ▲ | 76 (4.5) | 91 (2.5) △ | 96 (1.6) ▲ | 83 (3.9) △ | 84 (5.0) ▼ | 72 (20.6) | 72 (2.9) ▲ |
| Croatia | 64 (1.4) | 63 (5.0) ▼ | 64 (3.4) ▼ | 64 (4.1) | 73 (2.8) ▼ | 81 (2.7) | 49 (3.4) ▼ | 97 (1.4) | 78 (5.0) | 37 (2.6) ▼ |
| Czech Republic | 75 (1.4) | 77 (3.7) | 77 (2.5) | 69 (4.0) | 85 (2.1) | 86 (2.3) | 68 (4.2) | 100 (0.0) △ | 66 (8.3) | 47 (4.3) |
| Korea, Republic of | 81 (1.1) | 90 (1.9) ▲ | 91 (2.7) ▲ | 71 (3.8) | 92 (1.6) △ | 84 (3.2) | 87 (3.7) ▲ | 88 (3.3) | 60 (27.0) | 65 (4.4) ▲ |
| Lithuania | 80 (1.1) | 84 (4.1) | 85 (1.9) △ | 84 (2.8) ▲ | 86 (2.6) | 88 (3.0) | 80 (3.6) | 100 (0.5) △ | 75 (4.0) | 53 (3.1) |
| Poland | 71 (1.3) | 82 (2.9) | 70 (2.6) ▽ | 65 (4.6) | 79 (2.6) ▽ | 79 (3.5) | 72 (4.4) | 90 (3.0) | 100 (0.1) ▲ | 50 (3.4) |
| Russian Federation[1] | 82 (0.9) | 91 (1.8) ▲ | 79 (2.8) | 77 (3.1) | 85 (2.1) | 91 (1.1) △ | 92 (2.0) ▲ | 98 (1.9) | 70 (4.6) | 61 (3.2) |
| Slovak Republic | 71 (1.7) | 69 (3.7) ▼ | 75 (2.6) | 60 (4.7) ▼ | 81 (2.3) | 81 (2.7) | 74 (5.9) | 100 (0.0) △ | 75 (6.0) | 43 (2.9) ▼ |
| Slovenia | 81 (1.1) | 88 (1.9) △ | 90 (2.1) ▲ | 83 (2.9) ▲ | 95 (1.0) ▲ | 94 (2.1) △ | 76 (3.3) | 97 (2.2) | 72 (7.6) | 40 (3.2) ▼ |
| Thailand | 68 (2.2) | 67 (4.7) ▼ | 67 (5.0) ▼ | 61 (5.2) | 75 (4.2) ▽ | 68 (7.9) ▼ | 69 (5.3) | 93 (3.0) | 45 (9.4) ▼ | 50 (5.1) |
| Turkey | 58 (2.2) | 52 (3.2) ▼ | 63 (4.7) ▼ | 53 (4.9) ▼ | 72 (3.9) ▼ | 65 (4.0) ▼ | 60 (5.5) ▼ | 93 (3.5) | 27 (13.3) ▼ | 47 (3.4) ▽ |
| **ICILS 2013 average** | 76 (0.4) | 79 (1.0) | 79 (0.9) | 71 (1.1) | 84 (0.7) | 84 (1.0) | 75 (1.2) | 95 (0.7) | 68 (3.4) | 54 (1.0) |
| **Countries not meeting sample requirements** | | | | | | | | | | |
| Denmark | 93 (1.4) | 96 (2.3) | 98 (0.9) | 100 (0.0) | 93 (3.9) | 93 (4.9) | 54 (10.8) | | 100 (0.0) | 45 (10.9) |
| Germany | 57 (1.7) | 60 (4.4) | 47 (4.2) | 58 (4.6) | 57 (3.7) | 59 (5.1) | 53 (6.5) | 92 (8.5) | 83 (7.6) | 50 (5.4) |
| Hong Kong SAR | 83 (1.5) | 85 (3.0) | 81 (4.8) | 74 (4.0) | 88 (4.1) | 87 (2.7) | 90 (3.8) | 93 (2.7) | 73 (25.2) | 68 (4.2) |
| Netherlands | 88 (0.9) | 95 (2.3) | 93 (1.8) | 89 (3.0) | 95 (1.6) | 98 (1.5) | 93 (2.8) | 88 (13.2) | 92 (4.1) | 46 (4.5) |
| Norway (Grade 9) | 90 (1.0) | 96 (1.6) | 95 (1.9) | 93 (2.3) | 99 (0.7) | 96 (2.2) | 71 (4.2) | | | 78 (3.7) |
| **Benchmarking participant** | | | | | | | | | | |
| Newfoundland and Labrador, Canada | 85 (2.1) | 86 (4.1) | 99 (1.0) | 91 (4.1) | 91 (3.8) | 92 (3.4) | 79 (7.9) | 100 (0.0) | 23 (20.9) | 52 (6.8) |
| **Benchmarking participant not meeting sample requirements** | | | | | | | | | | |
| Ontario, Canada | 83 (2.4) | 85 (4.6) | 80 (8.9) | 84 (4.8) | 93 (5.2) | 88 (7.1) | 73 (13.1) | 100 (0.0) | | 62 (10.6) |

Notes:

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

▲ More than 10 percentage points above ICILS 2013 average
△ Significantly above ICILS 2013 average
▽ Significantly below ICILS 2013 average
▼ More than 10 percentage points below ICILS 2013 average

(92%), Australia (89%), and Korea (87%). Using ICT when teaching was not very prevalent in practical and vocational subjects, except in Poland and Australia, where the percentages were 100 percent and 81 percent respectively. The prevalence of ICT use in practical and vocational subjects was notably low for Thailand (45%) and Turkey (27%).

## Developing computer and information literacy

Teachers who use ICT in their classes can be expected to use those technologies not only to teach the substance of their subject more effectively but also to develop their students' computer and information literacy (CIL). The teacher questionnaire invited all teachers who said they used ICT in their teaching to indicate how much emphasis they placed on developing their students' CIL. More specifically, teachers were asked to indicate with regard to their reference class how much emphasis ("strong," "some," "little," "no emphasis") they had given to developing several specified ICT-based capabilities.[9] Teachers who said they did not use ICT in the reference class were assigned the category of no emphasis for the purpose of computing national percentages, thus ensuring that each country estimate encompassed the whole population of Grade 8 teachers.

Table 7.10 records the national percentages of teachers who placed some or strong emphasis (i.e., the combination of the first two categories) on developing each of the specified ICT-based capabilities. The capability most widely emphasized in their teaching was "accessing information efficiently." Overall across countries, 63 percent (the ICILS 2013 average) of teachers said they emphasized this skill in their teaching. The highest national percentage was recorded in Australia (76%) and the lowest in Lithuania (40%).

The ICT capabilities emphasized by more than half of the teachers were the following:

- Using computer software to construct digital work products (e.g., presentations, documents, images, and diagrams) (56% of teachers);
- Displaying information for a given audience/purpose (54%);
- Exploring a range of digital resources when searching for information (53%);
- Evaluating the relevance of digital information (52%);
- Evaluating the credibility of digital information (52%);
- Understanding the consequences of making information publically available online (51%); and
- Validating the accuracy of digital information (51%).

9 The capabilities were:
- Accessing information efficiently;
- Evaluating the relevance of digital information;
- Displaying information for a given audience/purpose;
- Evaluating the credibility of digital information;
- Validating the accuracy of digital information;
- Sharing digital information with others;
- Using computer software to construct digital work products (e.g., presentations, documents, images, and diagrams);
- Self-evaluating their [students'] approach to information searches;
- Providing digital feedback on the work of others (such as classmates);
- Exploring a range of digital resources when searching for information;
- Providing references for digital information sources; and
- Understanding the consequences of making information publically available online.

*Table 7.10: National percentages of teachers giving strong or some emphasis to ICT-based capabilities in their students*

| Country | Accessing Information Efficiently | Evaluating the Relevance of Digital Information | Displaying Information for a Given Audience/ Purpose | Evaluating the Credibility of Digital Information | Validating the Accuracy of Digital Information | Sharing Digital Information with Others | Using Computer Software to Construct Digital Work Products (e.g., Presentations, Documents, Images, and Diagrams) | Evaluating Their Approach to Information Searches | Providing Digital Feedback on the Work of Others (such as Classmates) | Exploring a Range of Digital Resources When Searching for Information | Providing References for Digital Information Sources | Understanding the Consequences of Making Information Publically Available Online |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 76 (1.0) ▲ | 66 (0.9) ▲ | 70 (1.0) ▲ | 62 (1.0) △ | 58 (0.9) △ | 53 (1.3) △ | 72 (1.1) ▲ | 53 (1.1) △ | 28 (1.7) ▽ | 62 (1.1) △ | 58 (1.3) △ | 51 (1.6) |
| Chile | 72 (1.7) △ | 65 (2.0) ▲ | 63 (2.1) △ | 61 (2.1) △ | 61 (2.2) △ | 55 (2.2) ▲ | 62 (2.1) △ | 57 (2.4) △ | 47 (2.2) ▲ | 64 (1.9) ▲ | 58 (2.3) △ | 54 (2.5) |
| Croatia | 62 (1.3) | 53 (1.4) | 57 (1.5) △ | 54 (1.2) | 55 (1.3) △ | 49 (1.3) △ | 58 (1.3) | 53 (1.3) △ | 41 (1.1) △ | 47 (1.3) ▽ | 44 (1.1) ▽ | 58 (1.3) △ |
| Czech Republic | 64 (1.4) | 55 (1.5) | 53 (1.6) | 56 (1.4) △ | 49 (1.2) | 33 (1.4) ▼ | 55 (1.8) | 43 (1.5) ▽ | 26 (1.2) ▽ | 57 (1.3) △ | 54 (1.4) △ | 49 (1.3) |
| Korea, Republic of | 62 (1.4) | 55 (1.5) | 50 (1.3) ▽ | 51 (1.8) | 50 (1.6) | 50 (1.4) △ | 54 (1.7) | 48 (2.8) | 40 (1.5) △ | 57 (1.2) △ | 56 (1.1) △ | 47 (1.1) ▽ |
| Lithuania | 40 (1.5) ▼ | 27 (1.2) ▼ | 34 (1.3) ▼ | 25 (1.0) ▼ | 24 (1.1) ▼ | 29 (1.3) ▼ | 35 (1.3) ▼ | 23 (1.0) ▼ | 18 (1.0) ▼ | 38 (1.2) ▼ | 34 (1.1) ▼ | 32 (1.2) ▼ |
| Poland | 61 (1.4) | 49 (1.5) ▽ | 50 (1.5) ▽ | 52 (1.5) | 52 (1.4) | 36 (1.4) ▽ | 55 (1.7) | 56 (1.4) △ | 25 (1.1) ▽ | 52 (1.3) | 44 (1.5) ▽ | 59 (1.6) △ |
| Russian Federation[1] | 68 (1.7) △ | 54 (1.7) | 60 (2.0) △ | 65 (1.5) ▲ | 65 (1.5) ▲ | 43 (2.1) | 65 (1.6) △ | 51 (2.1) | 35 (1.7) | 58 (1.6) △ | 51 (1.7) | 58 (1.9) △ |
| Slovak Republic | 66 (1.7) | 55 (1.6) | 55 (1.5) | 55 (1.4) | 53 (1.6) | 42 (1.5) | 58 (1.6) | 47 (1.7) | 32 (1.5) | 57 (1.6) △ | 52 (1.6) | 54 (1.7) |
| Slovenia | 67 (1.1) △ | 45 (1.4) ▽ | 49 (1.3) ▽ | 41 (1.5) ▼ | 40 (1.1) ▼ | 32 (1.2) ▼ | 49 (1.5) ▽ | 40 (1.2) ▽ | 25 (1.0) ▽ | 42 (1.2) ▼ | 39 (1.0) ▼ | 51 (1.1) |
| Thailand | 59 (2.0) | 49 (2.7) | 52 (3.3) | 50 (2.6) | 51 (2.0) | 49 (2.8) | 52 (2.0) | 51 (2.4) | 47 (2.0) ▲ | 52 (2.3) | 54 (2.1) △ | 55 (2.3) |
| Turkey | 56 (2.3) ▽ | 53 (2.2) | 53 (2.3) | 52 (2.0) | 52 (2.1) | 50 (2.2) △ | 53 (2.1) | 49 (2.2) | 45 (2.3) ▲ | 51 (2.3) | 49 (2.2) | 47 (2.1) |
| **ICILS 2013 average** | 63 (0.5) | 52 (0.5) | 54 (0.5) | 52 (0.5) | 51 (0.5) | 43 (0.5) | 56 (0.5) | 48 (0.5) | 34 (0.5) | 53 (0.5) | 49 (0.5) | 51 (0.5) |
| **Countries not meeting sample requirements** | | | | | | | | | | | | |
| Denmark | 78 (1.7) | 72 (2.1) | 72 (2.2) | 70 (2.0) | 61 (2.9) | 54 (2.8) | 68 (2.7) | 49 (2.6) | 26 (2.1) | 55 (2.8) | 54 (2.7) | 48 (2.4) |
| Germany | 36 (2.3) | 28 (1.2) | 30 (2.0) | 29 (1.4) | 23 (1.2) | 15 (1.2) | 29 (1.6) | 27 (1.7) | 9 (1.6) | 27 (2.0) | 32 (1.7) | 26 (1.2) |
| Hong Kong SAR | 53 (1.7) | 36 (1.6) | 42 (1.5) | 36 (1.6) | 36 (1.5) | 38 (1.8) | 51 (1.6) | 36 (1.5) | 27 (1.5) | 33 (1.6) | 40 (1.4) | 45 (2.0) |
| Netherlands | 49 (1.9) | 37 (1.6) | 35 (1.8) | 34 (1.6) | 36 (1.6) | 27 (1.6) | 52 (1.9) | 17 (1.2) | 11 (1.2) | 43 (1.5) | 18 (1.4) | 27 (1.8) |
| Norway (Grade 9) | 72 (1.7) | 65 (2.3) | 70 (1.8) | 67 (2.1) | 61 (2.2) | 47 (1.5) | 72 (2.0) | 44 (2.3) | 22 (1.7) | 49 (2.5) | 62 (1.8) | 55 (2.0) |
| **Benchmarking participant** | | | | | | | | | | | | |
| Newfoundland and Labrador, Canada | 75 (2.5) | 65 (2.6) | 69 (2.7) | 62 (2.4) | 58 (3.0) | 62 (2.9) | 70 (2.3) | 57 (2.8) | 30 (2.5) | 60 (2.4) | 52 (2.4) | 60 (2.8) |
| **Benchmarking participant not meeting sample requirements** | | | | | | | | | | | | |
| Ontario, Canada | 74 (2.6) | 66 (3.5) | 71 (2.6) | 66 (3.4) | 65 (3.3) | 62 (3.0) | 73 (2.7) | 55 (3.0) | 31 (3.3) | 61 (3.0) | 59 (3.2) | 66 (3.3) |

Notes:

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

▲ More than 10 percentage points above ICILS 2013 average
△ Significantly above ICILS 2013 average
▽ Significantly below ICILS 2013 average
▼ More than 10 percentage points below ICILS 2013 average

The capabilities emphasized by less than half of the teachers included these ones:

- Providing references for digital information sources (49%);
- Students self-evaluating their approach to information searches (48%);
- Sharing digital information with others (43%); and
- Providing digital feedback on the work of others (such as classmates) (34%).

In general, these findings suggest that more than half of the teachers at the ICILS target grade were intent on developing most of the ICT capabilities (listed in the questionnaire) of their students. This emphasis was most evident for the capabilities associated with accessing and evaluating digital information and least evident for the capabilities associated with sharing digital information.

## Factors associated with emphasis on developing CIL

We used the 12 items denoting teacher emphasis on *developing students' CIL* to obtain a highly reliable scale (the coefficient alpha was 0.93). As for previously described scales, we used the Rasch partial credit model to construct the scale and standardized its scores to have an ICILS 2013 average score of 50 points and a standard deviation of 10 points. The higher values on this scale reflect stronger levels of emphasis. We used this scale to explore the extent to which emphasis was associated with other characteristics of the teachers and their classes.

Table 7.11 reports the results of the regression analyses that we conducted for each ICILS country. The dependent variable in these analyses was the emphasis teachers placed on developing the ICT-based capabilities (seen here as equivalent to CIL) of their students. The independent variables were teachers' ICT self-efficacy, teachers' perceptions of whether or not the school environment had a collaborative approach to ICT use, positive teacher-held views of the value of using ICT in education,[10] and the extent to which teachers considered lack of resources impeded ICT use.

The independent variable that had the strongest correlation with the dependent variable was ICT self-efficacy. Thus, teachers who were confident about their own ICT capability were more likely than their less-confident colleagues to place a greater degree of emphasis on developing their students' ICT-related skills. The ICILS 2013 average for the regression coefficient was 0.32, which means that one (international) standard deviation difference in ICT self-efficacy (10 scale points) was associated with one third of a standard deviation in emphasis on developing student CIL (3.2 scale points). This association was statistically significant in all participating countries. Among those countries that satisfied the ICILS sampling requirements, the regression coefficients ranged from 0.20 (in Australia) to 0.43 (in Croatia), making for a consistent, moderately sized association across countries.

After we had allowed for the other influences incorporated in the analysis, we found that the teachers who were working in schools they saw as supporting ICT use through a planned collaborative approach were the teachers most likely to emphasize the development of student CIL. The ICILS 2013 average for the regression coefficient was 0.19. This means that one (international) standard deviation difference in planned ICT collaboration was associated with a difference in emphasis on developing students' CIL of about one fifth of a standard deviation.

10 A preliminary analysis showed that seeing the value of using ICT in education in negative terms was not a significant predictor of emphasis on developing CIL.

*Table 7.11: Multiple regression analyses of predictors of teacher emphasis on developing computer and information literacy*

| Country | Unstandardized Regression Coefficients* | | | | |
|---|---|---|---|---|---|
| | Student characteristics | | | | |
| | *ICT self-efficacy* | *Positive views of ICT* | *Collaboration about ICT use* | *Lack of ICT resources at school* | *Variance explained (%)* |
| Australia | **0.20** (0.03) | **0.17** (0.03) | **0.19** (0.02) | 0.02 (0.02) | 20 |
| Chile | **0.32** (0.03) | **0.14** (0.03) | **0.16** (0.02) | 0.01 (0.03) | 21 |
| Croatia | **0.43** (0.02) | **0.18** (0.04) | **0.12** (0.03) | -0.05 (0.03) | 24 |
| Czech Republic | **0.31** (0.03) | **0.12** (0.02) | **0.16** (0.03) | 0.00 (0.02) | 18 |
| Korea, Republic of | **0.33** (0.04) | **0.29** (0.04) | **0.16** (0.07) | -0.01 (0.02) | 26 |
| Lithuania | **0.32** (0.03) | **0.06** (0.03) | **0.16** (0.03) | **-0.06** (0.02) | 24 |
| Poland | **0.36** (0.02) | 0.02 (0.03) | **0.33** (0.04) | -0.06 (0.03) | 24 |
| Russian Federation[1] | **0.33** (0.02) | **0.06** (0.02) | **0.22** (0.03) | **-0.09** (0.02) | 32 |
| Slovak Republic | **0.36** (0.02) | **0.11** (0.04) | **0.20** (0.03) | -0.03 (0.04) | 19 |
| Slovenia | **0.29** (0.02) | **0.17** (0.03) | **0.19** (0.03) | -0.03 (0.02) | 23 |
| Thailand | **0.34** (0.04) | **0.13** (0.06) | **0.21** (0.08) | -0.05 (0.07) | 24 |
| Turkey | **0.28** (0.05) | **0.15** (0.04) | **0.23** (0.05) | **-0.21** (0.04) | 19 |
| **ICILS 2013 average** | **0.32** (0.01) | **0.13** (0.01) | **0.19** (0.01) | **-0.05** (0.01) | 23 |
| **Countries not meeting sample requirements** | | | | | |
| Denmark | **0.22** (0.03) | **0.14** (0.05) | **0.18** (0.03) | 0.03 (0.04) | 17 |
| Germany | **0.31** (0.03) | **0.15** (0.03) | **0.09** (0.03) | -0.05 (0.03) | 19 |
| Netherlands | **0.15** (0.03) | **0.12** (0.04) | **0.18** (0.03) | 0.02 (0.03) | 11 |
| Norway (Grade 9) | **0.25** (0.03) | 0.01 (0.04) | **0.19** (0.03) | 0.03 (0.03) | 12 |
| Hong Kong SAR | **0.22** (0.03) | **0.19** (0.05) | **0.23** (0.04) | -0.01 (0.04) | 19 |
| **Benchmarking participant** | | | | | |
| Newfoundland and Labrador, Canada | **0.32** (0.06) | **0.16** (0.04) | 0.03 (0.07) | -0.09 (0.07) | 18 |
| **Benchmarking participant not meeting sample requirements** | | | | | |
| Ontario, Canada | **0.40** (0.08) | 0.00 (0.09) | **0.26** (0.09) | 0.00 (0.04) | 26 |

Notes:

* Statistically significant ($p$<.05) coefficients in **bold**.

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

While we might consider this effect a small one, it was statistically significant in all participating countries that met sampling requirements. In the Canadian province of Newfoundland and Labrador, the value of the coefficient was close to zero. The magnitude of the coefficients among those countries that met the ICILS participation requirements ranged from 0.16 in Chile, the Czech Republic, Korea, and Lithuania to 0.33 in Poland.

Teacher positivity about the value of using ICT in school education was also consistently related to teacher emphasis on developing students' CIL. The regression coefficient was statistically significant in all countries except one (Poland) that met participation requirements. The ICILS 2013 average for the regression coefficient was 0.13. One (international) standard deviation difference in positive views of ICT was thus associated with one eighth of a standard deviation difference in the emphasis on developing students' CIL, making for a relatively weak association.

We found no consistent association between teachers stating that their schools lacked ICT resources and an emphasis on developing students' CIL. The only three countries

where we did record statistically significant regression coefficients were Turkey, the Russian Federation, and Lithuania. The negative sign in Table 7.11 indicates that schools in these countries not only had insufficient resources, as perceived by teachers, but also had teachers who placed relatively less emphasis on developing students' CIL. However, we can regard the lack of an association in most countries as an indication that, internationally, the development of ICT in schools has progressed to a point where resources can no longer be seen as an explanation for teachers failing to develop their students' CIL.

The combination of factors considered in our analysis accounted for 23 percent of the variance in the emphasis on CIL among the ICILS 2013 countries that met sampling requirements. The percentages of explained variance ranged from 18 in the Czech Republic to 32 percent in the Russian Federation.

We also investigated the extent to which emphases on CIL development differed across the ICILS countries and across the specified subject areas. Table 7.12 records the national average scores for each country overall and for each subject area within each country. The data also show the percentage distribution of the reference-class subject areas for each country. The data in Table 7.12 indicate that the strongest emphasis on developing CIL was evident in Australia and Chile (a national average of 53 scale points for each) and the least emphasis was evident in Lithuania (a national average of 47 scale points).

In order to indicate the extent to which the emphasis on developing CIL differed across subject areas, the last column of Table 7.12 shows the percentages of the variance in CIL emphasis attributable to the subject area of the reference class. The ICILS 2013 average for this difference was 12 percent, and the national percentages ranged from five percent in Turkey to 22 percent in Slovenia. What these two national percentages tell us is that there was little variation in emphasis across subjects in Turkey but relatively large differences in emphasis across subjects in Slovenia.

Across all ICILS countries, the emphasis was greatest in information technology or computer studies classes (the ICILS 2103 average was 58 scale points) and less so in (natural) sciences and human sciences and humanities classes (the ICILS 2013 average was 52 scale points). Emphasis on fostering CIL learning was least evident in classes concerned with mathematics (the ICILS 2013 average was 48 scale points) and in classes focused on the variety of subjects included under the heading "other" (morals/ethics, physical education, home economics, personal and social development). The ICILS 2013 average for this collection of subjects was 45 scale points.

The emphasis on students' CIL learning in information technology or computer studies was significantly greater than the emphasis in any other subject area. We found no differences in the emphases given to CIL learning across the subject areas of science, human sciences/humanities, and language arts. However, emphasis on students' CIL learning in science was significantly greater than the emphases in the creative arts, practical subjects, mathematics, and "other" subjects. We also recorded significantly greater emphases on CIL learning in the subject area human sciences and humanities than in the areas foreign language teaching, the creative arts, mathematics, and "other" subjects.

*Table 7.12: National means for emphasis on developing computer and information literacy by subject area*

| Country | Emphasis on Developing Computer and Literacy | | [Language Arts: Test Language] | | [Language Arts: Foreign and Other National Languages] | | Mathematics | | Sciences (General Science and/or Physics, Chemistry, Biology, Geology Earth Sciences) | | Human Sciences/ Humanities (History, Geography, Civic and Citizenship, Law, Economics, etc.) | | Creative Arts (Visual Arts, Music, Dance, Drama, etc.) | | [Information Technology, Computer Studies, or Similar] | | Practical and Vocational Subjects (Preparation for a Specific Occupation) | | Other (Morals/ Ethics, Physical Education, Home Economics, Personal and Social Development) | | Effect of Subject Area on Emphasis on Developing Computer and Information Literacy |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | SE | % | Mean scale score | % | Mean scale score | % | Mean scale score | % | Mean scale score | % | Mean scale score | % | Mean scale score | % | Mean scale score | % | Mean scale score | % | Mean scale score | Variance explained |
| Australia | 53 | (0.2) | 14 | 55 (0.4) | 7 | 53 (0.6) | 15 | 48 (0.6) | 12 | 54 (0.4) | 13 | 57 (0.3) | 12 | 51 (0.6) | 3 | 58 (0.8) | 6 | 50 (1.0) | 18 | 51 (0.4) | 15 (1.3) |
| Chile | 53 | (0.5) | 15 | 55 (1.0) | 11 | 54 (0.9) | 13 | 50 (1.1) | 12 | 55 (0.8) | 11 | 56 (0.7) | 11 | 53 (1.0) | 6 | 54 (1.6) | 0 | 57 (7.3) | 21 | 49 (0.6) | 7 (1.5) |
| Croatia | 50 | (0.3) | 11 | 50 (1.3) | 16 | 50 (0.7) | 10 | 49 (1.0) | 16 | 52 (0.7) | 13 | 54 (0.8) | 11 | 46 (0.8) | 5 | 61 (0.6) | 4 | 55 (1.3) | 15 | 44 (0.6) | 12 (1.2) |
| Czech Republic | 49 | (0.3) | 8 | 52 (0.9) | 21 | 49 (0.5) | 8 | 46 (0.7) | 20 | 51 (0.5) | 15 | 52 (0.5) | 10 | 48 (0.8) | 5 | 58 (0.4) | 2 | 49 (1.8) | 11 | 44 (0.9) | 12 (1.5) |
| Korea, Republic of | 50 | (0.2) | 12 | 53 (0.6) | 16 | 52 (0.9) | 14 | 47 (0.8) | 12 | 52 (0.6) | 10 | 51 (0.7) | 10 | 50 (0.7) | 4 | 53 (0.9) | 3 | 47 (5.0) | 19 | 47 (0.8) | 7 (1.5) |
| Lithuania | 47 | (0.2) | 9 | 47 (0.7) | 22 | 46 (0.3) | 9 | 47 (0.4) | 13 | 48 (0.6) | 12 | 49 (0.5) | 9 | 47 (0.6) | 4 | 56 (0.8) | 7 | 47 (0.7) | 16 | 43 (0.5) | 13 (1.8) |
| Poland | 49 | (0.3) | 11 | 52 (0.7) | 21 | 49 (0.6) | 10 | 47 (0.9) | 18 | 51 (0.6) | 9 | 51 (1.0) | 6 | 51 (1.2) | 6 | 57 (1.2) | 1 | 56 (1.1) | 18 | 44 (0.6) | 11 (1.7) |
| Russian Federation[1] | 51 | (0.3) | 11 | 52 (0.5) | 14 | 50 (0.6) | 10 | 49 (0.6) | 18 | 51 (0.5) | 16 | 53 (0.3) | 6 | 52 (0.7) | 7 | 56 (0.4) | 6 | 48 (0.9) | 14 | 46 (0.7) | 11 (1.5) |
| Slovak Republic | 50 | (0.3) | 10 | 50 (0.8) | 22 | 50 (0.6) | 9 | 47 (1.0) | 16 | 52 (0.5) | 15 | 52 (0.6) | 4 | 49 (1.2) | 6 | 59 (0.5) | 3 | 51 (1.5) | 15 | 44 (0.6) | 12 (1.2) |
| Slovenia | 49 | (0.2) | 14 | 51 (0.6) | 18 | 49 (0.5) | 13 | 47 (0.6) | 15 | 51 (0.4) | 12 | 53 (0.5) | 10 | 48 (0.7) | 2 | 59 (1.0) | 2 | 47 (1.6) | 14 | 40 (0.5) | 22 (1.6) |
| Thailand | 49 | (0.5) | 11 | 50 (1.1) | 12 | 49 (1.1) | 13 | 47 (1.0) | 13 | 51 (0.8) | 13 | 49 (1.6) | 10 | 49 (1.1) | 11 | 59 (0.9) | 3 | 45 (2.0) | 15 | 45 (0.9) | 12 (2.4) |
| Turkey | 50 | (0.6) | 18 | 48 (1.0) | 13 | 51 (1.3) | 13 | 49 (1.3) | 12 | 54 (1.2) | 11 | 53 (1.1) | 10 | 52 (1.5) | 3 | 62 (1.7) | 1 | 43 (3.2) | 20 | 47 (0.9) | 5 (1.4) |
| **ICILS 2013 average** | 50 | (0.1) | 12 | 51 (0.2) | 16 | 50 (0.2) | 11 | 48 (0.3) | 15 | 52 (0.2) | 12 | 52 (0.2) | 9 | 50 (0.3) | 5 | 58 (0.3) | 3 | 50 (0.9) | 16 | 45 (0.2) | 12 (0.5) |
| **Countries not meeting sample requirements** | | | | | | | | | | | | | | | | | | | | | |
| Denmark | 53 | (0.4) | 22 | 55 (0.7) | 23 | 53 (0.5) | 18 | 53 (0.6) | 18 | 53 (0.8) | 11 | 55 (1.3) | 2 | 43 (1.9) | 0 | 35 (0.0) | 0 | 59 (0.0) | 5 | 42 (1.3) | 19 (6.0) |
| Germany | 44 | (0.3) | 11 | 44 (0.6) | 17 | 42 (0.7) | 10 | 42 (1.0) | 15 | 43 (0.6) | 14 | 45 (0.9) | 10 | 43 (1.1) | 4 | 54 (2.1) | 2 | 48 (1.7) | 17 | 42 (0.6) | 8 (2.5) |
| Hong Kong SAR | 48 | (0.3) | 21 | 48 (0.6) | 12 | 47 (0.7) | 12 | 45 (0.8) | 9 | 48 (0.9) | 17 | 50 (0.6) | 8 | 49 (1.0) | 8 | 55 (1.0) | 1 | 46 (2.1) | 13 | 46 (0.9) | 8 (1.9) |
| Netherlands | 47 | (0.3) | 12 | 50 (0.7) | 23 | 46 (0.5) | 10 | 42 (0.6) | 20 | 48 (0.7) | 9 | 51 (0.7) | 9 | 47 (0.6) | 1 | 52 (1.1) | 4 | 49 (1.4) | 12 | 40 (0.8) | 20 (3.0) |
| Norway (Grade 9) | 51 | (0.3) | 17 | 55 (0.6) | 24 | 53 (0.7) | 13 | 51 (0.6) | 10 | 53 (0.5) | 9 | 54 (0.5) | 8 | 45 (1.0) | 0 | 0 (0.0) | 0 | 0 (0.0) | 19 | 48 (0.7) | 15 (3.0) |
| **Benchmarking participant** | | | | | | | | | | | | | | | | | | | | | |
| Newfoundland and Labrador, Canada | 52 | (0.5) | 18 | 54 (1.4) | 10 | 54 (0.9) | 17 | 50 (1.1) | 14 | 52 (0.9) | 12 | 54 (1.0) | 7 | 50 (1.8) | 6 | 58 (1.3) | 1 | 41 (8.0) | 15 | 45 (1.3) | 15 (4.0) |
| **Benchmarking participant not meeting sample requirements** | | | | | | | | | | | | | | | | | | | | | |
| Ontario, Canada | 53 | (0.7) | 42 | 55 (1.3) | 4 | 51 (2.3) | 24 | 50 (1.3) | 8 | 55 (1.4) | 9 | 56 (1.9) | 4 | 47 (2.2) | 1 | 69(10.8) | 0 | 0 (0.0) | 8 | 47 (2.2) | 12 (4.3) |

**Notes:**

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

## The ICT tools teachers were using

The ICILS teachers who were using ICT in their teaching said they used a variety of ICT tools for this purpose. The teacher questionnaire asked the teachers to identify the ICT tools they used, the learning activities in which they deployed these tools, and the teaching practices in which they incorporated them.

### Types of tools

The teacher questionnaire specified a number of ICT tools and asked teachers to indicate how much they used each one in their reference class. The response categories were "never," "in some lessons," "in most lessons," and in "every or almost every lesson." When computing the national percentages of teacher responses for each item, we assigned the category of never to teachers who said they did not use any form of ICT in their reference class. This approach ensured that the national estimates referred to the whole population of participating Grade 8 teachers.

Table 7.13 records the national percentages of teachers using each of the ICT tools while teaching most or almost all of their lessons to the reference class. The most or almost all category combines the two questionnaire response categories indicating most frequent use.

The ICT tools that teachers were most widely using on average across countries were wordprocessing and presentation software. Across all ICILS countries, 30 percent of teachers said they used these tools in most or all lessons. The prevalence of use of these utilities was greatest, by more than 10 percentage points above the ICILS 2013 average, in Korea (47%), the Russian Federation (44%), and Australia (41%). The lowest prevalence recorded was for Poland (13%).

Nearly one quarter (23%) of teachers said they used computer-based information resources (e.g., websites, wikis, and encyclopedias) in most or all lessons. National percentages of teachers reporting use of these resources were highest in Lithuania (32%), Australia (31%), Chile (28%), and the Russian Federation (28%) and lowest in Croatia (16%).

On average across the ICILS countries, 15 percent of teachers who made ICT part of their teaching practice were using interactive digital learning resources (e.g., learning objects) in most or all lessons. This use was most prevalent in Chile (21%), the Slovak Republic (21%), and the Russian Federation (20%) and least prevalent in Croatia (8%) and Poland (9%). Fifteen percent of teachers on average crossnationally said they were using tutorial software or practice programs in their lessons with the reference class. This usage was most prevalent in Korea (28%) and least prevalent in Australia (7%).

The ICILS data showed that those teachers using ICT were rarely using the following ICT tools when teaching their respective reference classes: simulation and modeling software (3% on average across countries), e-portfolios (4%), concept-mapping software (4%), and social media (4%). Digital learning games and data-logging and monitoring tools were also being used by only small percentages of teachers (5% and 6% respectively). Interesting exceptions to these low-prevalence tools were social media in Thailand (17%) and graphing and drawing software in Korea (20%).

*Table 7.13: National percentages of teachers using ICT tools for teaching in most lessons*

| Country | Tutorial Software or [Practice Programs] | Digital Learning Games | Wordprocessors or Presentation Software (e.g., [Microsoft Word ®], [Microsoft PowerPoint ®]) | Spreadsheets (e.g., [Microsoft Excel®]) | Multimedia Production Tools (e.g., Media Capture and Editing, Web Production) | Concept Mapping Software (e.g., [Inspiration ®], [Webspiration ®]) |
|---|---|---|---|---|---|---|
| Australia | 7 (0.6) ▽ | 6 (0.6) | 41 (1.2) ▲ | 5 (0.5) ▽ | 10 (0.6) | 2 (0.3) ▽ |
| Chile | 13 (1.1) | 6 (0.9) | 37 (1.4) △ | 5 (0.8) ▽ | 11 (0.9) △ | 7 (1.0) △ |
| Croatia | 11 (0.8) ▽ | 3 (0.4) ▽ | 26 (1.1) ▽ | 5 (0.5) ▽ | 4 (0.6) ▽ | 1 (0.2) ▽ |
| Czech Republic | 12 (1.1) ▽ | 2 (0.3) ▽ | 23 (1.4) ▽ | 3 (0.4) ▽ | 1 (0.3) ▽ | 0 (0.1) ▽ |
| Korea, Republic of | 28 (1.9) ▲ | 7 (1.0) | 47 (1.9) ▲ | 10 (0.8) △ | 17 (2.0) △ | 3 (0.7) |
| Lithuania | 19 (1.0) △ | 4 (0.6) | 29 (1.4) | 5 (0.5) ▽ | 9 (0.8) | 1 (0.3) ▽ |
| Poland | 9 (0.9) ▽ | 2 (0.4) ▽ | 13 (0.9) ▼ | 3 (0.4) ▽ | 6 (0.8) ▽ | 1 (0.4) ▽ |
| Russian Federation[1] | 19 (1.2) △ | 7 (0.6) △ | 44 (1.6) ▲ | 12 (1.0) △ | 9 (0.8) | 6 (0.7) △ |
| Slovak Republic | 15 (1.1) | 4 (0.5) | 25 (1.4) ▽ | 8 (0.6) | 3 (0.4) ▽ | 3 (0.5) |
| Slovenia | 22 (1.4) △ | 5 (0.6) | 31 (1.3) | 3 (0.3) ▽ | 9 (0.7) | 1 (0.2) ▽ |
| Thailand | 10 (1.3) ▽ | 6 (1.0) | 26 (1.4) ▽ | 16 (2.1) △ | 12 (1.6) △ | 9 (1.1) △ |
| Turkey | 15 (1.9) | 9 (1.4) △ | 23 (1.8) ▽ | 7 (1.3) | 10 (1.4) | 8 (0.9) △ |
| **ICILS 2013 average** | 15 (0.4) | 5 (0.2) | 30 (0.4) | 7 (0.3) | 8 (0.3) | 4 (0.2) |
| **Countries not meeting sample requirements** | | | | | | |
| Denmark | 7 (1.2) | 3 (0.8) | 31 (2.8) | 6 (1.2) | 4 (0.7) | 1 (0.3) |
| Germany | 1 (0.4) | 0 (0.1) | 10 (1.4) | 3 (0.6) | 2 (0.6) | 0 (0.2) |
| Hong Kong SAR | 22 (1.2) | 3 (0.6) | 52 (1.9) | 9 (1.0) | 11 (1.0) | 3 (0.6) |
| Netherlands | 15 (1.3) | 5 (0.8) | 33 (1.9) | 3 (0.7) | 4 (0.6) | 1 (0.3) |
| Norway (Grade 9) | 3 (0.7) | 2 (0.8) | 19 (1.5) | 1 (0.4) | 1 (0.3) | 0 (0.2) |
| **Benchmarking participant** | | | | | | |
| Newfoundland and Labrador, Canada | 11 (1.8) | 7 (1.5) | 42 (2.5) | 1 (0.3) | 10 (1.6) | 2 (1.0) |
| **Benchmarking participant not meeting sample requirements** | | | | | | |
| Ontario, Canada | 13 (2.5) | 10 (2.7) | 41 (3.6) | 5 (2.2) | 17 (2.8) | 5 (1.4) |

Notes:
() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.
[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

## Use in learning activities

In addition to asking teachers about the tools they used, ICILS asked them to indicate whether they required their students in the reference class to use ICT when engaged in various learning activities. As was the case for the question about ICT tools, we assigned, for the purpose of computing national percentages, the category of never to teachers who said they did not use ICT in the reference class. Again, doing this ensured that the national estimates referred to the whole population of Grade 8 teachers.

Table 7.14 records the percentages of teachers who said they often required their students to use ICT when carrying out the activities specified in the relevant teacher questionnaire item. The activities in which ICT was most widely used were those concerned with searching for information, completing reports, and doing assessments over certain periods of time. The relevant activities as listed in the teacher questionnaire were:

- Searching for information on a topic using outside resources (29% of teachers across the ICILS countries required their students to engage in this activity);
- Working on short assignments (i.e., within one week) (20%);

*Table 7.13: National percentages of teachers using ICT tools for teaching in most lessons (contd.)*

| Data-Logging and Monitoring Tools | Simulations and Modeling Software | Social Media (e.g., Facebook, Twitter) | Communication Software (e.g., Email, Blogs) | Computer-Based Information Resources (e.g., Websites, Wikis, Encyclopedias) | Interactive Digital Learning Resources (e.g., Learning Objects) | Graphing or Drawing Software | E-portfolios |
|---|---|---|---|---|---|---|---|
| 5 (0.5) | 4 (0.5) | 1 (0.3) ▽ | 15 (1.4) △ | 31 (1.1) △ | 15 (0.8) | 5 (0.5) ▽ | 3 (0.4) ▽ |
| 9 (0.9) △ | 4 (0.7) | 6 (0.8) △ | 15 (1.1) △ | 28 (1.5) △ | 21 (1.4) △ | 7 (0.8) | 4 (0.7) |
| 3 (0.4) ▽ | 2 (0.4) ▽ | 1 (0.2) ▽ | 3 (0.4) ▽ | 16 (0.9) ▽ | 8 (0.8) ▽ | 3 (0.5) ▽ | 1 (0.3) ▽ |
| 2 (0.4) ▽ | 0 (0.1) ▽ | 1 (0.2) ▽ | 4 (0.5) ▽ | 19 (1.3) ▽ | 16 (1.3) | 3 (0.4) ▽ | 2 (0.3) ▽ |
| 5 (0.9) | 6 (0.7) △ | 5 (0.8) △ | 12 (1.2) | 20 (1.0) ▽ | 11 (0.6) ▽ | 20 (2.4) ▲ | 6 (0.9) |
| 12 (0.7) △ | 2 (0.4) ▽ | 2 (0.5) ▽ | 16 (1.0) △ | 32 (1.3) △ | 13 (0.9) | 5 (0.7) ▽ | 10 (0.8) △ |
| 2 (0.4) ▽ | 1 (0.2) ▽ | 1 (0.3) ▽ | 6 (1.1) ▽ | 17 (1.0) ▽ | 9 (0.9) ▽ | 3 (0.5) ▽ | 1 (0.4) ▽ |
| 13 (0.9) △ | 5 (0.5) △ | 4 (0.6) | 10 (1.0) | 28 (1.4) △ | 20 (1.2) △ | 12 (0.9) △ | 7 (0.6) △ |
| 3 (0.5) ▽ | 2 (0.3) ▽ | 2 (0.6) ▽ | 8 (1.1) ▽ | 20 (1.4) | 21 (1.8) △ | 5 (0.8) | 2 (0.4) ▽ |
| 2 (0.3) ▽ | 2 (0.4) ▽ | 1 (0.2) ▽ | 7 (0.6) ▽ | 22 (1.1) | 12 (1.2) ▽ | 3 (0.4) ▽ | 1 (0.2) ▽ |
| 8 (1.0) △ | 5 (0.8) △ | 18 (2.2) ▲ | 17 (1.6) △ | 26 (1.5) | 16 (2.1) | 11 (1.8) △ | 9 (1.7) △ |
| 8 (0.9) △ | 5 (0.7) △ | 3 (0.5) | 8 (1.1) ▽ | 19 (1.9) ▽ | 15 (1.5) | 8 (0.9) | 4 (0.9) |
| 6 (0.2) | 3 (0.1) | 4 (0.2) | 10 (0.3) | 23 (0.4) | 15 (0.4) | 7 (0.3) | 4 (0.2) |
| | | | | | | | |
| 1 (0.3) | 1 (0.4) | 2 (1.1) | 10 (1.7) | 31 (2.1) | 21 (2.1) | 6 (0.9) | 2 (0.5) |
| 2 (0.3) | 1 (0.3) | 1 (0.2) | 1 (0.3) | 9 (1.3) | 3 (0.7) | 3 (0.5) | 0 (0.1) |
| 3 (0.6) | 3 (0.5) | 3 (0.6) | 9 (1.1) | 13 (1.0) | 13 (1.1) | 6 (0.7) | 2 (0.4) |
| 15 (1.2) | 1 (0.3) | 1 (0.3) | 8 (1.1) | 25 (1.7) | 18 (1.4) | 4 (0.8) | 1 (0.4) |
| 1 (0.2) | 0 (0.1) | 1 (0.3) | 3 (0.8) | 14 (1.3) | 6 (0.8) | 2 (0.7) | 2 (0.5) |
| | | | | | | | |
| 6 (1.7) | 4 (1.3) | 3 (0.9) | 13 (1.8) | 28 (2.5) | 17 (2.2) | 8 (1.7) | 5 (1.3) |
| | | | | | | | |
| 9 (2.0) | 6 (1.9) | 7 (1.8) | 20 (3.3) | 32 (3.2) | 18 (2.7) | 7 (2.0) | 5 (1.9) |

▲ More than 10 percentage points above ICILS 2013 average
△ Significantly above ICILS 2013 average
▽ Significantly below ICILS 2013 average
▼ More than 10 percentage points below ICILS 2013 average

- Submitting completed work for assessment (18%); and
- Working individually on learning materials at their [the students'] own pace (16%).

On average across countries, between 10 and 15 percent of teachers said they often asked their students to undertake extended and shared work that involved ICT use and included evaluating and processing information. The relevant activities were:

- Evaluating information resulting from a search (14%);
- Working on extended projects (i.e., over several weeks) (12%);
- Explaining and discussing ideas with other students (12%);
- Processing and analyzing data (11%); and
- Planning a sequence of learning activities for themselves (11%).

On average, fewer than 10 percent of teachers from the ICILS countries said they often had students engaged in the following activities requiring ICT use:

- Undertaking open-ended investigations or field work (8%);
- Seeking information from experts outside the school (7%);

*Table 7.14: National percentages of teachers often using ICT for learning activities in classrooms*

| Country | Working on Extended Projects (i.e., over Several Weeks) | Working on Short Assignments (i.e., within One Week) | Explaining and Discussing Ideas with Other Students | Submitting Completed Work for Assessment | Working Individually on Learning Materials at Their Own Pace |
|---|---|---|---|---|---|
| Australia | 31 (1.3) ▲ | 31 (1.5) ▲ | 15 (1.0) △ | 32 (1.3) ▲ | 28 (1.2) ▲ |
| Chile | 13 (1.3) | 28 (2.0) △ | 13 (1.5) | 28 (1.9) ▲ | 19 (1.6) △ |
| Croatia | 8 (0.7) ▽ | 12 (0.8) ▽ | 7 (0.7) ▽ | 8 (0.9) ▽ | 10 (0.8) ▽ |
| Czech Republic | 9 (0.9) ▽ | 17 (1.1) ▽ | 7 (0.5) ▽ | 12 (0.9) ▽ | 11 (0.9) ▽ |
| Korea, Republic of | 9 (1.3) ▽ | 13 (1.4) ▽ | 8 (0.9) ▽ | 11 (0.9) ▽ | 11 (1.2) ▽ |
| Lithuania | 15 (1.0) △ | 19 (1.1) | 13 (1.1) | 14 (0.9) ▽ | 15 (1.1) |
| Poland | 5 (0.6) ▽ | 25 (1.4) △ | 21 (1.0) △ | 32 (1.6) ▲ | 21 (1.0) △ |
| Russian Federation[1] | 13 (0.8) | 27 (1.6) △ | 18 (1.0) △ | 27 (1.6) △ | 21 (1.3) △ |
| Slovak Republic | 12 (0.9) | 20 (1.1) | 10 (0.9) | 17 (1.0) | 15 (1.0) |
| Slovenia | 10 (0.6) ▽ | 16 (0.8) ▽ | 8 (0.6) ▽ | 7 (0.6) ▼ | 7 (0.6) ▽ |
| Thailand | 8 (1.0) ▽ | 14 (1.6) ▽ | 10 (1.4) | 16 (2.3) | 18 (1.8) |
| Turkey | 13 (1.4) | 20 (1.9) | 8 (1.1) ▽ | 6 (1.1) ▼ | 10 (1.2) ▽ |
| **ICILS 2013 average** | 12 (0.3) | 20 (0.4) | 12 (0.3) | 18 (0.4) | 16 (0.3) |
| **Countries not meeting sample requirements** | | | | | |
| Denmark | 29 (2.2) | 40 (2.3) | 21 (1.7) | 43 (2.7) | 32 (1.9) |
| Germany | 11 (1.2) | 10 (1.2) | 4 (0.6) | 6 (0.7) | 5 (1.1) |
| Hong Kong SAR | 12 (1.1) | 5 (0.7) | 5 (0.7) | 7 (0.8) | 5 (0.6) |
| Netherlands | 15 (1.6) | 19 (2.0) | 4 (0.7) | 15 (1.4) | 16 (1.6) |
| Norway (Grade 9) | 27 (1.9) | 26 (1.6) | 5 (1.0) | 34 (2.1) | 15 (1.6) |
| **Benchmarking participant** | | | | | |
| Newfoundland and Labrador, Canada | 24 (2.4) | 26 (2.3) | 14 (2.0) | 21 (2.4) | 16 (2.0) |
| **Benchmarking participant not meeting sample requirements** | | | | | |
| Ontario, Canada | 43 (3.0) | 39 (3.7) | 19 (2.4) | 32 (3.7) | 23 (2.9) |

Notes:
() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.
[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

- Reflecting on their learning experiences (e.g., by using a learning log) (6%); and
- Communicating with students in other schools on projects (3%).

## Use in teaching practices

Teachers who used ICT when teaching their reference class were asked how frequently ("never," "sometimes," "often") they used ICT in a set of teaching practices. Teachers who said they did not use ICT in the reference class were assigned the category of never for the purpose of computing national percentages.

Table 7.15 records the percentages of teachers who often used ICT in each of these teaching practices. The two teaching practices most widely used across the participating countries were "presenting information through direct class instruction" (an ICILS 2013 international average percentage of 33%) and "reinforcing learning of skills through repetition of examples" (an ICILS 2013 international average percentage of 21%). Presenting information was most prevalent in Australia (46%) and least prevalent in Turkey (22%). Reinforcing learning of skills was most evident in the Russian Federation (34%) and least evident in Croatia (16%) and the Czech Republic (16%).

*Table 7.14: National percentages of teachers often using ICT for learning activities in classrooms (contd.)*

| Undertaking Open-Ended Investigations or Field Work | Reflecting on Their Learning Experiences (e.g., by Using a Learning Log) | Communicating with Students in Other Schools on Projects | Seeking Information from Experts Outside the School | Planning a Sequence of Learning Activities for Themselves | Processing and Analyzing Data | Searching for Information on a Topic Using Outside Resources | Evaluating Information Resulting from a Search |
|---|---|---|---|---|---|---|---|
| 16 (1.0) △ | 6 (0.6) | 4 (0.5) | 4 (0.4) ▽ | 3 (0.4) ▽ | 7 (0.7) ▽ | 32 (1.4) △ | 15 (0.9) |
| 19 (1.6) ▲ | 8 (1.2) | 3 (0.6) | 10 (1.5) △ | 17 (1.3) △ | 14 (1.2) △ | 30 (2.1) | 18 (1.7) |
| 11 (0.8) △ | 2 (0.3) ▽ | 3 (0.4) | 4 (0.5) ▽ | 4 (0.4) ▽ | 5 (0.7) ▽ | 22 (1.1) ▽ | 6 (0.8) ▽ |
| 2 (0.3) ▽ | 1 (0.2) ▽ | 1 (0.2) ▽ | 2 (0.4) ▽ | 3 (0.4) ▽ | 5 (0.5) ▽ | 21 (1.2) ▽ | 11 (0.8) ▽ |
| 5 (0.7) ▽ | 4 (0.6) ▽ | 4 (0.7) | 15 (1.7) △ | 5 (0.8) ▽ | 10 (1.4) | 19 (2.1) ▽ | 7 (1.0) ▽ |
| 13 (0.8) △ | 16 (1.4) ▲ | 4 (0.5) | 3 (0.4) ▽ | 12 (0.9) | 14 (0.9) △ | 36 (1.2) △ | 18 (1.2) △ |
| 1 (0.2) ▽ | 3 (0.4) ▽ | 2 (0.3) ▽ | 4 (0.7) ▽ | 11 (0.8) | 17 (1.1) △ | 35 (1.5) △ | 22 (1.1) △ |
| 4 (0.4) ▽ | 7 (0.6) | 4 (0.5) | 5 (0.6) ▽ | 21 (1.3) ▲ | 20 (1.2) △ | 38 (1.8) △ | 23 (1.3) △ |
| 1 (0.4) ▽ | 3 (0.5) ▽ | 2 (0.4) ▽ | 10 (0.8) △ | 10 (0.9) | 9 (0.9) ▽ | 28 (1.5) | 15 (1.2) |
| 2 (0.3) ▽ | 2 (0.3) ▽ | 2 (0.3) ▽ | 6 (0.6) | 13 (0.9) △ | 10 (0.7) | 30 (1.3) | 10 (0.7) ▽ |
| 14 (1.8) △ | 18 (2.2) ▲ | 9 (1.0) △ | 19 (1.5) ▲ | 20 (2.4) △ | 16 (2.9) | 28 (2.4) | 17 (2.1) |
| 11 (1.2) △ | 6 (0.9) | 4 (0.9) | 5 (1.0) ▽ | 8 (1.2) ▽ | 5 (0.9) ▽ | 22 (1.6) ▽ | 11 (1.3) ▽ |
| 8 (0.3) | 6 (0.3) | 3 (0.2) | 7 (0.3) | 11 (0.3) | 11 (0.4) | 29 (0.5) | 14 (0.4) |
| | | | | | | | |
| 8 (1.2) | 4 (1.1) | 1 (0.3) | 6 (0.9) | 6 (0.9) | 11 (1.6) | 20 (1.8) | 22 (1.9) |
| 3 (0.4) | 1 (0.2) | 1 (0.3) | 0 (0.2) | 1 (0.3) | 1 (0.3) | 14 (1.3) | 5 (0.7) |
| 3 (0.7) | 2 (0.5) | 2 (0.6) | 2 (0.5) | 2 (0.6) | 5 (0.8) | 11 (1.2) | 4 (0.8) |
| 6 (1.0) | 2 (0.6) | 1 (0.2) | 2 (0.5) | 11 (1.3) | 5 (0.9) | 22 (1.6) | 7 (0.7) |
| 5 (0.9) | 2 (0.5) | 1 (0.3) | 3 (0.7) | 3 (0.7) | 4 (0.9) | 22 (1.7) | 14 (1.1) |
| | | | | | | | |
| 7 (1.5) | 5 (1.2) | 2 (0.8) | 3 (0.7) | 3 (1.0) | 4 (1.0) | 27 (2.7) | 14 (2.0) |
| | | | | | | | |
| 17 (2.3) | 8 (2.6) | 8 (2.5) | 9 (2.6) | 5 (1.8) | 10 (1.9) | 40 (3.0) | 22 (2.5) |

▲ More than 10 percentage points above ICILS 2013 average
△ Significantly above ICILS 2013 average
▽ Significantly below ICILS 2013 average
▼ More than 10 percentage points below ICILS 2013 average

Several teaching practices incorporating ICT were each being used by about 16 percent (i.e., from 14% to 17%) of the ICILS teachers on average across countries. These were:

- Providing feedback to students;
- Assessing students' learning through tests;
- Supporting collaboration among students;
- Providing remedial or enrichment support to individual students or small groups of students;
- Enabling student-led whole-class discussions and presentations; and
- Supporting inquiry learning.

We recorded notably higher percentages of teachers in Thailand using ICT to support collaboration among students and to support inquiry learning (national averages of 30% and 31% respectively).

Teaching practices with a relatively low prevalence of ICT use were:

- Collaborating with parents or guardians in order to support students' learning (10% of teachers on average crossnationally),

*Table 7.15: National percentages of teachers often using ICT for teaching practices in classrooms*

| Country | Presenting Information through Direct Class Instruction | Providing Remedial or Enrichment Support to Individual Students or Small Groups of Students | Enabling Student-Led Whole-Class Discussions and Presentations | Assessing Students' Learning through Tests | Providing Feedback to Students | Reinforcing Learning of Skills through Repetition of Examples | Supporting Collaboration among Students | Mediating Communication between Students and Experts or External Mentors | Enabling Students to Collaborate with Other Students (within or outside School) | Collaborating With Parents or Guardians in Supporting Students' Learning | Supporting Inquiry Learning |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Australia | 46 (1.6) ▲ | 19 (0.9) △ | 18 (0.9) △ | 10 (0.8) ▽ | 17 (0.8) | 20 (1.1) | 14 (1.0) ▽ | 3 (0.4) ▽ | 7 (0.6) | 9 (0.7) | 18 (1.0) △ |
| Chile | 43 (2.1) △ | 20 (1.4) △ | 22 (1.9) △ | 22 (1.5) △ | 33 (1.9) ▲ | 29 (2.0) △ | 27 (2.1) ▲ | 6 (1.0) △ | 12 (1.3) △ | 11 (1.7) | 28 (1.8) ▲ |
| Croatia | 28 (1.3) ▽ | 10 (0.6) ▽ | 14 (0.9) | 5 (0.4) ▼ | 8 (0.6) ▽ | 14 (0.9) ▽ | 9 (0.7) ▽ | 3 (0.5) ▽ | 3 (0.5) ▽ | 2 (0.3) ▽ | 12 (0.8) ▽ |
| Czech Republic | 31 (1.5) | 4 (0.6) ▼ | 7 (0.7) ▽ | 8 (0.7) ▽ | 11 (0.8) ▽ | 14 (1.0) ▽ | 8 (0.8) ▽ | 1 (0.2) ▽ | 3 (0.4) ▽ | 6 (0.7) ▽ | 2 (0.3) ▼ |
| Korea, Republic of | 42 (1.9) △ | 22 (1.0) △ | 10 (1.2) ▽ | 12 (0.7) ▽ | 15 (1.7) | 20 (2.0) | 8 (1.0) ▽ | 5 (0.9) | 8 (0.8) | 4 (0.8) ▽ | 10 (1.4) ▽ |
| Lithuania | 36 (1.3) △ | 15 (1.1) | 15 (1.0) | 14 (1.0) | 17 (0.9) | 19 (1.1) ▽ | 12 (0.9) ▽ | 3 (0.5) | 5 (0.7) ▽ | 22 (1.3) ▲ | 6 (0.7) ▽ |
| Poland | 23 (1.2) ▼ | 19 (1.1) △ | 10 (0.8) ▽ | 28 (1.4) ▲ | 28 (1.3) ▲ | 24 (1.2) △ | 24 (1.2) △ | 3 (0.5) ▽ | 5 (0.6) ▽ | 16 (1.1) △ | 18 (1.2) △ |
| Russian Federation[1] | 43 (1.6) △ | 21 (1.3) △ | 24 (1.6) △ | 33 (1.7) ▲ | 16 (1.1) | 34 (1.7) ▲ | 26 (1.3) ▲ | 5 (0.6) | 10 (0.9) △ | 21 (1.7) ▲ | 19 (1.3) △ |
| Slovak Republic | 29 (1.5) ▽ | 10 (0.9) ▽ | 13 (1.1) | 9 (1.0) ▽ | 11 (0.9) ▽ | 18 (1.2) ▽ | 10 (0.9) ▽ | 3 (0.4) ▽ | 3 (0.5) ▽ | 6 (0.9) ▽ | 7 (1.0) ▽ |
| Slovenia | 35 (1.6) | 15 (1.3) | 19 (1.0) △ | 7 (0.6) ▽ | 13 (0.8) ▽ | 21 (1.3) | 12 (0.7) ▽ | 3 (0.4) ▽ | 5 (0.4) ▽ | 5 (0.7) ▽ | 8 (0.7) ▽ |
| Thailand | 22 (2.0) ▼ | 13 (1.4) | 14 (2.0) | 25 (2.6) △ | 19 (2.2) | 21 (2.5) | 30 (2.6) ▲ | 10 (1.2) △ | 18 (1.8) ▲ | 13 (1.5) | 31 (2.4) ▲ |
| Turkey | 22 (2.1) ▼ | 15 (2.1) | 15 (2.0) | 20 (2.0) | 17 (1.9) | 20 (2.0) | 11 (1.4) ▽ | 7 (1.1) △ | 7 (1.0) | 6 (1.0) ▽ | 13 (1.7) |
| **ICILS 2013 average** | 33 (0.5) | 15 (0.3) | 15 (0.4) | 16 (0.4) | 17 (0.4) | 21 (0.5) | 16 (0.4) | 4 (0.2) | 7 (0.3) | 10 (0.3) | 14 (0.4) |
| **Countries not meeting sample requirements** | | | | | | | | | | | |
| Denmark | 41 (2.5) | 22 (1.9) | 23 (2.1) | 18 (1.3) | 21 (2.6) | 16 (1.8) | 16 (2.0) | 4 (1.0) | 4 (0.9) | 23 (1.9) | 15 (1.7) |
| Germany | 13 (1.4) | 4 (1.0) | 5 (0.8) | 3 (0.5) | 4 (0.7) | 4 (0.7) | 4 (0.6) | 1 (0.2) | 2 (0.3) | 3 (0.6) | 4 (0.7) |
| Hong Kong SAR | 38 (1.6) | 9 (0.9) | 8 (0.8) | 12 (1.1) | 15 (1.5) | 16 (1.3) | 8 (0.9) | 3 (0.5) | 5 (0.7) | 3 (0.6) | 6 (0.7) |
| Netherlands | 44 (2.1) | 14 (1.3) | 11 (1.1) | 15 (1.3) | 10 (1.1) | 26 (1.6) | 11 (1.1) | 1 (0.4) | 3 (0.6) | 8 (1.0) | 8 (1.2) |
| Norway (Grade 9) | 33 (2.1) | 12 (1.2) | 9 (1.1) | 14 (1.6) | 25 (2.2) | 11 (1.3) | 6 (1.0) | 1 (0.4) | 5 (0.9) | 9 (1.2) | 5 (0.9) |
| **Benchmarking participant** | | | | | | | | | | | |
| Newfoundland and Labrador, Canada | 45 (2.5) | 18 (2.6) | 19 (2.6) | 9 (1.7) | 15 (2.1) | 22 (2.2) | 16 (2.3) | 3 (0.9) | 10 (1.8) | 21 (2.4) | 18 (2.0) |
| **Benchmarking participant not meeting sample requirements** | | | | | | | | | | | |
| Ontario, Canada | 49 (3.0) | 25 (2.7) | 33 (2.7) | 13 (2.5) | 17 (3.0) | 24 (2.5) | 20 (2.6) | 9 (1.7) | 12 (2.2) | 22 (2.6) | 24 (2.8) |

Notes:

() Standard errors appear in parentheses. Because some results are rounded to the nearest whole number, some totals may appear inconsistent.

[1] Country surveyed teachers retrospectively to the previous school year when they were teaching the target grade.

▲ More than 10 percentage points above ICILS 2013 average
△ Significantly above ICILS 2013 average
▽ Significantly below ICILS 2013 average
▼ More than 10 percentage points below ICILS 2013 average

- Enabling students to collaborate with other students (within or outside school) (7%); and
- Mediating communication between students and experts or external mentors (4%).

## Conclusion

In general, the ICILS data considered in this chapter confirm substantial use of ICT in teaching and learning. Across the ICILS 2013 countries, three out five teachers were using computers at least once per week when teaching, and four out of five were using computers on a weekly basis for other work at their schools. It is not possible to judge whether the level of use was appropriate, but it was certainly extensive.

Teachers in most countries were experienced users of ICT and generally recognized the positive aspects of using ICT in teaching and learning at school, especially in terms of accessing and managing information. On balance, teachers reported generally positive attitudes toward the use of these technologies despite reporting awareness of some potentially negative aspects of using them (e.g., for writing, calculation, and estimation).

Generally, teachers were confident regarding their ability to use a variety of computer applications, with two-thirds expressing confidence in their ability to use ICT for assessing and monitoring student progress. There were differences among countries in the level of confidence that teachers expressed with regard to using computer technologies, and it was evident that younger teachers were a little more confident than their older colleagues.

A substantial majority of teachers across the participating ICILS countries were using ICT in their teaching. Teachers were most likely to use these technologies when they were confident about their expertise in this regard, worked in school environments where there was collaboration about and planning of ICT use, and where there were fewer resource-based obstacles to using ICT. These were also the conditions that supported teaching about CIL. This finding suggests that if CIL is to be developed to the greatest extent possible, then teacher expertise in ICT use needs to be developed and supported by collaborative environments that incorporate institutional planning.

ICT use was reported in most subject areas. However, outside of information technology subjects, its use was more prevalent in the (natural) sciences and in the human sciences or humanities than in other areas. The ICILS results also show that ICT use in teaching was less prevalent in mathematics and in practical and vocational education. It seems that these latter subject areas are those in which teachers give less emphasis to developing their students' CIL capabilities.

The ICT tools that teachers were most frequently using in their classrooms were wordprocessing and presentation software as well as computer-based information resources such as websites, wikis, and encyclopedias. According to teachers' responses on the ICILS teacher survey, students were most commonly using ICT to search for information, work on short assignments, and carry out individual work on learning materials. The survey data also suggest that teachers were often using ICT to present information and reinforce skills. In general, the teachers appear to have been using ICT most frequently for relatively simple tasks rather than for more complex tasks.