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How Students' Use of Computers has Evolved in Recent Years

Children access and use information and communication technology (ICT) earlier than ever before. This chapter uses data from PISA 2012 to examine how students' access to ICT devices, and their experience in using these technologies, evolved in recent years. It explores the frequency and variety of uses of ICT at home, and the differences in students' use of computers between countries. The chapter also discusses how students' use of computers and the Internet at home is changing the way they engage with learning and school.

In recent years, information and communication technology (ICT) has modified the world in which students grow and learn. More and more families own an increasing number of computers, most of which are now connected to the Internet. New devices, such as tablet computers and smartphones, offer the possibility of accessing the Internet (almost) anytime, anywhere. This, in turn, means that children access and use ICT earlier than ever before – and increasingly by themselves, without adult supervision.

The rapid development of ICT has driven much of this change. In just three years, between 2008 and 2011, the volume of Internet traffic, measured in bytes, increased more than three-fold. The rolling out of broadband infrastructures has meant an expansion in the bandwidth available for all types of services whose primary activity is the transfer of information. Greater availability of bandwidth, in turn, has driven many services to online platforms that can increasingly be accessed with mobile devices. These services, including not only traditional telecommunication, such as telephony, but also broadcast TV and radio, video and book publishing, as well as banking and money transfer services, can now be – and increasingly are – consumed "on the go" (OECD, 2013a). To access this wealth of services, households have invested in upgrading their ICT equipment.

As a result, new technologies have transformed not only our professional lives, but our private lives too – the way we read, socialise and play. Young generations are at the forefront of this transformation. For them, ICT devices and the Internet are usually first experienced as a platform for communicating, playing games and sharing hobbies, through participation in social networks, e-mail or chat. Only later, and to a lesser extent, do they engage in formal learning activities on computers.

What the data tell us

- In 49 out of 63 countries and economies, the number of computer-equipped households among the PISA student population increased between 2009 and 2012. In all but one of the remaining 14 countries and economies, the number of home computers to which students had access increased.
- On average across OECD countries, students spend over 2 hours on line each day. The most common online activity is browsing the Internet for fun, with 88% of students doing this at least once a week – 6% more than in 2009, on average.
- Students who spend more than 6 hours on line per weekday, outside of school, are particularly at risk of reporting that they feel lonely at school, and that they arrived late for school or skipped days of school.

This chapter uses PISA 2012 data to investigate how students' access to ICT devices and experience in using these technologies evolved in recent years. It also explores the frequency and variety of uses of ICT at home, and differences between countries in how students use information and communication technology. Finally, it shows that these changes are not without consequences on the way students engage with learning and school.

Box 1.1. **How information on students' familiarity with ICT was collected**

PISA collects internationally comparable information on students' access to and use of computers and their attitudes towards the use of computers for learning. In PISA 2012, 29 OECD countries and 13 partner countries and economies chose to distribute the optional ICT familiarity component of the student questionnaire. In 2012, this component contained 12 questions, some of which were retained from the previous PISA survey (2009) to allow for comparisons across time. New questions focus on the age at first use of computers and the Internet; the amount of time spent on the Internet; and, since mathematics was the major domain assessed in PISA 2012, on the use of computers during mathematics lessons.

The OECD countries that participated were Australia, Austria, Belgium, Chile, the Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland and Turkey.

The partner countries and economies that participated were Costa Rica, Croatia, Hong Kong-China, Jordan, Latvia, Liechtenstein, Macao-China, the Russian Federation, Serbia, Shanghai-China, Singapore, Chinese Taipei and Uruguay.

With the exception of Costa Rica, Mexico, Shanghai-China and Chinese Taipei, all other countries and economies had also distributed the ICT familiarity module as part of the student questionnaire in 2009. Trends based on this module are therefore available for 28 OECD countries and 10 partner countries and economies.

Additional information on the availability and use of ICT at home and at school, as well as on school policies on using ICT, was collected through the main student and school questionnaires, and is available for all participants in PISA 2012. In the student questionnaire, students answered questions on whether or not they have a home computer to use for schoolwork, educational software, and a link to the Internet; how many computers they have at home; whether they program computers; and how many hours, on average, they spend repeating and training content from school lessons by working on a computer (e.g. learning vocabulary with training software). As part of the school questionnaire, principals provided information on the availability of computers at their schools and on whether they feel that a lack of computers hindered instruction in their school. A new question in PISA 2012 also asked school principals to report on the extent to which students are expected to access the Internet to perform school-related work.

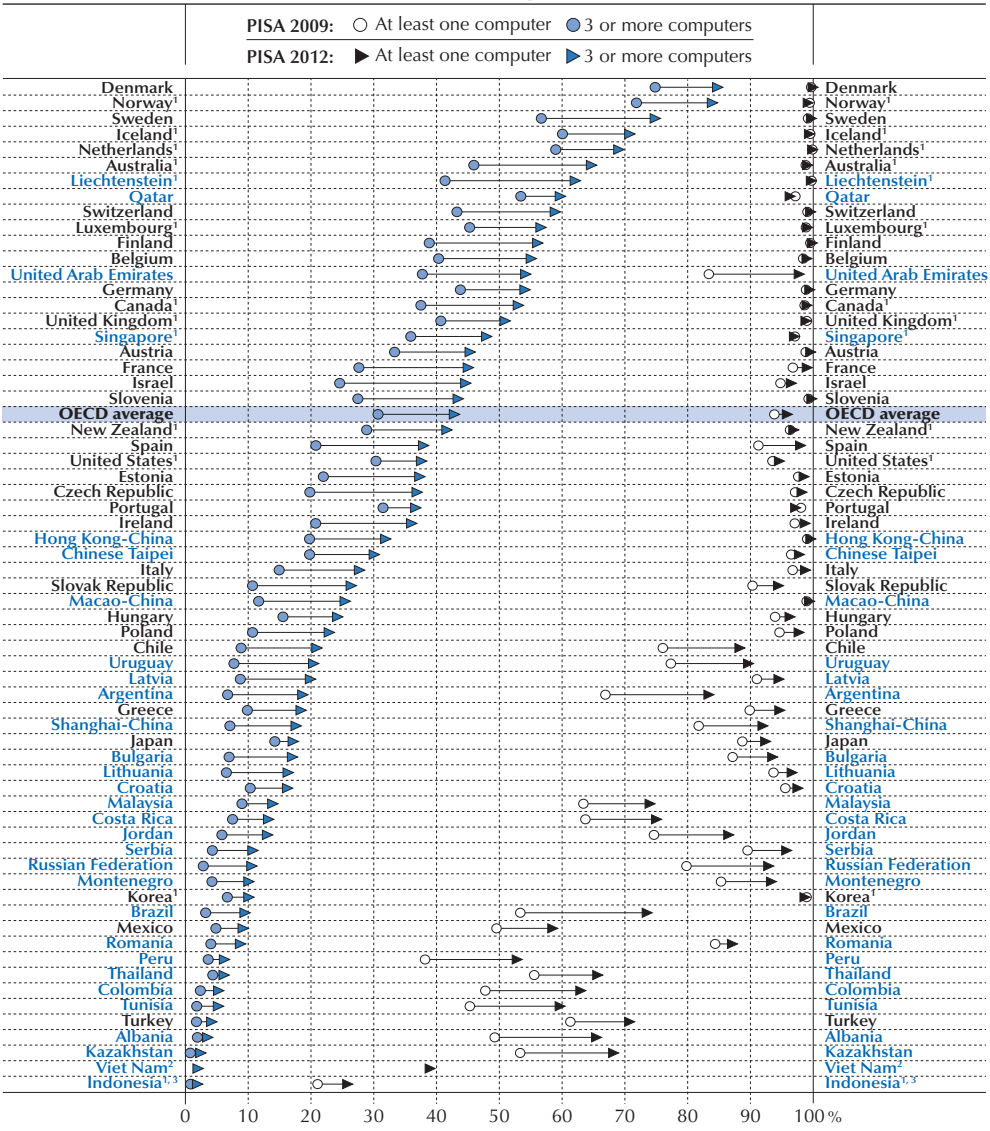
STUDENTS' ACCESS TO ICT AT HOME

Earlier publications on ICT have often emphasised the "digital divide" that separates those who live in a digital and connected world from those who are left behind on the analogue side of the divide. Students' use of ICT is conditional upon the accessibility of devices and the availability of a connection to the Internet. PISA data show that in a majority of participating countries, access to computers had, by 2012, become nearly universal. However, important between-country differences exist in the quantity and quality of devices accessible, and in the experience acquired in using them. This chapter focuses on these differences in computer access and use.

■ Figure 1.1 ■

Change between 2009 and 2012 in access to computers at home

Percentage of students who reported having at least one computer or three or more computers at home



1. The share of students with at least one computer at home is not significantly different in 2009 and 2012.
2. PISA 2009 data are missing for Viet Nam.
3. The share of students with three or more computers at home is not significantly different in 2009 and 2012.

Countries and economies are ranked in descending order of the percentage of students who reported having three or more computers at home in 2012.

Source: OECD, PISA 2012 Database, Table 1.1.

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Access to a home computer

Data collected from students participating in the PISA assessment show that by 2012, computers were present in almost every household across most OECD countries, and often in large numbers. On average across OECD countries, only 4% of 15-year-old students lived in homes where no computer was present, and 43% of them lived in homes with three or more computers. However, this country average masks large disparities. For instance, among OECD countries, 42% of students in Mexico and 29% of students in Turkey did not have a computer in their homes (and these shares exclude 15-year-olds who are not in school).[1] Meanwhile, more than half of students in the partner countries Indonesia (74%) and Viet Nam (61%) did not have a computer at home. In these countries, the so-called "first digital divide", between "have" and "have nots", has not yet been closed (Table 1.1).

Between 2009 and 2012, more students gained access to computers, and the share of students with no computer at home declined. In 49 out of the 63 countries and economies with comparable data for 2009 and 2012, the number of computer-equipped households increased, and where it did not – sometimes because almost all students already had computers at home by 2009 – the number of home computers to which students had access increased. For instance, in Albania, Argentina, Brazil and Colombia, the share of students with a computer at home increased by 15 percentage points or more. In Denmark, Iceland, the Netherlands, Norway and Sweden, where fewer than 1% of 15-year-old students had no computer at home in 2009, the share of students who reported having more than three home computers increased by around 10 percentage points or more over the three-year period. By 2012, more than two out of three students in these countries had three computers or more at home (Figure 1.1 and Table 1.1).

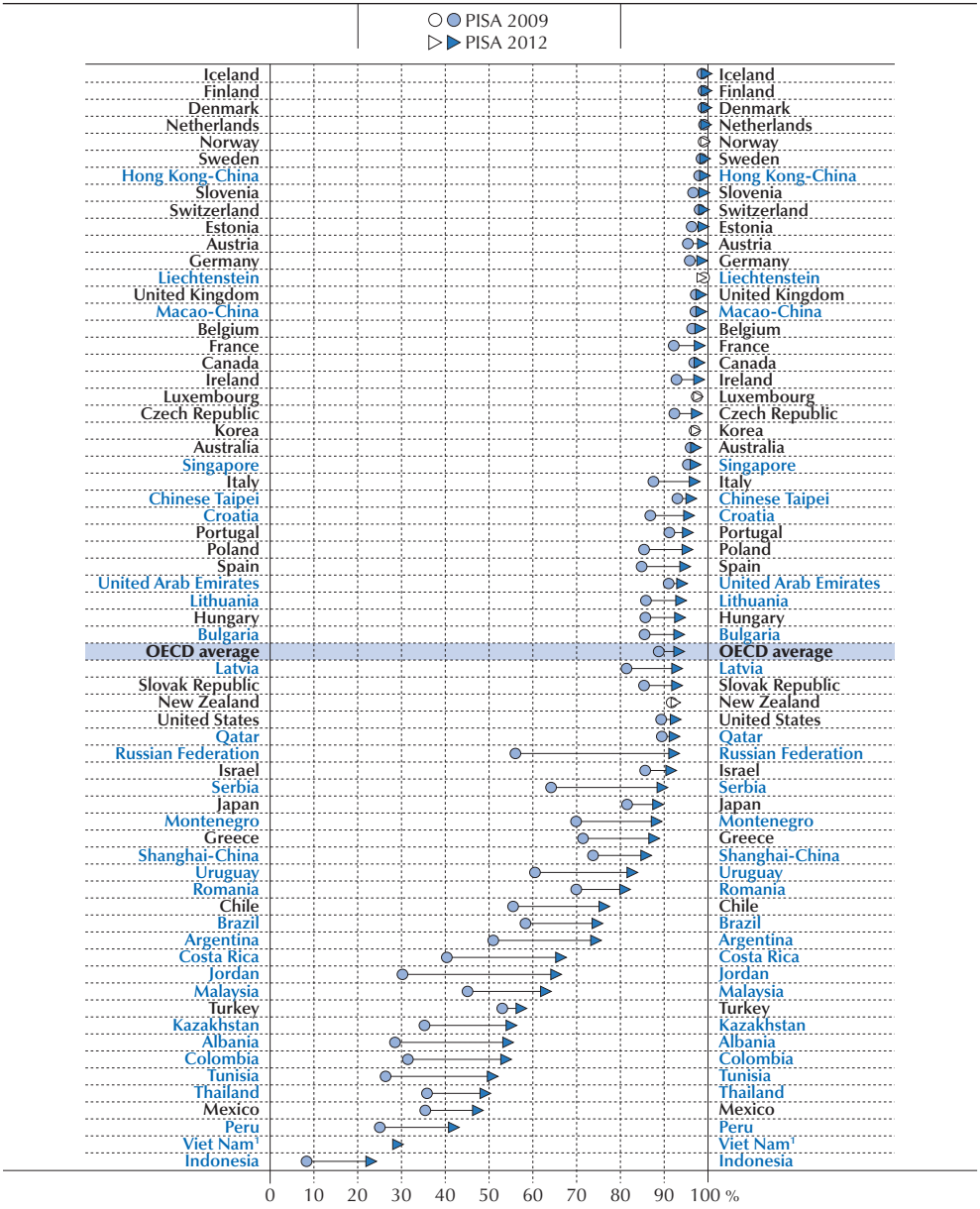
Home Internet access

Home ICT devices today are mostly used to access services offered on the Internet, such as computer-mediated communication (Internet telephony, e-mail, instant messaging, chat, etc.), web-based services (social network and online community services, news websites, e-commerce, online banking, etc.) and cloud computing services based on data transfer systems (software-as-a-service, file storage, video streaming, etc.). Many of these services can support formal and informal learning. As a result, home computers or mobile devices connected to the Internet also offer users a host of educational resources, both in terms of content and applications, and often for free. Without a connection to the Internet, students have only limited, if any, ICT tools that support collaboration; and they do not have access to online encyclopaedias or other multimedia content in native and foreign languages. An Internet connection at home thus represents a substantial difference in the educational resources available to students.

Figure 1.2 shows the percentage of students in each country who reported having access to the Internet at home. On average across OECD countries, 93% of students reported that they had a link to the Internet at home. In Denmark, Finland, Hong Kong-China, Iceland, the Netherlands, Norway, Slovenia, Sweden and Switzerland, at least 99% of students' homes had Internet access. Only in five countries that participated in the PISA 2012 survey – Indonesia, Mexico, Peru, Thailand and Viet Nam – did fewer than one in two homes have Internet access.

■ Figure 1.2 ■

Change between 2009 and 2012 in Internet access at home



1. PISA 2009 data are missing for Viet Nam.

Note: White symbols indicate differences between PISA 2009 and PISA 2012 that are not statistically significant.

Countries and economies are ranked in descending order of the percentage of students accessing the Internet at home in 2012.

Source: OECD, PISA 2012 Database, Table 1.2.

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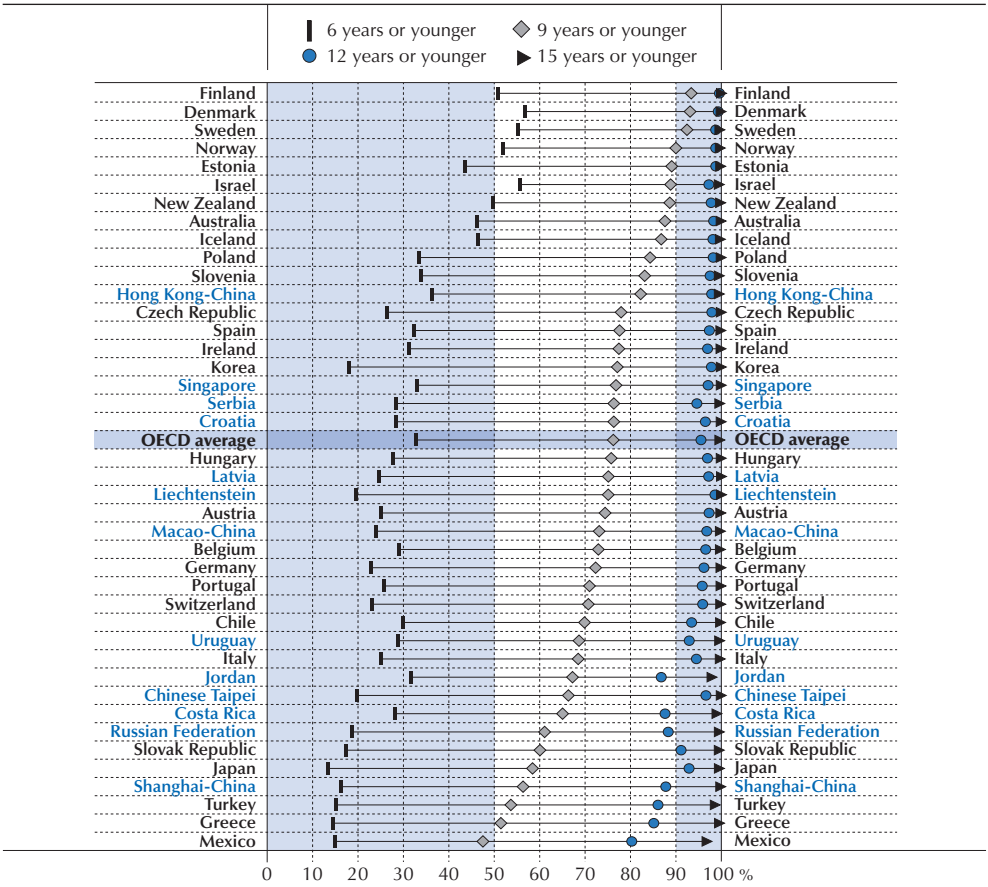
In almost all countries, Internet access increased between 2009 and 2012. The OECD average increase was 5 percentage points. The expansion in Internet access was largest in Albania, Costa Rica, Jordan, the Russian Federation and Serbia, with increases of more than 25 percentage points (Figure 1.2 and Table 1.2).

Students' experience using computers

At what age did students begin using computers? When did they first access the Internet? How many of them have never used a computer or accessed the Internet? Because the narrowing of the "first digital divide" is a recent trend, large gaps across and within countries emerge when examining the age at which students who were 15 in 2012 had started using computers (Figures 1.3 and 1.4).

■ Figure 1.3 ■

Age at first use of computers



Countries and economies are ranked in descending order of the percentage of students who started using computers at age 9 or younger.

Source: OECD, PISA 2012 Database, Table 1.3.

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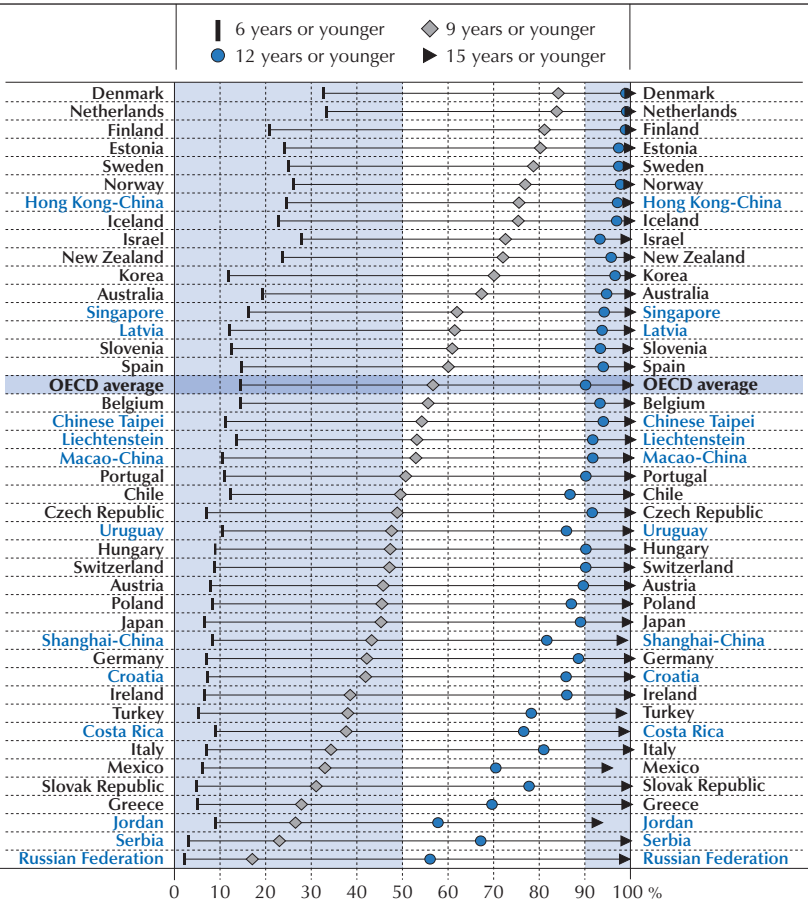
Age at first use of computers

The typical 15-year-old student in 2012 had at least five years of experience using computers. Across all countries and economies analysed, except Mexico, more than one in two students reported that they were 9 years old or younger when they used a computer for the first time. In five countries – Denmark, Finland, Israel, Norway and Sweden – a majority of 15-year-olds reported having first used computers at age 6 or younger, and therefore had started using computers in the early 2000s. These early users had already gained some familiarity with ICT tools when they were taught to read and write. More than nine out of ten students in Denmark, Finland and Sweden had started using computers by the time they turned 10 (Figure 1.3).

■ Figure 1.4 ■

Age at first use of the Internet



Countries and economies are ranked in descending order of the percentage of students who started using the Internet at age 9 or younger.

Source: OECD, PISA 2012 Database, Table 1.4.

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By contrast, more than one in ten students in Costa Rica, Greece, Jordan, Mexico, the Russian Federation, Shanghai-China and Turkey had no or only limited experience in using computers in 2012 when they were 15. These students first used a computer at age 13 or older – or, more rarely, they had never used one. Some 3% of students in Mexico, 2% in Jordan, and 1% of students in Costa Rica and Turkey had never used a computer; these students were overwhelmingly from the bottom quarter of disadvantaged students. In all other countries and economies, well under 1% of students had never used a computer (Table 1.3).

Age at first use of the Internet

At 15, students have typically had at least five years of experience with the Internet, although for many students, the first computer they used did not have Internet access. A comparison of students' answers about computer use, in general, and Internet use, in particular, implies that students typically accessed the Internet for the first time one-and-a-half years after they started using computers.[2] On average across OECD countries, 57% of students had accessed the Internet for the first time when they were younger than 10 (at that age, 76% of students were already using computers). In Denmark and the Netherlands, more than 30% of students had accessed the Internet for the first time before they turned 7 (Figure 1.4).

In some countries, large shares of students who had participated in PISA 2012 had accessed the Internet only recently, if at all. In Jordan, the Russian Federation and Serbia, more than 30% of students accessed the Internet for the first time after they turned 13 – i.e. after 2009. This is consistent with the observation that, in these countries, home Internet access expanded rapidly between the PISA 2009 and PISA 2012 surveys (see Figure 1.2). In Jordan and Mexico, a significant number of students (more than 5%) reported in 2012 that they had had no experience in accessing the Internet (Table 1.4).

STUDENTS' USE OF COMPUTERS AND THE INTERNET OUTSIDE OF SCHOOL

PISA data show that students spend far more time on line outside of school than while at school. Many of the students who were 15 years old in 2012 had started using computers before they even went to school. This section explores how students use ICT devices outside of school.

How much time students spend on line

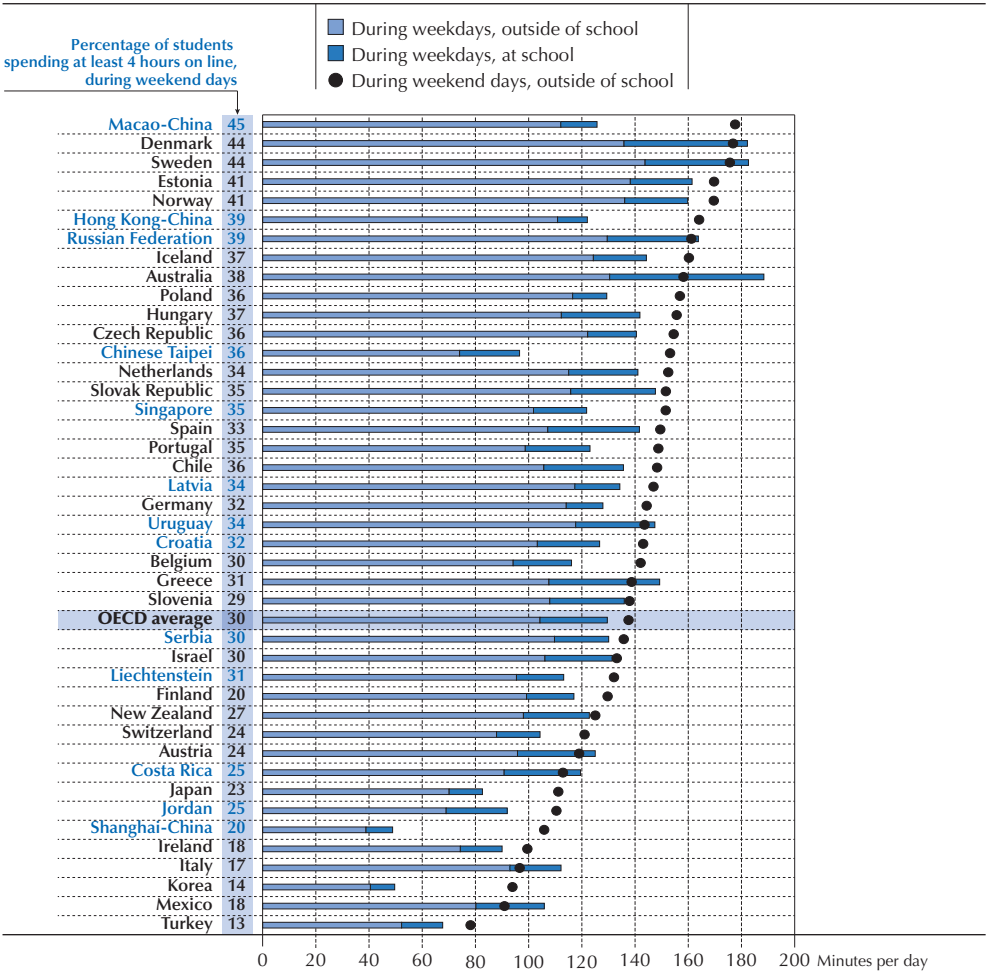
For the first time, PISA 2012 measured how much time, within a typical school week, students spend using the Internet at school and at home, both during school days and during weekends. Because the answers were given on a categorical scale, it is not possible to compute exactly the average time students spend on line. However, it is possible to establish with confidence a lower bound for the number of minutes students spend on online activities, whereby the answer "between one and two hours", for instance, is converted into "61 minutes at least". Self-reports show that, on average across OECD countries, students typically spend over two hours on line each day on school days as well as during weekends (Figure 1.5).

During weekdays, in Australia, Denmark, Estonia, Norway, the Russian Federation and Sweden, more than one in four students (25%) spend over four hours per day on line outside of school. On average, students in these countries, as well as in the Czech Republic and Iceland, spend at least two hours (120 minutes) on line outside of school, during weekdays (Table 1.5a).

■ Figure 1.5 ■

Time spent on line in school and outside of school

Minutes per day spent using the Internet (lower bound on the average)



Countries and economies are ranked in descending order of the average time students spend using the Internet during weekend days, outside of school.

Source: OECD, PISA 2012 Database, Tables 1.5a, b and c.

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During weekends, the share of students who spend more than four hours per day on line exceeds 40% in Denmark, Estonia, Macao-China, Norway and Sweden. At the opposite extreme are Ireland, Italy, Korea, Mexico and Turkey, where this share is below 20%, and about 60% or more students spend less than two hours on line during a typical weekend day (Figure 1.5 and Table 1.5b). While in Mexico and Turkey the lack of Internet access at home may represent the main constraint (see Figure 1.2 above), in Ireland, Italy and Korea, very few students have no

Internet access at home, and most students use the Internet at least to some extent – but rarely for more than two hours per day. Assuming that weekends are mostly devoted to social activities, these do not (yet) take place on line in the latter group of countries.

In most countries, boys spend more time on line than girls during weekends. In Denmark, Germany, Korea, Liechtenstein, Portugal, Sweden and Chinese Taipei, the estimated difference in favour of boys is at least 40 minutes per day (the average difference in favour of boys is at least 18 minutes across OECD countries). But there are exceptions: in Chile, Japan, Mexico and Spain, girls spend more time on line during weekends than boys (Table 1.5b).

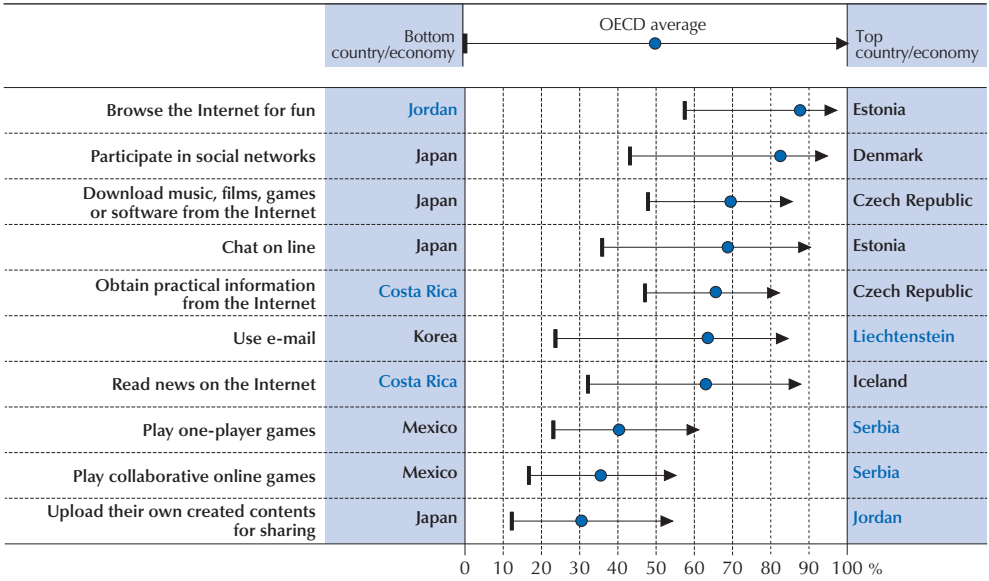
Students' ICT-related activities outside of school

In PISA 2012, students were asked how often they use a computer outside of school for ten different leisure tasks (six of which were included in the PISA 2009 questionnaire). In the following section, students who reported that they engage in any activity at least once a week are considered frequent users of computers for that task.

■ Figure 1.6 ■

Use of ICT for leisure

Percentage of students who reported engaging in each activity at least once a week



Source: OECD, PISA 2012 Database, Table 1.6.
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Computer use for leisure

Across OECD countries, the most common leisure activity using computers is browsing the Internet for fun. Some 88% of students do this at least once a week. This is followed by participating in social networks (83% of students), downloading music, films, games or software from the

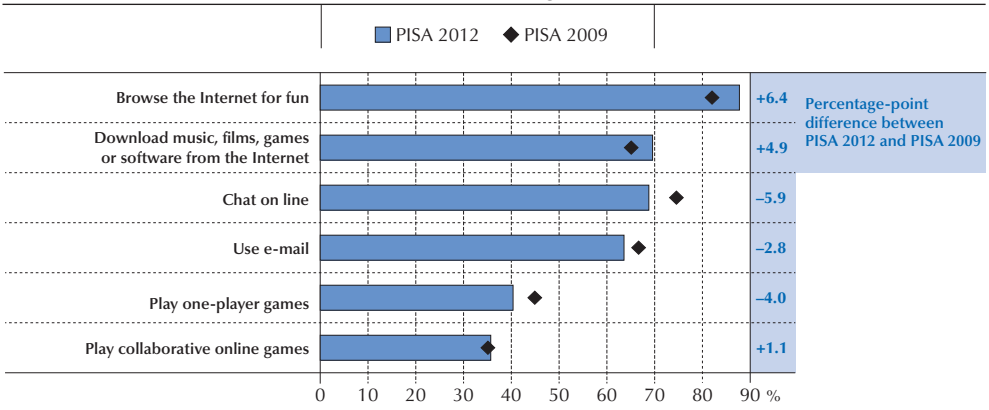
Internet (70%) and chatting online (69%). More than one in two students also use the Internet at least weekly to obtain practical information (66%), read or send e-mails (64%), or read news on the Internet (63%). Two in five students (40%) also play one-player games on computers, while 36% play online collaborative games. Only 31% of students use computers at least once a week to upload their own content, such as music, poetry, videos or computer programs (Figure 1.6).

Among the activities listed in both the 2009 and 2012 questionnaires, e-mail and chat use are on the decline, probably replaced by the use of social networking services and other web-based messaging tools. Participation in social networks was more popular than sending e-mail or using chat in 2012, but was not among the activities listed in the 2009 PISA questionnaire. Thus this trend does not reflect a decline in the use of ICT for communication and sharing interests, but rather a convergence of different forms of communication on new integrated platforms that require greater bandwidths. A second trend shows a decline in one-player games, which is partly offset by the emergence of online collaborative games. By contrast, the share of students who frequently browse the Internet for fun or download music, films, games or software from the Internet has increased significantly (Figure 1.7).

■ Figure 1.7 ■

Change between 2009 and 2012 in ICT use for entertainment

Percentage of students who reported engaging in each activity at least once a week (OECD average)



Notes: The difference between 2012 and 2009 is based on OECD countries with data in both PISA cycles. In contrast, the OECD average values for 2009 and 2012 are based on all countries with available data.
All reported differences between 2012 and 2009 are statistically significant.
Source: OECD, PISA 2012 Database, Table 1.6.
StatLink http://dx.doi.org/10.1787/888933252655

Within countries and economies, however, uses and trends can differ markedly from the OECD average. In Japan, for instance, the use of e-mail (79% of students) is more widespread among 15-year-olds than participation in social networks (43% of students), and has increased quickly. Computer games – both one-player games and online collaborative games – are more popular in Serbia than in any other PISA-participating country/economy: in Serbia, more students play

games using computers than use e-mail. More than 80% of students in the Czech Republic, Hungary, Latvia and the Russian Federation use computers to download music, films, games or software from the Internet. In Hong Kong-China, Korea, Macao-China and Singapore, the share of students who regularly use computers for gaming (one-player or collaborative games) or communication (chat, e-mail) has shrunk faster than in other countries/economies (Table 1.6).

When students' use of computers for leisure is summarised in the *index of ICT use outside of school for leisure*, clear and large differences between and within countries emerge. According to this composite index, computer use for entertainment is greatest (as measured by the frequency and variety of entertainment activities in which students engage) in the Czech Republic and Estonia. In these countries, for instance, more than 75% of students chat on line, more than 80% of students read news on the Internet, more than 75% of students use e-mail, and more than 40% of students play collaborative online games at least once or twice a week. The least use of computers for entertainment is found in Japan, Korea and Mexico.[3] The difference between the country that uses computers the most for entertainment and the country that uses them the least for entertainment is over one standard deviation (Table 1.7).

In all countries surveyed, boys make significantly more use of computers for entertainment activities than girls. The largest differences are found in Liechtenstein, Portugal, Sweden and Turkey (Table 1.7).

HOW STUDENTS' USE OF THE INTERNET OUTSIDE OF SCHOOL IS RELATED TO THEIR SOCIAL WELL-BEING AND ENGAGEMENT WITH SCHOOL

While children gain access to a host of educational resources and engaging experiences through ICT devices and the Internet, they also need to be protected from the potential negative consequences of using ICT. Risks include exposure to harmful content or contacts (including cyberbullying; see Box 1.2), consumer-related risks, such as online fraud or abusive marketing practices, and privacy-related risks, such as identity theft (OECD, 2012 and 2011). Many of these risks existed well before the Internet, but measures to protect children from the corresponding offline threats (such as physical barriers, age-related norms that prevent access to certain spaces, and adult supervision) are difficult to migrate and enforce in a virtual space that is inherently open. Education can thus empower children and parents to evaluate and minimise the risks.

Excessive use of the Internet has also been found to be related to various problems among adolescents, including poor academic performance, family and interpersonal problems, and even physical weakness (Park, Kang and Kim, 2014). While the causal direction is not always established, excessive use of the Internet for leisure can harm academic achievement and health, as it reduces the time available for sleep, study or physical activity. Conversely, students who feel excluded from school-based socialisation may retreat to online activities. In these cases, excessive use of the Internet is more a symptom than a cause of their problems. Acknowledging emerging concerns over adolescents' use of the Internet for online gaming, the fifth edition of the Diagnostic and Statistical Manual for Mental Disorders (DSM-5) identifies Internet Gaming Disorder as a condition warranting more clinical research (American Psychiatric Association, 2013).

Box 1.2. **Cyberbullying**

Cyberbullying, which occurs when a young person is repeatedly threatened, harassed, or embarrassed by another person using the Internet, has emerged as a public health problem and a threat to young people's social and emotional development (David-Ferdon and Feldman Hertz, 2007; Raskauskas and Stoltz, 2007; OECD, 2013b; OECD, 2014a). According to a survey carried out in 2010 in European countries, 6% of children aged 9-16 had been victims of cyberbullying in the preceding year (Livingstone et al., 2011). When the survey was repeated four years later, in 2014, the proportion had risen significantly (to 12%) for the seven countries involved (Mascheroni and Ólafsson, 2014).

Cyberbullying is often a continuation and extension of offline bullying behaviours, with the same children involved as bullies, victims and bystanders (Raskauskas and Stoltz, 2007; Katzer, Fetchenhauer and Belschak, 2009; Tokunaga, 2010; Salmivalli and Pöyhönen, 2012). In such cases, school-based programmes that are effective in reducing bullying (Ttofi and Farrington, 2011) may help to prevent cyberbullying as well. Other studies however document significant differences between (traditional) bullying and cyberbullying (Kubiszewski et al., 2015).

PISA data may be used to shed light on some of the associations between extreme use of the Internet (defined here as "using the Internet for more than six hours per day outside of school, during school days") and students' sense of belonging at school and engagement with learning.

Students' sense of belonging at school, which is related to their social well-being, is measured in PISA by asking students whether they agree with the following statements: I feel like an outsider at school; I make friends easily at school; I feel like I belong at school; I feel awkward and out of place at school; other students seem to like me; I feel lonely at school.

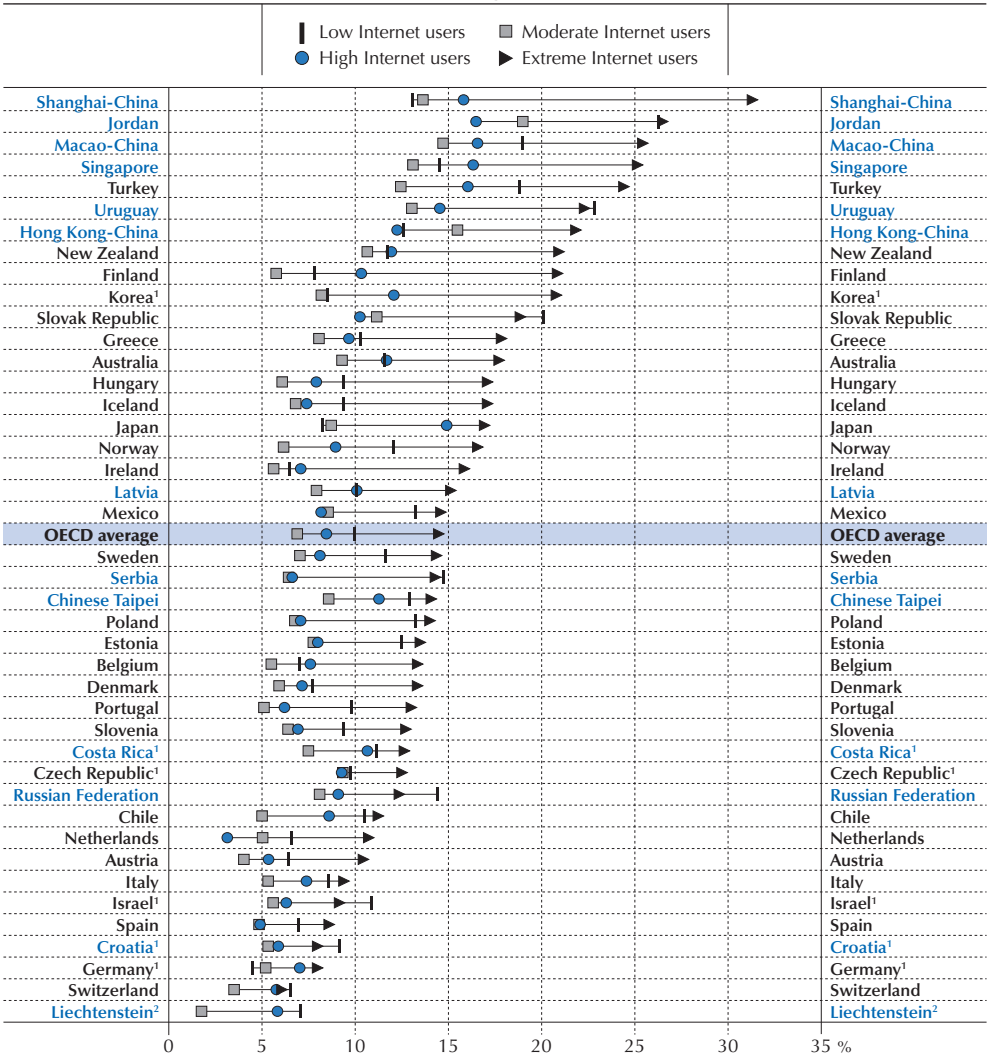
When the answers of students are related to the time they spend on line outside of school during weekdays, results clearly indicate lower levels of well-being among students who spend more than six hours per day on line. Extreme Internet users, who spend six or more hours per day on line during weekdays are twice as likely as moderate Internet users (those who spend between one and two hours per day on line) to report that they feel lonely at school (14% compared to 7%). Conversely, students who are well-integrated at school are less likely to spend more than six hours per day on line (Figure 1.8, Tables 1.8 and 1.9).

PISA data also show that extreme Internet users are particularly at risk of being less engaged with school. For instance, while 32% of students who spend less than one hour per day on line during weekdays arrived late for school in the two weeks prior to the PISA test, 45% of students who spend more than six hours per day on line arrived late. Lower levels of engagement with school may be related to less sense of belonging at school. It is also possible that truancy and arriving late for school are the consequence of lack of sleep among extreme Internet users (Figure 1.9 and Table 1.10).

■ Figure 1.8 ■

Students' sense of belonging at school, by amount of time spent on the Internet outside of school during weekdays

Percentage of students who agreed or strongly agreed with the statement "I feel lonely at school"



1. The difference between moderate and extreme Internet users is not statistically significant.
2. In Liechtenstein, the sample size for extreme Internet users is too small to report.

Note: Categories of Internet users are based on students' responses about how much time they spend on line, outside of school, during a typical weekday. Low Internet users: one hour or less; moderate Internet users: 1 to 2 hours; high Internet users: 2 to 6 hours; extreme Internet users: more than 6 hours.

Countries and economies are ranked in descending order of the percentage of extreme Internet users expressing feelings of loneliness/not belonging at school.

Source: OECD, PISA 2012 Database, Table 1.8.

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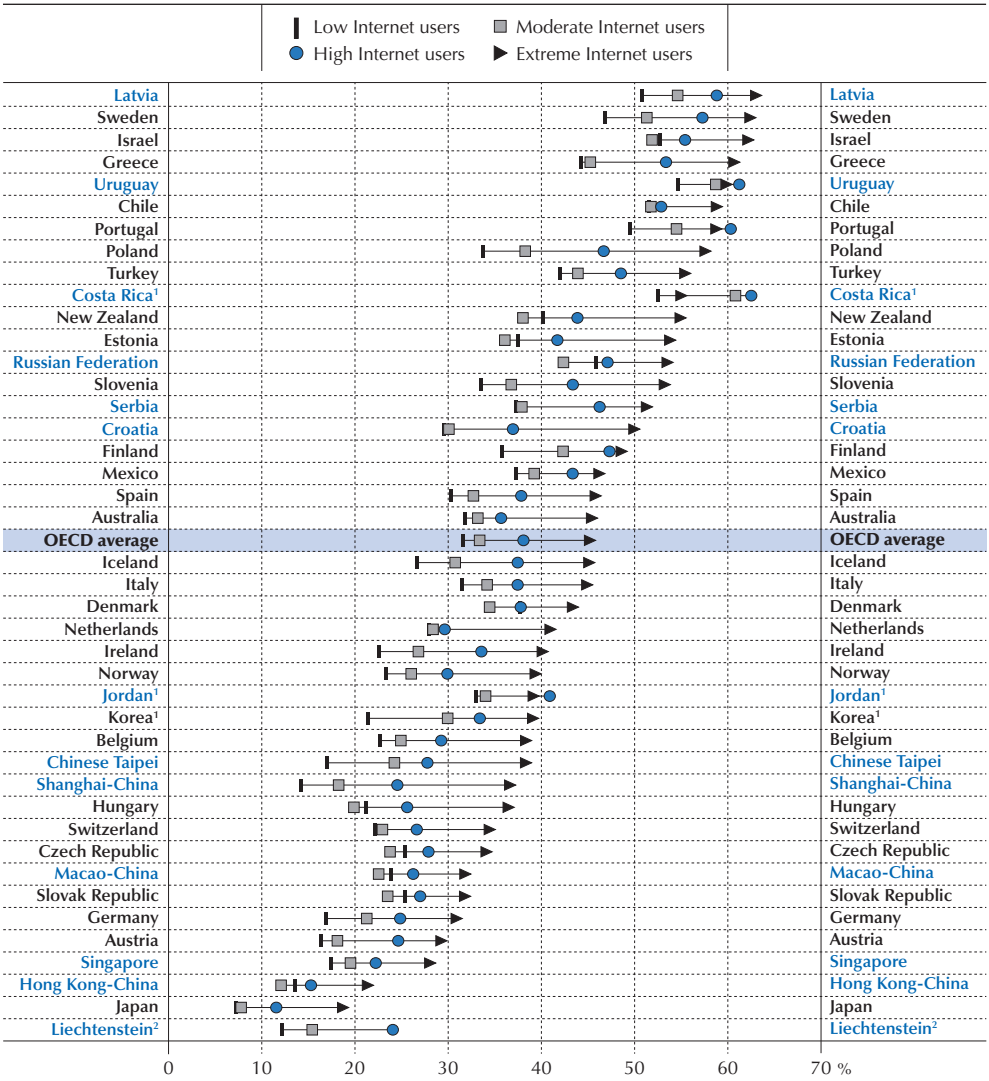
■ Figure 1.9 ■

Students arriving late for school, by amount of time spent on the Internet outside of school during weekdays

Percentage of students who reported arriving late at least once in the two weeks prior to PISA test



1. The difference between low and extreme Internet users is not statistically significant.
2. In Liechtenstein, the sample size for extreme Internet users is too small to report.

Note: Categories of Internet users are based on students' responses about how much time they spend on line, outside of school, during a typical weekday. Low Internet users: one hour or less; moderate Internet users: 1 to 2 hours; high Internet users: 2 to 6 hours; extreme Internet users: more than 6 hours.

Countries and economies are ranked in descending order of the percentage of extreme Internet users arriving late for school.

Source: OECD, PISA 2012 Database, Table 1.10.

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Notes

1. In 2012, 24% of 15-year-olds in Turkey, and 30% of 15-year-olds in Mexico, were not enrolled in school or had not completed six years of formal education (OECD, 2014b).

2. Assuming that the age when students started using computers follows a normal distribution, the best fit to the frequencies reported in Tables 1.3 and 1.4 for the OECD average implies a mean age of 8.2 years for the age of first use of computers, and 9.6 years for the age of first access to the Internet (standard deviations are 2.7 and 2.5, respectively).

3. Infrequent use of computers for entertainment in Japan and Korea may have different explanations. While students also consistently report spending less time on the Internet than on average across OECD countries (Figure 1.5), Japan and Korea have excellent broadband infrastructure, and are leaders in the use of handheld devices for accessing Internet services (OECD, 2014c, pp. 28 and 43). In 2013, Korea had the highest average broadband speed (22 Mbit/s); in 2012, 87.3% of households had access to the Internet, and 99.7% of them through a smartphone. Japan and Korea, together with Australia, Denmark, Finland, Sweden and the United States, are among the seven countries in which in June 2014 there were more mobile broadband subscriptions than inhabitants (OECD, 2014d). Korea and Japan also have excellent fixed broadband infrastructure, with more than 20 subscriptions to fibre connection providers per 100 inhabitants (OECD, 2014d). It may therefore be that some of the typical online and offline entertainment activities are done with smartphones, rather than with computers (questionnaires did not define the term "computer").

Chapter 1 tables are available on line at http://dx.doi.org/10.1787/edu-data-en.

Note regarding Israel

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

References

American Psychiatric Association (2013), "Internet Gaming Disorder", in *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.), American Psychiatric Publishing, Arlington, VA,. pp. 797-798.

David-Ferdon, C. and **M. Feldman Hertz** (2007), "Electronic Media, violence, and adolescents: an emerging public health problem", *Journal of Adolescent Health,* Vol. 41/6, S. 1-5.

Katzer, C., D. Fetchenhauer and **F. Belschak** (2009), "Cyberbullying: Who are the victims? A comparison of victimization in internet chatrooms and victimization in school", *Journal of Media Psychology,* Vol. 21/1, pp. 25-36.

Kubiszewski, V., R. Fontaine, C. Potard and **L. Auzoult** (2015), "Does cyberbullying overlap with school bullying when taking modality of involvement into account?", *Computers in Human Behavior*, 43, pp. 49-57.

Livingstone, S., L. Haddon, A. Görzig and **K. Ólafsson** (2011), *Risks and Safety on the Internet: the Perspective of European Children: Full Findings*, EU Kids Online, LSE, London.

Mascheroni, G. and **K. Ólafsson** (2014), *Net Children Go Mobile: Risks and Opportunities* (*Second edition*), Educatt, Milan, Italy.

OECD (2014a), *Trends Shaping Education 2014 Spotlight 5: Infinite Connections*, OECD, Paris, www.oecd.org/edu/ceri/Spotlight%205-%20Infinite%20Connections.pdf.

OECD (2014b), *PISA 2012 Technical Report*, PISA, OECD, Paris, www.oecd.org/pisa/pisaproducts/pisa2012technicalreport.htm.

OECD (2014c), *Measuring the Digital Economy: A New Perspective*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264221796-en.

OECD (2014d), *Fixed and Wireless Broadband Subscriptions per 100 Inhabitants* (indicator 1.2), OECD Publishing, Paris, www.oecd.org/sti/broadband/oecdbroadbandportal.htm (accessed 3 June 2015).

OECD (2013a), "Main trends in the communications industry", in *OECD Communications Outlook 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/comms_outlook-2013-en.

OECD (2013b), *Trends Shaping Education 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/trends_edu-2013-en.

OECD (2012), *The Protection of Children Online: Recommendation of the OECD Council: Report on Risks Faced by Children Online and Policies to Protect Them*, OECD Publishing, Paris, www.oecd.org/sti/ieconomy/childrenonline_with_cover.pdf.

OECD (2011), *The Protection of Children Online: Risks Faced by Children Online and Policies to Protect Them*, OECD Digital Economy Papers, No. 179, OECD Publishing, Paris, http://dx.doi.org/10.1787/5kgcjf71pl28-en.

Park, S., M. Kang and **E. Kim** (2014), "Social relationship on problematic Internet use (PIU) among adolescents in South Korea: A moderated mediation model of self-esteem and self-control", *Computers in Human Behavior,* Vol. 38, pp. 349-57.

Raskauskas, J. and **A.D. Stoltz** (2007), "Involvement in traditional and electronic bullying among adolescents", *Developmental Psychology*, Vol. 43/3, pp. 564-75.

Salmivalli, C. and **V. Pöyhönen** (2012), "Cyberbullying in Finland", in Qing, L, D. Cross and P.K. Smith (eds.), *Cyberbullying in the Global Playground*, Wiley-Blackwell, pp. 57-72.

Tokunaga, R.S. (2010), "Following you home from school: A critical review and synthesis of research on cyberbullying victimization", *Computers in Human Behavior,* Vol. 26/3, pp. 277-87.

Ttofi, Maria M. and **D.P. Farrington** (2011), "Effectiveness of school-based programs to reduce bullying: A systematic and meta-analytic review", *Journal of Experimental Criminology,* Vol. 7/1, pp. 27-56.