



ENVISIONING THE FUTURE OF EDUCATION AND JOBS

Trends, data and drawings



ABOUT THIS PUBLICATION

Envisioning the Future of Education and Jobs: Trends, Data and Drawings is the product of a collaboration between the Organisation for Economic Co-operation and Development (OECD) and the UK-based charity, Education and Employers.

The core of this publication, the text and figures concerning trends, is taken from the 2019 edition of the OECD publication, *Trends Shaping Education*. The figures at the bottom of pages 5 and 13 are taken from the 2018 edition of *Education at a Glance: OECD Indicators*. The figures at the bottom of pages 7, 9, 11 and 15 are based on data from the 2015 cycle of the OECD Programme for International Student Assessment (PISA). Text concerning employers and employment is provided by Education and Employers.

The children's drawings that appear in this publication were elicited as part of the Drawing the Future survey, which was conducted in 2017 by the Education and Employers charity, in partnership with the National Association of Head Teachers (UK), the University College London Institute of Education, Tes Global and the OECD Directorate for Education and Skills. The survey asked primary school children aged 7 to 11 to draw a picture of the job they want to do when they grow up. To determine the factors influencing career choices, the survey also asked participants whether they personally knew anyone who did the job, and if not, how they knew about the job. Over 20 000 entries were received from the United Kingdom and from Australia, Belarus, Bangladesh, China, Colombia, Indonesia, Pakistan, Romania, Russia, Switzerland, Uganda and Zambia.

More recently, children attending the primary school in Davos, Switzerland, were also asked to draw their future job. One of their drawings appears on the cover.

This publication was produced by Andreas Schleicher, Marilyn Achiron, Tracey Burns, Cassandra Davis and Rebecca Tessier at the OECD Directorate for Education and Skills, and by Nick Chambers at Education and Employers. The report was designed by ChoYou.

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FOREWORD

Revolution. Contained within that often-frightening word is another, less-destabilising one: evolution. If we look at this fourth Industrial Revolution as the end result of a series of advances propelled by the force of global trends, then we have a better chance of meeting the challenges it presents, rather than being ambushed by it. We will also be better equipped to help our children prepare for their future.

This report, the product of a collaboration between the Organisation for Economic Co-operation and Development (OECD) and the UK-based charity, Education and Employers, offers a glimpse of how children see their future, and the forces that, if properly understood and harnessed, will drive them forward to realise their dreams. Through concerted actions by educators and business leaders, we can help our children develop the kinds of skills needed not only to weather, but to take advantage of this revolution.

The future will be about pairing the artificial intelligence of computers with the cognitive, social and emotional capabilities of humans, so that we educate first-class humans, not second-class robots. It is our responsibility, as concerned adults, to acknowledge and understand the trends that are shaping this industrial revolution, and to impart that understanding to our children as early as possible. It is our responsibility, in other words, to help our children get ready for their future.



Andreas Schleicher
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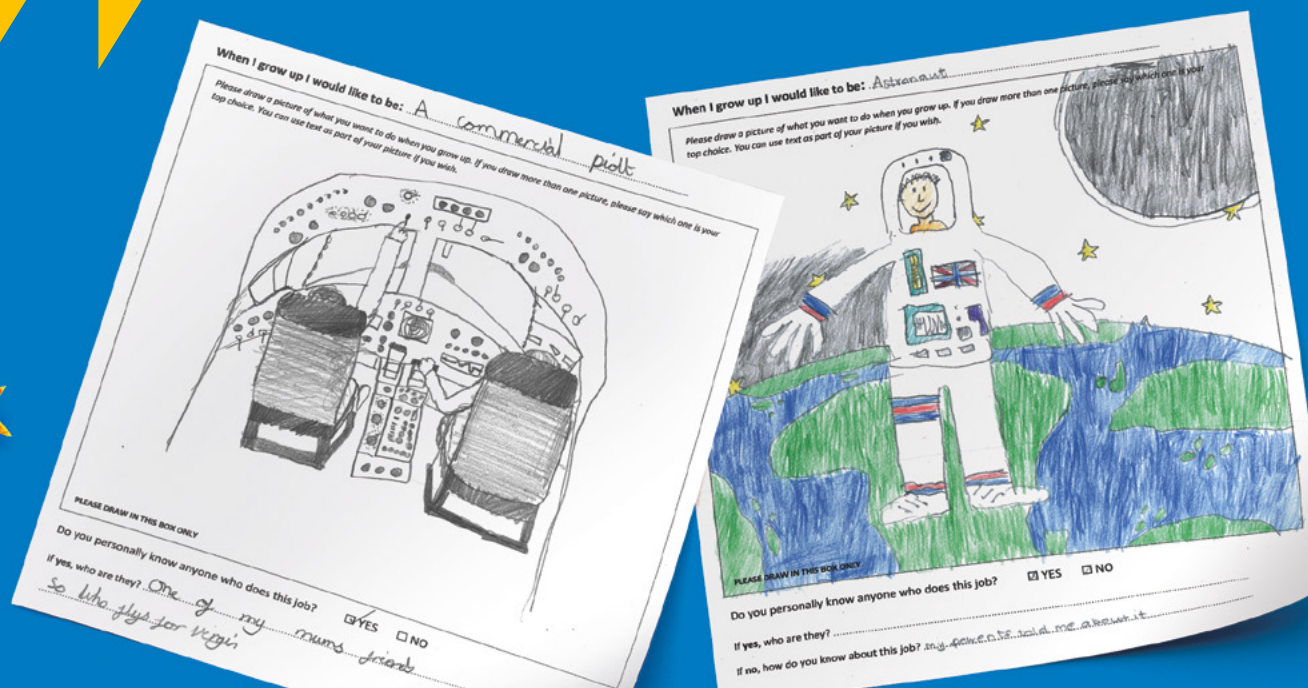


Nick Chambers
Chief Executive Officer
Education and Employers



GLOBALISATION

It's a small world



Everywhere on earth, people are on the move. Air transport of passengers worldwide has steadily increased from just over 300 million in 1970 to almost 4.1 billion in 2017. The expansion of air networks is the result of liberal air regulations and the rise of low-cost carriers. Air freight (the transport of goods by plane) too has increased over twelve-fold since 1970.

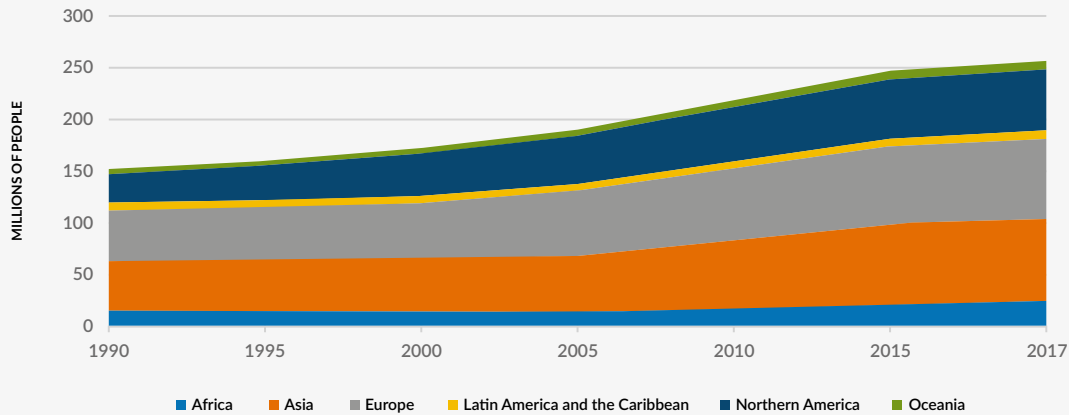
These numbers are expected to keep rising, with the strongest growth coming from Latin America and Asia. Although OECD countries still account for over half of all air transport, their share of the total has declined over time. Newly advanced economies, including those of Brazil, Russia, India and China, have contributed massively to the recent growth of air transport.

International migration has soared over the past decades too. People cross borders for different reasons – to flee conflict, to seek a better life, to preserve ties to their culture of origin, or to study. Between 1990 and 2017, the total number of international migrants grew from 153 to 258 million people, an increase of 69%. Today, international migrants account for just over 3% of the world's population.

With global mobility on the rise, classrooms are becoming ever more diverse. How can education systems better prepare for the inflow of students from various backgrounds, socio-economic classes and cultures? Are our education and labour systems able to adequately recognise prior learning and qualifications?

More people on the move

Estimates of international migrant stock by region of destination, 1990-2017

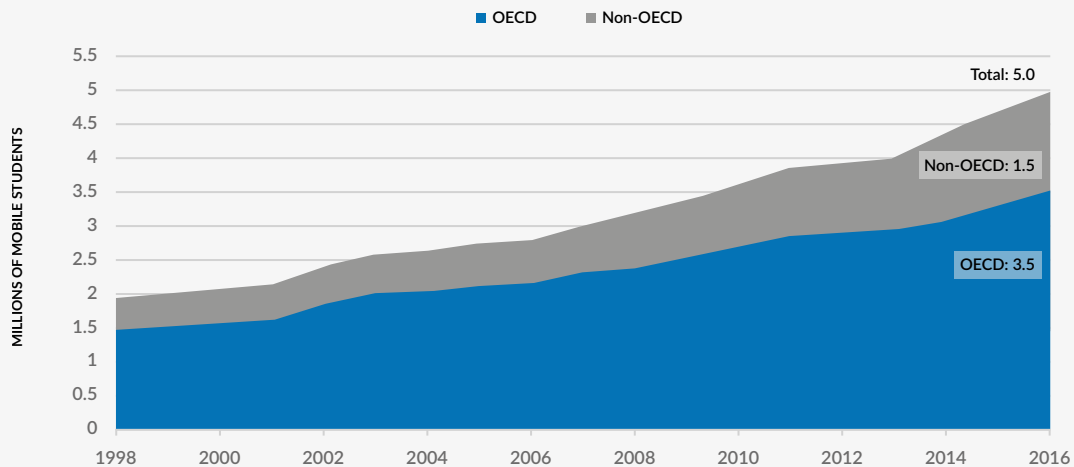


Note: Northern America includes Bermuda, Canada, Greenland, Saint Pierre and Miquelon, USA and Mexico.

Source: Trends Shaping Education, OECD 2019 (UN data).

Growth in international or foreign enrolment in universities worldwide (1998 to 2016)

Number of foreign students enrolled in OECD and non-OECD countries



Source: OECD/UIS/Eurostat (2018).

ENVIRONMENTAL SECURITY

A change in the weather



The impact of climate change is already seen in higher temperatures, rising sea levels and more frequent extreme weather events. The number and severity of natural disasters recorded per year has been steadily rising over the past century. 2018 saw hurricanes, floods, droughts and wildfires take thousands of lives.

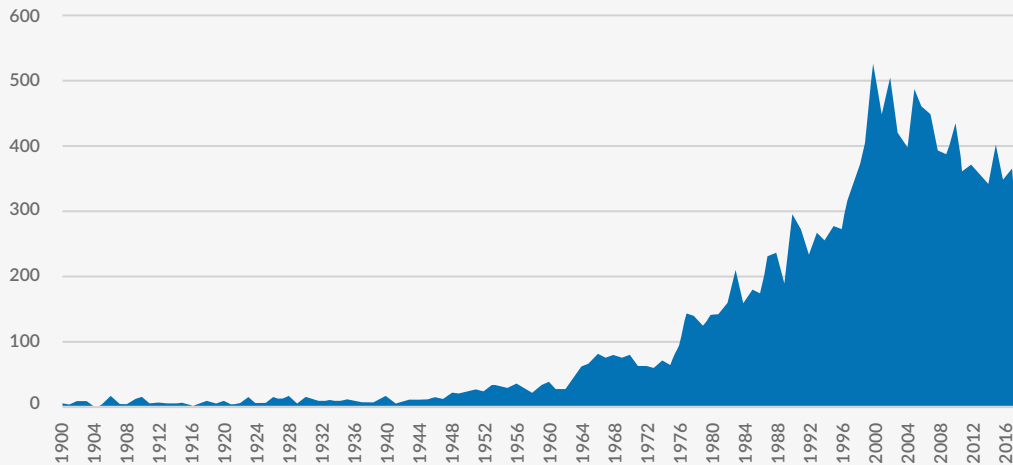
But efforts to mitigate climate change may be bearing fruit, for example in the growing use of renewable energy, and in students' greater awareness about environmental issues. In addition to limiting climate change, it will be increasingly important to build resilience

so that our economies and societies can withstand environmental shocks and bounce back from them as quickly as possible.

How can education systems help young people develop a greater awareness of the connections between their daily decisions and possible long-term consequences, not just for themselves but for society as a whole? What kinds of jobs will a more environmentally sensitive economy need, and what is the best way to prepare students for them?

Natural disasters worldwide

Number of recorded events, 1900-2018

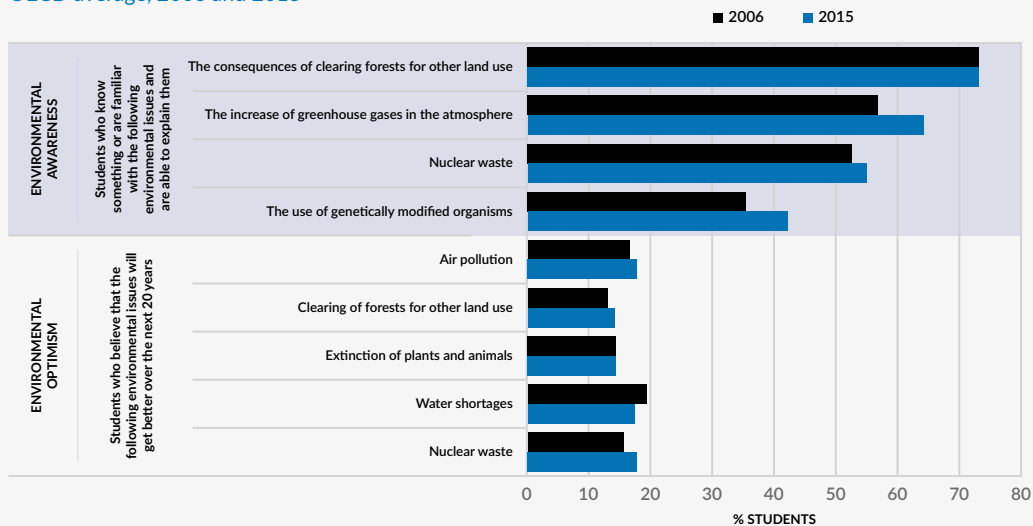


Note: Includes those from drought, floods, biological epidemics, extreme weather, extreme temperature, landslides, dry mass movements, extra-terrestrial impacts, wildfires, volcanic activity and earthquakes.

Source: Trends Shaping Education, OECD 2019 (Emergency Events Database).

Environmental awareness and optimism

OECD average, 2006 and 2015



Source: OECD, PISA Database.

DIGITALISATION

Data makes the world go round



In 2017, three out of four 16-74 year-olds who accessed the Internet used it daily or almost every day – to connect with friends and social networks, look up information or access a variety of online services, such as Internet banking. Digital engagement is generally higher among younger adults than among older ones, although the differences between age groups are less pronounced today than they were 10 years ago.

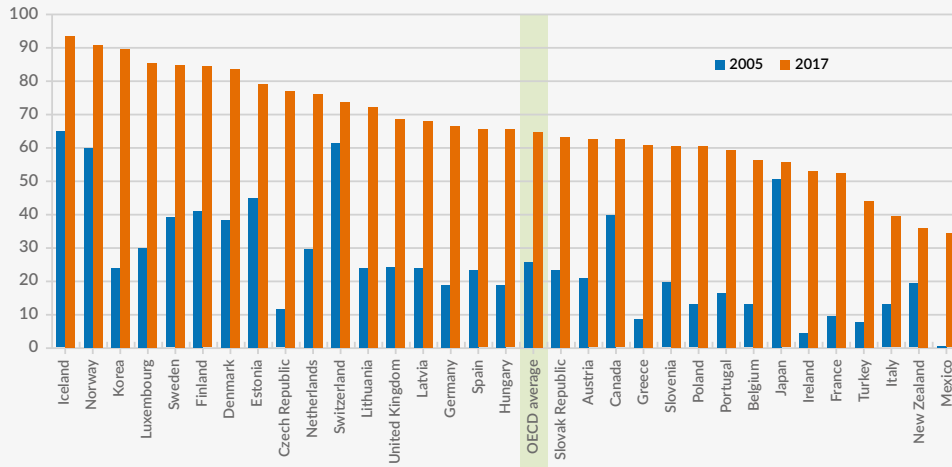
Digitalisation can challenge traditional assumptions of civic participation and public deliberation too. Over the past decade, the number of individuals reading or downloading the news on line increased by about 40% on average across OECD countries. By 2017, 65% of individuals used the Internet to keep up with the

news. Access to information at lower or even no cost is doubtless a positive trend; but it can be difficult to determine the quality and veracity of the information posted on the Internet. Search algorithms, which tailor their findings to individual interests, and the growth of social networking platforms, like Facebook and Twitter, mean that people are more likely to communicate in online echo chambers, associating with those who hold similar opinions and beliefs.

What are the media and digital literacy skills that citizens need to navigate through “digital” democracies? Is digital citizenship different from its traditional form?

Reading the news online: Is this for real?

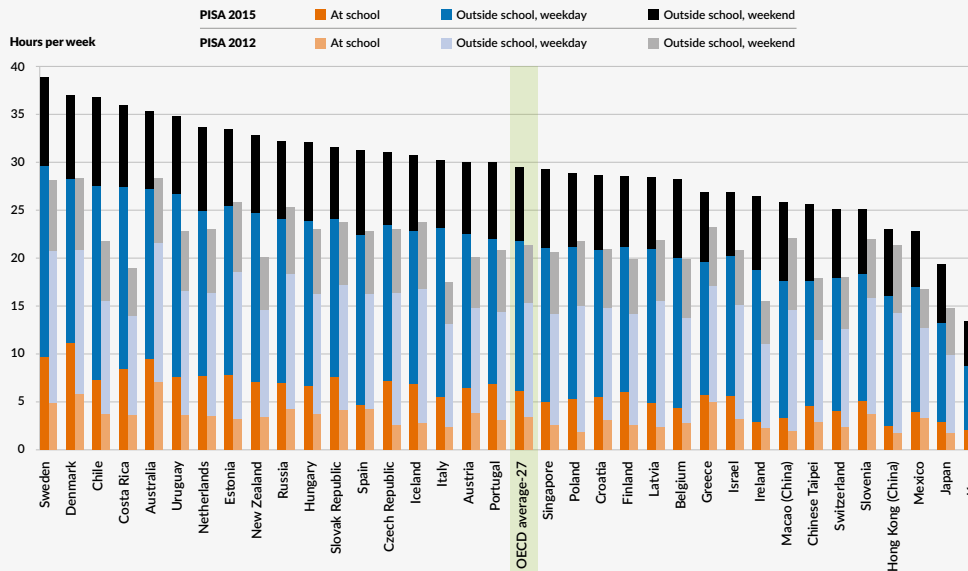
Percentage of individuals reading/downloading the news on line, 2005 and 2017



Note: Where the data for countries were not consistently available in the same years, figures from the closest year are used.

Source: Trends Shaping Education, OECD 2019 (OECD data).

Amount of time students spend on the Internet



Note: To obtain the weekly average, the response categories were recoded with the middle values (e.g. "31-60 minutes per day" was recoded as "45.5 minutes per day") and then multiplied by 5 if they refer to a school day and by 2 if they refer to a weekend day. Only countries and economies with comparable data from PISA 2012 and PISA 2015 are shown.

Source: OECD, PISA 2015 Database.

THE 4TH INDUSTRIAL REVOLUTION

New opportunities



Work has changed. Only a few decades ago, most work was not computer-based. But the use of information and communication technologies per hour worked more than doubled across most OECD countries between 1995 and 2014, and has only increased since then. The way work is organised is changing too, as remote working is now possible for more and more people. At the same time, the rise of the “gig economy” means that work is no longer tied to a steady job. In 28 out of 33 OECD countries where data were available, labour market insecurity rose between 2007 and 2015, meaning that the expected loss in earnings associated with potential unemployment went up, on average.

This insecurity is likely to be exacerbated by the progress made in artificial intelligence (AI). Machines that are able to perform cognitive tasks are expected to become especially important in key sectors, such as healthcare (cancer detection), transport (driverless cars) and the environment (smart energy consumption). The growth

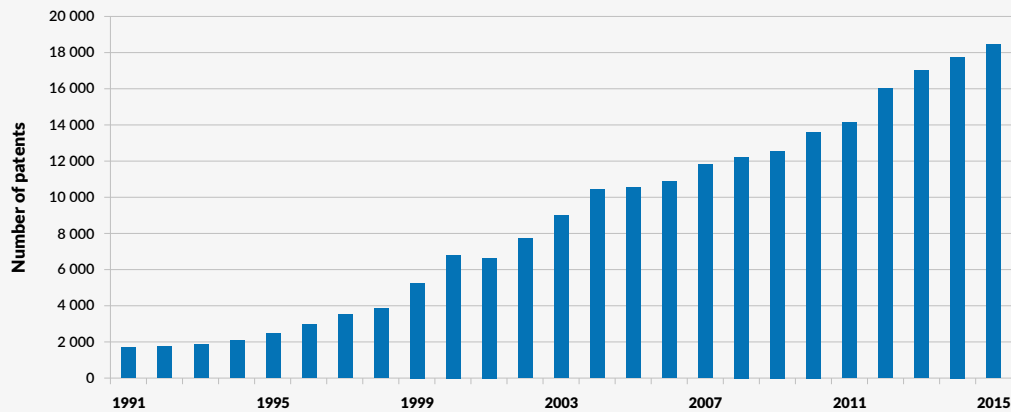
of AI technologies, measured by inventions patented in the top five international patent offices, increased by an average of almost 11% annually between 1991 and 2015.

What does all of this mean for young people? Among other things, it implies that a familiarity with technology, mathematics and science would be useful for many jobs they might do later on. But the Drawing the Future survey and PISA both show that children’s socio-economic background and gender have an effect on their career aspirations. Gender stereotyping is particularly evident when it comes to science careers. Though both girls and boys may expect to work in a science-related career, they tend to see themselves in very different fields.

Increasing competition in global research fuels the push for countries to constantly innovate to maintain their competitive position. Does education foster and value the creativity necessary to be innovative?

The growth of AI technologies

Number of patents in artificial intelligence technologies, 1991-2015

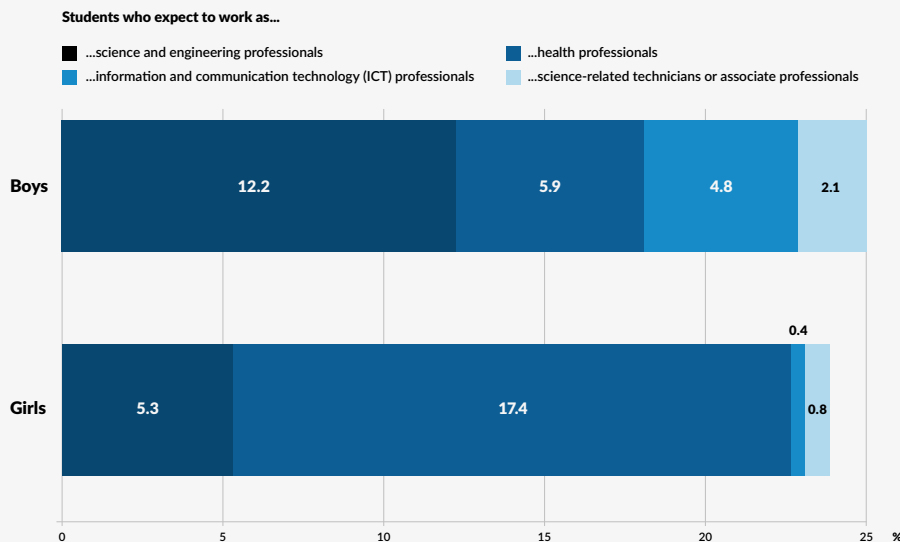


Note: Data refer to the number of IP5 patent families in artificial intelligence (AI), by filing date and inventor's country, using fractional counts. AI refers to the "Human interface" and "Cognition and meaning understanding" categories in the ICT patent taxonomy as described in Inaba and Squicciarini (2017). 2014 and 2015 figures are estimated based on available data for those years.

Source: *Trends Shaping Education*, OECD 2019 (OECD data).

Expectations of science-related careers among boys and girls

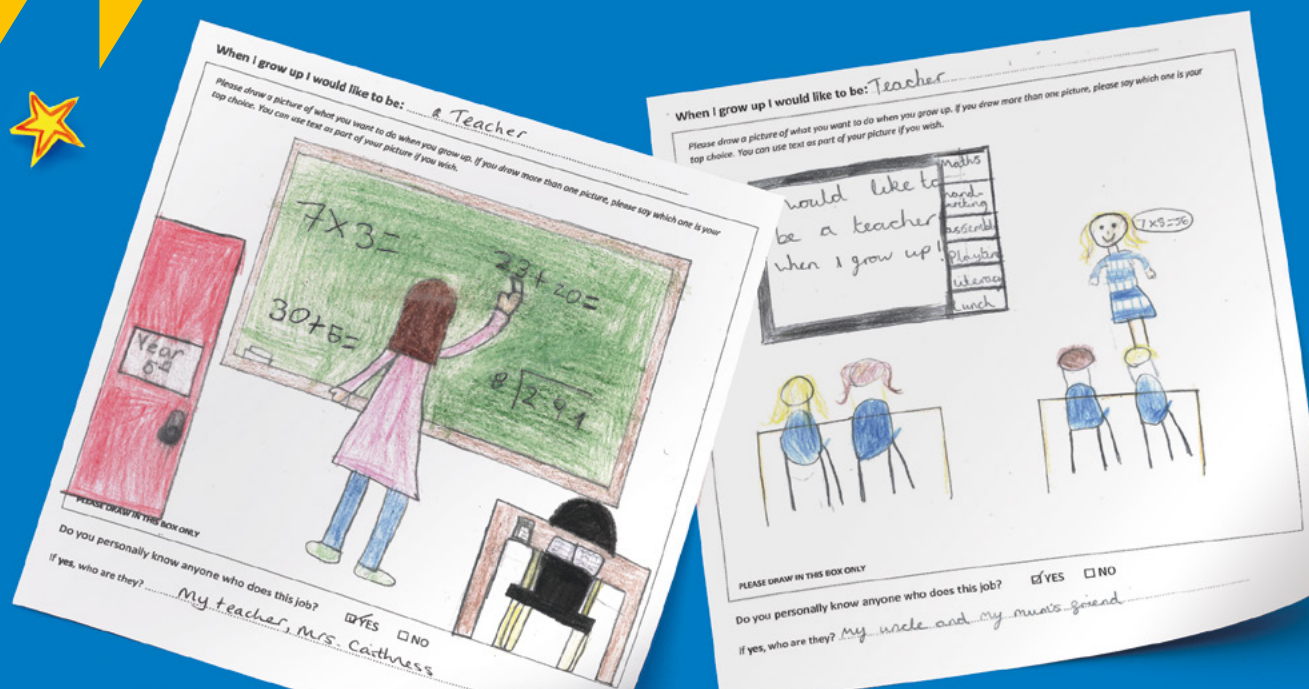
OECD average



Source: OECD, PISA 2015 Database, Tables I.3.11a-d.

LIFELONG LEARNING

Learning to work, working to learn



Although the average retirement age in OECD countries has remained relatively stable since 1970, longer life expectancy has increased the amount of time in retirement, from an average of 13 years (for women and men) in 1970 to 20 years in 2015. This threatens the financial sustainability of pension systems. As a result, many countries have discontinued early retirement policies and raised the official retirement age. Some have introduced flexible or partial retirement schemes, or created automatic-adjustment mechanisms for increases in life expectancy. These are intended to enable older workers to remain active in the workforce by reducing their working time and compensating lost income with benefits or a partial pension.

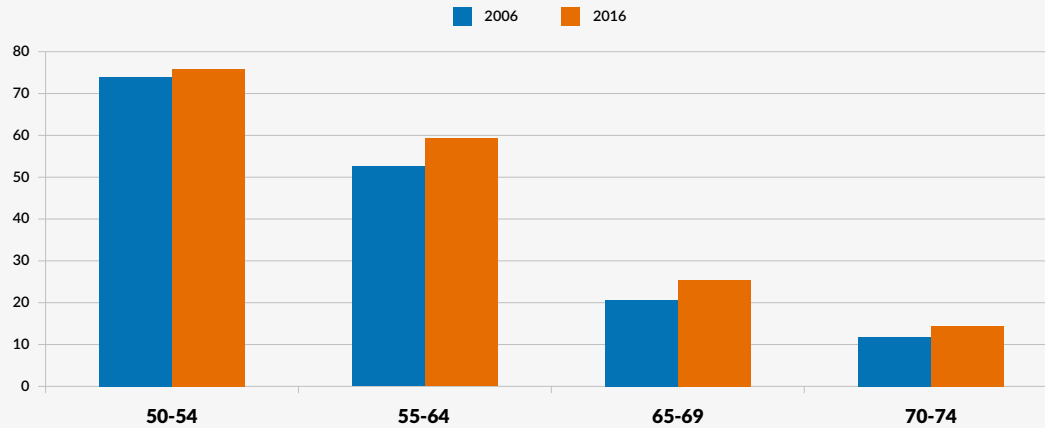
Indeed, between 2006 and 2016, the effective labour market

exit age rose from 62 to about 64 years, on average across OECD countries. At the same time, employment rates for individuals aged 55 to 64 increased from 53% to 59%, and for those aged 60 to 69, from 20% to almost 26%. There was even a modest, 3% increase in workers aged 70 to 74 during the period. It is becoming increasingly essential for governments and employers to offer training programmes to maintain and improve workers' skills throughout their careers. Linear career paths, and clear distinctions between working and non-working time might be things of the past – and not only for older people.

Longer working lives and rapidly changing skill demands increase the need for continuous learning throughout life. Should some form of lifelong learning be compulsory? Should lifelong learning be a right?

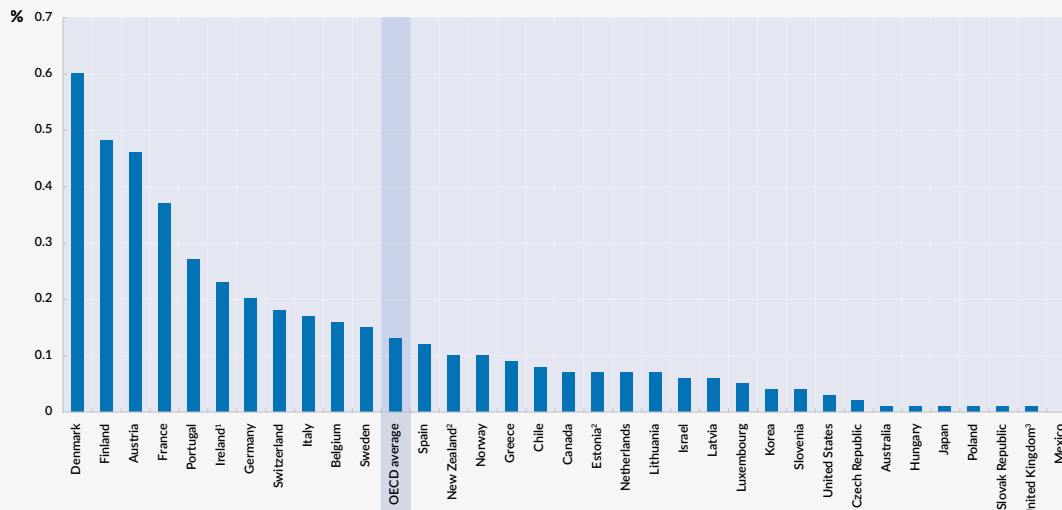
Working later in life

Senior and elder (50-74 years) labour participation rates (% of the age group), 2006 and 2016



Source: Trends Shaping Education, OECD 2019 (OECD data).

Public expenditure on training programmes for the unemployed as a percentage of GDP (2015)



¹ In 2016 Ireland produced a modified GNI (GNI*) that was recommended by the Economic Statistics Review Group and is designed to exclude globalisation effects that are disproportionately impacting the measurement size of the Irish economy.

² Reference year is 2014.

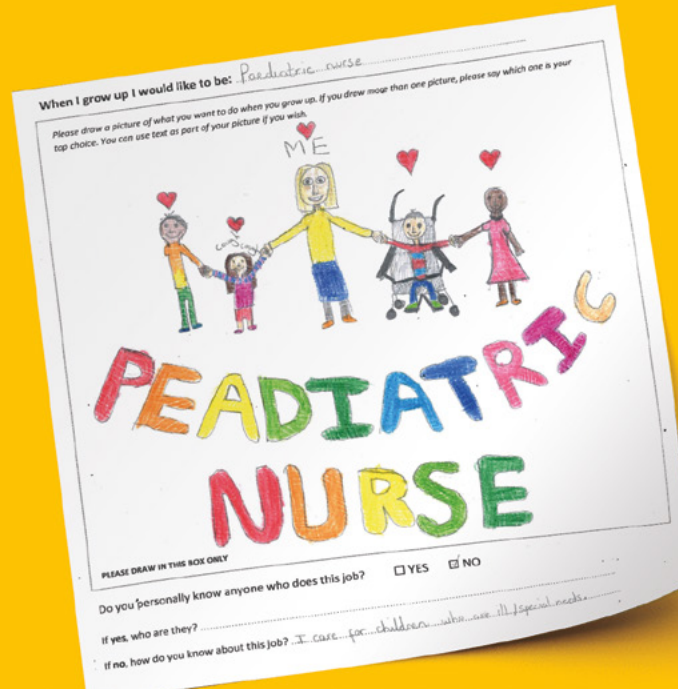
³ Reference year is 2011.

Notes: Countries are ranked in descending order of public expenditure on training programmes as part of active labour market programmes as a percentage of GDP. Lithuania was not a member of the OECD at the time this graph was prepared. Accordingly, Lithuania does not appear in the list of OECD members and is not included in the zone aggregates.

Source: OECD (2018), Labour Market Programmes; Public expenditure and participant stocks on LMP.

COLLABORATION AND CO-OPERATION

Working together to create new opportunities



Since the 1960s, many western democracies have moved towards a multicultural accommodation of increasing ethnic, religious and linguistic diversity. The logic of minority-rights protection is not restricted to immigrant communities. In fact, it is not even restricted to minorities. Since the early 1990s, an increasing number of countries worldwide have adopted laws to ensure equal representation for women in national parliaments, either by setting up candidate gender quotas or reserving seats for women in parliament.

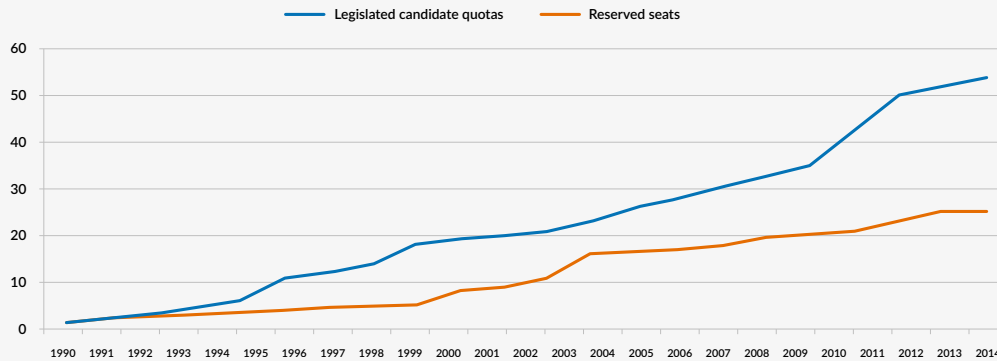
To thrive in increasingly diverse classrooms and workplaces, students and workers need to be able to collaborate with others who might not look or think like them, or share their beliefs.

Changing demographics, and a greater emphasis on teamwork, both in school and at work, mean that social skills are becoming more highly prized in society – and more essential to acquire at the youngest possible ages.

In a world in which most people will have to collaborate with people from different cultures, do education systems have an obligation to help young people learn how to appreciate a range of ideas and perspectives – some of which may be far from their own?

Objective: 50/50

Number of countries with laws defining gender quotas in national legislatures worldwide, 1990 – 2014

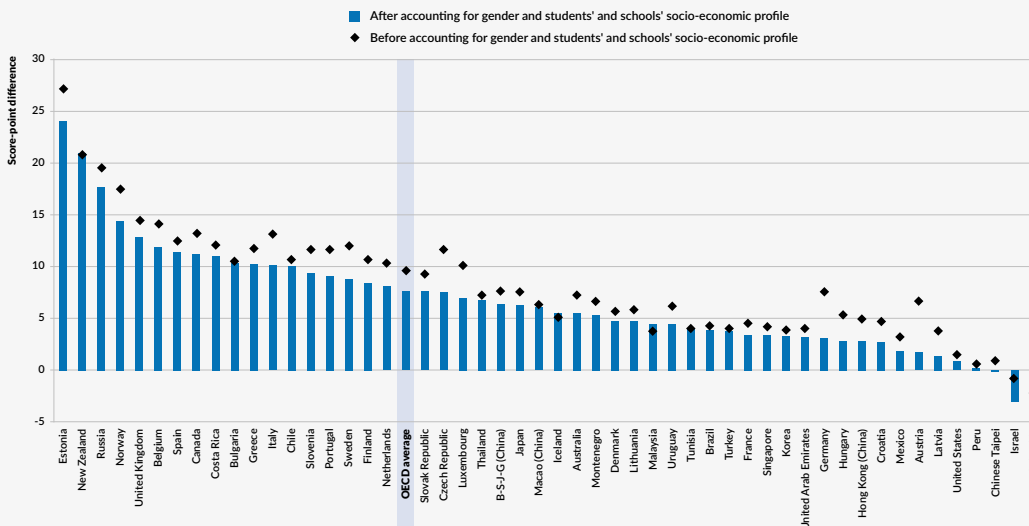


Note: The figure includes only quotas introduced at the national level. It does not include voluntary party quotas because the adoption year varies across parties in a given country.

Source: Trends Shaping Education, OECD 2019 (World Bank data).

Taking into account others' interests and performance in collaborative problem solving

Difference in collaborative problem-solving performance between students who agreed/strongly agreed with the statement "I take into account what others are interested in" and those who disagreed/strongly disagreed with that statement, after accounting for performance in science, reading and mathematics.



Notes: B-S-J-G (China) refers to Beijing-Shanghai-Jiangsu-Guangdong (China). Countries and economies are ranked in descending order of the score-point difference between students who agreed/strongly agreed with the above statement and students who disagreed/strongly disagreed, after accounting for gender and students' and schools' socio-economic profile.

Source: OECD, PISA 2015 Database, Table V.5.2d.



GET READY

Linking the world of school with the world of work



Some 59% of the 7-11 year-olds who participated in the Drawing the Future survey said that they had heard about their preferred job from parents/guardians or other family members. Of those who didn't know someone who did the job, 56% heard about it via TV/film and social media. Less than 1% heard about it from someone who did the job and had visited their school. PISA also finds that while most 15-year-olds already have an idea about the kind of work they want to do later on, one in three students cites one of only 10 occupations.

The survey also revealed that the career aspirations of 7-11 year-olds have little in common with projected labour market demands. One could argue that this is not a cause for concern as children should not be encouraged to choose careers at such a young age. But the mismatch between the jobs they preferred and those required in the labour market is similar to that found in another Education and Employers study. That study, entitled *Nothing in Common*, mapped the career aspirations of 11 000 17-18 year-olds in the United Kingdom against jobs in different economic sectors. It showed that

there was statistically “nothing in common” with adolescents' career aspirations and projected labour market demand. It also found that these young people's aspirations reflected a narrow view of the world of work.

But we can do something about this. Technology now allows us to give all children, regardless of their social background, where they live or the jobs their parents do, the same chance to meet people – if not in person, then via the Internet – who do all kinds of jobs, to help them understand the vast array of opportunities open to them. It is also essential that employers and educators work far more closely together to help broaden young people's horizons, raise their aspirations, and provide them with the vital work-related knowledge and skills that will help them as they make the transition from school to work. Not only will these kinds of efforts give young people the best possible start in life, they will reduce mismatch between young people's aspirations and the demands of the labour market, thereby ensuring that we have a workforce that will secure our economic prosperity in the future.

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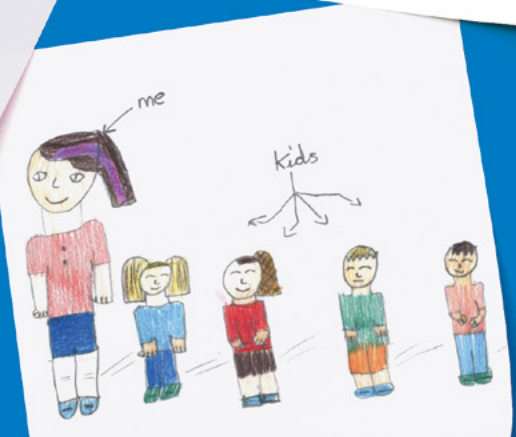
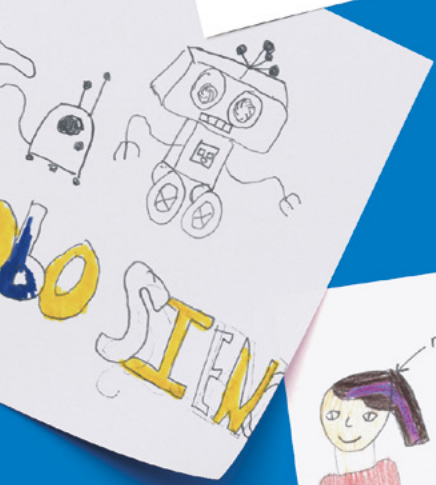
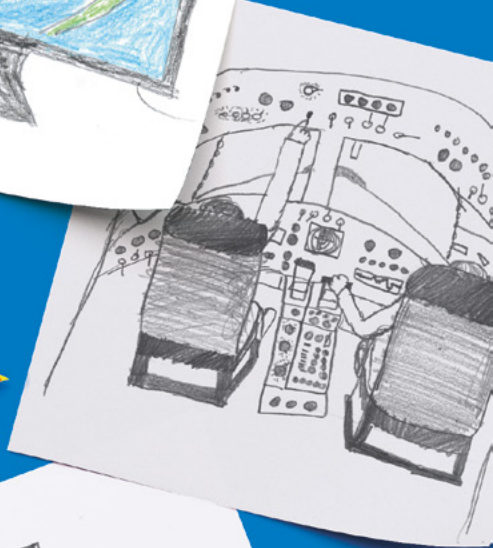
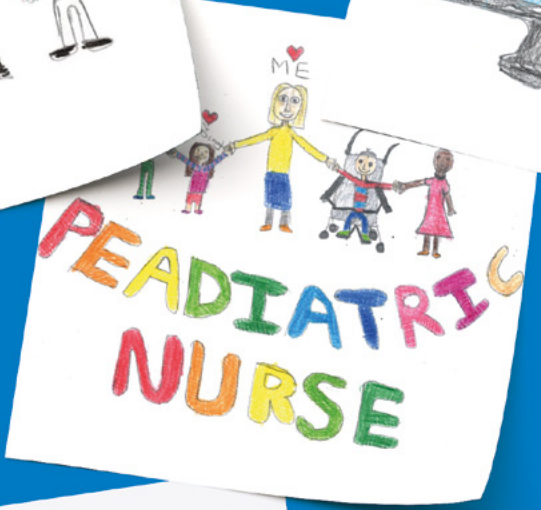
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