OECD

EDUCATION INDICATORS IN FOCUS

education **data** education **evidence** education **policy** education **analysis** education **statistics**

2016 (March)

40

Teachers' ICT and problem-solving skills: Competencies and needs

- **The education sector performs well for information and communication technology (ICT) and problem-solving skills, although it still lags behind the professional, scientific and technical activities sector.**
- **Primary and secondary teachers have better ICT and problem-solving skills than the general population, and similar skills to other tertiary-educated adults. In Japan and Korea, however, primary and secondary teachers are over 40 percentage points more likely than other tertiary graduates to have good skills when age is taken into account.**
- **On average, across the countries participating to the TALIS survey, 59% of lower secondary teachers expressed a need for professional development in ICT skills for teaching.**

How are ICT and problem-solving skills measured?

Individuals with "good ICT and problem-solving skills" are individuals scoring at the two highest proficiency levels (Levels 2 and 3) in the assessment of problem solving in technology-rich environment of the Survey of Adults Skills. To score at these levels, individuals must participate in the computer-based assessment and solve problems that require both ICT and problem-solving skills. These individuals are able to solve problems that require at least some navigation across webpages and applications, involve multiple steps and operators, and possibly the use of tools (such as a sort function). The tasks may also require evaluating the relevance of a set of items to discard distractors, and applying integration and inferential reasoning. These individuals thus demonstrate a high level of problem-solving competence and at least a basic level of ICT skills (OECD, 2013b).

More than 40% of workers employed in the education sector have good ICT and problem-solving skills.

As Figure 1 shows, workers employed in the education sector (either as teachers or in other roles) are more likely to have good ICT and problem-solving skills than workers employed in human health and social work activities. The difference is on average 15 percentage points across the countries and sub-national entities participating in the Survey of Adult Skills (PIAAC)[1] in 2012, and it is over 20 percentage points in the Czech Republic and in Finland.

However, on average, workers in the education sector are 15 percentage points less likely to have good ICT and problem-solving skills than those working in the professional, scientific and technical activities sector, which includes scientific research and development and legal and accounting activities. Hence, education can be considered as a high-performing sector in ICT and problem solving, although it still lags behind some very skill-intensive activities.

Teachers' skills are similar to those of other tertiary-educated adults.

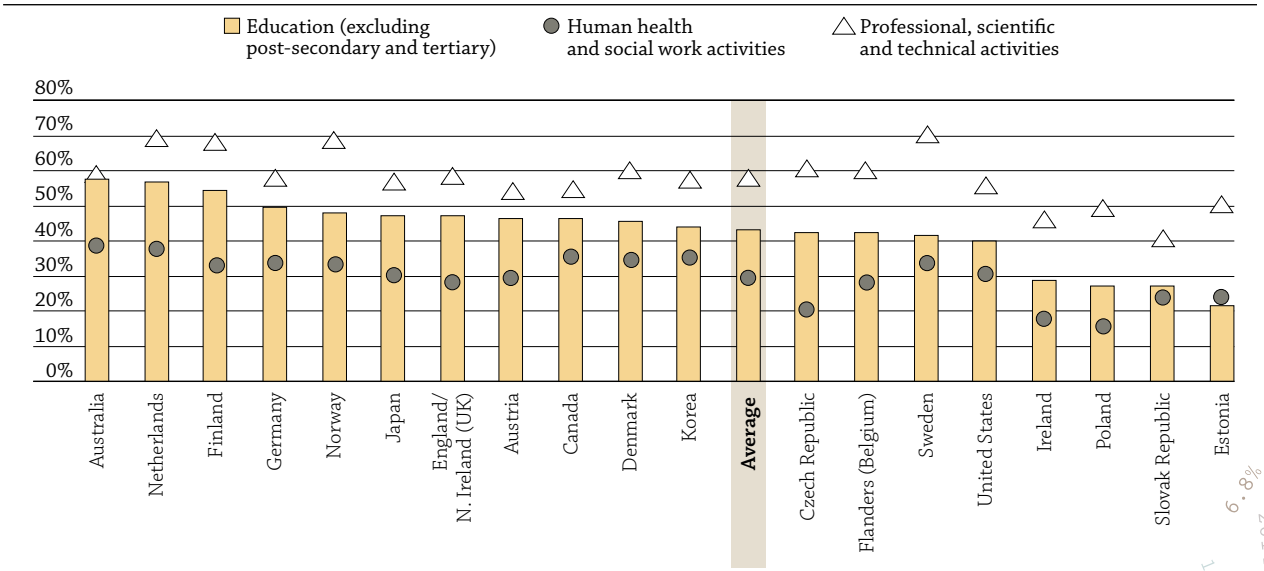
The fact that education has a relatively high proportion of workers with good ICT and problem-solving skills can be explained by the fact that it employs many tertiary-educated workers, particularly teachers. For example, among countries that participated in the 2013 Teaching and Learning International Survey (TALIS),[2] more than 95% of primary and lower secondary education teachers had a tertiary degree.

In all countries participating in the Survey of Adult Skills, the proportion of other tertiary-educated adults (i.e. excluding teachers) with good ICT and problem-solving skills is significantly higher than that of the general adult population

[1] The Survey of Adult Skills is a product of the OECD Programme for the International Assessment of Adult Competencies (PIAAC), assessing adults' competencies and skills.

[2] TALIS is the OECD Teaching and Learning International Survey. It asks teachers and school leaders about the conditions that contribute to the learning environments in their schools.

Figure 1. **Percentage of adults with good ICT and problem-solving skills, by selected industry (2012)**
Survey of Adult Skills, 25-64 year-olds



Source: OECD Education database, *www.oecd.org/site/piaac/publicdataandanalysis.htm*.

(see Figure 2) – on average, 51% compared to 31% for the adult population overall. The proportion of primary and secondary teachers with good skills in this domain is also much higher than that of the general population, although it is three percentage points lower than that of other tertiary-educated adults. In 13 out of the 17 countries for which data are available, primary and secondary teachers are less likely than other tertiary-educated adults to have good ICT and problem-solving skills. Teachers only outperform other tertiary-educated adults in Canada, England/ Northern Ireland (United Kingdom), Japan and Korea.

Data show that younger people have better ICT and problem-solving skills than older people (OECD, 2013a), which may explain the lower skill levels of primary and secondary teachers compared to other tertiary-educated adults. When age is taken into account, primary and secondary teachers are four percentage points more likely than other tertiary-educated adults to have good problem-solving skills in a digital and ICT environment. In Japan and Korea, they are over 40 percentage points more likely than other tertiary graduates to have good ICT and problem-solving skills. In Korea, this could be due to the ability of schools to attract highly skilled professionals by offering relatively high wages to primary and secondary teachers, compared to similarly educated workers (OECD, 2015a). Another reason could be that teachers, in these countries, have better opportunities than other tertiary graduates to develop their skills on the job.[3]

Primary and secondary teachers tend to be proficient in other domains as well. For example, after accounting for age, they are on average eight percentage points more likely to have good literacy skills than other tertiary graduates across participating countries. This difference is significant at the 5% confidence level.

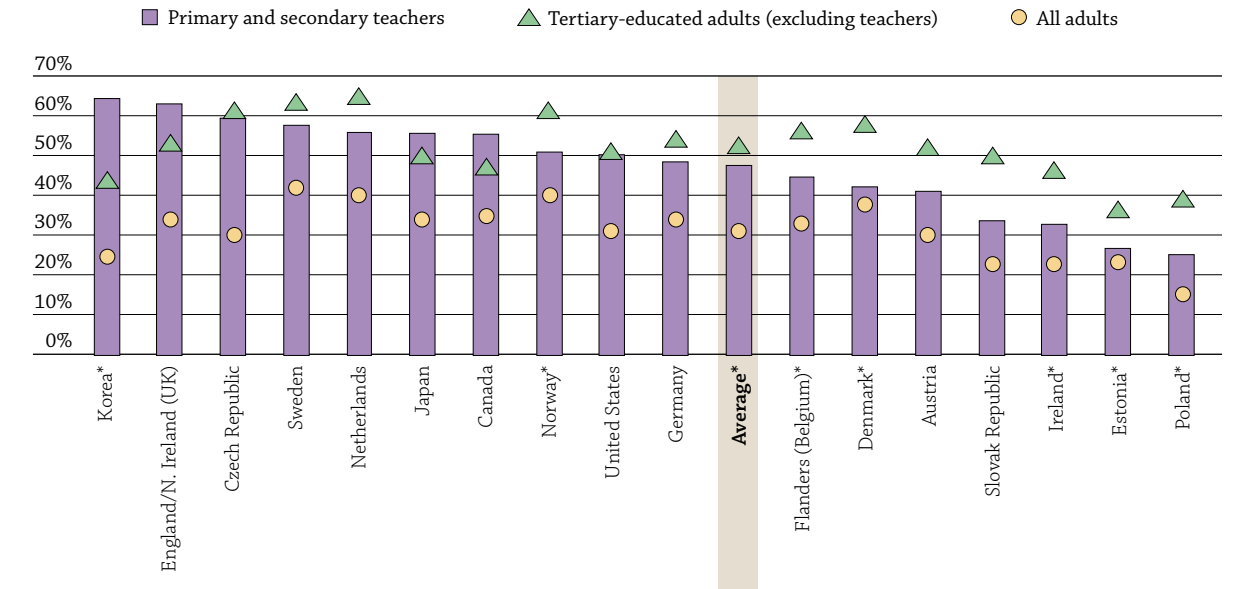
Lower secondary teachers are expressing a need for professional development in ICT skills for teaching.

ICT has permeated many aspects of everyday life and work. As a result, students who have not learned to navigate through a complex digital landscape will find it difficult to develop their professional and social life fully in the future. To address this

[3] These results were reached by running a regression of a binary (0 or 1) variable for having good ICT and problem-solving skills for the tertiary-educated adults of each country with available data on a binary variable for being a teacher and on the age of the respondent. The coefficient for the teacher dummy is positive and significant for Canada, Japan, Korea and the United Kingdom, and negative and significant for Flanders (Belgium). The results for literacy have been obtained in the same way.

Figure 2. **ICT and problem-solving skills: primary and secondary teachers, other tertiary-educated adults and the overall adult population (2012)**

Percentage of individuals with good ICT and problem-solving skills among 25-64 year-olds, by population subgroup



* The difference between primary and secondary teachers and other tertiary-educated adults is significant at the 5% confidence level.

Note: The average sample size for primary and secondary teachers is 152 per country.
Source: OECD Education database, *www.oecd.org/site/piaac/publicdataandanalysis.htm*.

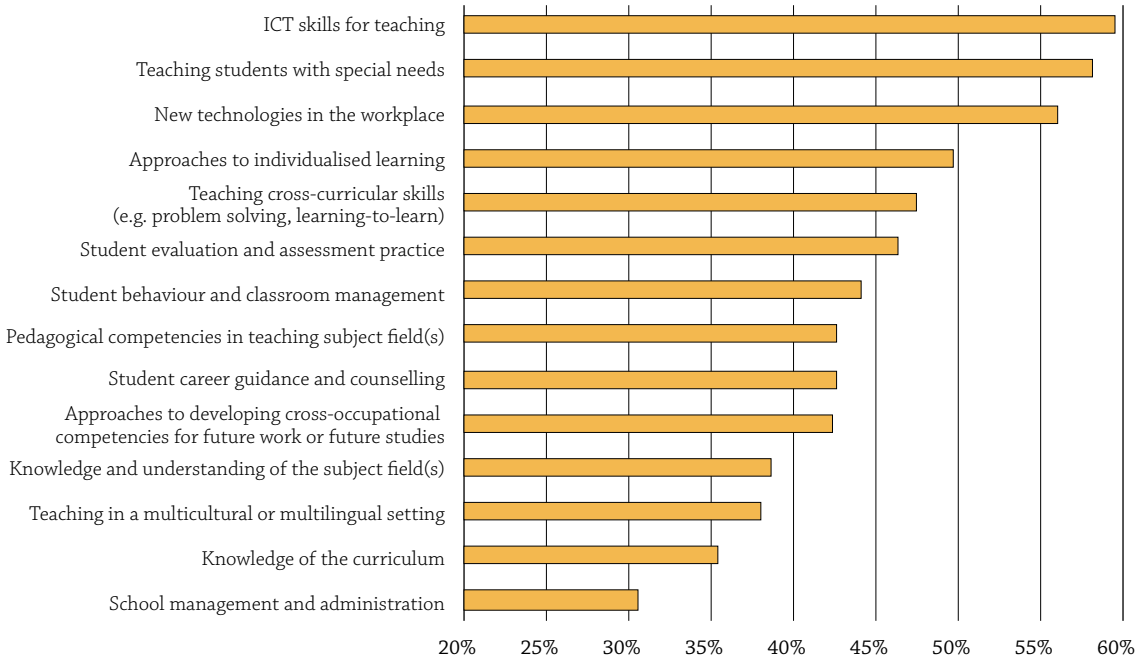
challenge, there have been an increasing number of new initiatives to develop teachers' ICT skills for teaching and greater investment in new technologies to support the use of ICT in classrooms (OECD, 2015b, 2015c).

TALIS found evidence that the use of ICT in classrooms varies widely across countries. For example, in Denmark, 74% of lower secondary teachers reported that their students used ICT for project or class work frequently or in all or nearly all lessons, compared with only 10% in Japan (OECD, 2014). Low use of ICT for teaching practices may be related to a lack of the relevant skills. As shown in Figure 3, more lower secondary teachers expressed a moderate or high need for professional development in ICT skills for teaching than any other area. In all 34 countries for which data are available, except Japan and Israel, teachers were more likely to express a need for professional development in the area of ICT skills for teaching than in knowledge and understanding of their subject fields (OECD, 2014). But TALIS data also show that, after participating in a professional development activity, the share of teachers reporting a moderate or a large positive impact on their teaching is 10 percentage points lower for ICT skills for teaching than for knowledge and understanding of their subject fields (OECD, 2014).

Building teachers' skills is of vital importance to deliver the promises technology holds. In a context of rapid change, teachers must become active agents not just in implementing technological innovations in the field of education, but in designing them too. Despite teachers' strong ICT and problem-solving skills, the TALIS data show that applying these skills in a teaching situation often remains a challenge. Meanwhile, Programme for International Student Assessment (PISA) results suggest that although limited use of computers at school may be better for students than not using them at all, using them more intensively than the current OECD average tends to be associated with significantly poorer student performance (OECD, 2015c).

One interpretation of these findings is that educators need the training to learn how to use technology to improve teaching methodologies, while staying firmly focused on student learning. Meanwhile, online tools can help teachers and school leaders to exchange ideas and good practices, creating collaborative networks and inspiring each other, transforming what used to be an individual task into a collaborative process. In the end, technology can amplify great teaching, but great technology cannot replace poor teaching.

Figure 3. **Lower secondary teachers' needs for professional development (2013)**
Percentage of lower secondary education teachers indicating they have a moderate or high level of need for professional development in selected areas



Source: OECD, TALIS 2013 Database, *http://dx.doi.org/10.1787/888933045183*, Table 4.12.Web.

The bottom line: The education sector performs well for ICT and problem-solving skills as teachers – who make up a large proportion of its workforce – tend to have better ICT and problem-solving skills than the overall population. In a world where students must learn to navigate complex digital landscapes to succeed in the future, teachers play an important role which poses high demands on their skills and competencies. This may be why, despite their relatively high skills, more than half of lower secondary teachers expressed the need for professional development in ICT skills for teaching.

For more information

OECD (2015a), *Education at a Glance 2015: OECD Indicators,* OECD Publishing, Paris, *http://dx.doi.org/10.1787/eag-2015-en*.

OECD (2015b), *Education Policy Outlook 2015: Making Reforms Happen*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264225442-en*.

OECD (2015c), *Students, Computers and Learning: Making the Connection*, PISA, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264239555-en*.

OECD (2014), *TALIS 2013 Results: An International Perspective on Teaching and Learning*, TALIS, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264196261-en*.

OECD (2013a), *OECD Skills Outlook 2013: First Results from the Survey of Adult Skills*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264204256-en*.

OECD (2013b), *The Survey of Adult Skills: Reader's Companion*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264204027-en*.

Contact

Elian Bogers (e.w.bogers@minocw.nl), Gabriele Marconi (gabriele.marconi@oecd.org), Simon Normandeau (simon.normandeau@oecd.org)

Visit
www.oecd.org/education/education-at-a-glance-19991487.htm
Education Indicators in Focus (previous issues)
PISA in Focus
Teaching in Focus

Next topic
How much do terciary students pay and what public support do they receive?

Photo credit: © Ghislain & Marie David de Lossy/Cultura/Getty Images

This paper is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

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.