

## Chapter 11.

### Innovation in access and use of learning resources

*This chapter presents the change in the availability of learning resources for students in school or in their classroom. The learning resources include school libraries, reading corners and computers. The change within countries is presented as an increase or decrease in the share of students exposed to the practice. The percentage point change is also expressed as a standardised effect size in the final table.*

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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.

## 61. Availability of science laboratory for students

### Why it matters

Hands-on science education requires some form of science laboratory where students can experiment. Those exist in almost all secondary schools, but only in some primary schools. While useful, school laboratories may be replaced by outdoor experiments in some instances or by remote or virtual laboratories. Their very existence incentivises teachers to use them for science education though, which makes them very convenient in spite of the availability of other learning solutions to teach well in science.

### Primary education

#### Change at the OECD level: small

Across the OECD area, negative changes slightly outweigh positive ones and the share of 4th grade students having access to a science laboratory at school decreased by 1 percentage point on average. Between 2007 and 2015, the average absolute change in the availability of this resource was 8 percentage points, corresponding to a small effect size of 0.2. In 2015, there were big differences across OECD countries in this domain: while primary schools in Korea and Japan have a science laboratory available for almost all 4th grade students, practically no school in Northern Ireland reported to have any.

#### Countries where there has been the most change

Poland experienced the largest increase in this domain (59 percentage points), followed by the Russian Federation and Portugal (over 20 percentage points). By contrast, access to science laboratories significantly dropped in several countries, with declines by 24 percentage points in Denmark and by 22 percentage points in Turkey, Hungary and Ontario (Canada). (Some of these changes were measured between 2011 and 2015 instead of between 2007 and 2015.)

### Secondary education

#### Change at the OECD level: small

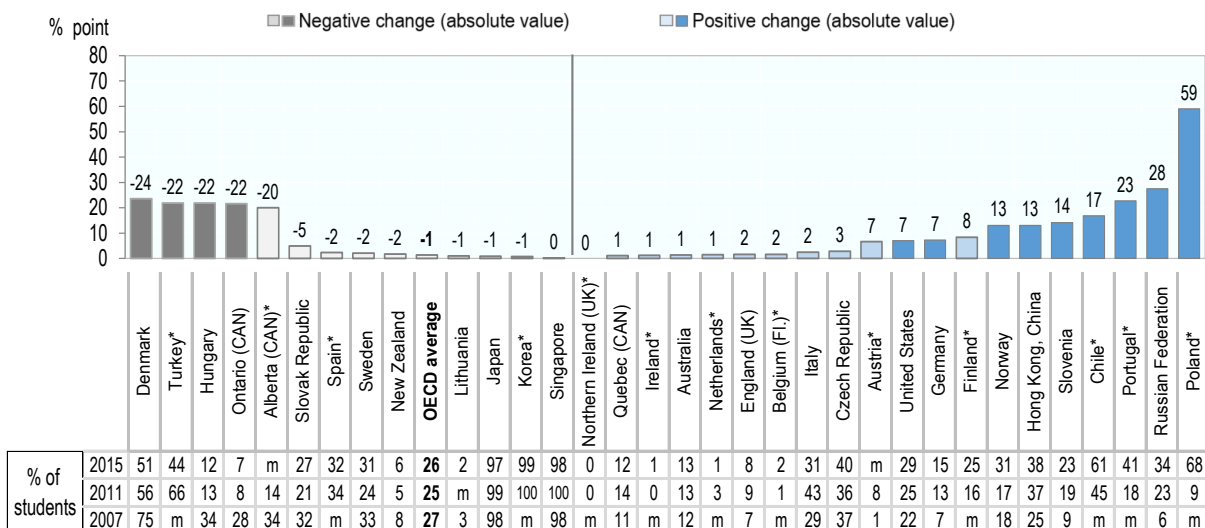
Between 2007 and 2015, the share of 8th grade students with access to a science laboratory at school decreased by 2 percentage points on average in OECD systems. Only a small number of countries innovated in this domain and the absolute change in the access to this resource amounted to 3 percentage points, corresponding to a small absolute effect size of 0.12. At the OECD level, on average 81% of secondary students had access to a science laboratory at school in 2015.

#### Countries where there has been the most change

Between 2007 and 2011, Minnesota (United States) recorded a 16-percentage point increase in the share of 8th grade students with access to a science laboratory at school. In the same way, the Russian Federation saw an increase of 13 percentage points between 2007 and 2015. Reductions in the availability of this resource were generally small. Only students in Hungary experienced a decrease by over 10 percentage points.

**Figure 11.1. 4th grade students with access to a science laboratory at school**

Change in and share of students who have access to a science laboratory at school, 2007-2015, school principals report

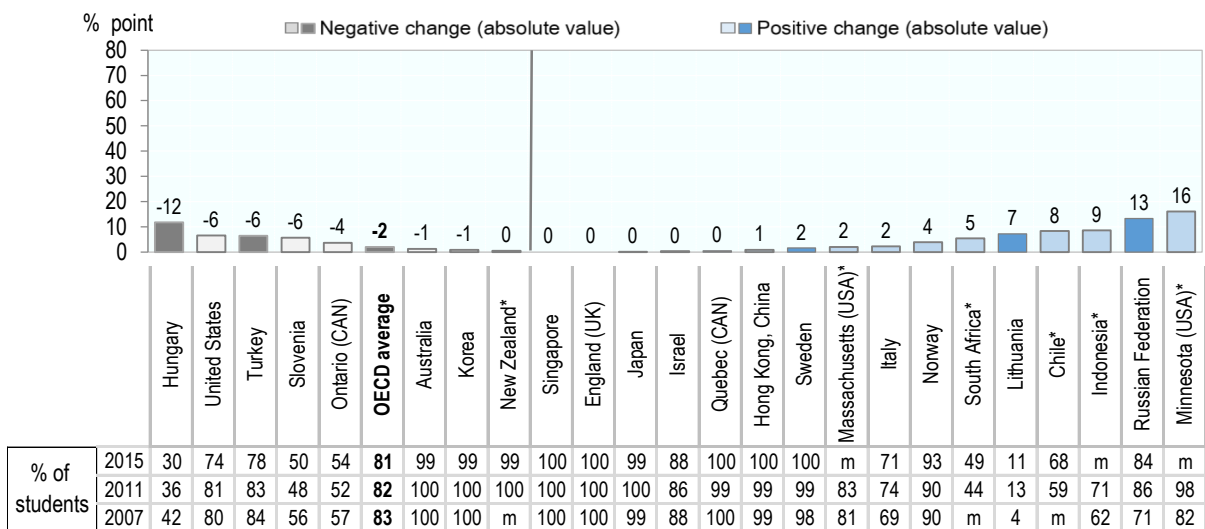


Note: Darker tones correspond to statistically significant values.  
 \* refers to calculations based on other years, based on data availability.  
 The OECD average is based on OECD countries with available data in 2007, 2011 and 2015.  
 Source: Authors' calculations based on TIMSS Databases.

StatLink <https://doi.org/10.1787/888933905322>

**Figure 11.2. 8th grade students with access to a science laboratory at school**

Change in and share of students who have access to a science laboratory at school, 2007-2015, school principals report



Note: Darker tones correspond to statistically significant values.  
 \* refers to calculations based on other years, based on data availability.  
 The OECD average is based on OECD countries with available data in 2007, 2011 and 2015.  
 Source: Authors' calculations based on TIMSS Databases.

StatLink <https://doi.org/10.1787/888933905341>

## 62. Availability of a school library

### Why it matters

A school library is an important learning and school resource, notably if librarians can support teachers in curating their teaching materials and support students in learning to access information. The quality of the available resources within the library and its use certainly make more difference to student learning and socialising, but ideally one would still want to see such a resource in schools, especially for students who have less access to culture and information at home.

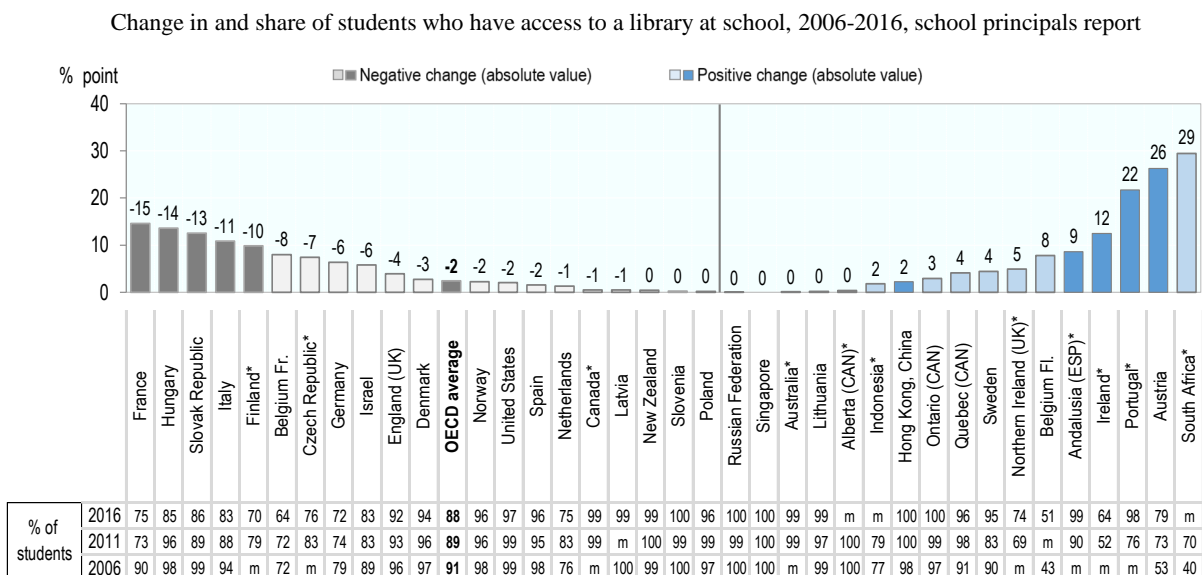
### Change at the OECD level: moderate-low

OECD systems have experienced differing trends, although on average the net availability of school libraries in primary education has slightly decreased by 2 percentage points between 2006 and 2016. All country-level variations lead to an average absolute change of 6 percentage points, corresponding to a moderate-low effect size of 0.22. At the OECD level, on average 88% of 4th grade students have access to a library at school, ranging from 64% in Ireland to 100% in Slovenia in 2016.

### Countries where there has been the most change

Between 2006 and 2016, widened access to school libraries in primary has been an innovation in Austria, where the share of students concerned expanded by 26 percentage points. Students in South Africa experienced an even more prominent increase of 29 percentage points between 2006 and 2011. On the contrary, decreased access exceeded 10 percentage points in France, Hungary, the Slovak Republic and Italy.

Figure 11.3. 4th grade students with access to a school library



Note: Darker tones correspond to statistically significant values;

\* refers to calculations based on other years, based on data availability.

The OECD average is based on OECD countries with available data in 2006, 2011 and 2016.

Source: Authors' calculations based on PIRLS Databases.

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### 63. Availability of a library or a reading corner in the classroom

#### Why it matters

Classrooms with a library or reading corner makes it easier to introduce small group work, to let students read books of their choice, to work on an assignment as other students are (still) engaged in another activity, or just to read for entertainment. This may also create a cosy atmosphere in the classroom and make reading and learning resources more easily available and pleasurable for the students.

#### Change at the OECD level: moderate-low

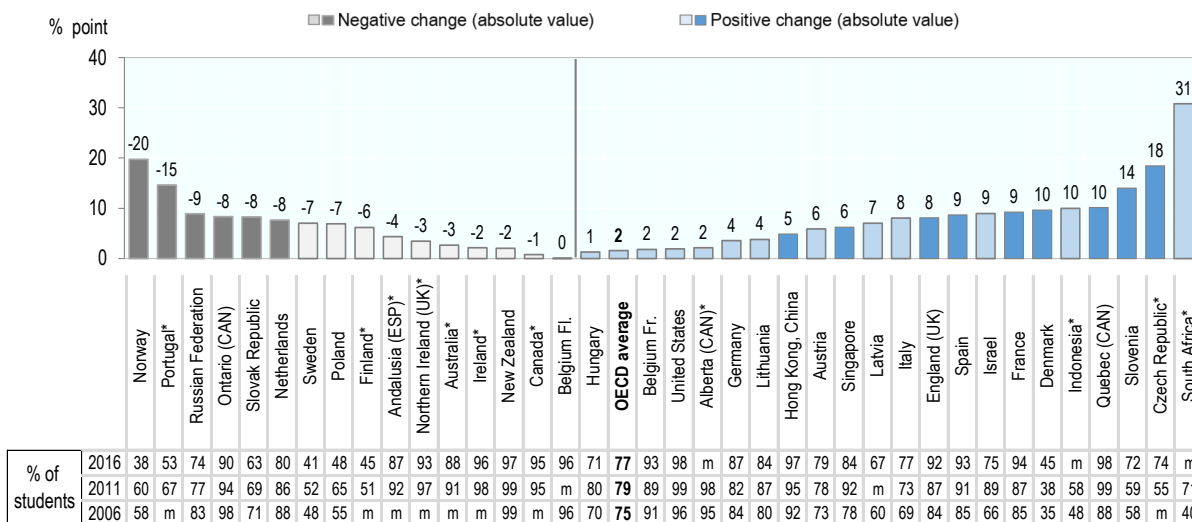
OECD countries experienced both increases and reductions in the share of 4th grade students with access to a library or reading corner in the classroom, while overall the net OECD average rose by 2 percentage points. Positive and negative changes combined resulted in a modest average absolute change of 8 percentage points, corresponding to an effect size of 0.21. On average, in 2016, three in four primary (77%) students had access to a library or reading corner in the classroom in OECD systems.

#### Countries where there has been the most change

The practice gained significant ground in South Africa and Czech Republic, with prominent increases of 31 and 18 percentage points in the availability of this resource, between 2006-2011 and 2011-2016 respectively. Conversely, students in Norway experienced a notable decrease by 20 percentage points between 2006 and 2016.

Figure 11.4. 4th grade students with access to a library or reading corner in the classroom

Change in and share of students who have access to a library or a reading corner in the classroom, 2006-2016, teachers report



Note: Darker tones correspond to statistically significant values;  
 \* refers to calculations based on other years, based on data availability.  
 The OECD average is based on OECD countries with available data in 2006, 2011 and 2016.  
 Source: Authors' calculations based on PIRLS Databases.

## 64. Allowing students to borrow books from the classroom library

### Why it matters

Allowing students to borrow books from the classroom library signals that the classroom library has enough materials to allow students to borrow them. It may also give students responsibilities, and signal to them that they are trustworthy persons that can take care of books. Students themselves could even be in charge of the classroom library. One could in principle only applaud that students can borrow books from their classroom library.

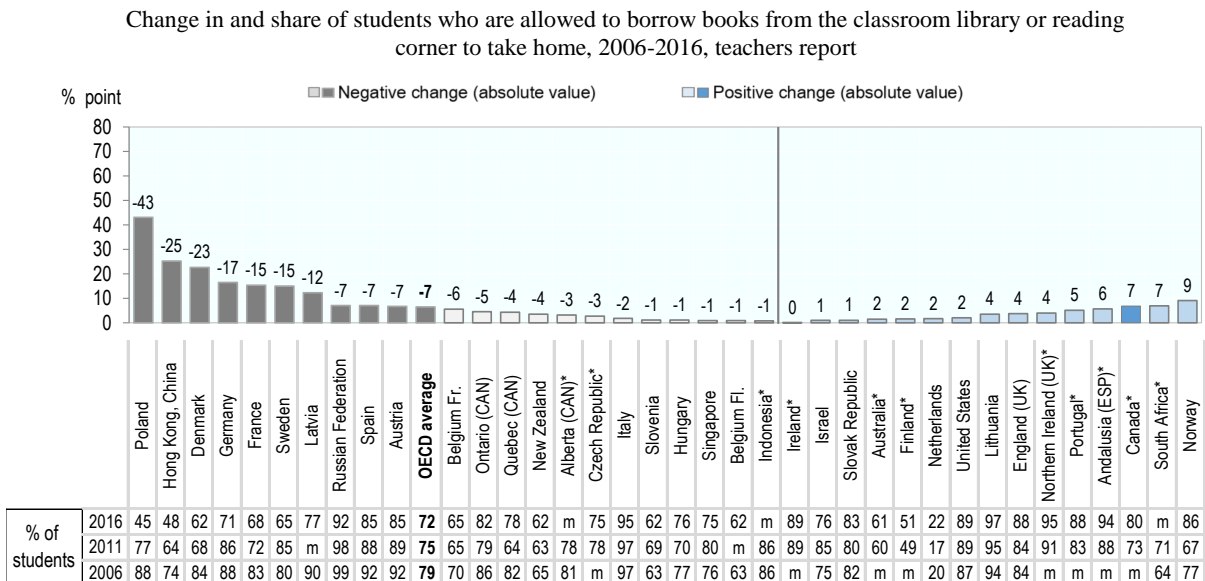
### Change at the OECD level: moderate-low

This practice has become a bit less common in OECD systems, with the average share of primary students allowed to borrow books from the classroom library going down from 79% to 72% between 2006 and 2016. Regardless of change direction, the absolute change was 8 percentage points, corresponding to a modest effect size of 0.21. Across OECD systems, in 2016, the extent to which 4th grade students could borrow books from the classroom library ranged from 22% in the Netherlands to 95% in Northern Ireland and Italy.

### Countries where there has been the most change

Innovation took the form of large decreases in the use of this practice. Poland experienced a significant reduction of 43 percentage points in the share of students given this possibility, followed by Hong Kong, China and Denmark with declines by over 20 percentage points both. No country in the sample registered an increase exceeding 10 percentage points, showing little innovation in that direction.

**Figure 11.5. 4th grade students borrowing books from the classroom library**



Note: Darker tones correspond to statistically significant values;

\* refers to calculations based on other years, based on data availability.

The OECD average is based on OECD countries with available data in 2006, 2011 and 2016.

Source: Authors' calculations based on PIRLS Databases.

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## 65. Frequency of use of computers or tablets in elementary schools

### Why it matters

The first wave of school digitalisation focused too much on computer availability rather than on their pedagogical use. While technology is just a medium for instruction, it sometimes allows teachers to do things that would not be possible without it, for example individualised real time feedback. As the relatively low frequency of computer and tablet use in primary schools remains stable, one can wonder whether this is a missed opportunity or not.

### Change at the OECD level: moderate

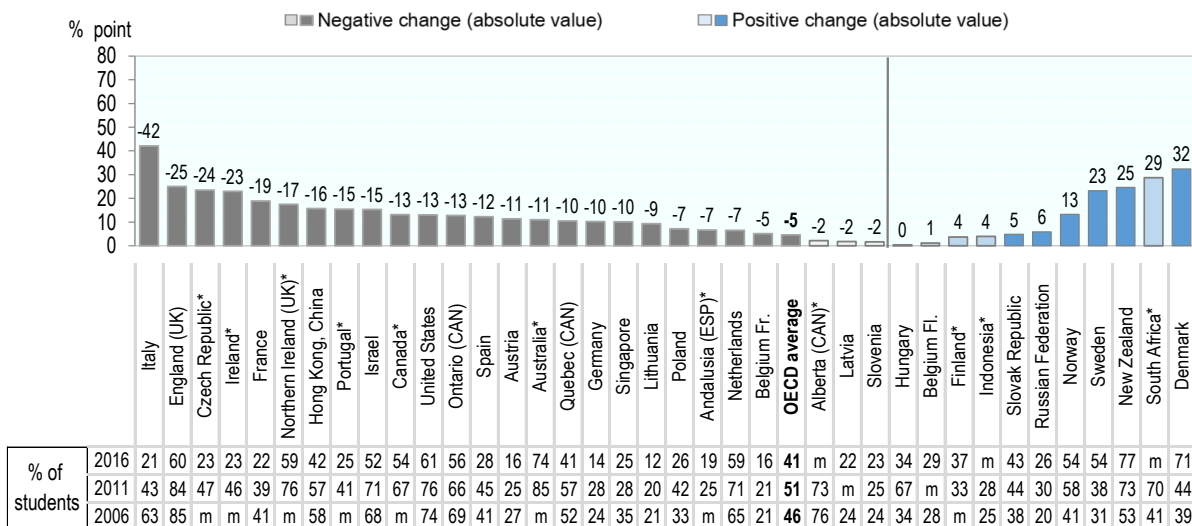
Between 2006 and 2016, the share of primary students using computers at least once a week has decreased in a majority of countries. In the OECD education systems covered, it has decreased by 5 percentage points on average. Negative and positive variations resulted in an average absolute change of 14 percentage points, corresponding to a moderate effect size of 0.31. In 2016, on average 41% of 4th grade students used computers at school at least once a week in OECD countries.

### Countries where there has been the most change

The share of primary students using regularly computers in Italy decreased by 42 percentage points between 2006 and 2016, followed by England where it declined by 25 percentage points. Conversely, Denmark registered a remarkable increase of 32 percentage points, as well as South Africa, New Zealand and Sweden, with increases above 23 percentage points.

**Figure 11.6. 4th grade students using computers at school**

Change in and share of students who use computers at school at least once a week, 2006-2016, students report



Note: Darker tones correspond to statistically significant values;  
 \* refers to calculations based on other years, based on data availability.  
 The OECD average is based on OECD countries with available data in 2006, 2011 and 2016.  
 Source: Authors' calculations based on PIRLS Databases.

StatLink <https://doi.org/10.1787/888933905417>

## 66. Students visiting a library other than their classroom library

### Why it matters

By nature, classrooms libraries have a limited amount of resources. It would thus be welcome that all students could visit another library: either their school library (if any) or any other library that could provide them with a socialising and learning space. This is a practice one would want to see universal, although online libraries may gradually give access to similar learning and reading resources.

### Change at the OECD level: moderate-high

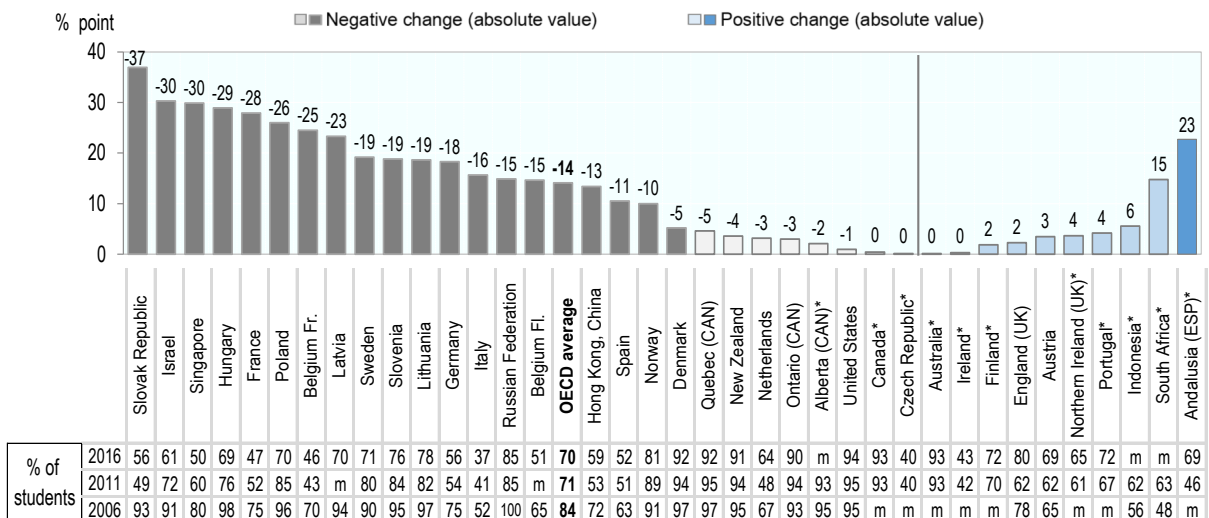
This activity has been reduced in most OECD countries, with 14% less of 4th grade students visiting at least once a month another library than their classroom library in 2016 compared to 2006. Combining the few positive changes to the numerous decreases, we reach an average absolute change of less than 15 percentage points corresponding to an absolute effect size of 0.38. Despite its decline, this practice remains common across OECD systems and concerns 70% of primary students on average. It is universal in the United States where 94% of students did so in 2016.

### Countries where there has been the most change

Innovation mainly took the form of a contraction of this activity. Between 2006 and 2016, the share of 4th grade students visiting external libraries on a regular basis decreased over 30 percentage points in the Slovak Republic, Israel and Singapore. Andalusia (Spain) and South Africa experienced the only two notable increases in this domain (23 and 15 percentage points respectively), in a shorter time period.

**Figure 11.7. 4th grade students visiting a library other than the classroom library**

Change in and share of students who visit a library other than a classroom library at least once a month, 2006-2016, teachers report



Note: Darker tones correspond to statistically significant values;

\* refers to calculations based on other years, based on data availability.

The OECD average is based on OECD countries with available data in 2006, 2011 and 2016.

Source: Authors' calculations based on PIRLS Databases.

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## 67. Access to desktop computers for students' use at school

### Why it matters

In a time where even students from disadvantaged backgrounds have a computer at home, access to desktop computers for student use at schools may be less important. Mobile phones, tablets, laptops, etc., may also have made desktop computers redundant. However, while access to computers may have become less of an issue, use of digital devices in school remains important for schools to be an integral part of our digital societies, whether these devices belong to the school or the students.

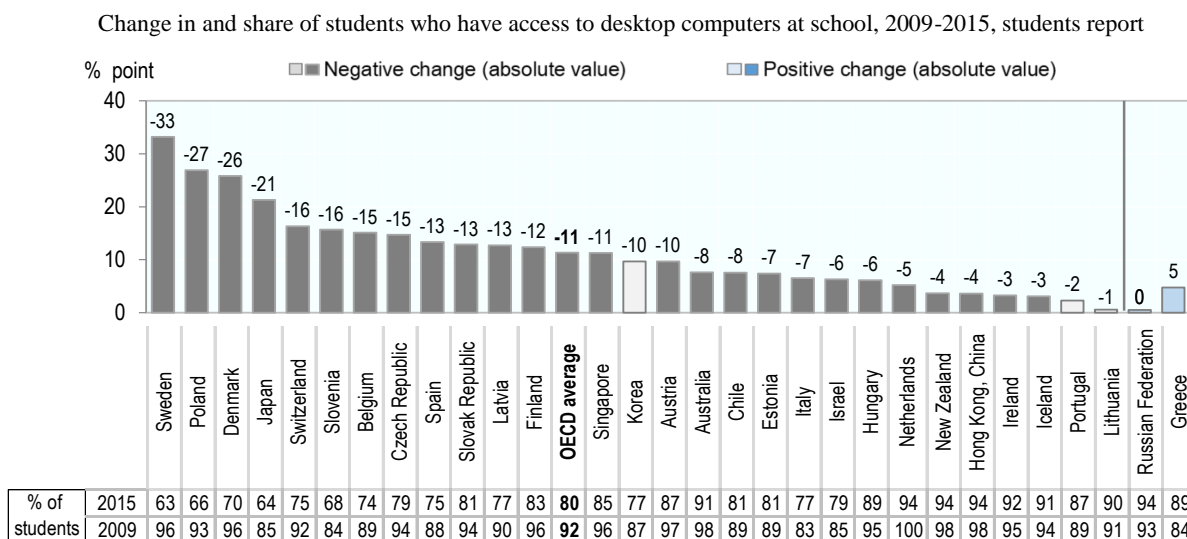
### Change at the OECD level: moderate

With the exception of Greece, all OECD systems covered experienced falling access to desktop computers in schools. Between 2009 and 2015, the share of 15 year old students with access to this resource at school decreased by 11 percentage points on average. The average absolute change was 12 percentage points, corresponding to a moderate effect size of 0.34. Despite the declining trend, in 2015, on average, 80% of students in the OECD area still had access to desktop computers in school.

### Countries where there has been the most change

Innovation took the form of important reductions in the availability of desktop computers in schools. Sweden stood out with a decline of 33 percentage points in the share of 15 year old students having access to desktop computers, as well as Poland and Denmark where access declined by 27 and 26 percentage points respectively.

**Figure 11.8. 15 year old students with access to desktop computers at school**



Note: Darker tones correspond to statistically significant values.

Source: Authors' calculations based on PISA Databases.

StatLink  <https://doi.org/10.1787/888933905455>

## 68. Availability of portable laptops or notebooks for use at school

### Why it matters

Digital technologies mainly reached schools through the availability of computers. Technology is now increasingly seen as “mobile” thanks to the availability of portable devices. While the availability of desktop computers has decreased over the past years, digitalisation is reflected by the availability of other forms of digital computing devices: laptops (or notebooks) are some of them. To produce good results, these devices need to support good pedagogical practices.

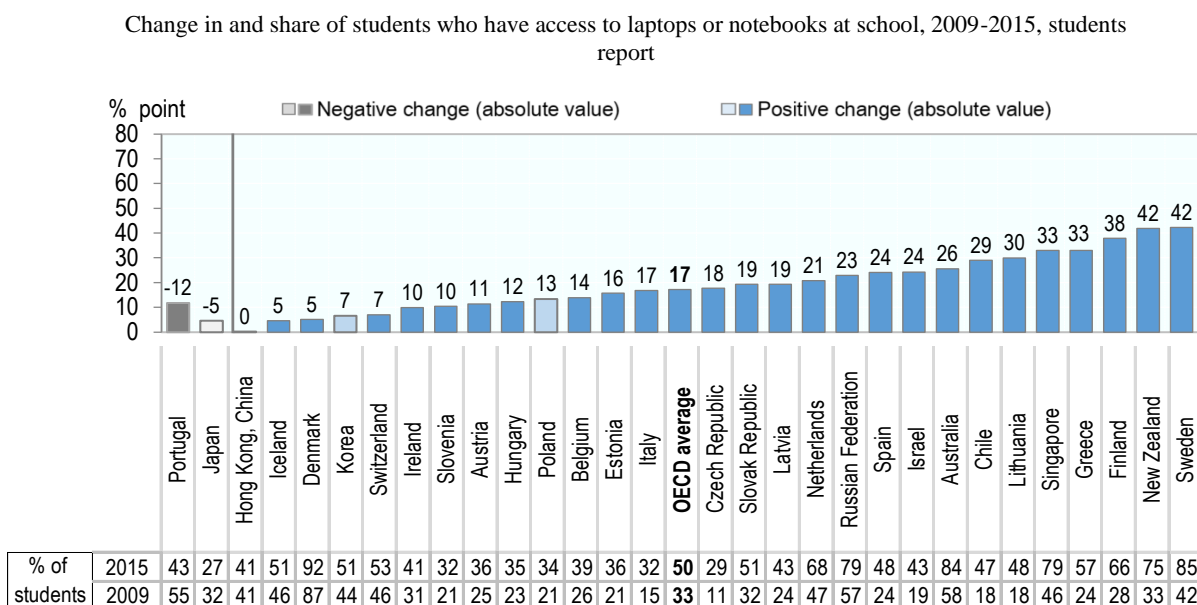
### Change at the OECD level: large

Among OECD countries, by and large, access to laptops and notebooks for students at school has scaled up. Between 2009 and 2015, the share of 15 year old students having access to these devices in their schools rose by 17 percentage points on average. The average absolute change amounted to 18 percentage points, corresponding to a large effect size of 0.40. While one in two secondary students had access to laptops at school on average in OECD countries, the span ranged from 92% in Denmark to 27% in Japan in 2015.

### Countries where there has been the most change

Increased access to laptops was a noticeable innovation in most countries. In Sweden and New Zealand, the share of students with access to laptops at school increased by 42 percentage points between 2009 and 2015. Finland, Greece, Singapore and Lithuania saw also significant increases above 30 percentage points. Only Portugal and Japan experienced declines in access (12 and 5 percentage points respectively).

**Figure 11.9. 15 year old students with access to laptops or notebooks at school**



Note: Darker tones correspond to statistically significant values.

Source: Authors' calculations based on PISA Databases.

StatLink <https://doi.org/10.1787/888933905474>

## 69. Availability of computers and tablets to use during reading lessons

### Why it matters

Computers and tablets can support reading in different ways, at the very least by providing students immediate access to the variety of digital texts and writing styles they are expected to learn to understand. Specific software can also support the learning of reading for children with difficulties, or allow for the personalisation of reading instruction.

### Change at the OECD level: very large

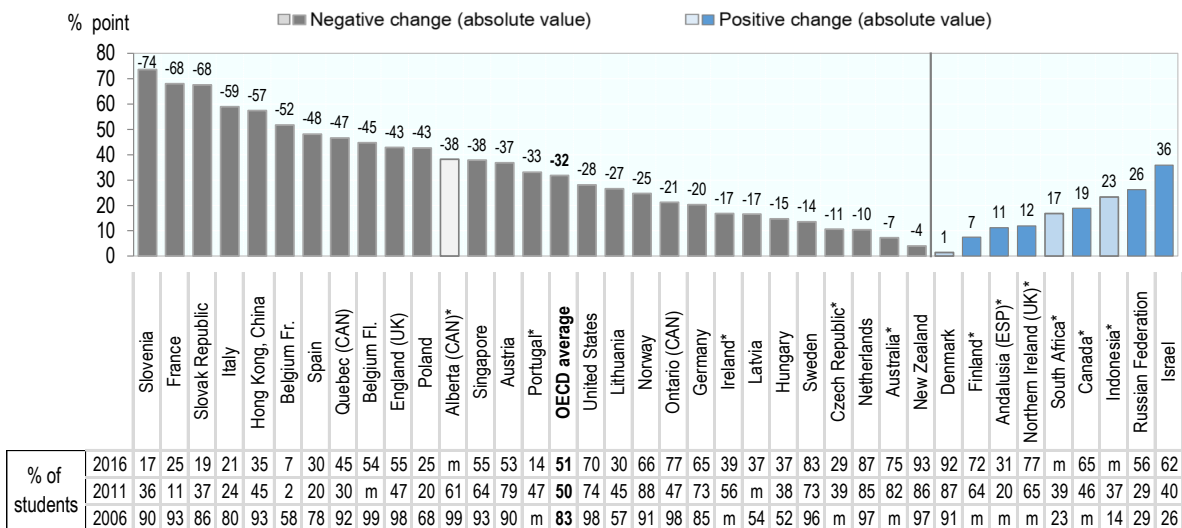
The share of students with computers available during 4th grade reading lessons has decreased by 32 percentage points on average in OECD education systems. The average absolute change was 35 percentage points, corresponding to a very large absolute effect size of 0.85. In 2016, 51% of primary students had a computer available during reading lessons, the span ranged from 93% in New Zealand to 7% in Belgium (Fr.).

### Countries where there has been the most change

The decline of computer availability in reading lessons was a significant innovation in many countries. The share of students having computers in reading lesson decreased by over 50 percentage points in Slovenia (74), France (68), the Slovak Republic (68), Italy (59), Hong Kong, China (57) and Belgium (Fr.) (52). Notable increases above 25 percentage points occurred in Israel and the Russian Federation.

**Figure 11.10. 4th grade students with computers or tablets available during reading lessons**

Change in and share of students who have computers or tablets available during lessons, 2006-2016, teachers report



Note: Darker tones correspond to statistically significant values;

\* refers to calculations based on other years, based on data availability.

The OECD average is based on OECD countries with available data in 2006, 2011 and 2016.

Source: Authors' calculations based on PIRLS Databases.

StatLink <https://doi.org/10.1787/888933905569>

## 70. Availability of computers and tablets to use during mathematics lessons

### Why it matters

As computers and tablets calculate far better than humans, computers could be used to release to some extent this burden from students and allow them to focus on more conceptual issues in maths. They can also help students drill and acquire procedural knowledge in mathematics. The decrease in this availability shows that teachers have not become more dependent on these tools over time. Perhaps they prefer calculators, or they still emphasise human calculation.

### Primary education

#### Change at the OECD level: moderate

At the primary level, most OECD countries innovated by reducing the availability of computers and tablets during 4th grade maths lessons. Between 2007 and 2015, the share of 4th grade students with access to these resources during maths lessons decreased by 12 percentage points on average. Moreover, positive and negative changes lead to a mean absolute change of 15 percentage points, corresponding to a moderate effect size of 0.32. In an average OECD system, one in two primary students had access to a computer during maths lessons, with a share of students ranging from 89% in New Zealand to 14% in Korea in 2015.

#### Countries where there has been the most change

Innovation mainly took the form of large decreases in the availability of these resources. Singapore saw the largest decrease in the share of maths students accessing these devices during lessons (44 percentage points). In Czech Republic and Japan, access concerned around 30 students less in 100. Fewer countries innovated by providing more access to these resources. For example, in the Russian Federation the practice spread by 48 percentage points.

### Secondary education

#### Change at the OECD level: moderate-high

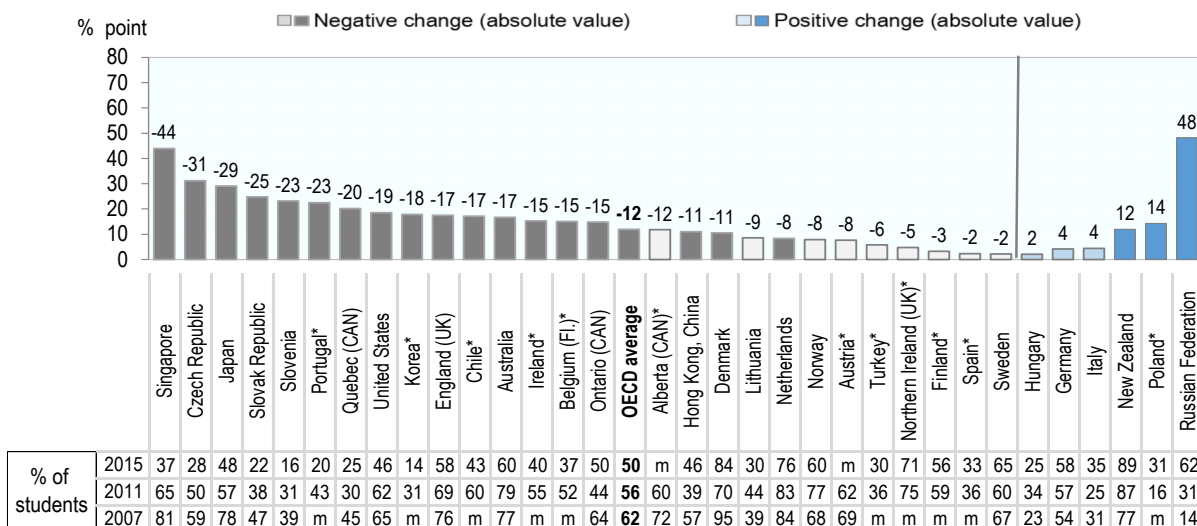
The availability of computers and tablets during 8th grade maths lessons decreased significantly in OECD countries (10 percentage points on average). The absolute change was 18 percentage points, corresponding to a moderate-high effect size of 0.37. At the OECD level, the share of 8th grade students with access to a computer or a tablet during maths lessons varied from 19% in Slovenia to 65% in Sweden in 2015.

#### Countries where there has been the most change

Innovation often took the form of less students having access to computers and tablets. Between 2007 and 2015, the share of 8th grade students with access to computers during maths lessons decreased by over 30 percentage points in Lithuania, Slovenia, Japan and England. Access expanded in Sweden (27 percentage points) and Italy (13 percentage points) between 2007 and 2015, as well as in New Zealand between 2011 and 2015 (18 percentage points).

**Figure 11.11. 4th grade students with computers or tablets available during maths lessons**

Change in and share of students who have computers or tablets available during lessons, 2007-2015, teachers report

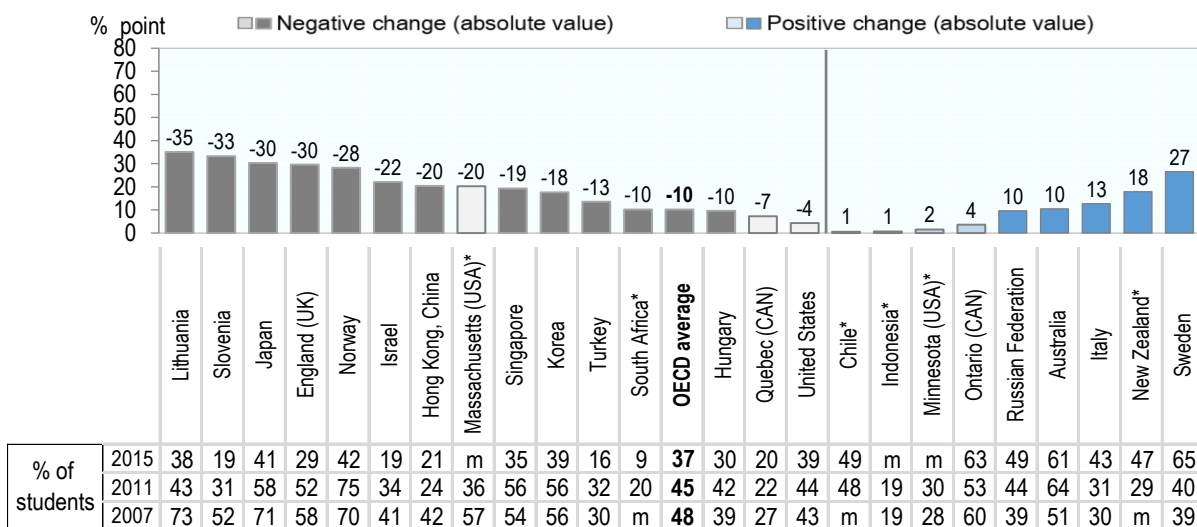


Note: Darker tones correspond to statistically significant values;  
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 The OECD average is based on OECD countries with available data in 2007, 2011 and 2015.  
 Source: Authors' calculations based on TIMSS Databases.

StatLink <https://doi.org/10.1787/888933905493>

**Figure 11.12. 8th grade students with computers or tablets available during maths lessons**

Change in and share of students who have computers or tablets available during lessons, 2007-2015, teachers report



Note: Darker tones correspond to statistically significant values;  
 \* refers to calculations based on other years, based on data availability.  
 The OECD average is based on OECD countries with available data in 2007, 2011 and 2015.  
 Source: Authors' calculations based on TIMSS Databases.

StatLink <https://doi.org/10.1787/888933905512>

## 71. Availability of computers and tablets to use during science lessons

### Why it matters

Computers and tablets can support science lessons in different ways, including the use of remote or virtual laboratories, real-time assessment, or learning through science games. They can also support collaborative science projects. They might be less useful for more traditional teaching strategies that may just rely on calculators. In any case, unless they remain unused, the availability of computers and tablets allow teachers to use a broader range of teaching strategies.

### Primary education

#### Change at the OECD level: moderate

In the majority of OECD countries, the share of students with computers and tablets during 4th grade science lessons has decreased between 2007 and 2015, with an average net decrease of 8 percentage points. Taking into account both increases and decreases, on average this practice changed by 12 percentage points, corresponding to a modest effect size of 0.26. With an average at 57%, the share of students having computers or tablets available in science lessons varies across the OECD area: from 22% in Slovenia to 91% in New Zealand in 2015.

#### Countries where there has been the most change

The Russian Federation saw the greatest increase in the availability of computers during science lessons between 2007 and 2015 (50 percentage points). Between 2011 and 2015, this was also a big innovation in Poland where the share of students concerned increased by 24 percentage points. Contractions were particularly notable in Singapore, Slovenia and the United States (around 30 percentage points in all cases).

### Secondary education

#### Change at the OECD level: moderate-high

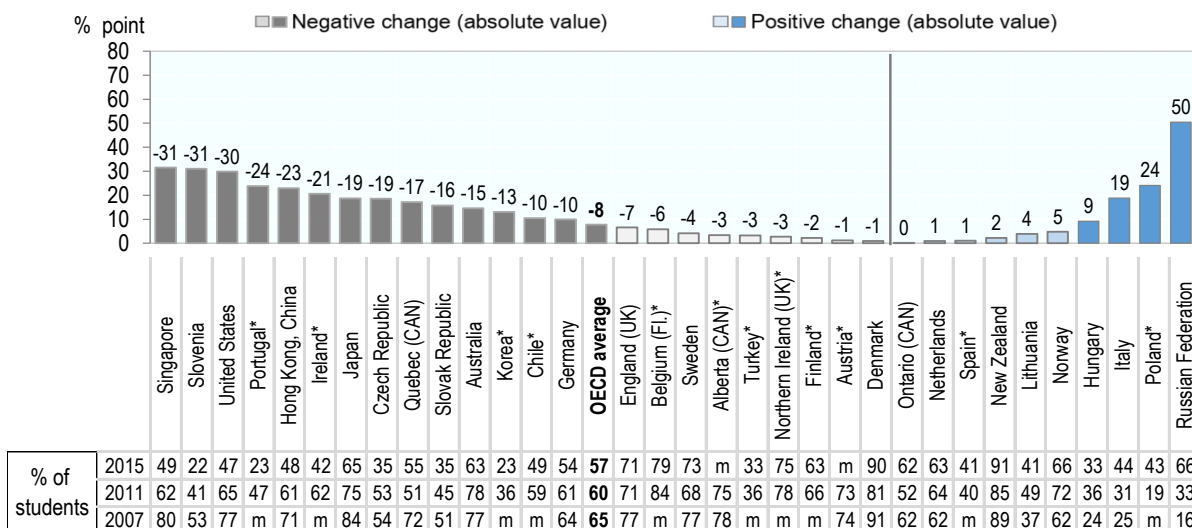
At the OECD level, contractions overcome expansions in the availability of computers and tablets in science lessons, leading to an average net decline of 12 percentage points in the share of 8th grade students. Regardless of its direction, the absolute change was 18 percentage points on average, corresponding to a moderate-high effect size of 0.38. Across the OECD region, the prevalence of this practice varies considerably: in 2015, only 26% of the 8th grade students had computers or tablets available during science lessons in Quebec (Canada) compared to more than 80% in Sweden.

#### Countries where there has been the most change

Between 2007 and 2015, the share of students using computers during their lessons declined by over 30 percentage points in Quebec (Canada), Hong Kong, China and Slovenia, and by over 20 percentage points in Korea, Norway, the United States and Japan. This has been a significant innovation in the learning process for many students. In Sweden and New Zealand, students experienced significantly more computer availability.

**Figure 11.13. 4th grade students with computers or tablets available during science lessons**

Change in and share of students who have computers or tablets available during lessons, 2007-2015, teachers report

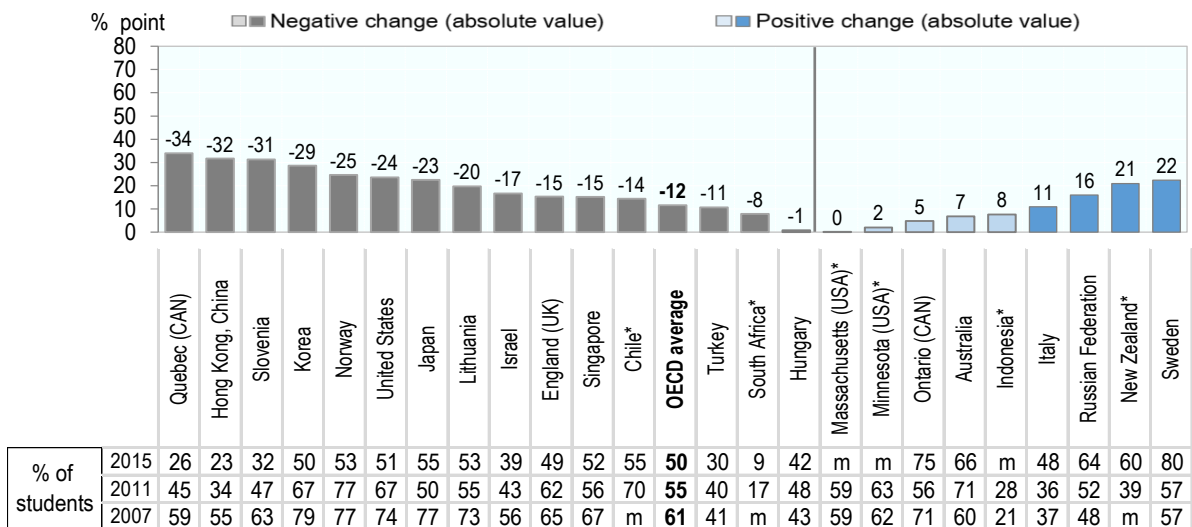


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 The OECD average is based on OECD countries with available data in 2007, 2011 and 2015.  
 Source: Authors' calculations based on TIMSS Databases.

StatLink <https://doi.org/10.1787/888933905531>

**Figure 11.14. 8th grade students with computers or tablets available during science lessons**

Change in and share of students who have computers or tablets available during lessons, 2007-2015, teachers report



Note: Darker tones correspond to statistically significant values;  
 \* refers to calculations based on other years, based on data availability.  
 The OECD average is based on OECD countries with available data in 2007, 2011 and 2015.  
 Source: Authors' calculations based on TIMSS Databases.

StatLink <https://doi.org/10.1787/888933905550>



**Table 11.1. Effect sizes for changes in access and use of learning resources**

	Availability of a science laboratory for students		Availability of a school library	Availability of a library or a reading corner in the classroom	Allowing students to borrow books from the classroom library	Students visiting a library other than their classroom library
	4th Grade	8th Grade	4th grade	4th grade	4th grade	4th grade
Australia	0.04	-0.22	0.02	-0.09	0.03	0.00
Austria	0.35	m	0.56	0.14	-0.22	0.07
Belgium (Fl.)	0.14	m	0.16	0.00	-0.02	-0.30
Belgium (Fr.)	m	m	-0.17	0.07	-0.12	-0.50
Canada	m	m	-0.05	-0.03	0.16	-0.02
Canada (Alberta)	-0.48	m	0.13	0.12	-0.08	-0.09
Canada (Ontario)	-0.60	-0.07	0.30	-0.37	-0.12	-0.11
Canada (Quebec)	0.03	0.11	0.17	0.43	-0.11	-0.21
Chile	0.34	0.17	m	m	m	m
Czech Republic	0.06	m	-0.18	0.39	-0.07	0.00
Denmark	-0.50	m	-0.14	0.20	-0.52	-0.23
Finland	0.21	m	-0.23	-0.12	0.03	0.04
France	m	m	-0.39	0.31	-0.36	-0.58
Germany	0.24	m	-0.15	0.10	-0.42	-0.39
Hungary	-0.53	-0.25	-0.53	0.03	-0.03	-0.90
Ireland	0.22	m	0.25	-0.14	0.00	0.01
Israel	m	0.01	-0.17	0.20	0.03	-0.75
Italy	0.05	0.05	-0.35	0.18	-0.09	-0.32
Japan	-0.06	0.00	m	m	m	m
Korea	-0.18	-0.19	m	m	m	m
Latvia	m	m	-0.07	0.15	-0.34	-0.64
Lithuania	-0.06	0.29	0.02	0.10	0.17	-0.62
Netherlands	0.24	m	-0.03	-0.21	0.04	-0.07
New Zealand	-0.07	-0.11	-0.04	-0.13	-0.07	-0.14
Norway	0.31	0.14	-0.13	-0.40	0.24	-0.29
Poland	1.33	m	-0.01	-0.14	-0.97	-0.76
Portugal	0.51	m	0.72	-0.30	0.15	0.09
Slovak Republic	-0.11	m	-0.53	-0.18	0.03	-0.92
Slovenia	0.40	-0.11	-0.10	0.30	-0.03	-0.57
Spain	-0.05	m	-0.09	0.28	-0.22	-0.21
Spain (Andalusia)	m	m	0.41	-0.14	0.20	0.46
Sweden	-0.05	0.25	0.17	-0.14	-0.34	-0.50
Turkey	-0.44	-0.17	m	m	m	m
U.K. (England)	0.06	0.00	-0.17	0.25	0.11	0.06
U.K. (Northern Ireland)	0.00	m	0.11	-0.16	0.16	0.08
United States	0.16	-0.15	-0.15	0.12	0.06	-0.04
U.S. (Massachusetts)	m	0.05	m	m	m	m
U.S. (Minnesota)	m	0.58	m	m	m	m
<b>OECD (average)</b>	<b>-0.03</b>	<b>-0.05</b>	<b>-0.08</b>	<b>0.04</b>	<b>-0.15</b>	<b>-0.34</b>
<b>OECD (av. absolute)</b>	<b>0.21</b>	<b>0.12</b>	<b>0.22</b>	<b>0.21</b>	<b>0.21</b>	<b>0.38</b>



	Availability of a science laboratory for students		Availability of a school library	Availability of a library or a reading corner in the classroom	Allowing students to borrow books from the classroom library	Students visiting a library other than their classroom library
	4th Grade	8th Grade	4th grade	4th grade	4th grade	4th grade
Hong Kong, China	0.28	0.19	0.30	0.23	-0.53	-0.28
Indonesia	m	0.18	0.04	0.20	-0.02	0.11
Russian Federation	0.74	0.32	0.00	-0.22	-0.38	-0.67
Singapore	-0.01	0.00	0.00	0.16	-0.02	-0.64
South Africa	m	0.11	0.60	0.63	0.15	0.30

Effect size from -0.5 to -0.2 and from 0.2 and 0.5

Effect size from -0.8 to -0.5 and from 0.5 and 0.8

Effect size equals or less than -0.8 and equals or greater than 0.8

Source: Authors' calculations based on TIMSS (2007, 2011 and 2015) and PIRLS (2006, 2011 and 2016).

StatLink  <https://doi.org/10.1787/888933905588>

**Table 11.2. Effect sizes for changes in access and use of ICT learning resources**

	Availability of desktop computers for use at school	Availability of portable laptops or notebooks for use at school	Frequency of use of computer or a tablet at school	Availability of computers (including tablets) to use during lessons				
	8th grade	8th grade	4th grade	4th grade Maths	8th grade Maths	4th grade Science	8th grade Science	4th grade Reading
Australia	-0.35	0.58	-0.28	-0.36	0.21	-0.32	0.14	-0.18
Austria	-0.38	0.25	-0.28	-0.16	m	-0.03	m	-0.86
Belgium	-0.40	0.30	m	m	m	m	m	m
Belgium (Fl.)	m	m	0.02	-0.30	m	-0.15	m	-1.26
Belgium (Fr.)	m	m	-0.13	m	m	m	m	-1.22
Canada	m	m	-0.27	m	m	m	m	0.38
Canada (Alberta)	m	m	-0.05	-0.25	m	-0.08	m	-1.14
Canada (Ontario)	m	m	-0.26	-0.30	0.07	0.00	0.11	-0.73
Canada (Quebec)	m	m	-0.21	-0.43	-0.17	-0.36	-0.70	-1.08
Chile	-0.22	0.64	m	-0.34	0.01	-0.21	-0.30	m
Czech Republic	-0.45	0.46	-0.50	-0.64	m	-0.38	m	-0.22
Denmark	-0.76	0.17	0.66	-0.35	m	-0.03	m	0.05
Estonia	-0.21	0.35	m	m	m	m	m	m
Finland	-0.43	0.78	0.08	-0.06	m	-0.05	m	0.16
France	m	m	-0.41	m	m	m	m	-1.56
Germany	m	m	-0.26	0.08	m	-0.20	m	-0.48
Greece	0.14	0.69	m	m	m	m	m	m
Hungary	-0.23	0.27	0.01	0.05	-0.20	0.20	-0.02	-0.30
Iceland	-0.12	0.09	m	m	m	m	m	m
Ireland	-0.13	0.21	-0.49	-0.31	m	-0.42	m	-0.34
Israel	-0.16	0.53	-0.31	m	-0.49	m	-0.34	0.74
Italy	-0.16	0.40	-0.88	0.09	0.26	0.40	0.22	-1.26
Japan	-0.50	-0.10	m	-0.62	-0.62	-0.44	-0.48	m
Korea	-0.25	0.13	m	-0.44	-0.35	-0.29	-0.61	m
Latvia	-0.35	0.41	-0.04	m	m	m	m	-0.33
Lithuania	-0.02	0.65	-0.26	-0.18	-0.72	0.08	-0.41	-0.54
Netherlands	-0.36	0.42	-0.14	-0.21	m	0.02	m	-0.41
New Zealand	-0.19	0.87	0.53	0.32	0.37	0.08	0.42	-0.19
Norway	m	m	0.27	-0.16	-0.58	0.10	-0.53	-0.63
Poland	-0.71	0.30	-0.16	0.34	m	0.53	m	-0.88
Portugal	-0.07	-0.23	-0.33	-0.49	m	-0.51	m	-0.75
Slovak Republic	-0.40	0.39	0.10	-0.53	m	-0.32	m	-1.49
Slovenia	-0.37	0.24	-0.04	-0.53	-0.71	-0.65	-0.64	-1.67
Spain	-0.35	0.51	-0.26	-0.05	m	0.02	m	-1.01
Spain (Andalusia)	m	m	-0.16	m	m	m	m	0.26
Sweden	-0.91	0.92	0.48	-0.05	0.54	-0.10	0.49	-0.46
Switzerland	-0.45	0.14	m	m	m	m	m	m
Turkey	m	m	m	-0.12	-0.32	-0.07	-0.22	m
U.K. (England)	m	m	-0.57	-0.37	-0.61	-0.15	-0.31	-1.19
U.K. (Northern Ireland)	m	m	-0.38	-0.11	m	-0.07	m	0.27

	Availability of desktop computers for use at school	Availability of portable laptops or notebooks for use at school	Frequency of use of computer or a tablet at school	Availability of computers (including tablets) to use during lessons				
	8th grade	8th grade	4th grade	4th grade Maths	8th grade Maths	4th grade Science	8th grade Science	4th grade Reading
United States	m	m	-0.28	-0.38	-0.09	-0.63	-0.49	-0.89
U.S. (Massachusetts)	m	m	m	m	-0.41	m	0.00	m
U.S. (Minnesota)	m	m	m	m	0.03	m	0.04	m
<b>OECD (average)</b>	<b>-0.33</b>	<b>0.35</b>	<b>-0.09</b>	<b>-0.24</b>	<b>-0.21</b>	<b>-0.16</b>	<b>-0.24</b>	<b>-0.70</b>
<b>OECD (av. absolute)</b>	<b>0.35</b>	<b>0.40</b>	<b>0.31</b>	<b>0.32</b>	<b>0.37</b>	<b>0.26</b>	<b>0.38</b>	<b>0.85</b>
Hong Kong, China	-0.19	-0.01	-0.31	-0.22	-0.44	-0.47	-0.66	-1.32
Indonesia	m	m	0.09	m	0.02	m	0.18	0.55
Russian Federation	0.02	0.50	0.14	1.05	0.19	1.08	0.32	0.54
Singapore	-0.41	0.70	-0.22	-0.93	-0.39	-0.67	-0.31	-0.93
South Africa	m	m	0.59	m	-0.29	m	-0.24	0.37

Effect size from -0.5 to -0.2 and from 0.2 and 0.5

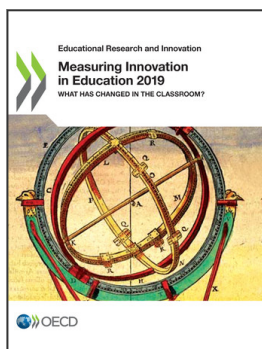
Effect size from -0.8 to -0.5 and from 0.5 and 0.8

Effect size equals or less than -0.8 and equals or greater than 0.8

Source: Authors' calculations based on TIMSS (2007, 2011 and 2015) and PIRLS (2006, 2011 and 2016).

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