Annex A

TECHNICAL BACKGROUND

All tables in Annex A are available on line

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ANNEX A1a

CONSTRUCTION OF DIGITAL READING SCALES AND INDICES FROM THE STUDENT, SCHOOL AND ICT QUESTIONNAIRES

How the PISA 2009 digital reading assessments were designed, analysed and scaled

The development of the PISA 2009 digital reading tasks was identical in most respects to that of print reading tasks.[1] It was co-ordinated by an international consortium of educational research institutions contracted by the OECD, under the guidance of a group of reading experts from participating countries. Both consortium test-development centres and participating countries contributed stimulus material and questions, which were reviewed, tested and refined iteratively over the three years leading up to the administration of the assessment in 2009. The development process involved provisions for several rounds of commentary from participating countries, as well as small-scale piloting and a formal field trial in which samples of 15-year-olds from all of the countries participating in the international option took part. The reading expert group recommended the final selection of tasks. The selection was made based on both the tasks' technical quality, assessed on the basis of their performance in the field trial, and their cultural appropriateness and interest level for 15-year-olds, as judged by the participating countries. Another essential criterion for selecting the set of material as a whole was its fit in the framework described in *PISA 2009 Results: What Students Know and Can Do: Student Performance in Reading, Mathematics and Science (Volume I)*, to maintain the balance across various categories of text, aspects and situations, and variations in the amount and kind of navigation required. Finally, the set of questions was selected to ensure that a range of difficulty was covered, allowing good measurement and description of the digital reading literacy of all 15-year-old students, from the least proficient to the highly able.

Twenty-nine digital reading tasks were used in PISA 2009, but each student in the sample saw only two-thirds of the total pool because different sets of questions were given to different students. The main survey tasks for the digital reading assessment were allocated to three clusters with each cluster requiring 20 minutes of test administration time. The tasks were presented to students in six test forms, with each form composed of two clusters. Each cluster was paired with each of the other clusters in two forms, once in the first position and once in the second position. Each sampled student was randomly assigned one of the six forms, which meant that each student undertook 40 minutes of testing.

This design made it possible to construct a single scale of digital reading proficiency, in which each task is associated with a particular point on the scale that indicates its difficulty, and each student's performance is associated with a particular point on the same scale that indicates his or her estimated proficiency. A description of the modelling technique used to construct this scale can be found in the *PISA 2009 Technical Report* (OECD, forthcoming).

The relative difficulty of tasks in a test is estimated by considering the proportion of test-takers who answer each question correctly. The relative proficiency of students taking a particular test can be estimated by considering the proportion of test questions they answer correctly. A single continuous scale shows the relationship between the difficulty of questions and the proficiency of students. By constructing a scale that shows the difficulty of each question, it is possible to locate the level of digital reading literacy that the question represents. By showing the proficiency of each student on the same scale, it is possible to describe the level of digital reading literacy that the student possesses.

The location of student proficiency on this scale is set in relation to the particular group of questions used in the assessment. However, just as the sample of students taking PISA 2009 is drawn to represent all the 15-year-olds in the participating countries, so the individual questions used in the assessment are designed to represent the definition of digital reading literacy adequately. Estimates of student proficiency reflect the kinds of tasks they would be expected to perform successfully. This means that students are likely to be able to complete questions successfully at or below the difficulty level associated with their own position on the scale (but they may not always do so). Conversely, they are unlikely to be able to successfully complete questions above the difficulty level associated with their position on the scale (but they may sometimes do so).

The further a student's proficiency is located above a given question, the more likely he or she is to successfully complete the question (and other questions of similar difficulty); the further the student's proficiency is located below a given question, the lower the probability that the student will be able to successfully complete the question, and other questions of similar difficulty.

How digital reading proficiency levels are defined in PISA 2009

PISA applies a standard methodology for constructing proficiency scales. Based on a student's performance on the tasks in the test, his or her score is generated and located in a specific part of the scale, thus allowing the score to be associated with a defined proficiency level. The level at which the student's score is located is the highest level for which he or she would be expected to

1. One notable difference was that only an English-source version of the digital reading tasks was developed, instead of both English- and French-source versions, as is standard for the PISA paper-based assessments. The decision to build only one source version for digital reading was governed by a lack of time and resources. For PISA 2012, there will be French- as well as English-source versions for all computer-based assessments, including digital reading.

answer correctly most of a random selection of questions within the same level. Thus, for example, in an assessment composed of tasks spread uniformly across Level 3, students with a score located within Level 3 would be expected to complete at least 50% of the tasks successfully. Because a level covers a range of difficulty and proficiency, success rates across the band vary. Students near the bottom of the level would be likely to succeed on just over 50% of the tasks spread uniformly across the level, while students at the top of the level would be likely to succeed on well over 70% of the same tasks. The approach to developing described proficiency levels for digital reading was identical to that used for print reading and the other paper-based domains. However, there was a variation in the way the mean and standard deviation were established.

Since digital and print reading were conceived of as a single construct – reading – in the framework, the digital reading scale was constructed in such as way as to allow for a comparison with print reading, and to combine the two scales into a composite reading scale, should the data support construction of such a scale (OECD, 2009b, p. 77). Once the main survey data were collected, the correlation between digital and print reading instruments was inspected, and was judged sufficiently high, at 0.83, to pursue the plan of working towards a composite scale combining print and digital reading, as well as to report digital reading separately.

In each country, the sample of students who participated in the digital reading assessment was a subsample of all those who participated in the paper-based assessment. It was decided to impute digital reading scores for those students who did not take part in the digital reading assessment. The imputation followed the normal imputation procedures used in PISA.

Plausible values (PVs) for digital reading performance were drawn for all students included in the PISA 2009 main data file. These PVs were drawn by running a four-dimensional model (digital reading, print reading, mathematics and science), while fixing regression coefficients for the three paper-based dimensions at values estimated from analyses of the paper-based dimensions alone. Further details on digital reading scaling and sampling can be found in the *PISA 2009 Technical Report* (OECD, forthcoming).

To verify if the imputations are valid, it is necessary to analyse country mean performances of students with and without imputation for both digital and print reading. Countries' mean performance of the group of student who participated in digital reading assessment (*i.e.* non-imputed scores) is compared to the group of students who did not participate in digital reading assessment (*i.e.* imputed). The results are included in Table A1a.1. The differences in the countries' digital performance are similar to the differences in print reading performance, indicating that the imputation process was valid. As Table A1a.1 shows, for most countries, the differences between scores that were imputed and those that were not are of similar order. For example, in Australia, the difference between imputed and non-imputed scores in the digital reading is 7.9 while for print reading it is 6.9. The scatter plots of the differences are shown in Figure A1a.1.

[Part 1/1]

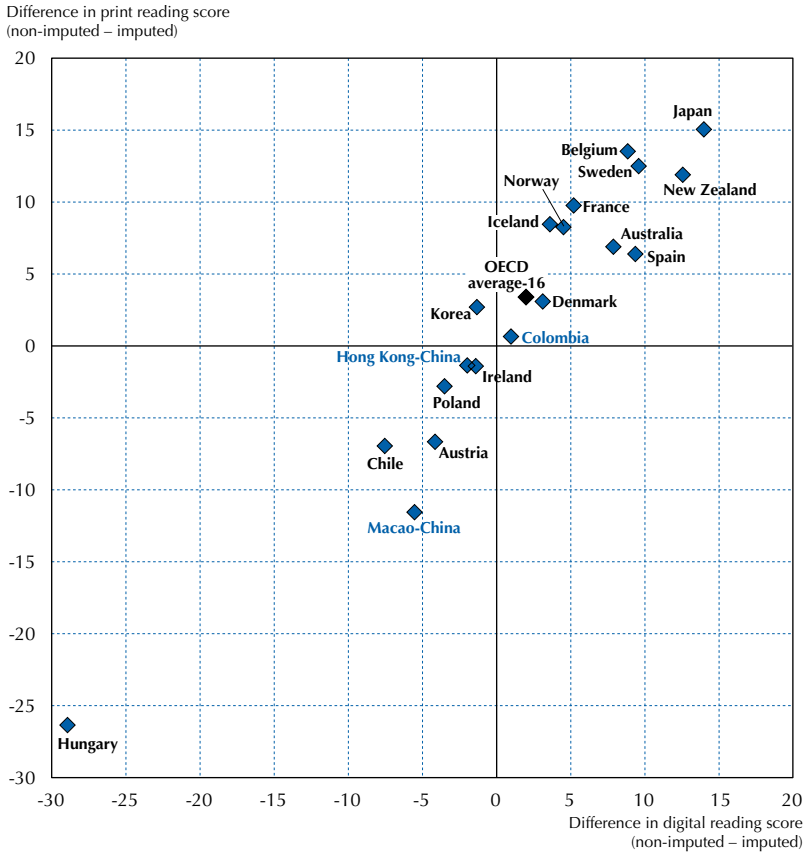
Table A1a.1 Performance in digital and print reading for the group of students who participated in the digital reading assessment and all other students

		Digital reading					Print reading				
		Group of students who participated in digital reading assessment (non-imputed)		Group of students who did not participate in digital reading assessment (imputed)		Difference (non-imputed – imputed)	Group of students who participated in digital reading assessment (non-imputed in digital reading)		Group of students who did not participate in digital reading assessment (imputed in digital reading)		Difference (non-imputed – imputed)
		Mean score	S.E.	Mean score	S.E.	Score dif.	Mean score	S.E.	Mean score	S.E.	Score dif.
OECD	Australia	543	(3.4)	535	(2.8)	7.9	520	(2.9)	513	(2.4)	6.9
	Austria	456	(4.4)	460	(5.1)	-4.2	466	(3.7)	473	(3.7)	-6.7
	Belgium	513	(2.5)	504	(2.3)	8.8	515	(2.6)	501	(2.6)	13.5
	Chile	429	(4.0)	437	(3.9)	-7.5	445	(3.7)	451	(3.4)	-6.9
	Denmark	491	(4.3)	488	(2.6)	3.1	497	(3.9)	494	(2.1)	3.1
	France	498	(6.3)	493	(5.2)	5.2	502	(4.5)	493	(4.3)	9.8
	Hungary	452	(5.5)	481	(4.6)	-28.9	479	(4.6)	505	(3.3)	-26.3
	Iceland	514	(2.7)	511	(1.8)	3.6	507	(2.9)	498	(1.8)	8.5
	Ireland	508	(3.5)	509	(3.1)	-1.4	495	(3.2)	496	(3.6)	-1.4
	Japan	525	(4.0)	511	(3.4)	14.0	526	(4.7)	511	(8.6)	15.1
	Korea	567	(3.5)	568	(3.2)	-1.3	541	(3.7)	538	(3.7)	2.7
	New Zealand	545	(3.1)	533	(2.6)	12.6	528	(3.2)	516	(2.9)	11.9
	Norway	503	(3.0)	498	(3.1)	4.5	508	(3.0)	500	(3.0)	8.3
	Poland	461	(3.3)	465	(3.3)	-3.5	499	(3.0)	502	(2.8)	-2.8
	Spain	481	(3.9)	472	(4.2)	9.4	484	(3.8)	478	(3.2)	6.4
	Sweden	516	(3.5)	506	(3.7)	9.6	505	(3.2)	492	(3.3)	12.5
	OECD average-16	500	(1.0)	498	(0.9)	2.0	501	(0.9)	498	(0.9)	3.4
Partners	Colombia	369	(4.9)	368	(3.4)	1.0	412	(4.6)	411	(3.8)	0.7
	Hong Kong-China	513	(2.8)	515	(2.7)	-2.0	532	(2.5)	534	(2.4)	-1.3
	Macao-China	489	(1.4)	494	(1.1)	-5.5	480	(1.8)	492	(1.2)	-11.5

StatLink http://dx.doi.org/10.1787/888932435492

■ Figure A1a.1 ■

Differences between students who participated in the digital reading assessment and all other students, for print and digital reading



Source: OECD, *PISA 2009 Database,* Table A1a.1.
StatLink http://dx.doi.org/10.1787/888932435492

It is interesting to note that the biggest difference between imputed and non-imputed scores is seen in Hungary. This is consistently evident in both the digital print reading assessments, validating the consistency of the imputation procedure for digital and print reading, but at the same time raising the question as to why it was so large in both cases in that country. An examination of the PISA *index of economic, social and cultural status* (ESCS) of the students sheds some light on this. At the same time it should be remembered that Hungary has one of the largest associations of ESCS with student performance in both digital and print reading (see Chapter 4): 26% of variance in student performance is explained by ESCS in Hungary. The difference between the means of imputed and non-imputed scores seems mainly attributable to the difference in ESCS for the group of students who participated in the digital reading assessment and those for whom scores were imputed. The mean ESCS index for the group that participated (scores not imputed) is -0.33, compared to -0.09 for the group of students who did not participate (scores imputed) in the digital reading assessment. A comparison of the ESCS means for all countries is included in Table A1a.2.

In the core domains of (paper-based) mathematics, reading and science, the scales were constructed with a mean of 500 and standard deviation of 100. For digital reading, however, to allow comparison with print reading results, the metric for the digital reading scale was set so that the mean and the standard deviation of the 16 OECD countries that participated in the digital reading assessment were the same as those for the same group of countries' print reading mean and standard deviation. In computing the mean and standard deviation, an equal weight was given to each of the 16 countries. The mean was 499 score points and the standard deviation was 90. Cut-scores at the same points on the digital reading scale as those on the print reading scale were then applied and given labels that made their alignment with the print reading levels transparent. Items within each band of the digital scale (of those bands that contained sufficient items to justify the exercise) were then inspected, and generalised descriptions of the characteristics of items within each band were generated. Because of the relatively small number of items in the pool for PISA 2009, only four of the seven defined levels were described. The four levels that were described were aligned with the four middle print reading levels and labelled Level 2, Level 3, Level 4 and Level 5 or above. Figure VI.2.8 provides details of the nature of digital reading skills, knowledge and understanding required at each of these levels of the digital reading scale. Below Level 2 there is a "place-holder" region of the scale,

with too few items to support level descriptions. This area is called simply "Below Level 2". It is anticipated that more items reflecting this region on the scale will be developed for future PISA surveys, so that it will be possible to describe what students at these lower levels can do. Similarly, tasks may be added to the top of the scale to allow for the description of a Level 6.

There was no attempt to construct subscales for digital reading because of the relatively small number of items in the digital reading pool for PISA 2009.

[Part 1/1]

Table A1a.2 Student socio-economic background (ESCS) for the group of students who participated in the digital reading assessment and all other students

		PISA index of economic, social and cultural status (ESCS)				
		Group of students who participated in digital reading assessment (non-imputed)		Group of students who did not participate in digital reading assessment (imputed)		Difference (non-imputed – imputed)
		Mean index	S.E.	Mean index	S.E.	Dif.
OECD	Australia	0.37	(0.02)	0.33	(0.01)	0.05
	Austria	0.04	(0.02)	0.07	(0.03)	-0.03
	Belgium	0.22	(0.02)	0.18	(0.02)	0.04
	Chile	-0.56	(0.05)	-0.56	(0.04)	0.00
	Denmark	0.29	(0.05)	0.29	(0.02)	0.00
	France	-0.11	(0.03)	-0.14	(0.03)	0.03
	Hungary	-0.33	(0.04)	-0.09	(0.03)	-0.24
	Iceland	0.58	(0.03)	0.76	(0.02)	-0.18
	Ireland	0.02	(0.03)	0.06	(0.03)	-0.04
	Japan	-0.02	(0.02)	0.01	(0.03)	-0.02
	Korea	-0.17	(0.03)	-0.15	(0.03)	-0.02
	New Zealand	0.1	(0.02)	0.08	(0.02)	0.02
	Norway	0.46	(0.02)	0.47	(0.02)	-0.02
	Poland	-0.3	(0.03)	-0.27	(0.03)	-0.03
	Spain	-0.31	(0.05)	-0.34	(0.04)	0.03
	Sweden	0.35	(0.03)	0.31	(0.02)	0.04
	OECD average-16	0.04	(0.01)	0.06	(0.01)	-0.02
Partners	Colombia	-1.27	(0.06)	-1.15	(0.05)	-0.12
	Hong Kong-China	-0.78	(0.05)	-0.80	(0.04)	0.02
	Macao-China	-0.61	(0.02)	-0.77	(0.01)	0.15

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How the composite digital and print reading scale and proficiency levels were developed

Digital reading literacy is represented in two ways in reporting on student proficiency in reading: first, as a scale representing digital reading only, and second, in combination with print reading, as part of a composite reading scale.

As outlined earlier, inspection of the main survey data supported construction of a composite reading scale. The scale is based on equal weighting of results from the two assessments – an arithmetic average – consistent with the framework's proposition that the two kinds of reading are equally important. In measurement terms, the precision and reliability of estimates of student performance in the two media are comparable with, on average, 33 score points for print reading and 25 score points for digital reading yielded from the data collected per student. Moreover, the distribution of the digital reading items as a single scale is similar to the distribution of the print reading items, and when the two sets of items are calibrated together, the difficulty estimates of each item are very similar to their estimates on the separate scales. This outcome supports the validity of combining the results of the digital and print reading assessments into a single composite scale. Substantively, the fact that the digital reading tasks were built on a framework similar to the print reading framework, ensured that the construct and content of the assessments in the two media were aligned. In generating descriptions for the composite levels, the combined sets of items from the two separate scales were again inspected, and the main common features identified as characteristics of the new composite level. The descriptions also include some elements specifically pertaining to navigation, consistent with items within the level. Thus, the construction of a described scale for composite reading provides an overall picture of reading proficiency that is both qualitatively and quantitatively consistent with the two separate scales.

Explanation of indices

This section explains the indices derived from the student, school and Information Communication Technology (ICT) questionnaires used in PISA 2009. ICT questionnaire indices are only available for the 45 countries and economies that chose to administer the optional ICT questionnaire.

Several PISA measures reflect indices that summarise responses from students or school representatives (typically principals) to a series of related questions. The questions were selected from a larger pool of questions on the basis of theoretical considerations and previous research. Structural equation modelling was used to confirm the theoretically expected behaviour of the indices and to validate their comparability across countries. For this purpose, a model was estimated separately for each country and collectively for all OECD countries.

For a detailed description of other PISA indices and details on the methods, see *PISA 2009 Technical Report* (OECD, forthcoming).

There are two types of indices: simple indices and scale indices.

Simple indices are the variables that are constructed through the arithmetic transformation or recoding of one or more items in exactly the same way across assessments.

Scale indices are the variables constructed through the scaling of multiple items. Unless otherwise indicated, the index was scaled using a weighted maximum likelihood estimate (WLE) (Warm, 1985), using a one-parameter item response model (a partial credit model was used in the case of items with more than two categories).

The scaling was done in three stages:

- The item parameters were estimated from equal-sized subsamples of students from each OECD country.
- The estimates were computed for all students and all schools by anchoring the item parameters obtained in the preceding step.
- The indices were then standardised so that the mean of the index value for the OECD student population was zero and the standard deviation was one (countries being given equal weight in the standardisation process).

Sequential codes were assigned to the different response categories of the questions in the sequence in which the latter appeared in the student, school or parent questionnaires. Where indicated in this section, these codes were inverted for the purpose of constructing indices or scales. It is important to note that negative values for an index do not necessarily imply that students responded negatively to the underlying questions. A negative value merely indicates that the respondents answered less positively than all respondents did on average across OECD countries. Likewise, a positive value on an index indicates that the respondents answered more favourably, or more positively, than respondents did, on average, in OECD countries. Terms enclosed in brackets < > in the following descriptions were replaced in the national versions of the student, school and parent questionnaires by the appropriate national equivalent. For example, the term <classes in the language of assessment> in Luxembourg was translated into "German classes" or "French classes" depending on whether students received the German or French version of the assessment instruments.

In addition to simple and scaled indices described in this annex, there are a number of variables from the questionnaires that correspond to single items not used to construct indices. These non-recoded variables have prefix of "ST" for the questionnaire items in the student questionnaire, "SC" for the items in the school questionnaire, and "IC" for the items in the ICT questionnaire. All the context questionnaires as well as the PISA international database, including all variables, are available through *www.pisa.oecd.org*.

Student-level simple indices

Occupational status of parents

Occupational data for both a student's father and a student's mother were obtained by asking open-ended questions in the student questionnaire (ST9a, ST9b, ST12, ST13a, ST13b and ST16). The responses were coded to four-digit ISCO codes (ILO, 1990) and then mapped to Ganzeboom, *et al.*'s SEI index (1992). Higher scores of SEI indicate higher levels of occupational status. The following three indices are obtained:

- Mother's occupational status (BMMJ).
- Father's occupational status (BFMJ).
- The highest occupational level of parents (HISEI) corresponds to the higher SEI score of either parent or to the only available parent's SEI score.

Educational level of parents

The educational level of parents is classified using ISCED (OECD, 1999) based on students' responses in the student questionnaire (ST10, ST11, ST14 and ST15). Please note that the question format for school education in PISA 2009 differs from the one used in PISA 2000, 2003 and 2006 but the method used to compute parental education is the same.

As in PISA 2000, 2003 and 2006, indices were constructed by selecting the highest level for each parent and then assigning them to the following categories: (0) None, (1) ISCED 1 (primary education), (2) ISCED 2 (lower secondary), (3) ISCED Level 3B or 3C (vocational/pre-vocational upper secondary), (4) ISCED 3A (upper secondary) and/or ISCED 4 (non-tertiary post-secondary),

(5) ISCED 5B (vocational tertiary), and (6) ISCED 5A/6 (theoretically oriented tertiary and post-graduate). The following three indices with these categories are developed:

- Mother's educational level (MISCED).
- Father's educational level (FISCED).
- Highest educational level of parents (HISCED) corresponds to the higher ISCED level of either parent.

Highest educational level of parents was also converted into the number of years of schooling (PARED). For the conversion of level of education into years of schooling (Table A1a.3).

Immigration and language background

Information on the country of birth of students and their parents (ST17) is collected in a similar manner as in PISA 2000, 2003 and 2006 by using nationally specific ISO coded variables. The ISO codes of the country of birth for students and their parents are available in the PISA international database (COBN_S, COBN_M, and COBN_F).

The index on immigrant background (IMMIG) has the following categories: (1) native students (those students born in the country of assessment, or those with at least one parent born in that country; students who were born abroad with at least one parent born in the country of assessment are also classified as 'native' students), (2) second-generation students (those born in the country of assessment but whose parents were born in another country), and (3) first-generation students (those born outside the country of assessment and whose parents were also born in another country). Students with missing responses for either the student or for both parents, or for all three questions have been given missing values for this variable.

Students indicate the language they usually speak at home. The data are captured in nationally-specific language codes, which were recoded into variable ST19Q01 with the following two values: (1) language at home is the same as the language of assessment, and (2) language at home is a different language than the language of assessment.

Family structure

The index of family structure (FAMSTRUC) is based on students' responses regarding people living at home with them (ST08). This index has the following three values: (1) single-parent family (students living with only one of the following: mother, father, male guardian, female guardian), (2) two-parent family (students living with a father or step/foster father and a mother or step/foster mother), and (3) other (except the non-responses, which are coded as missing or not applicable).

Computer use

Students were asked if they have ever used a computer (IC03Q01). The same question was asked in PISA 2003 (IC02Q01). Students' responses are compared between PISA 2003 and PISA 2009 in Chapter 5.

Computer availability at home

Students' responses on the number of computers at home (ST21Q03) was coded into a dichotomous variable. It was coded as 0 for students who reported "none" and as1 for students who reported having one, two, or three or more computers. The same question was asked in PISA 2000 (ST22Q04). This was also coded into a dichotomous variable in the same way. Responses are compared between PISA 2000 and PISA 2009 in Chapter 5.

Internet availability at home

Students were asked whether they have a link to the Internet at home (ST20Q06). As the same question was asked in PISA 2000 (ST21Q04), the responses are compared between PISA 2000 and PISA 2009 in Chapter 5.

Student-level scale indices

Family wealth

The index of family wealth (WEALTH) is based on students' responses on whether they had the following at home: a room of their own, a link to the Internet, a dishwasher (treated as a country-specific item), a DVD player, and three other country-specific items (some items in ST20); and their responses on the number of cellular phones, televisions, computers, cars and the rooms with a bath or shower (ST21).

Home educational resources

The *index of home educational resources* (HEDRES) is based on the items measuring the existence of educational resources at home including a desk and a quiet place to study, a computer that students can use for schoolwork, educational software, books to help with students' school work, technical reference books and a dictionary (some items in ST20).

Cultural possessions

The *index of cultural possessions* (CULTPOSS) is based on the students' responses to whether they had the following at home: classic literature, books of poetry and works of art (some items in ST20).

[Part 1/1]

Table A1a.3 Levels of parental education converted into years of schooling

		Did not go to school	Completed ISCED Level 1 (primary education)	Completed ISCED Level 2 (lower secondary education)	Completed ISCED Levels3B or 3C (upper secondary education providing direct access to the labour market or to ISCED 5B programmes)	Completed ISCED Level 3A (upper secondary education providing access to ISCED 5A and 5B programmes) and/or ISCED Level 4 (non-tertiary post-secondary)	Completed ISCED Level 5A (university level tertiary education) or ISCED Level 6 (advanced research programmes)	Completed ISCED Level 5B (non-university tertiary education)
OECD	Australia	0.0	6.0	10.0	11.0	12.0	15.0	14.0
	Austria	0.0	4.0	9.0	12.0	12.5	17.0	15.0
	Belgium	0.0	6.0	9.0	12.0	12.0	17.0	14.5
	Canada	0.0	6.0	9.0	12.0	12.0	17.0	15.0
	Chile	0.0	6.0	8.0	12.0	12.0	17.0	16.0
	Czech Republic	0.0	5.0	9.0	11.0	13.0	16.0	16.0
	Denmark	0.0	6.0	9.0	12.0	12.0	17.0	15.0
	Estonia	0.0	4.0	9.0	12.0	12.0	16.0	15.0
	Finland	0.0	6.0	9.0	12.0	12.0	16.5	14.5
	France	0.0	5.0	9.0	12.0	12.0	15.0	14.0
	Germany	0.0	4.0	10.0	13.0	13.0	18.0	15.0
	Greece	0.0	6.0	9.0	11.5	12.0	17.0	15.0
	Hungary	0.0	4.0	8.0	10.5	12.0	16.5	13.5
	Iceland	0.0	7.0	10.0	13.0	14.0	18.0	16.0
	Ireland	0.0	6.0	9.0	12.0	12.0	16.0	14.0
	Israel	0.0	6.0	9.0	12.0	12.0	15.0	15.0
	Italy	0.0	5.0	8.0	12.0	13.0	17.0	16.0
	Japan	0.0	6.0	9.0	12.0	12.0	16.0	14.0
	Korea	0.0	6.0	9.0	12.0	12.0	16.0	14.0
	Luxembourg	0.0	6.0	9.0	12.0	13.0	17.0	16.0
	Mexico	0.0	6.0	9.0	12.0	12.0	16.0	14.0
	Netherlands	0.0	6.0	10.0	a	12.0	16.0	a
	New Zealand	0.0	5.5	10.0	11.0	12.0	15.0	14.0
	Norway	0.0	6.0	9.0	12.0	12.0	16.0	14.0
	Poland	0.0	a	8.0	11.0	12.0	16.0	15.0
	Portugal	0.0	6.0	9.0	12.0	12.0	17.0	15.0
	Scotland	0.0	7.0	11.0	13.0	13.0	16.0	16.0
	Slovak Republic	0.0	4.5	8.5	12.0	12.0	17.5	13.5
	Slovenia	0.0	4.0	8.0	11.0	12.0	16.0	15.0
	Spain	0.0	5.0	8.0	10.0	12.0	16.5	13.0
	Sweden	0.0	6.0	9.0	11.5	12.0	15.5	14.0
	Switzerland	0.0	6.0	9.0	12.5	12.5	17.5	14.5
	Turkey	0.0	5.0	8.0	11.0	11.0	15.0	13.0
	United Kingdom	0.0	6.0	9.0	12.0	13.0	16.0	15.0
	United States	0.0	6.0	9.0	a	12.0	16.0	14.0
Partners	Albania	0.0	6.0	9.0	12.0	12.0	16.0	16.0
	Argentina	0.0	6.0	10.0	12.0	12.0	17.0	14.5
	Azerbaijan	0.0	4.0	9.0	11.0	11.0	17.0	14.0
	Brazil	0.0	4.0	8.0	11.0	11.0	16.0	14.5
	Bulgaria	0.0	4.0	8.0	12.0	12.0	17.5	15.0
	Colombia	0.0	5.0	9.0	11.0	11.0	15.5	14.0
	Croatia	0.0	4.0	8.0	11.0	12.0	17.0	15.0
	Dubai (UAE)	0.0	5.0	9.0	12.0	12.0	16.0	15.0
	Hong Kong- China	0.0	6.0	9.0	11.0	13.0	16.0	14.0
	Indonesia	0.0	6.0	9.0	12.0	12.0	15.0	14.0
	Jordan	0.0	6.0	10.0	12.0	12.0	16.0	14.5
	Kazakhstan	0.0	4.0	9.0	11.5	12.5	15.0	14.0
	Kyrgyzstan	0.0	4.0	8.0	11.0	10.0	15.0	13.0
	Latvia	0.0	3.0	8.0	11.0	11.0	16.0	16.0
	Liechtenstein	0.0	5.0	9.0	11.0	13.0	17.0	14.0
	Lithuania	0.0	3.0	8.0	11.0	11.0	16.0	15.0
	Macao-China	0.0	6.0	9.0	11.0	12.0	16.0	15.0
	Montenegro	0.0	4.0	8.0	11.0	12.0	16.0	15.0
	Panama	0.0	6.0	9.0	12.0	12.0	16.0	a
	Peru	0.0	6.0	9.0	11.0	11.0	17.0	14.0
	Qatar	0.0	6.0	9.0	12.0	12.0	16.0	15.0
	Romania	0.0	4.0	8.0	11.5	12.5	16.0	14.0
	Russian Federation	0.0	4.0	9.0	11.5	12.0	15.0	a
	Serbia	0.0	4.0	8.0	11.0	12.0	17.0	14.5
	Shanghai-China	0.0	6.0	9.0	12.0	12.0	16.0	15.0
	Singapore	0.0	6.0	8.0	10.5	10.5	12.5	12.5
	Chinese Taipei	0.0	6.0	9.0	12.0	12.0	16.0	14.0
	Thailand	0.0	6.0	9.0	12.0	12.0	16.0	14.0
	Trinidad and Tobago	0.0	5.0	9.0	12.0	12.0	16.0	15.0
	Tunisia	0.0	6.0	9.0	12.0	13.0	17.0	16.0
	Uruguay	0.0	6.0	9.0	12.0	12.0	17.0	15.0

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Economic, social and cultural status

The *PISA index of economic, social and cultural status* (ESCS) was derived from the following three indices: highest occupational status of parents (HISEI), highest educational level of parents in years of education according to ISCED (PARED), and home possessions (HOMEPOS). The *index of home possessions* (HOMEPOS) comprises all items on the indices of WEALTH, CULTPOSS and HEDRES, as well as books in the home recoded into a four-level categorical variable (0-10 books, 11-25 or 26-100 books, 101-200 or 201-500 books, more than 500 books).

The *PISA index of economic, social and cultural status* (ESCS) was derived from a principal component analysis of standardised variables (each variable has an OECD mean of zero and a standard deviation of one), taking the factor scores for the first principal component as measures of the index of economic, social and cultural status.

Principal component analysis was also performed for each participating country to determine to what extent the components of the index operate in similar ways across countries. The analysis revealed that patterns of factor loading were very similar across countries, with all three components contributing to a similar extent to the index. For the occupational component, the average factor loading was 0.80, ranging from 0.66 to 0.87 across countries. For the educational component, the average factor loading was 0.79, ranging from 0.69 to 0.87 across countries. For the home possession component, the average factor loading was 0.73, ranging from 0.60 to 0.84 across countries. The reliability of the index ranged from 0.41 to 0.81. These results support the cross-national validity of the *PISA index of economic, social and cultural status*.

The imputation of components for students missing data on one component was done on the basis of a regression on the other two variables, with an additional random error component. The final values on the *PISA index of economic, social and cultural status* (ESCS) have an OECD mean of 0 and a standard deviation of 1.

Enjoyment of reading activities

The *index of enjoyment of reading activities* (ENJOY) was derived from students' level of agreement with the following statements (ST24): *i)* I read only if I have to; *ii)* reading is one of my favourite hobbies; *iii)* I like talking about books with other people; *iv)* I find it hard to finish books; *v)* I feel happy if I receive a book as a present; *vi)* for me, reading is a waste of time; *vii)* I enjoy going to a bookstore or a library; *viii)* I read only to get information that I need; *ix)* I cannot sit still and read for more than a few minutes; *x)* I like to express my opinions about books I have read; and *xi)* I like to exchange books with my friends.

As all items that are negatively phrased (items *i*, *iv*, *vi*, *viii* and *ix*) are inverted for scaling, the higher values on this index indicate higher levels of enjoyment of reading.

Diversity of reading materials

The *index of diversity of reading materials* (DIVREAD) was derived from the frequency with which students read the following materials because they want to (ST25): magazines, comic books, fiction, non-fiction books and newspapers. The higher values on this index indicate higher diversity in reading.

Online reading activities

The *index of online reading activities* (ONLNREAD) was derived from the frequency with which students are involved in the following reading activities (ST26): reading emails, chatting on line, reading online news, using an online dictionary or encyclopaedia, searching online information to learn about a particular topic, taking part in online group discussions or forums, and searching for practical information on line. The higher values on this index indicate more frequent online reading activities.

More in-depth analyses applied to the set of online reading activities reveal that there are clearly two distinct kinds of online reading activities: searching for information and social activities. The two new indices *index of online searching-information activities* and the *index of online social activities,* developed for Volume VI, are principal components, unlike other PISA indices, which are constructed using an IRT model. The seven items of Question 26 (ST26) of the student questionnaire were submitted to a principal components analysis and a Varimax rotation was implemented on the first two components. Since ST26Q06, "Taking part in online group discussion forums", presented lower correlations with the two rotated components, it was removed and the analysis was rerun.

The final factor analysis was conducted on OECD countries only, with each country contributing equally. A Varimax rotation was also implemented. The correlation between the items and the rotated components are presented in Table A1a.4.

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Table A1a.4 Rotated component pattern

Question in student questionnaire	Description	Component 1	Component 2
ST26Q01	Online – Reading e-mail	0.16762	0.77252
ST26Q02	Online – Chat on line	0.13677	0.80565
ST26Q03	Online – Reading news	0.58826	0.39559
ST26Q04	Online – Using dictionary	0.78550	0.16918
ST26Q05	Online – Particular topic	0.83625	0.09389
ST26Q07	Online – Practical information	0.73889	0.14218

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As can be seen from Table A1a.4, the first rotated component correlates highly with ST26Q03, ST26Q04, ST26Q05 and ST26Q07, which reflect searching information on line, while the second factor mainly presents high correlations with ST26Q01 and ST26Q02, reading e-mails and chatting, which reflect socially-related digital reading.

Metacognition strategies: understanding and remembering

The *index of understanding and remembering* (UNDREM) was derived from students' reports on the usefulness of the following strategies for understanding and memorising the text (ST41): A) I concentrate on the parts of the text that are easy to understand; B) I quickly read through the text twice; C) After reading the text, I discuss its content with other people; D) I underline important parts of the text; E) I summarise the text in my own words; and F) I read the text aloud to another person.

This index was scored using a rater-scoring system. Through a variety of trial activities, both with reading experts and national centres, a preferred ordering of the strategies according to their effectiveness to achieve the intended goal was agreed. The experts' agreed order of the six items consisting this index is CDE > ABF. Scaling was conducted with two steps. First, a score was assigned to each student, which is a number that ranged from 0 to 1 and can be interpreted as the proportion of the total number of expert pair-wise relations that are consistent with the student ordering. For example, if the expert rule is (ABFD>CEG, 4×3=12 pair wise rules are created (*i.e.* A>C, A>E, A>G, B>C, B>E, B>G, F>C, F>E, F>G, D>C, D>E, D>G). If the responses of a student on this task follow 8 of the 12 rules, the student gets a score of 8/12 = 0.67. Second, these scores were standardised for the index to have a mean of 0 and a standard deviation of 1 across OECD countries. Higher values on this index indicate greater students' perception of usefulness of this strategy.

Metacognition strategies: summarising

The *index of summarising* (METASUM) was derived from students' reports on the usefulness of the following strategies for writing a summary of a long and rather difficult two-page text about fluctuations in the water levels of a lake in Africa (ST42): A) I write a summary. Then I check that each paragraph is covered in the summary, because the content of each paragraph should be included; B) I try to copy out accurately as many sentences as possible; C) before writing the summary, I read the text as many times as possible; D) I carefully check whether the most important facts in the text are represented in the summary; and E) I read through the text, underlining the most important sentences, then I write them in my own words as a summary.

This index was scored using a rater-scoring system. The experts' agreed order of the five items consisting this index is DE>AC>B. Higher values on this index indicate greater students' perception of usefulness of this strategy.

ICT resources at home

The index of ICT resources at home (ICTRES) was derived from students' reports on whether they have an educational software (ST20Q05) and/or a link to the Internet at home (ST20Q06) and the number of computers at home (ST21Q03). Higher values on this index indicate more ICT resources at home.

ICT availability at home

The *index of ICT availability at home* (ICTHOME) was derived from students' reports on whether any of the following are available for them to use at home (IC01): *i)* a desktop computer; *ii)* a portable laptop or notebook; *iii)* an Internet connection; *iv)* a video games console; *v)* a cell phone; *vi)* MP3/MP4 or iPod or similar; *vii)* a printer; and *viii)* a USB stick. As all items were inverted for scaling, higher values on this index indicate greater ICT availability at home.

ICT availability at school

The *index of ICT availability at school* (ICTSCH) was derived from students' reports on whether any of the following are available for them to use at home (IC02): *i)* a desktop computer; *ii)* a portable laptop or notebook; *iii)* an Internet connection; *iv)* a printer; and *v)* a USB stick. This question is new to PISA 2009 and provides information on ICT availability at school. As all items were inverted for scaling, higher values on this index indicate greater ICT availability at school.

Computer use at home for leisure

The *index of computer use at home for leisure* (ENTUSE) was derived from students' reports on how often they use a computer for the following activities at home (IC04): *i)* play one-player games; *ii)* play collaborative online games; *iii)* use e-mail; *iv)* chat on line; *v)* browse the Internet for fun; *vi)* download music, films, games or software from the Internet; *vii)* publish and maintain a personal website, weblog or blog; and viii) participate in online forums, virtual communities or spaces. Higher values on this index indicate more frequent computer use at home for leisure.

Computer use at home for schoolwork

The *index of computer use at home for schoolwork* (HOMSCH) was derived from students' reports on how often they use a computer for the following activities at home (IC05): *i)* browse the Internet for schoolwork; *ii)* use e-mail to communicate with other students about schoolwork; *iii)* use e-mail to communicate with teachers and submit of homework or other schoolwork; *iv)* download, upload or browse material from the school's website; and *v)* check the school's website for announcements. Higher values on this index indicate more frequent computer use at home for schoolwork.

Computer use at school

The *index of computer use at school* (USESCH) was derived from students' reports on how often they use a computer for the following activities at school (IC06): *i)* chat on line at school; *ii)* use e-mail at school; *iii)* browse the Internet for schoolwork; *iv)* download, upload or browse material from the school's website; *v)* post their work on the school's website; *vi)* play simulations at school; *vii)* practice and drilling, such as for foreign language learning or mathematics; *viii)* do individual homework on a school computer; and *ix)* use school computers for group work and to communicate with other students. Higher values on this index indicate more frequent computer use at school.

Self-confidence in ICT high-level tasks

The *index of self-confidence in ICT high-level tasks* (HIGHCONF) was derived from students' reports on the extent to which they are able to do the following tasks: *i)* edit digital photographs or other graphic images; *ii)* create a database; *iii)* use a spreadsheet to plot a graph; *iv)* create a presentation; and *v)* create a multi-media presentation. As all items were inverted for scaling, higher values on this index indicate higher self-confidence.

Among these items, the following three items were asked in the same way in PISA 2003 and 2009: use a spreadsheet to plot a graph; create a presentation; and create a multi-media presentation. These items were re-coded to 1 if students reported they can do this task "very well by myself" and to 0 for other responses. The percentage of students able to do these tasks very well by themselves was then compared between PISA 2003 and 2009 in Chapter 5.

Attitude towards computers

The *index of attitude towards computers* (ATTCOMP) was derived from students' reports on the extent to which they agree with the following statements: *i)* it is very important to me to work with a computer; *ii)* I think playing or working with a computer is really fun; *iii)* I use a computer because I am very interested; and *iv)* I lose track of time when I am working with the computer. Higher values on this index indicate a more positive attitude towards computers.

School-level simple indices

Computer-per-student ratio

The *index of computer availability* (IRATCOMP) was derived by dividing the number of computers available for educational purposes available to students in the modal grade for 15-year-olds (SC10Q02) by the number of students in the modal grade for 15-year-olds (SC10Q01).

Since the question regarding the number of students in the modal grade for 15-year-olds was not included in PISA 2000, another set of ratios was computed to examine the change in the computer-per-student ratio from PISA 2000 to 2009. In PISA 2009, a computer-per-student ratio was obtained by dividing the number of computers available for educational purposes to 15-year-olds in the modal grade (SC10Q02) by school size (SC06Q01 and SC06Q02). In PISA 2000, a computer-per-student ratio was obtained by dividing the number of computers available to 15-year-old students (SC13Q02) by school size (SC02Q01 and SC02Q02). Thus, the ratio can be biased downwards for PISA 2009 as the group of students considered in the numerator in PISA 2009 can be smaller than the group considered in PISA 2000, while the school size in the denominator was defined in the same way.

School-level scale indices

School's educational resources

The *index of the school's educational resources* (SCMATEDU) was derived from seven items measuring school principals' perceptions of potential factors hindering instruction at their school (SC11). These factors are: *i)* shortage or inadequacy of science laboratory equipment; *ii)* shortage or inadequacy of instructional materials; *iii)* shortage or inadequacy of computers for instruction; *iv)* lack or inadequacy of Internet connectivity; *v)* shortage or inadequacy of computer software for instruction; *vi)* shortage or inadequacy of library materials; and *vii)* shortage or inadequacy of audio-visual resources. As all items were inverted for scaling, higher values on this index indicate better quality of educational resources.

The item "shortage or inadequacy of computer software for instruction" was also asked in PISA 2000 (SC11Q05). This item was coded as 0 for responses "not at all" or "very little" and 1 for responses "to some extent" or "a lot". A comparison of the percentages between PISA 2000 and 2009 is presented in Chapter 5.

ANNEX A1b
CONSTRUCTION OF NAVIGATION INDICES

How the navigation indices were constructed

The PISA 2009 digital reading assessment tasks were deliberately constructed so that navigation was required to obtain full credit. As described in Chapter 3, students were required to go through a number of pages to access the information they needed to complete the task, or to integrate information from at least two different pages. These navigation indices are available in a separate data file on the PISA website (*www.pisa.oecd.org*).

In Chapter 3, the associations of digital reading scores and the following three navigation indices are examined: the *number of page visits* (PAGES), the *number of visits to relevant pages* (REL_PAGES) and the *number of relevant pages visited* (UNI_REL_PAGES). These indices are constructed based on the log files that were collected while students completed the digital reading assessment. These log files contain information on: which pages were visited in which order, which devices (*i.e.* menus, text-embedded links) were used to visit a page, and how much time students spent on a page each time they visited it. The *number of page visits* represents how many times individual students visited any pages during the digital reading assessment, regardless of the pages' relevance to the task and regardless of whether each is a first visit to the page or a revisit. If a student visits the same page several times, it is counted as several visits. The *number of visits to relevant pages* represents how many times individual students visited the pages that were relevant to the task during the digital reading assessment. Pages classified as relevant were those that either contained information needed to answer the task, were helpful for answering the task or at least could sensibly be deemed helpful for answering a task, or lay on a pathway leading from the starting page of a task to a page where task-relevant information could be found. If a student visited the same task-relevant page several times, it is counted as several visits. The *number of relevant pages visited* represents how many task-relevant pages students visited during the whole digital reading assessment. Even if a student visited the same task-relevant page several times, it is counted as one page.

In analysing students' navigation behaviour during the PISA 2009 digital reading assessment, it is important to take PISA's rotated booklet design into consideration. Not all students responded to the same set of units and items. The digital reading assessment consisted of nine units that were organised into three clusters. Out of these three clusters, each student received two clusters, in either of the two possible orders. Thus, there were six tests that differed either in the clusters of which they were composed, or the order in which these were presented.

To account for possible effects of test composition and the order of cluster presentation on navigation, the navigation indices are centred on the respective index's mean for the tests that were administered. In order words, first, the mean of the index is computed with the equal weights to the OECD countries per test, then this mean value is subtracted from individual students' values. The navigation indices are then centred around the respective index's mean for the countries. By centring on the tests and countries, the following three indices are developed: the centred *number of page visits* (PAGES_SO_C), the centred *number of visits to relevant pages* (REL_PAGES_SO_C) and the centred *number of relevant pages visited* (UNI_REL_PAGES_SO_C). These indices are used in all analyses related to the navigation indices in Volume VI, except the three main columns in Table VI.3.1 (Number of relevent pages visited, Number of visits to relevent pages and number of page visits), in which the un-centred navigation indices are used. Therefore, in general, the navigation indices refer to these three centred indices, unless otherwise stated.

This transformation, which removes the effects that the administered tests might have on the indices' means, keeps the original metric of the number of pages visited, or the number of page visits. This means that regression coefficients can still be interpreted as expected changes in digital reading scores per *page visit*, per *visit to relevant pages* or per *relevant page visited*.

Further examination of the standardised navigation indices

Differences in the tests that were administered might influence not only the means of the navigation indices, but also the standard deviations of the navigation indices. Further analyses are, therefore, conducted using the following navigation indices that are standardised per test (*i.e.* within each test, the mean is zero and the standard deviation is one) and centred around countries' means: the standardised *number of page visits* (PAGES_SOS_C), the standardised *number of visits to relevant pages* (REL_PAGES_SOS_C) and the standardised *number of relevant pages visited* (UNI_REL_PAGES_SOS_C).

As seen in Tables A1b.1 to A1b.8, the main findings in Chapter 3 are consistent even when standardised navigation indices are used instead of the centred navigation indices. Only slight differences are found, as follows:

- The associations between the navigation indices and digital reading performance turn out to be slightly stronger with the standardised navigation indices. On average across OECD countries, the correlation between the standardised *number of page visits* and digital reading performance is 0.43, while it is 0.42 for the correlation between the centred *number of page visits* and digital reading performance (Tables VI.3.2 and A1b.1). On average across OECD countries, the correlation between the standardised *number of page visits* and print reading performance is 0.34, while it is 0.33 for the correlation between the centred *number of page visits* and print reading performance (Tables VI.3.3 and A1b.2).
- The unique amount of variance accounted for by the standardised *number of relevant pages visited* after accounting for print reading performance is 0.24, while it is 0.23 with the centred *the number of relevant pages visited* (Tables VI.3.4 and A1b.3).

- In the regression analyses, the meaning of the regression coefficients is different between the standardised and centred navigation indices (Tables VI.3.4, VI.3.5, VI.3.6, A1b.3, A1b.4 and A1b.5). The regression coefficients of the standardised navigation indices are the expected change in digital reading performance per one standard deviation change in the respective navigation index. For instance, on average across OECD countries, one standard deviation increase in the standardised *number of relevant pages visited* corresponds to an increase of 66 score points on the digital reading scale (Table A1b.3); one standard deviation increase in the standardised *number of visits to relevant pages* corresponds to an increase of 40 score points on the digital reading scale (Table A1b.4); and one standard deviation increase in standardised *number of page visits* corresponds to an increase of 24 score points on the digital reading scale (Table A1b.5). These score point changes in digital reading per standard deviation change in each standardised navigation index are calculated after accounting for print reading performance.

Since there is no major difference in the results between the centred and standardised navigation indices, centred navigation indices are used in Chapter 3 in order to facilitate interpretation.

[Part 1/1]

Table A1b.1 Correlations of navigation indices (standardised per test) with digital reading scores (WLEs), by country

		Correlations between digital reading scores (WLEs) and the following navigation indices:					
		Number of relevant pages visited		Number of visits to relevant pages		Number of page visits	
		Correlation	S.E.	Correlation	S.E.	Correlation	S.E.
OECD	Australia	0.80	(0.01)	0.61	(0.02)	0.39	(0.02)
	Austria	0.85	(0.01)	0.73	(0.01)	0.57	(0.02)
	Belgium	0.83	(0.01)	0.63	(0.01)	0.40	(0.02)
	Chile	0.82	(0.01)	0.64	(0.02)	0.48	(0.03)
	Denmark	0.82	(0.02)	0.64	(0.03)	0.44	(0.04)
	France	0.85	(0.02)	0.63	(0.04)	0.43	(0.04)
	Hungary	0.86	(0.01)	0.76	(0.02)	0.61	(0.03)
	Iceland	0.80	(0.01)	0.59	(0.03)	0.37	(0.03)
	Ireland	0.83	(0.01)	0.64	(0.02)	0.43	(0.03)
	Japan	0.74	(0.02)	0.52	(0.03)	0.36	(0.04)
	Korea	0.68	(0.03)	0.38	(0.04)	0.19	(0.04)
	New Zealand	0.80	(0.01)	0.56	(0.02)	0.30	(0.03)
	Norway	0.82	(0.01)	0.66	(0.02)	0.50	(0.02)
	Poland	0.86	(0.01)	0.71	(0.01)	0.56	(0.02)
	Spain	0.84	(0.01)	0.66	(0.03)	0.48	(0.03)
	Sweden	0.80	(0.01)	0.61	(0.02)	0.42	(0.03)
	OECD average-16	0.81	(0.00)	0.62	(0.01)	0.43	(0.01)
Partners	Colombia	0.76	(0.01)	0.57	(0.03)	0.48	(0.03)
	Hong Kong-China	0.77	(0.01)	0.55	(0.03)	0.36	(0.03)
	Macao-China	0.71	(0.01)	0.42	(0.02)	0.16	(0.03)

Note: Page visit counts are standardised per test and centred on the country mean for each country.
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[Part 1/1]

Table A1b.2 Correlations of navigation indices (standardised per test) with print reading scores (WLEs), by country

		Correlations between print reading scores (WLEs) and the following navigation indices:					
		Number of relevant pages visited		Number of visits to relevant pages		Number of page visits	
		Correlation	S.E.	Correlation	S.E.	Correlation	S.E.
OECD	Australia	0.64	(0.01)	0.48	(0.02)	0.31	(0.02)
	Austria	0.67	(0.01)	0.58	(0.02)	0.44	(0.02)
	Belgium	0.69	(0.01)	0.55	(0.01)	0.36	(0.02)
	Chile	0.65	(0.02)	0.53	(0.02)	0.42	(0.03)
	Denmark	0.61	(0.03)	0.48	(0.03)	0.32	(0.04)
	France	0.58	(0.06)	0.46	(0.04)	0.32	(0.04)
	Hungary	0.72	(0.02)	0.64	(0.03)	0.53	(0.03)
	Iceland	0.62	(0.03)	0.47	(0.03)	0.31	(0.03)
	Ireland	0.61	(0.02)	0.47	(0.02)	0.30	(0.03)
	Japan	0.48	(0.03)	0.34	(0.03)	0.23	(0.03)
	Korea	0.54	(0.04)	0.34	(0.04)	0.18	(0.04)
	New Zealand	0.63	(0.02)	0.42	(0.03)	0.20	(0.03)
	Norway	0.58	(0.02)	0.47	(0.02)	0.36	(0.02)
	Poland	0.67	(0.02)	0.55	(0.02)	0.43	(0.02)
	Spain	0.64	(0.02)	0.49	(0.03)	0.35	(0.03)
	Sweden	0.64	(0.02)	0.49	(0.02)	0.33	(0.02)
	OECD average-16	0.62	(0.01)	0.48	(0.01)	0.34	(0.01)
Partners	Colombia	0.58	(0.03)	0.48	(0.03)	0.43	(0.03)
	Hong Kong-China	0.48	(0.02)	0.33	(0.04)	0.21	(0.03)
	Macao-China	0.43	(0.02)	0.24	(0.02)	0.07	(0.02)

Note: Page visit counts are standardised per test and centred on the country mean for each country.
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Table A1b.3 Regression of digital reading scores (WLEs) on print reading scores (WLEs) and the number of relevant pages visited (standardised per test)

		Intercept		Number of relevant pages visited				Print reading (WLE)				Model fit	
		Intercept	S.E.	Change in score	S.E.	ΔR^2	Effect size f^2	Change in score	S.E.	ΔR^2	Effect size f^2	R^2	S.E.
OECD	Australia	335	(7.00)	**69.08**	(1.79)	0.20	0.72	**0.35**	(0.01)	0.08	0.29	**0.72**	(0.01)
	Austria	343	(11.37)	**66.38**	(2.21)	0.24	1.03	**0.29**	(0.02)	0.04	0.17	**0.77**	(0.01)
	Belgium	326	(7.27)	**62.72**	(1.79)	0.17	0.68	**0.35**	(0.01)	0.07	0.28	**0.75**	(0.01)
	Chile	342	(11.78)	**60.57**	(2.03)	0.24	0.86	**0.31**	(0.02)	0.04	0.14	**0.72**	(0.01)
	Denmark	323	(15.80)	**66.29**	(3.46)	0.24	0.89	**0.33**	(0.03)	0.06	0.22	**0.73**	(0.02)
	France	374	(15.56)	**71.32**	(5.41)	0.32	1.40	**0.25**	(0.03)	0.05	0.22	**0.77**	(0.03)
	Hungary	333	(10.63)	**65.37**	(1.97)	0.21	0.98	**0.32**	(0.02)	0.04	0.19	**0.79**	(0.01)
	Iceland	370	(11.75)	**71.21**	(2.95)	0.25	0.80	**0.27**	(0.02)	0.05	0.16	**0.69**	(0.02)
	Ireland	370	(10.72)	**68.93**	(2.23)	0.27	1.01	**0.26**	(0.02)	0.05	0.19	**0.73**	(0.01)
	Japan	384	(7.94)	**62.56**	(2.54)	0.28	0.72	**0.23**	(0.02)	0.06	0.15	**0.61**	(0.03)
	Korea	344	(10.27)	**56.13**	(2.59)	0.16	0.37	**0.34**	(0.02)	0.11	0.26	**0.57**	(0.03)
	New Zealand	316	(9.17)	**67.93**	(2.21)	0.18	0.67	**0.39**	(0.02)	0.09	0.33	**0.73**	(0.01)
	Norway	363	(8.41)	**67.39**	(1.67)	0.28	1.01	**0.27**	(0.02)	0.05	0.18	**0.72**	(0.01)
	Poland	358	(9.44)	**65.36**	(1.50)	0.26	1.13	**0.26**	(0.02)	0.03	0.13	**0.77**	(0.01)
	Spain	368	(13.51)	**70.49**	(3.25)	0.28	1.08	**0.26**	(0.03)	0.03	0.12	**0.74**	(0.01)
	Sweden	345	(10.11)	**63.24**	(2.53)	0.20	0.68	**0.32**	(0.02)	0.07	0.24	**0.71**	(0.01)
	OECD average-16	350	(2.74)	**65.94**	(0.67)	0.24	0.88	**0.30**	(0.01)	0.06	0.20	**0.72**	(0.00)
Partners	Colombia	337	(12.77)	**53.96**	(2.11)	0.24	0.65	**0.27**	(0.03)	0.05	0.14	**0.63**	(0.02)
	Hong Kong-China	342	(9.71)	**62.41**	(1.61)	0.29	0.87	**0.30**	(0.02)	0.08	0.24	**0.67**	(0.02)
	Macao-China	333	(5.99)	**52.75**	(1.31)	0.25	0.66	**0.32**	(0.01)	0.11	0.29	**0.62**	(0.01)

Notes: Page visit counts are standardised per test and centred on the country mean for each country. Changes in score and R^2 values that are statistically significant are indicated in bold (see Annex A3).

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Table A1b.4 Regression of digital reading scores (WLEs) on print reading scores (WLEs) and the number of visits to relevant pages (standardised per test)

		Intercept		Number of visits to relevant pages				Print reading (WLE)				Model fit	
		Intercept	S.E.	Change in score	S.E.	ΔR^2	Effect size f^2	Change in score	S.E.	ΔR^2	Effect size f^2	R^2	S.E.
OECD	Australia	246	(7.42)	**40.45**	(2.40)	0.09	0.23	**0.55**	(0.01)	0.24	0.62	**0.61**	(0.01)
	Austria	258	(11.78)	**50.50**	(2.54)	0.15	0.46	**0.46**	(0.02)	0.14	0.43	**0.68**	(0.01)
	Belgium	222	(7.98)	**34.80**	(2.18)	0.06	0.17	**0.56**	(0.02)	0.25	0.70	**0.64**	(0.01)
	Chile	200	(14.21)	**35.88**	(2.61)	0.11	0.26	**0.55**	(0.03)	0.17	0.41	**0.58**	(0.02)
	Denmark	234	(14.32)	**44.17**	(3.55)	0.12	0.30	**0.52**	(0.03)	0.20	0.51	**0.61**	(0.02)
	France	276	(9.87)	**45.64**	(2.79)	0.13	0.31	**0.45**	(0.02)	0.18	0.43	**0.58**	(0.06)
	Hungary	233	(11.68)	**49.52**	(2.40)	0.13	0.44	**0.51**	(0.02)	0.13	0.44	**0.71**	(0.02)
	Iceland	263	(17.30)	**37.77**	(4.30)	0.10	0.22	**0.49**	(0.03)	0.19	0.41	**0.54**	(0.02)
	Ireland	279	(14.80)	**44.48**	(2.80)	0.13	0.32	**0.46**	(0.03)	0.19	0.47	**0.60**	(0.02)
	Japan	311	(10.67)	**31.33**	(2.10)	0.12	0.22	**0.37**	(0.02)	0.18	0.32	**0.44**	(0.03)
	Korea	274	(12.76)	**15.37**	(1.91)	0.03	0.05	**0.51**	(0.02)	0.30	0.54	**0.44**	(0.03)
	New Zealand	216	(9.61)	**38.97**	(2.79)	0.08	0.21	**0.60**	(0.02)	0.31	0.83	**0.63**	(0.02)
	Norway	291	(10.47)	**47.88**	(2.50)	0.16	0.40	**0.42**	(0.02)	0.16	0.40	**0.60**	(0.01)
	Poland	238	(10.72)	**44.49**	(2.18)	0.14	0.40	**0.48**	(0.02)	0.15	0.43	**0.65**	(0.02)
	Spain	240	(16.28)	**44.68**	(4.77)	0.14	0.35	**0.51**	(0.03)	0.17	0.43	**0.60**	(0.02)
	Sweden	254	(9.49)	**37.43**	(2.70)	0.09	0.23	**0.51**	(0.02)	0.23	0.58	**0.60**	(0.02)
	OECD average-16	252	(3.04)	**40.21**	(0.72)	0.11	0.29	**0.50**	(0.01)	0.20	0.50	**0.59**	(0.01)
Partners	Colombia	213	(12.98)	**29.20**	(2.42)	0.10	0.20	**0.45**	(0.03)	0.16	0.31	**0.49**	(0.03)
	Hong Kong-China	253	(11.54)	**32.77**	(1.79)	0.14	0.29	**0.46**	(0.02)	0.21	0.43	**0.51**	(0.02)
	Macao-China	253	(8.29)	**23.16**	(1.66)	0.08	0.14	**0.47**	(0.02)	0.27	0.49	**0.45**	(0.01)

Notes: Page visit counts are standardised per test and centred on the country mean for each country. Changes in score and R^2 values that are statistically significant are indicated in bold (see Annex A3).

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Table A1b.5 **Regression of digital reading scores (WLEs) on print reading scores (WLEs) and the number of page visits (standardised per test)**

		Intercept		Number of page visits				Print reading (WLE)				Model fit	
		Intercept	S.E.	Change in score	S.E.	ΔR^2	Effect size f^2	Change in score	S.E.	ΔR^2	Effect size f^2	R^2	S.E.
OECD	Australia	199	(7.40)	**22.57**	(2.37)	0.03	0.07	**0.66**	(0.01)	0.41	0.92	**0.56**	(0.01)
	Austria	184	(12.80)	**33.34**	(2.59)	0.07	0.18	**0.60**	(0.02)	0.28	0.71	**0.60**	(0.01)
	Belgium	167	(8.79)	**17.26**	(2.47)	0.02	0.05	**0.67**	(0.02)	0.44	1.09	**0.60**	(0.01)
	Chile	136	(12.16)	**22.47**	(2.37)	0.04	0.08	**0.67**	(0.03)	0.29	0.60	**0.52**	(0.02)
	Denmark	177	(14.58)	**27.36**	(3.60)	0.05	0.11	**0.64**	(0.03)	0.35	0.76	**0.54**	(0.02)
	France	225	(10.81)	**29.28**	(3.14)	0.05	0.10	**0.55**	(0.02)	0.32	0.65	**0.51**	(0.07)
	Hungary	148	(11.67)	**32.33**	(3.40)	0.06	0.17	**0.67**	(0.02)	0.26	0.72	**0.64**	(0.02)
	Iceland	210	(14.89)	**19.28**	(3.03)	0.03	0.06	**0.59**	(0.03)	0.33	0.63	**0.47**	(0.03)
	Ireland	228	(15.29)	**28.54**	(3.03)	0.06	0.12	**0.56**	(0.03)	0.33	0.68	**0.52**	(0.02)
	Japan	287	(12.68)	**17.91**	(2.25)	0.05	0.08	**0.43**	(0.02)	0.25	0.40	**0.38**	(0.03)
	Korea	260	(14.10)	**5.19**	(1.55)	0.00	0.00	**0.56**	(0.02)	0.38	0.65	**0.42**	(0.03)
	New Zealand	174	(9.69)	**20.47**	(2.77)	0.03	0.07	**0.70**	(0.02)	0.48	1.12	**0.57**	(0.02)
	Norway	240	(10.97)	**32.16**	(2.77)	0.08	0.17	**0.52**	(0.02)	0.27	0.56	**0.52**	(0.02)
	Poland	173	(10.60)	**31.95**	(2.24)	0.08	0.20	**0.60**	(0.02)	0.27	0.66	**0.59**	(0.02)
	Spain	177	(13.49)	**30.25**	(3.74)	0.06	0.13	**0.64**	(0.03)	0.30	0.64	**0.53**	(0.02)
	Sweden	209	(9.01)	**21.56**	(2.27)	0.04	0.09	**0.61**	(0.02)	0.37	0.82	**0.55**	(0.02)
	OECD average-16	200	(3.01)	**24.49**	(0.70)	0.05	0.10	**0.60**	(0.01)	0.33	0.73	**0.53**	(0.01)
Partners	Colombia	176	(11.77)	**21.05**	(2.08)	0.06	0.11	**0.50**	(0.03)	0.22	0.40	**0.45**	(0.03)
	Hong Kong-China	216	(13.51)	**17.83**	(1.90)	0.06	0.10	**0.53**	(0.02)	0.30	0.52	**0.43**	(0.02)
	Macao-China	231	(8.95)	**7.35**	(1.35)	0.01	0.02	**0.52**	(0.02)	0.36	0.58	**0.38**	(0.01)

Notes: Page visit counts are standardised per test and centred on the country mean for each country. Changes in score and R^2 values that are statistically significant are indicated in bold (see Annex A3).

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Table A1b.6 **Regression of digital reading scores (WLEs) on print reading scores (WLEs) and the number of page visits (standardised per test) including a quadratic trend for the number of page visits**

		Intercept		Print reading (WLE)		Number of page visits		Number of page visits (squared)		Model fit		Increment of quadratic term	
		Intercept	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	R^2	S.E.	ΔR^2	Effect size f^2
OECD	Australia	244	(7.53)	**0.60**	(0.01)	**30.27**	(2.03)	**-18.50**	(1.58)	**0.60**	(0.01)	0.04	0.10
	Austria	219	(12.69)	**0.54**	(0.03)	**40.36**	(2.55)	**-15.59**	(1.25)	**0.64**	(0.01)	0.04	0.11
	Belgium	214	(7.75)	**0.60**	(0.01)	**26.63**	(1.98)	**-15.60**	(1.40)	**0.64**	(0.01)	0.04	0.11
	Chile	169	(13.24)	**0.60**	(0.03)	**29.80**	(2.23)	**-10.15**	(1.79)	**0.55**	(0.02)	0.03	0.07
	Denmark	216	(15.68)	**0.58**	(0.03)	**35.58**	(3.57)	**-16.89**	(2.44)	**0.58**	(0.02)	0.04	0.10
	France	276	(16.76)	**0.48**	(0.03)	**41.63**	(5.83)	**-22.05**	(3.84)	**0.59**	(0.04)	0.09	0.22
	Hungary	196	(9.63)	**0.57**	(0.02)	**41.67**	(2.53)	**-15.08**	(1.43)	**0.68**	(0.02)	0.04	0.12
	Iceland	266	(14.55)	**0.51**	(0.03)	**29.40**	(2.67)	**-15.29**	(2.18)	**0.53**	(0.03)	0.06	0.13
	Ireland	273	(15.71)	**0.50**	(0.03)	**35.24**	(2.57)	**-19.11**	(2.18)	**0.57**	(0.02)	0.05	0.12
	Japan	335	(12.34)	**0.39**	(0.02)	**23.48**	(1.74)	**-9.33**	(0.87)	**0.43**	(0.04)	0.05	0.09
	Korea	283	(13.35)	**0.53**	(0.02)	**9.01**	(1.44)	**-5.15**	(0.87)	**0.44**	(0.03)	0.02	0.04
	New Zealand	209	(12.89)	**0.65**	(0.02)	**28.42**	(2.44)	**-12.02**	(3.23)	**0.60**	(0.02)	0.03	0.07
	Norway	278	(10.65)	**0.46**	(0.02)	**40.71**	(1.87)	**-16.03**	(2.66)	**0.58**	(0.02)	0.06	0.14
	Poland	213	(12.57)	**0.52**	(0.02)	**39.46**	(1.79)	**-14.02**	(2.31)	**0.63**	(0.02)	0.04	0.11
	Spain	229	(14.96)	**0.55**	(0.03)	**37.33**	(3.36)	**-19.03**	(2.58)	**0.59**	(0.02)	0.06	0.15
	Sweden	251	(9.65)	**0.55**	(0.02)	**30.26**	(2.17)	**-12.17**	(1.57)	**0.58**	(0.02)	0.04	0.10
	OECD average-16	242	(3.20)	**0.54**	(0.01)	**32.45**	(0.69)	**-14.75**	(0.54)	**0.58**	(0.01)	0.05	0.11
Partners	Colombia	188	(10.87)	**0.46**	(0.03)	**29.98**	(2.12)	**-7.00**	(0.99)	**0.48**	(0.03)	0.03	0.06
	Hong Kong-China	275	(12.96)	**0.47**	(0.02)	**23.26**	(1.54)	**-8.63**	(1.00)	**0.48**	(0.02)	0.05	0.10
	Macao-China	261	(9.39)	**0.49**	(0.02)	**13.55**	(1.37)	**-4.78**	(0.89)	**0.41**	(0.02)	0.03	0.05

Notes: Page visit counts are standardised per test and centred on the country mean for each country. Changes in score and R^2 values that are statistically significant are indicated in bold (see Annex A3).

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Table A1b.7 Regression of digital reading scores (WLEs) on print reading scores (WLEs) and the number of visits to relevant pages (standardised per test) including a quadratic trend for the number of relevant page visits

		Intercept		Print reading (WLE)		Number of visits to relevant pages		Number of visits to relevant pages (squared)		Model fit		Increment of quadratic term	
		Intercept	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	R^2	S.E.	ΔR^2	Effect size f^2
OECD	Australia	286	(7.56)	**0.51**	(0.01)	**37.79**	(1.73)	**-15.22**	(1.31)	**0.64**	(0.01)	0.03	0.08
	Austria	262	(11.81)	**0.44**	(0.02)	**48.57**	(2.30)	**-12.00**	(1.43)	**0.69**	(0.01)	0.02	0.07
	Belgium	255	(8.11)	**0.52**	(0.02)	**33.70**	(1.75)	**-14.64**	(1.11)	**0.67**	(0.01)	0.03	0.09
	Chile	207	(13.12)	**0.51**	(0.03)	**39.82**	(2.23)	**-5.86**	(1.34)	**0.60**	(0.02)	0.02	0.05
	Denmark	265	(16.14)	**0.48**	(0.03)	**42.07**	(2.66)	**-18.41**	(2.02)	**0.65**	(0.02)	0.04	0.11
	France	306	(12.88)	**0.42**	(0.02)	**43.88**	(2.90)	**-19.70**	(2.87)	**0.68**	(0.03)	0.10	0.31
	Hungary	233	(10.70)	**0.48**	(0.02)	**49.76**	(2.22)	**-8.37**	(1.31)	**0.72**	(0.02)	0.01	0.04
	Iceland	314	(14.56)	**0.42**	(0.03)	**39.39**	(2.69)	**-16.46**	(1.67)	**0.60**	(0.02)	0.06	0.15
	Ireland	316	(13.93)	**0.41**	(0.03)	**42.09**	(2.15)	**-14.91**	(1.63)	**0.63**	(0.02)	0.03	0.08
	Japan	362	(11.03)	**0.34**	(0.02)	**29.71**	(1.58)	**-12.28**	(1.52)	**0.49**	(0.03)	0.05	0.10
	Korea	313	(12.64)	**0.48**	(0.02)	**16.67**	(1.73)	**-8.49**	(1.08)	**0.47**	(0.03)	0.03	0.06
	New Zealand	257	(11.53)	**0.56**	(0.02)	**37.34**	(2.47)	**-12.85**	(2.49)	**0.65**	(0.02)	0.02	0.06
	Norway	315	(9.23)	**0.39**	(0.02)	**47.35**	(2.19)	**-13.37**	(1.96)	**0.64**	(0.01)	0.04	0.11
	Poland	253	(9.65)	**0.44**	(0.02)	**45.64**	(1.52)	**-10.79**	(0.91)	**0.68**	(0.01)	0.02	0.06
	Spain	272	(14.87)	**0.45**	(0.03)	**46.55**	(3.27)	**-13.14**	(2.24)	**0.64**	(0.02)	0.04	0.11
	Sweden	291	(9.75)	**0.47**	(0.02)	**36.93**	(2.10)	**-12.90**	(1.17)	**0.63**	(0.02)	0.03	0.08
	OECD average-16	282	(2.99)	**0.46**	(0.01)	**39.83**	(0.57)	**-13.09**	(0.43)	**0.63**	(0.00)	0.04	0.10
Partners	Colombia	204	(11.18)	**0.42**	(0.03)	**34.91**	(1.96)	**-5.72**	(1.19)	**0.51**	(0.03)	0.02	0.04
	Hong Kong-China	314	(11.83)	**0.39**	(0.02)	**34.77**	(1.89)	**-9.41**	(1.44)	**0.56**	(0.02)	0.04	0.09
	Macao-China	293	(8.26)	**0.43**	(0.02)	**26.96**	(1.30)	**-9.35**	(1.44)	**0.49**	(0.02)	0.04	0.08

Notes: Page visit counts are standardised per test and centred on the country mean for each country. Changes in score and R^2 values that are statistically significant are indicated in bold (see Annex A3).

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Table A1b.8 Regression of digital reading scores (WLEs) on print reading scores (WLEs) and the number of relevant pages visited (standardised per test) including a quadratic trend for the number of relevant pages visited

		Intercept		Print reading (WLE)		Number of relevant pages visited		Number of relevant pages visited (squared)		Model fit		Increment of quadratic term	
		Intercept	S.E.	Change in score	S.E.	Change in score	S.E.	Change in score	S.E.	R^2	S.E.	ΔR^2	Effect size f^2
OECD	Australia	358	(7.38)	**0.35**	(0.01)	**69.74**	(2.07)	**0.54**	(1.63)	**0.72**	(0.01)	0.00	0.00
	Austria	322	(11.05)	**0.29**	(0.02)	**66.79**	(1.98)	**0.54**	(1.43)	**0.77**	(0.01)	0.00	0.00
	Belgium	334	(7.44)	**0.35**	(0.01)	**63.05**	(1.74)	**0.34**	(1.25)	**0.75**	(0.01)	0.00	0.00
	Chile	290	(10.65)	**0.31**	(0.02)	**60.57**	(1.98)	**0.02**	(1.19)	**0.72**	(0.01)	0.00	0.00
	Denmark	329	(16.46)	**0.33**	(0.03)	**62.62**	(3.22)	**-3.89**	(2.17)	**0.73**	(0.02)	0.00	0.01
	France	365	(9.61)	**0.27**	(0.02)	**64.85**	(2.53)	**-4.17**	(2.03)	**0.77**	(0.03)	0.00	0.02
	Hungary	298	(10.15)	**0.32**	(0.02)	**66.59**	(1.97)	**2.59**	(1.35)	**0.79**	(0.01)	0.00	0.00
	Iceland	378	(11.85)	**0.27**	(0.02)	**66.79**	(3.66)	**-4.20**	(2.31)	**0.69**	(0.02)	0.00	0.01
	Ireland	377	(10.58)	**0.26**	(0.02)	**69.45**	(2.40)	**0.57**	(1.39)	**0.73**	(0.01)	0.00	0.00
	Japan	409	(8.66)	**0.23**	(0.02)	**59.92**	(2.67)	**-2.70**	(2.85)	**0.61**	(0.03)	0.00	0.00
	Korea	381	(11.14)	**0.34**	(0.02)	**54.37**	(3.15)	**-1.90**	(1.86)	**0.57**	(0.03)	0.00	0.00
	New Zealand	339	(9.68)	**0.39**	(0.02)	**68.23**	(2.91)	**0.26**	(1.75)	**0.73**	(0.01)	0.00	0.00
	Norway	366	(8.48)	**0.27**	(0.02)	**65.48**	(1.71)	**-1.91**	(1.43)	**0.72**	(0.01)	0.00	0.00
	Poland	329	(9.04)	**0.26**	(0.02)	**65.49**	(1.54)	**0.25**	(1.00)	**0.77**	(0.01)	0.00	0.00
	Spain	353	(13.38)	**0.26**	(0.03)	**70.33**	(2.45)	**-0.20**	(2.26)	**0.74**	(0.01)	0.00	0.00
	Sweden	354	(10.42)	**0.32**	(0.02)	**63.88**	(2.84)	**0.66**	(1.40)	**0.71**	(0.01)	0.00	0.00
	OECD average-16	349	(2.65)	**0.30**	(0.01)	**64.88**	(0.62)	**-0.82**	(0.44)	**0.72**	(0.00)	0.00	0.00
Partners	Colombia	253	(11.01)	**0.27**	(0.03)	**51.86**	(2.27)	**5.97**	(1.30)	**0.64**	(0.02)	0.01	0.02
	Hong Kong-China	355	(10.00)	**0.30**	(0.02)	**60.52**	(2.03)	**-2.35**	(1.31)	**0.67**	(0.02)	0.00	0.00
	Macao-China	334	(5.99)	**0.32**	(0.01)	**51.45**	(1.48)	**-2.08**	(1.11)	**0.62**	(0.01)	0.00	0.00

Notes: Page visit counts are standardised per test and centred on the country mean for each country. Changes in score and R^2 values that are statistically significant are indicated in bold (see Annex A3).

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ANNEX A2
THE PISA TARGET POPULATION, THE PISA SAMPLES AND THE DEFINITION OF SCHOOLS

The definition of the PISA target population

PISA 2009 provides an assessment of the cumulative yield of education and learning at a point at which most young adults are still enrolled in initial education.

A major challenge for an international survey is to ensure that international comparability of national target populations is guaranteed in such a venture.

Differences between countries in the nature and extent of pre-primary education and care, the age of entry into formal schooling and the institutional structure of educational systems do not allow the definition of internationally comparable grade levels of schooling. Consequently, international comparisons of educational performance typically define their populations with reference to a target age group. Some previous international assessments have defined their target population on the basis of the grade level that provides maximum coverage of a particular age cohort. A disadvantage of this approach is that slight variations in the age distribution of students across grade levels often lead to the selection of different target grades in different countries, or between education systems within countries, raising serious questions about the comparability of results across, and at times within, countries. In addition, because not all students of the desired age are usually represented in grade-based samples, there may be a more serious potential bias in the results if the unrepresented students are typically enrolled in the next higher grade in some countries and the next lower grade in others. This would exclude students with potentially higher levels of performance in the former countries and students with potentially lower levels of performance in the latter.

In order to address this problem, PISA uses an age-based definition for its target population, *i.e.* a definition that is not tied to the institutional structures of national education systems. PISA assesses students who were aged between 15 years and 3 (complete) months and 16 years and 2 (complete) months at the beginning of the assessment period, plus or minus a one-month allowable variation, and who were enrolled in an educational institution at grade seven or higher, regardless of the grade levels or type of institution in which they were enrolled, and regardless of whether they were in full-time or part-time education. Educational institutions are generally referred to as schools in this publication, although some educational institutions (in particular, some types of vocational education establishments) may not be termed schools in certain countries. As expected from this definition, the average age of students across OECD countries was 15 years and 9 months. The range in country means was 2 months and 5 days (0.18 year) from the minimum country mean of 15 years and 8 months to the maximum country mean of 15 years and 10 months.

Given this definition of population, PISA makes statements about the knowledge and skills of a group of individuals who were born within a comparable reference period, but who may have undergone different educational experiences both in and outside of schools. In PISA, these knowledge and skills are referred to as the yield of education at an age that is common across countries. Depending on countries' policies on school entry, selection and promotion, these students may be distributed over a narrower or a wider range of grades across different education systems, tracks or streams. It is important to consider these differences when comparing PISA results across countries, as observed differences between students at age 15 may no longer appear as students' educational experiences converge later on.

If a country's scale scores in print reading, scientific, mathematical, digital reading literacy are significantly higher than those in another country, it cannot automatically be inferred that the schools or particular parts of the education system in the first country are more effective than those in the second. However, one can legitimately conclude that the cumulative impact of learning experiences in the first country, starting in early childhood and up to the age of 15 and embracing experiences both in school, home and beyond, have resulted in higher outcomes in the literacy domains that PISA measures.

The PISA target population did not include residents attending schools in a foreign country. It does, however, include foreign nationals attending schools in the country of assessment.

To accommodate countries that desired grade-based results for the purpose of national analyses, PISA 2009 provided a sampling option to supplement age-based sampling with grade-based sampling.

Population coverage for the paper-based assessment

All countries attempted to maximise the coverage of 15-year-olds enrolled in education in their national samples, including students enrolled in special educational institutions. As a result, PISA 2009 reached standards of population coverage that are unprecedented in international surveys of this kind.

The sampling standards used in PISA permitted countries to exclude up to a total of 5% of the relevant population either by excluding schools or by excluding students within schools. All but five countries, Denmark (8.17%), Luxembourg (8.15%), Canada (6.00%), Norway (5.93%) and the United States (5.16%) achieved this standard, and in 36 countries and economies the overall exclusion rate was less than 2%. When language exclusions were accounted for (*i.e.* removed from the overall exclusion rate), the United States no longer had an exclusion rate greater than 5%. For details, see *www.pisa.oecd.org*.

Exclusions within the above limits include:

- *At the school level: i)* schools that were geographically inaccessible or where the administration of the PISA assessment was not considered feasible; and *ii)* schools that provided teaching only for students in the categories defined under "within-school exclusions", such as schools for the blind. The percentage of 15-year-olds enrolled in such schools had to be less than 2.5% of the nationally desired target population (0.5% maximum for *i)* and 2% maximum for *ii)*). The magnitude, nature and justification of school-level exclusions are documented in the *PISA 2009 Technical Report* (OECD, forthcoming).
- *At the student level: i)* students with an intellectual disability; *ii)* students with a functional disability; *iii)* students with limited assessment language proficiency; *iv)* other – a category defined by the national centres and approved by the international centre; and *v)* students taught in a language of instruction for the main domain for which no materials were available. Students could not be excluded solely because of low proficiency or normal discipline problems. The percentage of 15-year-olds excluded within schools had to be less than 2.5% of the nationally desired target population.

Table A2.1 describes the target population of the countries participating in PISA 2009. Further information on the target population and the implementation of PISA sampling standards can be found in the *PISA 2009 Technical Report* (OECD, forthcoming).

- ***Column 1*** shows the **total number of 15-year-olds** according to the most recent available information, which in most countries was the year 2008, the year before the assessment.
- ***Column 2*** shows the number of 15-year-olds enrolled in schools in grades seven or above (as defined above), which is referred to as the **eligible population**.
- ***Column 3*** shows the **national desired target population**. Countries were allowed to exclude up to 0.5% of students *a priori* from the eligible population, essentially for practical reasons. The following *a priori* exclusions exceed this limit but were agreed with the PISA Consortium: Canada excluded 1.1% of its population from Territories and Aboriginal reserves; ***France*** excluded 1.7% of its students in its *territoires d'outre-mer* and other institutions; ***Indonesia*** excluded 4.7% of its students from four provinces because of security reasons; Kyrgyzstan excluded 2.3% of its population in remote, inaccessible schools; and Serbia excluded 2% of its students taught in Serbian in Kosovo.
- ***Column 4*** shows the **number of students enrolled in schools that were excluded from the national desired target population** either from the sampling frame or later in the field during data collection.
- ***Column 5*** shows the **size of the national desired target population after subtracting the students enrolled in excluded schools**. This is obtained by subtracting column 4 from column 3.
- ***Column 6*** shows the **percentage of students enrolled in excluded schools**. This is obtained by dividing column 4 by column 3 and multiplying by 100.
- ***Column 7*** shows the **number of students participating in PISA 2009**. Note that in some cases this number does not account for 15-year-olds assessed as part of additional national options.
- ***Column 8*** shows the **weighted number of participating students**, *i.e.* the number of students in the nationally defined target population that the PISA sample represents.
- Each country attempted to maximise the coverage of PISA's target population within the sampled schools. In the case of each sampled school, all eligible students, namely those 15 years of age, regardless of grade, were first listed. Sampled students who were to be excluded had still to be included in the sampling documentation, and a list drawn up stating the reason for their exclusion. ***Column 9*** indicates the **total number of *excluded students,*** which is further described and classified into specific categories in Table A2.2. ***Column 10*** indicates the **weighted number of excluded students,** *i.e.* the overall number of students in the nationally defined target population represented by the number of students excluded from the sample, which is also described and classified by exclusion categories in Table A2.2. Students were excluded based on five categories: *i)* students with an intellectual disability – the student has a mental or emotional disability and is cognitively delayed such that he/she cannot perform in the PISA testing situation; *ii)* students with a functional disability – the student has a moderate to severe permanent physical disability such that he/she cannot perform in the PISA testing situation; *iii)* students with a limited assessment language proficiency – the student is unable to read or speak any of the languages of the assessment in the country and would be unable to overcome the language barrier in the testing situation (typically a student who has received less than one year of instruction in the languages of the assessment may be excluded); *iv) other* – a category defined by the national centres and approved by the international centre; and *v)* students taught in a language of instruction for the main domain for which no materials were available.
- ***Column 11*** shows the **percentage of students excluded within schools.** This is calculated as the weighted number of excluded students (column 10), divided by the weighted number of excluded and participating students (column 8 plus column 10) then multiplied by 100.

[Part 1/2]

Table A2.1 PISA target populations and samples (paper-based assessment)

		Population and sample information							
		Total population of 15-year-olds	Total population of 15-year-olds enrolled at Grade 7 or above	Total in national desired target population	Total school-level exclusions	Total in national desired target population after all school exclusions and before within-school exclusions	School-level exclusion rate (%)	Number of participating students	Weighted number of participating students
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OECD	Australia	286 334	269 669	269 669	7 057	262 612	2.62	14 251	240 851
	Austria	99 818	94 192	94 192	115	94 077	0.12	6 590	87 326
	Belgium	126 377	126 335	126 335	2 474	123 861	1.96	8 501	119 140
	Canada	430 791	426 590	422 052	2 370	419 682	0.56	23 207	360 286
	Chile	290 056	265 542	265 463	2 594	262 869	0.98	5 669	247 270
	Czech Republic	122 027	116 153	116 153	1 619	114 534	1.39	6 064	113 951
	Denmark	70 522	68 897	68 897	3 082	65 815	4.47	5 924	60 855
	Estonia	14 248	14 106	14 106	436	13 670	3.09	4 727	12 978
	Finland	66 198	66 198	66 198	1 507	64 691	2.28	5 810	61 463
	France	749 808	732 825	720 187	18 841	701 346	2.62	4 298	677 620
	Germany	852 044	852 044	852 044	7 138	844 906	0.84	4 979	766 993
	Greece	102 229	105 664	105 664	696	104 968	0.66	4 969	93 088
	Hungary	121 155	118 387	118 387	3 322	115 065	2.81	4 605	105 611
	Iceland	4 738	4 738	4 738	20	4 718	0.42	3 646	4 410
	Ireland	56 635	55 464	55 446	276	55 170	0.50	3 937	52 794
	Israel	122 701	112 254	112 254	1 570	110 684	1.40	5 761	103 184
	Italy	586 904	573 542	573 542	2 694	570 848	0.47	30 905	506 733
	Japan	1 211 642	1 189 263	1 189 263	22 955	1 166 308	1.93	6 088	1 113 403
	Korea	717 164	700 226	700 226	2 927	697 299	0.42	4 989	630 030
	Luxembourg	5 864	5 623	5 623	186	5 437	3.31	4 622	5 124
	Mexico	2 151 771	1 425 397	1 425 397	5 825	1 419 572	0.41	38 250	1 305 461
	Netherlands	199 000	198 334	198 334	6 179	192 155	3.12	4 760	183 546
	New Zealand	63 460	60 083	60 083	645	59 438	1.07	4 643	55 129
	Norway	63 352	62 948	62 948	1 400	61 548	2.22	4 660	57 367
	Poland	482 500	473 700	473 700	7 650	466 050	1.61	4 917	448 866
	Portugal	115 669	107 583	107 583	0	107 583	0.00	6 298	96 820
	Slovak Republic	72 826	72 454	72 454	1 803	70 651	2.49	4 555	69 274
	Slovenia	20 314	19 571	19 571	174	19 397	0.89	6 155	18 773
	Spain	433 224	425 336	425 336	3 133	422 203	0.74	25 887	387 054
	Sweden	121 486	121 216	121 216	2 323	118 893	1.92	4 567	113 054
	Switzerland	90 623	89 423	89 423	1 747	87 676	1.95	11 812	80 839
	Turkey	1 336 842	859 172	859 172	8 569	850 603	1.00	4 996	757 298
	United Kingdom	786 626	786 825	786 825	17 593	769 232	2.24	12 179	683 380
	United States	4 103 738	4 210 475	4 210 475	15 199	4 195 276	0.36	5 233	3 373 264
Partners	Albania	55 587	42 767	42 767	372	42 395	0.87	4 596	34 134
	Argentina	688 434	636 713	636 713	2 238	634 475	0.35	4 774	472 106
	Azerbaijan	185 481	184 980	184 980	1 886	183 094	1.02	4 727	105 886
	Brazil	3 292 022	2 654 489	2 654 489	15 571	2 638 918	0.59	20 127	2 080 159
	Bulgaria	80 226	70 688	70 688	1 369	69 319	1.94	4 507	57 833
	Colombia	893 057	582 640	582 640	412	582 228	0.07	7 921	522 388
	Croatia	48 491	46 256	46 256	535	45 721	1.16	4 994	43 065
	Dubai (UAE)	10 564	10 327	10 327	167	10 160	1.62	5 620	9 179
	Hong Kong-China	85 000	78 224	78 224	809	77 415	1.03	4 837	75 548
	Indonesia	4 267 801	3 158 173	3 010 214	10 458	2 999 756	0.35	5 136	2 259 118
	Jordan	117 732	107 254	107 254	0	107 254	0.00	6 486	104 056
	Kazakhstan	281 659	263 206	263 206	7 210	255 996	2.74	5 412	250 657
	Kyrgyzstan	116 795	93 989	91 793	1 149	90 644	1.25	4 986	78 493
	Latvia	28 749	28 149	28 149	943	27 206	3.35	4 502	23 362
	Liechtenstein	399	360	360	5	355	1.39	329	355
	Lithuania	51 822	43 967	43 967	522	43 445	1.19	4 528	40 530
	Macao-China	7 500	5 969	5 969	3	5 966	0.05	5 952	5 978
	Montenegro	8 500	8 493	8 493	10	8 483	0.12	4 825	7 728
	Panama	57 919	43 623	43 623	501	43 122	1.15	3 969	30 510
	Peru	585 567	491 514	490 840	984	489 856	0.20	5 985	427 607
	Qatar	10 974	10 665	10 665	114	10 551	1.07	9 078	9 806
	Romania	152 084	152 084	152 084	679	151 405	0.45	4 776	151 130
	Russian Federation	1 673 085	1 667 460	1 667 460	25 012	1 642 448	1.50	5 308	1 290 047
	Serbia	85 121	75 128	73 628	1 580	72 048	2.15	5 523	70 796
	Shanghai-China	112 000	100 592	100 592	1 287	99 305	1.28	5 115	97 045
	Singapore	54 982	54 212	54 212	633	53 579	1.17	5 283	51 874
	Chinese Taipei	329 249	329 189	329 189	1 778	327 411	0.54	5 831	297 203
	Thailand	949 891	763 679	763 679	8 438	755 241	1.10	6 225	691 916
	Trinidad and Tobago	19 260	17 768	17 768	0	17 768	0.00	4 778	14 938
	Tunisia	153 914	153 914	153 914	0	153 914	0.00	4 955	136 545
	Uruguay	53 801	43 281	43 281	30	43 251	0.07	5 957	33 971

Note: For a full explanation of the details in this table, please refer to the *PISA 2009 Technical Report* (OECD, forthcoming). The figure for the total national population of 15-year-olds enrolled in Column 1 may occasionally be larger than the total number of 15-year-olds in Column 2 due to differing data sources. In Greece, Column 1 does not include immigrants but Column 2 does.

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[Part 2/2]

Table A2.1 **PISA target populations and samples (paper-based assessment)**

		Population and sample information				Coverage indices		
		Number of excluded students	Weighted number of excluded students	Within-school exclusion rate (%)	Overall exclusion rate (%)	Coverage index 1: Coverage of national desired population	Coverage index 2: Coverage of national enrolled population	Coverage index 3: Coverage of 15-year-old population
		(9)	(10)	(11)	(12)	(13)	(14)	(15)
OECD	Australia	313	4 389	1.79	4.36	0.956	0.956	0.841
	Austria	45	607	0.69	0.81	0.992	0.992	0.875
	Belgium	30	292	0.24	2.20	0.978	0.978	0.943
	Canada	1 607	20 837	5.47	6.00	0.940	0.930	0.836
	Chile	15	620	0.25	1.22	0.988	0.987	0.852
	Czech Republic	24	423	0.37	1.76	0.982	0.982	0.934
	Denmark	296	2 448	3.87	8.17	0.918	0.918	0.863
	Estonia	32	97	0.74	3.81	0.962	0.962	0.911
	Finland	77	717	1.15	3.40	0.966	0.966	0.928
	France	1	304	0.04	2.66	0.973	0.957	0.904
	Germany	28	3 591	0.47	1.30	0.987	0.987	0.900
	Greece	142	2 977	3.10	3.74	0.963	0.963	0.911
	Hungary	10	361	0.34	3.14	0.969	0.969	0.872
	Iceland	187	189	4.10	4.50	0.955	0.955	0.931
	Ireland	136	1 492	2.75	3.23	0.968	0.967	0.932
	Israel	86	1 359	1.30	2.68	0.973	0.973	0.841
	Italy	561	10 663	2.06	2.52	0.975	0.975	0.863
	Japan	0	0	0.00	1.93	0.981	0.981	0.919
	Korea	16	1 748	0.28	0.69	0.993	0.993	0.879
	Luxembourg	196	270	5.01	8.15	0.919	0.919	0.874
	Mexico	52	1 951	0.15	0.56	0.994	0.994	0.607
	Netherlands	19	648	0.35	3.46	0.965	0.965	0.922
	New Zealand	184	1 793	3.15	4.19	0.958	0.958	0.869
	Norway	207	2 260	3.79	5.93	0.941	0.941	0.906
	Poland	15	1 230	0.27	1.88	0.981	0.981	0.930
	Portugal	115	1 544	1.57	1.57	0.984	0.984	0.837
	Slovak Republic	106	1 516	2.14	4.58	0.954	0.954	0.951
	Slovenia	43	138	0.73	1.61	0.984	0.984	0.924
	Spain	775	12 673	3.17	3.88	0.961	0.961	0.893
	Sweden	146	3 360	2.89	4.75	0.953	0.953	0.931
	Switzerland	209	940	1.15	3.08	0.969	0.969	0.892
	Turkey	11	1 497	0.20	1.19	0.988	0.988	0.566
	United Kingdom	318	17 094	2.44	4.62	0.954	0.954	0.869
	United States	315	170 542	4.81	5.16	0.948	0.948	0.822
Partners	Albania	0	0	0.00	0.87	0.991	0.991	0.614
	Argentina	14	1 225	0.26	0.61	0.994	0.994	0.686
	Azerbaijan	0	0	0.00	1.02	0.990	0.990	0.571
	Brazil	24	2 692	0.13	0.72	0.993	0.993	0.632
	Bulgaria	0	0	0.00	1.94	0.981	0.981	0.721
	Colombia	11	490	0.09	0.16	0.998	0.998	0.585
	Croatia	34	273	0.63	1.78	0.982	0.982	0.888
	Dubai (UAE)	5	7	0.07	1.69	0.983	0.983	0.869
	Hong Kong-China	9	119	0.16	1.19	0.988	0.988	0.889
	Indonesia	0	0	0.00	0.35	0.997	0.950	0.529
	Jordan	24	443	0.42	0.42	0.996	0.996	0.884
	Kazakhstan	82	3 844	1.51	4.21	0.958	0.958	0.890
	Kyrgyzstan	86	1 384	1.73	2.96	0.970	0.948	0.672
	Latvia	19	102	0.43	3.77	0.962	0.962	0.813
	Liechtenstein	0	0	0.00	1.39	0.986	0.986	0.890
	Lithuania	74	632	1.53	2.70	0.973	0.973	0.782
	Macao-China	0	0	0.00	0.05	0.999	0.999	0.797
	Montenegro	0	0	0.00	0.12	0.999	0.999	0.909
	Panama	0	0	0.00	1.15	0.989	0.989	0.527
	Peru	9	558	0.13	0.33	0.997	0.995	0.730
	Qatar	28	28	0.28	1.35	0.986	0.986	0.894
	Romania	0	0	0.00	0.45	0.996	0.996	0.994
	Russian Federation	59	15 247	1.17	2.65	0.973	0.973	0.771
	Serbia	10	133	0.19	2.33	0.977	0.957	0.832
	Shanghai-China	7	130	0.13	1.41	0.986	0.986	0.866
	Singapore	48	417	0.80	1.96	0.980	0.980	0.943
	Chinese Taipei	32	1 662	0.56	1.09	0.989	0.989	0.903
	Thailand	6	458	0.07	1.17	0.988	0.988	0.728
	Trinidad and Tobago	11	36	0.24	0.24	0.998	0.998	0.776
	Tunisia	7	184	0.13	0.13	0.999	0.999	0.887
	Uruguay	14	67	0.20	0.26	0.997	0.997	0.631

Note: For a full explanation of the details in this table please refer to the *PISA 2009 Technical Report* (OECD, forthcoming). The figure for the total national population of 15-year-olds enrolled in Column 1 may occasionally be larger than the total number of 15-year-olds in Column 2 due to differing data sources. In Greece, Column 1 does not include immigrants but Column 2 does.

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[Part 1/1]

Table A2.2 Exclusions (paper-based assessment)

		Student exclusions (unweighted)						Student exclusion (weighted)					
		Number of excluded students with a disability (Code 1)	Number of excluded students with a disability (Code 2)	Number of excluded students because of language (Code 3)	Number of excluded students for other reasons (Code 4)	Number of excluded students because of no materials available in the language of instruction (Code 5)	Total number of excluded students	Weighted number of excluded students with a disability (Code 1)	Weighted number of excluded students with a disability (Code 2)	Weighted number of excluded students because of language (Code 3)	Weighted number of excluded students for other reasons (Code 4)	Number of excluded students because of no materials available in the language of instruction (Code 5)	Total weighted number of excluded students
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
OECD	Australia	24	210	79	0	0	313	272	2 834	1 283	0	0	4 389
	Austria	0	26	19	0	0	45	0	317	290	0	0	607
	Belgium	3	17	10	0	0	30	26	171	95	0	0	292
	Canada	49	1 458	100	0	0	1 607	428	19 082	1 326	0	0	20 837
	Chile	5	10	0	0	0	15	177	443	0	0	0	620
	Czech Republic	8	7	9	0	0	24	117	144	162	0	0	423
	Denmark	13	182	35	66	0	296	165	1 432	196	656	0	2 448
	Estonia	3	28	1	0	0	32	8	87	2	0	0	97
	Finland	4	48	12	11	2	77	38	447	110	99	23	717
	France	1	0	0	0	0	1	304	0	0	0	0	304
	Germany	6	20	2	0	0	28	864	2 443	285	0	0	3 591
	Greece	7	11	7	117	0	142	172	352	195	2 257	0	2 977
	Hungary	0	1	0	9	0	10	0	48	0	313	0	361
	Iceland	3	78	64	38	1	187	3	78	65	39	1	189
	Ireland	4	72	25	35	0	136	51	783	262	396	0	1 492
	Israel	10	69	7	0	0	86	194	1 049	116	0	0	1 359
	Italy	45	348	168	0	0	561	748	6 241	3 674	0	0	10 663
	Japan	0	0	0	0	0	0	0	0	0	0	0	0
	Korea	7	9	0	0	0	16	994	753	0	0	0	1 748
	Luxembourg	2	132	62	0	0	196	2	206	62	0	0	270
	Mexico	25	25	2	0	0	52	1 010	905	36	0	0	1 951
	Netherlands	6	13	0	0	0	19	178	470	0	0	0	648
	New Zealand	19	84	78	0	3	184	191	824	749	0	29	1 793
	Norway	8	160	39	0	0	207	90	1 756	414	0	0	2 260
	Poland	2	13	0	0	0	15	169	1 061	0	0	0	1 230
	Portugal	2	100	13	0	0	115	25	1 322	197	0	0	1 544
	Slovak Republic	12	37	1	56	0	106	171	558	19	768	0	1 516
	Slovenia	6	10	27	0	0	43	40	32	66	0	0	138
	Spain	45	441	289	0	0	775	1 007	7 141	4 525	0	0	12 673
	Sweden	115	0	31	0	0	146	2 628	0	732	0	0	3 360
	Switzerland	11	106	92	0	0	209	64	344	532	0	0	940
	Turkey	3	3	5	0	0	11	338	495	665	0	0	1 497
	United Kingdom	40	247	31	0	0	318	2 438	13 482	1 174	0	0	17 094
	United States	29	236	40	10	0	315	15 367	127 486	21 718	5 971	0	170 542
Partners	Albania	0	0	0	0	0	0	0	0	0	0	0	0
	Argentina	4	10	0	0	0	14	288	937	0	0	0	1 225
	Azerbaijan	0	0	0	0	0	0	0	0	0	0	0	0
	Brazil	21	3	0	0	0	24	2 495	197	0	0	0	2 692
	Bulgaria	0	0	0	0	0	0	0	0	0	0	0	0
	Colombia	7	2	2	0	0	11	200	48	242	0	0	490
	Croatia	4	30	0	0	0	34	34	239	0	0	0	273
	Dubai (UAE)	1	1	3	0	0	5	2	2	3	0	0	7
	Hong Kong-China	0	9	0	0	0	9	0	119	0	0	0	119
	Indonesia	0	0	0	0	0	0	0	0	0	0	0	0
	Jordan	11	7	6	0	0	24	166	149	127	0	0	443
	Kazakhstan	10	17	0	0	55	82	429	828	0	0	2 587	3 844
	Kyrgyzstan	68	13	5	0	0	86	1 093	211	80	0	0	1 384
	Latvia	6	8	5	0	0	19	25	44	33	0	0	102
	Liechtenstein	0	0	0	0	0	0	0	0	0	0	0	0
	Lithuania	4	69	1	0	0	74	33	590	9	0	0	632
	Macao-China	0	0	0	0	0	0	0	0	0	0	0	0
	Montenegro	0	0	0	0	0	0	0	0	0	0	0	0
	Panama	0	0	0	0	0	0	0	0	0	0	0	0
	Peru	4	5	0	0	0	9	245	313	0	0	0	558
	Qatar	9	18	1	0	0	28	9	18	1	0	0	28
	Romania	0	0	0	0	0	0	0	0	0	0	0	0
	Russian Federation	11	47	1	0	0	59	2 081	13 010	157	0	0	15 247
	Serbia	4	5	0	0	1	10	66	53	0	0	13	133
	Shanghai-China	1	6	0	0	0	7	19	111	0	0	0	130
	Singapore	2	22	24	0	0	48	17	217	182	0	0	417
	Chinese Taipei	13	19	0	0	0	32	684	977	0	0	0	1 662
	Thailand	0	5	1	0	0	6	0	260	198	0	0	458
	Trinidad and Tobago	1	10	0	0	0	11	3	33	0	0	0	36
	Tunisia	4	1	2	0	0	7	104	21	58	0	0	184
	Uruguay	2	9	3	0	0	14	14	34	18	0	0	67

Exclusion codes:
Code 1 Functional disability – student has a moderate to severe permanent physical disability.
Code 2 Intellectual disability – student has a mental or emotional disability and has either been tested as cognitively delayed or is considered in the professional opinion of qualified staff to be cognitively delayed.
Code 3 Limited assessment language proficiency – student is not a native speaker of any of the languages of the assessment in the country and has been resident in the country for less than one year.
Code 4 Other defined by the national centres and approved by the international centre.
Code 5 No materials available in the language of instruction.
Note: For a full explanation of other details in this table, please refer to the *PISA 2009 Technical Report* (OECD, forthcoming).
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- ***Column 12*** shows the **overall exclusion rate,** which represents the weighted percentage of the national desired target population excluded from PISA either through school-level exclusions or through the exclusion of students within schools. It is calculated as the school-level exclusion rate (column 6 divided by 100) plus within-school exclusion rate (column 11 divided by 100) multiplied by 1 minus the school-level exclusion rate (column 6 divided by 100). This result is then multiplied by 100. Five countries, Denmark, Luxembourg, Canada, Norway and the United States, had exclusion rates higher than 5%. When language exclusions were accounted for (*i.e.* removed from the overall exclusion rate), the United States no longer had an exclusion rate greater than 5%.
- ***Column 13*** presents an **index of the extent to which the national desired target population is covered by the PISA sample**. Denmark, Luxembourg, Canada, Norway and the United States were the only countries where the coverage is below 95%.
- ***Column 14*** presents an **index of the extent to which 15-year-olds enrolled in schools are covered by the PISA sample**. The index measures the overall proportion of the national enrolled population that is covered by the non-excluded portion of the student sample. The index takes into account both school-level and student-level exclusions. Values close to 100 indicate that the PISA sample represents the entire education system as defined for PISA 2009. The index is the weighted number of participating students (column 8) divided by the weighted number of participating and excluded students (column 8 plus column 10), times the nationally defined target population (column 5) divided by the eligible population (column 2) (times 100).
- ***Column 15*** presents an **index of the coverage of the 15-year-old population**. This index is the weighted number of participating students (column 8) divided by the total population of 15-year-old students (column 1).

This high level of coverage contributes to the comparability of the assessment results. For example, even assuming that the excluded students would have systematically scored worse than those who participated, and that this relationship is moderately strong, an exclusion rate in the order of 5% would likely lead to an overestimation of national mean scores of less than five score points (on a scale with an international mean of 500 score points and a standard deviation of 100 score points). This assessment is based on the following calculations: If the correlation between the propensity of exclusions and student performance is 0.3, resulting mean scores would likely be overestimated by one score point if the exclusion rate is 1%, by three score points if the exclusion rate is 5%, and by six score points if the exclusion rate is 10%. If the correlation between the propensity of exclusions and student performance is 0.5, resulting mean scores would be overestimated by one score point if the exclusion rate is 1%, by five score points if the exclusion rate is 5%, and by ten score points if the exclusion rate is 10%. For this calculation, a model was employed that assumes a bivariate normal distribution for performance and the propensity to participate. For details, see the *PISA 2009 Technical Report* (OECD, forthcoming).

Sampling procedures and response rates

The accuracy of any survey result depends on the quality of the information on which national samples are based as well as on the sampling procedures. Quality standards, procedures, instruments and verification mechanisms were developed for PISA that ensured that national samples yielded comparable data and that the results could be compared with confidence.

Most PISA samples were designed as two-stage stratified samples (where countries applied different sampling designs, these are documented in the *PISA 2009 Technical Report* [OECD, forthcoming]). The first stage consisted of sampling individual schools in which 15-year-old students could be enrolled. Schools were sampled systematically with probabilities proportional to size, the measure of size being a function of the estimated number of eligible (15-year-old) students enrolled. A minimum of 150 schools were selected in each country (where this number existed), although the requirements for national analyses often required a somewhat larger sample. As the schools were sampled, replacement schools were simultaneously identified, in case a sampled school chose not to participate in PISA 2009.

In the case of Iceland, Liechtenstein, Luxembourg, Macao-China, and Qatar, all schools and all eligible students within schools were included in the sample.

Experts from the PISA Consortium performed the sample selection process for most participating countries and monitored it closely in those countries that selected their own samples. The second stage of the selection process sampled students within sampled schools. Once schools were selected, a list of each sampled school's 15-year-old students was prepared. From this list, 35 students were then selected with equal probability (all 15-year-old students were selected if fewer than 35 were enrolled). The number of students to be sampled per school could deviate from 35 but could not be less than 20.

Data-quality standards in PISA required minimum participation rates for schools as well as for students. These standards were established to minimise the potential for response biases. In the case of countries meeting these standards, it was likely that any bias resulting from non-response would be negligible, *i.e.* typically smaller than the sampling error.

A minimum response rate of 85% was required for the schools initially selected. Where the initial response rate of schools was between 65% and 85%, however, an acceptable school response rate could still be achieved through the use of replacement schools. This procedure brought with it a risk of increased response bias. Participating countries were, therefore, encouraged to persuade as many of the schools in the original sample as possible to participate. Schools with a student participation rate between 25% and 50% were not regarded as participating schools, but data from these schools were included in the database and contributed to the various estimations. Data from schools with a student participation rate of less than 25% were excluded from the database.

[Part 1/2]

Table A2.3 Response rates (paper-based assessment)

		Initial sample – before school replacement					Final sample – after school replacement		
		Weighted school participation rate before replacement (%)	Weighted number of responding schools (weighted also by enrolment)	Weighted number of schools sampled (responding and non-responding) (weighted also by enrolment)	Number of responding schools (unweighted)	Number of responding and non-responding schools (unweighted)	Weighted school participation rate after replacement (%)	Weighted number of responding schools (weighted also by enrolment)	Weighted number of schools sampled (responding and non-responding) (weighted also by enrolment)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
OECD	Australia	97.78	265 659	271 696	342	357	98.85	268 780	271 918
	Austria	93.94	88 551	94 261	280	291	93.94	88 551	94 261
	Belgium	88.76	112 594	126 851	255	292	95.58	121 291	126 899
	Canada	88.04	362 152	411 343	893	1 001	89.64	368 708	411 343
	Chile	94.34	245 583	260 331	189	201	99.04	257 594	260 099
	Czech Republic	83.09	94 696	113 961	226	270	97.40	111 091	114 062
	Denmark	83.94	55 375	65 967	264	325	90.75	59 860	65 964
	Estonia	100.00	13 230	13 230	175	175	100.00	13 230	13 230
	Finland	98.65	62 892	63 751	201	204	100.00	63 748	63 751
	France	94.14	658 769	699 776	166	177	94.14	658 769	699 776
	Germany	98.61	826 579	838 259	223	226	100.00	838 259	838 259
	Greece	98.19	98 710	100 529	181	184	99.40	99 925	100 529
	Hungary	98.21	101 523	103 378	184	190	99.47	103 067	103 618
	Iceland	98.46	4 488	4 558	129	141	98.46	4 488	4 558
	Ireland	87.18	48 821	55 997	139	160	88.44	49 526	55 997
	Israel	92.03	103 141	112 069	170	186	95.40	106 918	112 069
	Italy	94.27	532 432	564 811	1 054	1 108	99.08	559 546	564 768
	Japan	87.77	999 408	1 138 694	171	196	94.99	1 081 662	1 138 694
	Korea	100.00	683 793	683 793	157	157	100.00	683 793	683 793
	Luxembourg	100.00	5 437	5 437	39	39	100.00	5 437	5 437
	Mexico	95.62	1 338 291	1 399 638	1 512	1 560	97.71	1 367 668	1 399 730
	Netherlands	80.40	154 471	192 140	155	194	95.54	183 555	192 118
	New Zealand	84.11	49 917	59 344	148	179	91.00	54 130	59 485
	Norway	89.61	55 484	61 920	183	207	96.53	59 759	61 909
	Poland	88.16	409 513	464 535	159	187	97.70	453 855	464 535
	Portugal	93.61	102 225	109 205	201	216	98.43	107 535	109 251
	Slovak Republic	93.33	67 284	72 092	180	191	99.01	71 388	72 105
	Slovenia	98.36	19 798	20 127	337	352	98.36	19 798	20 127
	Spain	99.53	422 692	424 705	888	892	99.53	422 692	424 705
	Sweden	99.91	120 693	120 802	189	191	99.91	120 693	120 802
	Switzerland	94.25	81 005	85 952	413	429	98.71	84 896	86 006
	Turkey	100.00	849 830	849 830	170	170	100.00	849 830	849 830
	United Kingdom	71.06	523 271	736 341	418	549	87.35	643 027	736 178
	United States	67.83	2 673 852	3 941 908	140	208	77.50	3 065 651	3 955 606
Partners	Albania	97.29	39 168	40 259	177	182	99.37	39 999	40 253
	Argentina	97.18	590 215	607 344	194	199	99.42	603 817	607 344
	Azerbaijan	99.86	168 646	168 890	161	162	100.00	168 890	168 890
	Brazil	93.13	2 435 250	2 614 824	899	976	94.75	2 477 518	2 614 806
	Bulgaria	98.16	56 922	57 991	173	178	99.10	57 823	58 346
	Colombia	90.21	507 649	562 728	260	285	94.90	533 899	562 587
	Croatia	99.19	44 561	44 926	157	159	99.86	44 862	44 926
	Dubai (UAE)	100.00	10 144	10 144	190	190	100.00	10 144	10 144
	Hong Kong-China	69.19	53 800	77 758	108	156	96.75	75 232	77 758
	Indonesia	94.54	2 337 438	2 472 502	172	183	100.00	2 473 528	2 473 528
	Jordan	100.00	105 906	105 906	210	210	100.00	105 906	105 906
	Kazakhstan	100.00	257 427	257 427	199	199	100.00	257 427	257 427
	Kyrgyzstan	98.53	88 412	89 733	171	174	99.47	89 260	89 733
	Latvia	97.46	26 986	27 689	180	185	99.39	27 544	27 713
	Liechtenstein	100.00	356	356	12	12	100.00	356	356
	Lithuania	98.13	41 759	42 555	192	197	99.91	42 526	42 564
	Macao-China	100.00	5 966	5 966	45	45	100.00	5 966	5 966
	Montenegro	100.00	8 527	8 527	52	52	100.00	8 527	8 527
	Panama	82.58	33 384	40 426	180	220	83.76	33 779	40 329
	Peru	100.00	480 640	480 640	240	240	100.00	480 640	480 640
	Qatar	97.30	10 223	10 507	149	154	97.30	10 223	10 507
	Romania	100.00	150 114	150 114	159	159	100.00	150 114	150 114
	Russian Federation	100.00	1 392 765	1 392 765	213	213	100.00	1 392 765	1 392 765
	Serbia	99.21	70 960	71 524	189	191	99.97	71 504	71 524
	Shanghai-China	99.32	98 841	99 514	151	152	100.00	99 514	99 514
	Singapore	96.19	51 552	53 592	168	175	97.88	52 454	53 592
	Chinese Taipei	99.34	322 005	324 141	157	158	100.00	324 141	324 141
	Thailand	98.01	737 225	752 193	225	230	100.00	752 392	752 392
	Trinidad and Tobago	97.21	17 180	17 673	155	160	97.21	17 180	17 673
	Tunisia	100.00	153 198	153 198	165	165	100.00	153 198	153 198
	Uruguay	98.66	42 820	43 400	229	233	98.66	42 820	43 400

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[Part 2/2]

Table A2.3 Response rates (paper-based assessment)

		Final sample – after school replacement		Final sample – students within schools after school replacement				
		Number of responding schools (unweighted)	Number of responding and non-responding schools (unweighted)	Weighted student participation rate after replacement (%)	Number of students assessed (weighted)	Number of students sampled (assessed and absent) (weighted)	Number of students assessed (unweighted)	Number of students sampled (assessed and absent) (unweighted)
		(9)	(10)	(11)	(12)	(13)	(14)	(15)
OECD	Australia	345	357	86.05	205 234	238 498	14 060	16 903
	Austria	280	291	88.63	72 793	82 135	6 568	7 587
	Belgium	275	292	91.38	104 263	114 097	8 477	9 245
	Canada	908	1 001	79.52	257 905	324 342	22 383	27 603
	Chile	199	201	92.88	227 541	244 995	5 663	6 097
	Czech Republic	260	270	90.75	100 685	110 953	6 049	6 656
	Denmark	285	325	89.29	49 236	55 139	5 924	6 827
	Estonia	175	175	94.06	12 208	12 978	4 727	5 023
	Finland	203	204	92.27	56 709	61 460	5 810	6 309
	France	166	177	87.12	556 054	638 284	4 272	4 900
	Germany	226	226	93.93	720 447	766 993	4 979	5 309
	Greece	183	184	95.95	88 875	92 631	4 957	5 165
	Hungary	187	190	93.25	97 923	105 015	4 605	4 956
	Iceland	129	141	83.91	3 635	4 332	3 635	4 332
	Ireland	141	160	83.81	39 248	46 830	3 896	4 654
	Israel	176	186	89.45	88 480	98 918	5 761	6 440
	Italy	1 095	1 108	92.13	462 655	502 190	30 876	33 390
	Japan	185	196	95.32	1 010 801	1 060 382	6 077	6 377
	Korea	157	157	98.76	622 187	630 030	4 989	5 057
	Luxembourg	39	39	95.57	4 897	5 124	4 622	4 833
	Mexico	1 531	1 560	95.13	1 214 827	1 276 982	38 213	40 125
	Netherlands	185	194	89.78	157 912	175 897	4 747	5 286
	New Zealand	161	179	84.65	42 452	50 149	4 606	5 476
	Norway	197	207	89.92	49 785	55 366	4 660	5 194
	Poland	179	187	85.87	376 767	438 739	4 855	5 674
	Portugal	212	216	87.11	83 094	95 386	6 263	7 169
	Slovak Republic	189	191	93.03	63 854	68 634	4 555	4 898
	Slovenia	337	352	90.92	16 777	18 453	6 135	6 735
	Spain	888	892	89.60	345 122	385 164	25 871	28 280
	Sweden	189	191	92.97	105 026	112 972	4 567	4 912
	Switzerland	425	429	93.58	74 712	79 836	11 810	12 551
	Turkey	170	170	97.85	741 029	757 298	4 996	5 108
	United Kingdom	481	549	86.96	520 121	598 110	12 168	14 046
	United States	160	208	86.99	2 298 889	2 642 598	5 165	5 951
Partners	Albania	181	182	95.39	32 347	33 911	4 596	4 831
	Argentina	198	199	88.25	414 166	469 285	4 762	5 423
	Azerbaijan	162	162	99.14	105 095	106 007	4 691	4 727
	Brazil	926	976	89.04	1 767 872	1 985 479	19 901	22 715
	Bulgaria	176	178	97.34	56 096	57 630	4 499	4 617
	Colombia	274	285	92.83	462 602	498 331	7 910	8 483
	Croatia	158	159	93.76	40 321	43 006	4 994	5 326
	Dubai (UAE)	190	190	90.39	8 297	9 179	5 620	6 218
	Hong Kong-China	151	156	93.19	68 142	73 125	4 837	5 195
	Indonesia	183	183	96.91	2 189 287	2 259 118	5 136	5 313
	Jordan	210	210	95.85	99 734	104 056	6 486	6 777
	Kazakhstan	199	199	98.49	246 872	250 657	5 412	5 489
	Kyrgyzstan	173	174	98.04	76 523	78 054	4 986	5 086
	Latvia	184	185	91.27	21 241	23 273	4 502	4 930
	Liechtenstein	12	12	92.68	329	355	329	355
	Lithuania	196	197	93.36	37 808	40 495	4 528	4 854
	Macao-China	45	45	99.57	5 952	5 978	5 952	5 978
	Montenegro	52	52	95.43	7 375	7 728	4 825	5 062
	Panama	183	220	88.67	22 666	25 562	3 913	4 449
	Peru	240	240	96.35	412 011	427 607	5 985	6 216
	Qatar	149	154	93.63	8 990	9 602	8 990	9 602
	Romania	159	159	99.47	150 331	151 130	4 776	4 803
	Russian Federation	213	213	96.77	1 248 353	1 290 047	5 308	5 502
	Serbia	190	191	95.37	67 496	70 775	5 522	5 804
	Shanghai-China	152	152	98.89	95 966	97 045	5 115	5 175
	Singapore	171	175	91.04	46 224	50 775	5 283	5 809
	Chinese Taipei	158	158	95.30	283 239	297 203	5 831	6 108
	Thailand	230	230	97.37	673 688	691 916	6 225	6 396
	Trinidad and Tobago	155	160	85.92	12 275	14 287	4 731	5 518
	Tunisia	165	165	96.93	132 354	136 545	4 955	5 113
	Uruguay	229	233	87.03	29 193	33 541	5 924	6 815

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PISA 2009 also required a minimum participation rate of 80% of students within participating schools. This minimum participation rate had to be met at the national level, not necessarily by each participating school. Follow-up sessions were required in schools in which too few students had participated in the original assessment sessions. Student participation rates were calculated over all original schools, and also over all schools whether original sample or replacement schools, and from the participation of students in both the original assessment and any follow-up sessions. A student who participated in the original or follow-up cognitive sessions was regarded as a participant. Those who attended only the questionnaire session were included in the international database and contributed to the statistics presented in this publication if he or she provided at least a description of his or her father's or mother's occupation.

Table A2.3 shows the response rates for students and schools, before and after replacement.

- ***Column 1*** shows the **weighted participation rate of schools before replacement.** This is obtained by dividing column 2 by column 3.
- ***Column 2*** shows the **weighted number of responding schools before school replacement** (weighted by student enrolment).
- ***Column 3*** shows the **weighted number of sampled schools before school replacement** (including both responding and non-responding schools, weighted by student enrolment).
- ***Column 4*** shows the **unweighted** number **of responding schools before school replacement**.
- ***Column 5*** shows the **unweighted number of responding and non-responding schools before school replacement**.
- ***Column 6*** shows the **weighted participation rate of schools after replacement.** This is obtained by dividing column 7 by column 8.
- ***Column 7*** shows the **weighted number of responding schools after school replacement** (weighted by student enrolment).
- ***Column 8*** shows the **weighted number of schools sampled after school replacement** (including both responding and non-responding schools, weighted by student enrolment).
- ***Column 9*** shows the **unweighted number of responding schools after school replacement.**
- ***Column 10*** shows the **unweighted number of responding and non-responding schools after school replacement.**
- ***Column 11*** shows the **weighted student participation rate after replacement.** This is obtained by dividing column 12 by column 13.
- ***Column 12*** shows the **weighted number of students assessed**.
- ***Column 13*** shows the **weighted number of students sampled** (including both students who were assessed and students who were absent on the day of the assessment).
- ***Column 14*** shows the **unweighted number of students assessed.** Note that any students in schools with student-response rates less than 50% were not included in these rates (both weighted and unweighted).
- ***Column 15*** shows the **unweighted number of students sampled** (including both students that were assessed and students who were absent on the day of the assessment). Note that any students in schools where fewer than half of the eligible students were assessed were not included in these rates (neither weighted nor unweighted).

Definition of schools

In some countries, sub-units within schools were sampled instead of schools and this may affect the estimation of the between-school variance components. In Austria, the Czech Republic, Germany, Hungary, Japan, Romania and Slovenia, schools with more than one study programme were split into the units delivering these programmes. In the Netherlands, for schools with both lower and upper secondary programmes, schools were split into units delivering each programme level. In the Flemish Community of Belgium, in the case of multi-campus schools, implantations (campuses) were sampled, whereas in the French area, in the case of multi-campus schools, the larger administrative units were sampled. In Australia, for schools with more than one campus, the individual campuses were listed for sampling. In Argentina, Croatia, and Dubai (UAE), schools that had more than one campus had the locations listed for sampling. In Spain, the schools in the Basque region with multi-linguistic models were split into linguistic models for sampling.

Grade levels

Students assessed in PISA 2009 are at various grade levels. The percentage of students at each grade level is presented by country in Table A2.4a and by gender within each country in Table A2.4b.

Sampling and weighting for the digital reading assessment

Sampling for the digital reading assessment

Nineteen countries participated in the digital reading assessment: Australia, Austria, Belgium, Chile, Denmark, France, Hungary, Iceland, Ireland, Japan, Korea, New Zealand, Norway, Poland, Spain, Sweden and the partner countries and economies Colombia, Hong Kong-China and Macao-China. When a country participated in the digital reading assessment option, it was expected that student sampling of the digital reading assessment would occur in every school that participated in the paper-based PISA survey.

[Part 1/1]

Table A2.4a Percentage of students at each grade level

		Grade level											
		7th grade		8th grade		9th grade		10th grade		11th grade		12th grade	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	0.0	(0.0)	0.1	(0.0)	10.4	(0.6)	70.8	(0.6)	18.6	(0.6)	0.1	(0.0)
	Austria	0.7	(0.2)	6.2	(1.0)	42.4	(0.9)	50.7	(1.0)	0.0	(0.0)	0.0	c
	Belgium	0.4	(0.2)	5.5	(0.5)	32.0	(0.6)	60.8	(0.7)	1.2	(0.1)	0.0	(0.0)
	Canada	0.0	(0.0)	1.2	(0.2)	13.6	(0.5)	84.1	(0.5)	1.1	(0.1)	0.0	(0.0)
	Chile	1.0	(0.2)	3.9	(0.5)	20.5	(0.8)	69.4	(1.0)	5.2	(0.3)	0.0	(0.0)
	Czech Republic	0.5	(0.2)	3.8	(0.3)	48.9	(1.0)	46.7	(1.1)	0.0	c	0.0	c
	Denmark	0.1	(0.0)	14.7	(0.6)	83.5	(0.8)	1.7	(0.5)	0.0	c	0.0	c
	Estonia	1.6	(0.3)	24.0	(0.7)	72.4	(0.9)	1.8	(0.3)	0.1	(0.1)	0.0	c
	Finland	0.5	(0.1)	11.8	(0.5)	87.3	(0.5)	0.0	c	0.4	(0.1)	0.0	c
	France	1.3	(0.9)	3.6	(0.7)	34.4	(1.2)	56.6	(1.5)	4.0	(0.7)	0.1	(0.0)
	Germany	1.2	(0.2)	11.0	(0.5)	54.8	(0.8)	32.5	(0.8)	0.4	(0.1)	0.0	(0.0)
	Greece	0.4	(0.2)	1.4	(0.5)	5.5	(0.8)	92.7	(1.0)	0.0	c	0.0	c
	Hungary	2.8	(0.6)	7.6	(1.1)	67.1	(1.4)	22.4	(0.9)	0.1	(0.1)	0.0	(0.0)
	Iceland	0.0	c	0.0	c	0.0	(0.0)	98.3	(0.1)	1.7	(0.1)	0.0	c
	Ireland	0.1	(0.0)	2.4	(0.3)	59.1	(1.0)	24.0	(1.4)	14.4	(1.1)	0.0	c
	Israel	0.0	c	0.3	(0.1)	17.9	(1.0)	81.3	(1.0)	0.5	(0.2)	0.0	(0.0)
	Italy	0.1	(0.1)	1.4	(0.3)	16.9	(0.4)	78.4	(0.6)	3.2	(0.3)	0.0	c
	Japan	0.0	c	0.0	c	0.0	c	100.0	(0.0)	0.0	c	0.0	c
	Korea	0.0	c	0.0	(0.0)	4.2	(0.9)	95.1	(0.9)	0.7	(0.1)	0.0	c
	Luxembourg	0.6	(0.1)	11.6	(0.2)	51.6	(0.3)	36.0	(0.2)	0.3	(0.0)	0.0	c
	Mexico	1.7	(0.1)	7.4	(0.3)	34.5	(0.8)	55.6	(0.9)	0.7	(0.2)	0.0	(0.0)
	Netherlands	0.2	(0.2)	2.7	(0.3)	46.2	(1.1)	50.5	(1.1)	0.5	(0.1)	0.0	c
	New Zealand	0.0	c	0.0	c	0.0	(0.0)	5.9	(0.4)	88.8	(0.5)	5.3	(0.3)
	Norway	0.0	c	0.0	c	0.5	(0.1)	99.3	(0.2)	0.2	(0.1)	0.0	c
	Poland	1.0	(0.2)	4.5	(0.4)	93.6	(0.6)	0.9	(0.3)	0.0	c	0.0	c
	Portugal	2.3	(0.3)	9.0	(0.8)	27.9	(1.6)	60.4	(2.2)	0.4	(0.1)	0.0	c
	Slovak Republic	1.0	(0.2)	2.6	(0.3)	35.7	(1.4)	56.9	(1.6)	3.8	(0.8)	0.0	(0.0)
	Slovenia	0.0	c	0.1	(0.1)	3.0	(0.7)	90.7	(0.7)	6.2	(0.2)	0.0	c
	Spain	0.1	(0.0)	9.9	(0.4)	26.5	(0.6)	63.4	(0.7)	0.0	(0.0)	0.0	c
	Sweden	0.1	(0.1)	3.2	(0.3)	95.1	(0.6)	1.6	(0.5)	0.0	c	0.0	c
	Switzerland	0.6	(0.1)	15.5	(0.9)	61.7	(1.3)	21.0	(1.1)	1.2	(0.5)	0.0	(0.0)
	Turkey	0.7	(0.1)	3.5	(0.8)	25.2	(1.3)	66.6	(1.5)	3.8	(0.3)	0.2	(0.1)
	United Kingdom	0.0	c	0.0	c	0.0	c	1.2	(0.1)	98.0	(0.1)	0.8	(0.0)
	United States	0.0	c	0.1	(0.1)	10.9	(0.8)	68.5	(1.0)	20.3	(0.7)	0.1	(0.1)
	OECD average	0.8	(0.1)	5.8	(0.1)	37.0	(0.2)	52.9	(0.2)	9.9	(0.1)	0.5	(0.0)
Partners	Albania	0.4	(0.1)	2.2	(0.3)	50.9	(2.0)	46.4	(2.0)	0.1	(0.0)	0.0	c
	Argentina	4.7	(0.9)	12.9	(1.3)	20.4	(1.2)	57.8	(2.1)	4.3	(0.5)	0.0	c
	Azerbaijan	0.6	(0.2)	5.3	(0.5)	49.4	(1.3)	44.3	(1.3)	0.4	(0.1)	0.0	c
	Brazil	6.8	(0.4)	18.0	(0.7)	37.5	(0.8)	35.7	(0.8)	2.1	(0.1)	0.0	c
	Bulgaria	1.5	(0.3)	6.1	(0.6)	88.7	(0.9)	3.8	(0.6)	0.0	c	0.0	c
	Colombia	4.4	(0.5)	10.3	(0.7)	22.1	(0.8)	42.3	(1.0)	21.0	(1.0)	0.0	c
	Croatia	0.0	c	0.2	(0.2)	77.5	(0.4)	22.3	(0.4)	0.0	c	0.0	c
	Dubai (UAE)	1.1	(0.1)	3.4	(0.1)	14.8	(0.4)	56.9	(0.5)	22.9	(0.4)	0.9	(0.1)
	Hong Kong-China	1.7	(0.2)	7.2	(0.5)	25.2	(0.5)	65.9	(0.9)	0.1	(0.0)	0.0	c
	Indonesia	1.5	(0.5)	6.5	(0.8)	46.0	(3.1)	40.5	(3.2)	5.0	(0.8)	0.5	(0.4)
	Jordan	0.1	(0.1)	1.3	(0.2)	7.0	(0.5)	91.6	(0.6)	0.0	c	0.0	c
	Kazakhstan	0.4	(0.1)	6.4	(0.4)	73.3	(1.9)	19.7	(2.0)	0.1	(0.0)	0.0	c
	Kyrgyzstan	0.2	(0.1)	7.9	(0.5)	71.4	(1.3)	19.8	(1.4)	0.7	(0.1)	0.0	c
	Latvia	2.7	(0.5)	15.5	(0.7)	79.4	(0.9)	2.4	(0.3)	0.1	(0.1)	0.0	(0.0)
	Liechtenstein	0.8	(0.5)	17.5	(1.1)	71.3	(0.8)	10.4	(1.0)	0.0	c	0.0	c
	Lithuania	0.5	(0.1)	10.2	(0.9)	80.9	(0.8)	8.4	(0.6)	0.0	(0.0)	0.0	c
	Macao-China	6.7	(0.1)	19.2	(0.2)	34.9	(0.1)	38.7	(0.1)	0.5	(0.1)	0.0	c
	Montenegro	0.0	c	2.5	(1.7)	82.7	(1.5)	14.8	(0.3)	0.0	c	0.0	c
	Panama	2.9	(0.8)	10.6	(1.6)	30.6	(3.3)	49.8	(4.5)	6.1	(1.4)	0.0	c
	Peru	4.0	(0.4)	8.9	(0.6)	17.1	(0.7)	44.6	(1.1)	25.4	(0.8)	0.0	c
	Qatar	1.7	(0.1)	3.6	(0.1)	13.5	(0.2)	62.6	(0.2)	18.2	(0.2)	0.4	(0.1)
	Romania	0.0	c	7.2	(1.0)	88.6	(1.1)	4.3	(0.6)	0.0	c	0.0	c
	Russian Federation	0.9	(0.2)	10.0	(0.7)	60.1	(1.8)	28.1	(1.6)	0.9	(0.2)	0.0	c
	Serbia	0.2	(0.1)	2.1	(0.5)	96.0	(0.6)	1.7	(0.2)	0.0	c	0.0	c
	Shanghai-China	1.0	(0.2)	4.1	(0.4)	37.4	(0.8)	57.1	(0.9)	0.4	(0.2)	0.0	(0.0)
	Singapore	1.0	(0.2)	2.6	(0.2)	34.7	(0.4)	61.6	(0.3)	0.0	c	0.0	(0.0)
	Chinese Taipei	0.0	c	0.1	(0.0)	34.4	(0.9)	65.5	(0.9)	0.0	(0.0)	0.0	c
	Thailand	0.1	(0.0)	0.5	(0.1)	23.2	(1.1)	73.5	(1.1)	2.7	(0.4)	0.0	c
	Trinidad and Tobago	2.1	(0.2)	8.8	(0.4)	25.3	(0.4)	56.1	(0.4)	7.7	(0.3)	0.0	c
	Tunisia	6.4	(0.4)	13.4	(0.6)	23.9	(0.9)	50.9	(1.4)	5.4	(0.4)	0.0	c
	Uruguay	7.1	(0.8)	10.6	(0.6)	21.5	(0.8)	56.2	(1.1)	4.6	(0.4)	0.0	c

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[Part 1/2]

Table A2.4b Percentage of students at each grade level, by gender

		Boys – grade level											
		7th grade		8th grade		9th grade		10th grade		11th grade		12th grade	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	0.0	c	0.1	(0.0)	13.1	(0.9)	69.6	(1.1)	17.1	(0.8)	0.1	(0.0)
	Austria	0.7	(0.2)	7.4	(1.2)	42.6	(1.3)	49.3	(1.3)	0.0	(0.0)	0.0	c
	Belgium	0.6	(0.2)	6.4	(0.7)	34.6	(0.9)	57.3	(1.0)	1.1	(0.2)	0.0	(0.0)
	Canada	0.0	(0.0)	1.4	(0.3)	14.6	(0.6)	82.9	(0.6)	1.1	(0.1)	0.0	(0.0)
	Chile	1.3	(0.3)	4.9	(0.6)	23.2	(1.0)	65.9	(1.3)	4.7	(0.3)	0.0	c
	Czech Republic	0.7	(0.2)	4.5	(0.5)	52.5	(2.2)	42.3	(2.4)	0.0	c	0.0	c
	Denmark	0.1	(0.0)	19.5	(0.9)	79.5	(1.0)	0.8	(0.3)	0.0	c	0.0	c
	Estonia	2.4	(0.5)	27.0	(1.0)	69.6	(1.1)	1.0	(0.3)	0.0	c	0.0	c
	Finland	0.6	(0.2)	14.0	(0.8)	85.2	(0.8)	0.0	c	0.2	(0.1)	0.0	c
	France	1.3	(0.9)	4.0	(0.6)	39.6	(1.5)	51.4	(1.9)	3.6	(0.8)	0.0	(0.0)
	Germany	1.4	(0.3)	13.1	(0.7)	56.1	(1.0)	28.8	(0.9)	0.6	(0.1)	0.0	c
	Greece	0.5	(0.2)	1.9	(0.5)	6.2	(1.2)	91.4	(1.5)	0.0	c	0.0	c
	Hungary	3.2	(0.8)	9.3	(1.3)	68.8	(1.6)	18.7	(0.9)	0.0	(0.0)	0.0	(0.0)
	Iceland	0.0	c	0.0	c	0.0	c	98.7	(0.2)	1.3	(0.2)	0.0	c
	Ireland	0.1	(0.0)	2.8	(0.5)	60.9	(1.3)	22.4	(1.5)	13.8	(1.4)	0.0	c
	Israel	0.0	c	0.5	(0.2)	19.9	(1.1)	78.7	(1.2)	1.0	(0.4)	0.0	c
	Italy	0.1	(0.1)	1.7	(0.4)	20.1	(0.6)	75.7	(0.7)	2.5	(0.3)	0.0	c
	Japan	0.0	c	0.0	c	0.0	c	100.0	(0.0)	0.0	c	0.0	c
	Korea	0.0	c	0.1	(0.1)	4.7	(1.3)	94.5	(1.4)	0.7	(0.2)	0.0	c
	Luxembourg	0.8	(0.2)	12.5	(0.4)	52.4	(0.5)	34.0	(0.4)	0.3	(0.1)	0.0	c
	Mexico	2.0	(0.2)	8.8	(0.5)	37.6	(0.9)	51.0	(0.9)	0.5	(0.2)	0.0	c
	Netherlands	0.4	(0.3)	3.0	(0.4)	48.9	(1.3)	47.3	(1.3)	0.3	(0.1)	0.0	c
	New Zealand	0.0	c	0.0	c	0.0	c	6.9	(0.5)	87.9	(0.6)	5.2	(0.5)
	Norway	0.0	c	0.0	c	0.5	(0.1)	99.2	(0.2)	0.3	(0.2)	0.0	c
	Poland	1.5	(0.3)	6.5	(0.6)	91.6	(0.7)	0.5	(0.2)	0.0	c	0.0	c
	Portugal	3.4	(0.5)	10.5	(0.9)	30.9	(2.0)	54.9	(2.6)	0.4	(0.1)	0.0	c
	Slovak Republic	1.4	(0.3)	3.7	(0.5)	40.1	(1.9)	51.6	(2.1)	3.3	(0.7)	0.0	c
	Slovenia	0.0	c	0.1	(0.1)	4.0	(1.2)	91.1	(1.2)	4.7	(0.4)	0.0	c
	Spain	0.1	(0.0)	12.2	(0.6)	28.7	(0.8)	58.9	(0.9)	0.0	(0.0)	0.0	c
	Sweden	0.0	(0.0)	4.1	(0.4)	94.7	(0.6)	1.1	(0.3)	0.0	c	0.0	c
	Switzerland	0.8	(0.2)	18.0	(1.2)	60.7	(1.8)	19.4	(1.8)	1.0	(0.4)	0.1	(0.1)
	Turkey	1.0	(0.2)	4.0	(0.9)	30.2	(1.4)	61.3	(1.7)	3.2	(0.3)	0.2	(0.1)
	United Kingdom	0.0	c	0.0	c	0.0	c	1.3	(0.2)	98.0	(0.2)	0.7	(0.1)
	United States	0.0	c	0.1	(0.0)	13.2	(1.0)	68.6	(1.4)	17.9	(0.9)	0.1	(0.1)
	OECD average	1.0	(0.1)	7.0	(0.1)	40.8	(0.2)	50.8	(0.2)	9.8	(0.1)	0.7	(0.0)
Partners	Albania	0.5	(0.2)	2.6	(0.4)	54.0	(2.0)	42.9	(2.1)	0.0	(0.0)	0.0	c
	Argentina	5.9	(1.1)	15.4	(1.4)	22.7	(1.5)	52.5	(2.4)	3.5	(0.5)	0.0	c
	Azerbaijan	0.6	(0.2)	4.7	(0.5)	47.8	(1.4)	46.5	(1.5)	0.3	(0.1)	0.0	c
	Brazil	8.4	(0.6)	21.0	(0.9)	37.8	(0.8)	31.1	(0.9)	1.7	(0.2)	0.0	c
	Bulgaria	2.0	(0.4)	7.4	(0.9)	86.9	(1.2)	3.7	(0.6)	0.0	c	0.0	c
	Colombia	5.5	(0.9)	11.5	(0.9)	21.9	(1.1)	42.4	(1.4)	18.7	(1.2)	0.0	c
	Croatia	0.0	c	0.1	(0.1)	79.1	(0.6)	20.7	(0.6)	0.0	c	0.0	c
	Dubai (UAE)	1.6	(0.2)	4.5	(0.3)	16.0	(0.6)	53.6	(0.7)	23.1	(0.6)	1.1	(0.2)
	Hong Kong-China	1.9	(0.3)	7.3	(0.6)	26.6	(0.7)	64.1	(1.0)	0.1	(0.1)	0.0	c
	Indonesia	1.8	(0.7)	8.2	(1.0)	49.3	(3.4)	36.2	(3.6)	4.0	(0.9)	0.5	(0.3)
	Jordan	0.1	(0.1)	1.2	(0.4)	7.5	(0.8)	91.2	(0.9)	0.0	c	0.0	c
	Kazakhstan	0.5	(0.1)	7.1	(0.6)	75.2	(2.2)	17.2	(2.3)	0.1	(0.0)	0.0	c
	Kyrgyzstan	0.2	(0.1)	8.9	(0.7)	72.9	(1.6)	17.4	(1.6)	0.5	(0.2)	0.0	c
	Latvia	3.6	(0.9)	19.9	(1.1)	74.7	(1.4)	1.6	(0.4)	0.1	(0.1)	0.0	(0.0)
	Liechtenstein	1.1	(0.7)	19.7	(1.6)	68.9	(1.2)	10.3	(1.2)	0.0	c	0.0	c
	Lithuania	0.6	(0.2)	12.3	(1.2)	80.0	(1.2)	7.2	(0.7)	0.0	c	0.0	c
	Macao-China	8.9	(0.2)	22.0	(0.2)	34.9	(0.2)	33.6	(0.2)	0.5	(0.1)	0.0	c
	Montenegro	0.0	c	3.0	(2.0)	85.0	(1.8)	12.0	(0.4)	0.0	c	0.0	c
	Panama	3.4	(1.1)	13.6	(2.5)	32.6	(4.4)	45.7	(5.5)	4.7	(1.8)	0.0	c
	Peru	4.9	(0.5)	11.2	(0.8)	18.8	(1.0)	42.3	(1.4)	22.9	(0.9)	0.0	c
	Qatar	1.9	(0.1)	4.3	(0.2)	14.8	(0.3)	60.4	(0.3)	18.2	(0.2)	0.4	(0.1)
	Romania	0.0	c	6.3	(1.1)	89.9	(1.3)	3.9	(0.7)	0.0	c	0.0	c
	Russian Federation	1.4	(0.3)	10.4	(0.9)	61.2	(1.9)	26.3	(1.9)	0.8	(0.2)	0.0	c
	Serbia	0.3	(0.1)	2.7	(0.7)	95.6	(0.8)	1.4	(0.2)	0.0	c	0.0	c
	Shanghai-China	1.2	(0.3)	5.1	(0.6)	38.8	(1.2)	54.7	(1.4)	0.2	(0.1)	0.0	c
	Singapore	0.8	(0.2)	2.9	(0.3)	35.7	(0.6)	60.6	(0.5)	0.0	c	0.0	c
	Chinese Taipei	0.0	c	0.2	(0.1)	35.2	(1.5)	64.7	(1.5)	0.0	c	0.0	c
	Thailand	0.2	(0.1)	0.8	(0.2)	26.3	(1.4)	70.5	(1.4)	2.2	(0.5)	0.0	c
	Trinidad and Tobago	2.7	(0.3)	10.7	(0.5)	28.4	(0.6)	51.0	(0.5)	7.1	(0.4)	0.0	c
	Tunisia	8.9	(0.6)	16.8	(0.9)	24.4	(1.1)	45.3	(1.5)	4.7	(0.5)	0.0	c
	Uruguay	9.1	(1.0)	12.0	(0.8)	24.9	(0.8)	50.4	(1.3)	3.6	(0.4)	0.0	c

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[Part 2/2]

Table A2.4b **Percentage of students at each grade level, by gender**

		Girls – grade level											
		7th grade		8th grade		9th grade		10th grade		11th grade		12th grade	
		%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.	%	S.E.
OECD	Australia	0.0	(0.0)	0.1	(0.0)	7.9	(0.5)	72.0	(0.8)	20.0	(0.8)	0.1	(0.0)
	Austria	0.6	(0.4)	5.0	(1.2)	42.2	(1.4)	52.1	(1.5)	0.0	(0.0)	0.0	c
	Belgium	0.3	(0.1)	4.5	(0.5)	29.3	(1.1)	64.5	(1.1)	1.3	(0.2)	0.0	(0.0)
	Canada	0.0	(0.0)	1.0	(0.2)	12.5	(0.5)	85.3	(0.5)	1.1	(0.1)	0.0	(0.0)
	Chile	0.7	(0.1)	2.9	(0.5)	17.7	(0.9)	73.0	(1.1)	5.6	(0.4)	0.0	(0.0)
	Czech Republic	0.3	(0.2)	3.1	(0.4)	44.8	(1.9)	51.8	(1.9)	0.0	c	0.0	c
	Denmark	0.1	(0.0)	10.0	(0.7)	87.3	(0.9)	2.5	(0.8)	0.0	c	0.0	c
	Estonia	0.9	(0.3)	20.8	(0.9)	75.4	(1.1)	2.7	(0.5)	0.2	(0.2)	0.0	c
	Finland	0.4	(0.1)	9.6	(0.6)	89.4	(0.6)	0.0	c	0.6	(0.2)	0.0	c
	France	1.3	(0.9)	3.2	(0.9)	29.4	(1.5)	61.6	(1.7)	4.4	(0.8)	0.1	(0.1)
	Germany	1.1	(0.2)	8.8	(0.6)	53.4	(1.1)	36.4	(1.1)	0.3	(0.1)	0.0	(0.0)
	Greece	0.2	(0.2)	0.9	(0.5)	4.9	(0.7)	94.0	(0.9)	0.0	c	0.0	c
	Hungary	2.3	(0.7)	5.9	(1.1)	65.4	(1.6)	26.2	(1.2)	0.2	(0.1)	0.0	c
	Iceland	0.0	c	0.0	c	0.0	(0.1)	97.9	(0.2)	2.1	(0.2)	0.0	c
	Ireland	0.1	(0.1)	2.0	(0.4)	57.3	(1.5)	25.7	(2.0)	15.1	(1.5)	0.0	c
	Israel	0.0	c	0.1	(0.1)	15.9	(1.0)	83.8	(1.1)	0.2	(0.1)	0.0	(0.0)
	Italy	0.2	(0.1)	1.0	(0.2)	13.5	(0.6)	81.4	(0.7)	3.9	(0.3)	0.0	c
	Japan	0.0	c	0.0	c	0.0	c	100.0	(0.0)	0.0	c	0.0	c
	Korea	0.0	c	0.0	c	3.6	(1.0)	95.6	(1.0)	0.8	(0.1)	0.0	c
	Luxembourg	0.4	(0.1)	10.6	(0.3)	50.8	(0.4)	38.0	(0.3)	0.2	(0.1)	0.0	c
	Mexico	1.5	(0.2)	6.1	(0.4)	31.5	(0.9)	60.1	(1.0)	0.8	(0.3)	0.0	(0.0)
	Netherlands	0.1	(0.1)	2.3	(0.4)	43.4	(1.4)	53.5	(1.3)	0.7	(0.2)	0.0	c
	New Zealand	0.0	c	0.0	c	0.1	(0.1)	4.8	(0.5)	89.8	(0.6)	5.4	(0.5)
	Norway	0.0	c	0.0	c	0.4	(0.1)	99.4	(0.2)	0.1	(0.1)	0.0	c
	Poland	0.6	(0.2)	2.5	(0.3)	95.6	(0.7)	1.3	(0.6)	0.0	c	0.0	c
	Portugal	1.4	(0.2)	7.7	(0.8)	25.1	(1.4)	65.4	(1.9)	0.4	(0.1)	0.0	c
	Slovak Republic	0.7	(0.2)	1.5	(0.3)	31.4	(1.8)	62.1	(2.1)	4.3	(0.9)	0.0	(0.0)
	Slovenia	0.0	c	0.0	c	1.9	(0.7)	90.3	(0.8)	7.8	(0.5)	0.0	c
	Spain	0.1	(0.1)	7.6	(0.4)	24.2	(0.7)	68.0	(0.8)	0.0	(0.0)	0.0	c
	Sweden	0.1	(0.1)	2.3	(0.3)	95.4	(0.7)	2.2	(0.7)	0.0	c	0.0	c
	Switzerland	0.4	(0.1)	12.9	(0.9)	62.6	(1.8)	22.7	(2.0)	1.4	(0.6)	0.0	c
	Turkey	0.4	(0.2)	2.9	(0.8)	19.8	(1.3)	72.3	(1.6)	4.4	(0.4)	0.2	(0.1)
	United Kingdom	0.0	c	0.0	c	0.0	c	1.0	(0.1)	98.1	(0.1)	0.9	(0.1)
	United States	0.0	c	0.2	(0.2)	8.5	(0.7)	68.4	(1.1)	22.8	(1.0)	0.1	(0.1)
	OECD average	0.6	(0.1)	5.0	(0.1)	35.6	(0.2)	55.0	(0.2)	10.2	(0.1)	0.5	(0.0)
Partners	Albania	0.2	(0.1)	1.8	(0.4)	47.6	(2.3)	50.2	(2.3)	0.2	(0.1)	0.0	c
	Argentina	3.6	(0.9)	10.7	(1.5)	18.4	(1.2)	62.3	(2.2)	4.9	(0.6)	0.0	c
	Azerbaijan	0.6	(0.3)	5.8	(0.6)	51.0	(1.5)	42.1	(1.4)	0.4	(0.1)	0.0	c
	Brazil	5.4	(0.4)	15.3	(0.6)	37.1	(0.9)	39.7	(0.9)	2.5	(0.2)	0.0	c
	Bulgaria	0.9	(0.3)	4.6	(0.7)	90.6	(1.0)	3.9	(0.7)	0.0	c	0.0	c
	Colombia	3.3	(0.4)	9.1	(0.8)	22.4	(1.0)	42.2	(1.1)	23.0	(1.1)	0.0	c
	Croatia	0.0	c	0.2	(0.2)	75.8	(0.6)	24.1	(0.5)	0.0	c	0.0	c
	Dubai (UAE)	0.6	(0.1)	2.2	(0.2)	13.5	(0.5)	60.4	(0.6)	22.7	(0.7)	0.6	(0.1)
	Hong Kong-China	1.5	(0.2)	7.1	(0.6)	23.5	(0.6)	67.9	(1.0)	0.0	c	0.0	c
	Indonesia	1.2	(0.3)	4.9	(0.8)	42.7	(3.7)	44.6	(3.8)	6.0	(1.1)	0.6	(0.5)
	Jordan	0.1	(0.0)	1.3	(0.3)	6.5	(0.7)	92.1	(0.9)	0.0	c	0.0	c
	Kazakhstan	0.4	(0.1)	5.7	(0.5)	71.5	(2.0)	22.3	(2.1)	0.2	(0.1)	0.0	c
	Kyrgyzstan	0.1	(0.1)	7.1	(0.6)	69.9	(1.5)	22.0	(1.6)	0.9	(0.2)	0.0	c
	Latvia	1.7	(0.4)	11.2	(0.6)	83.9	(0.8)	3.1	(0.4)	0.1	(0.1)	0.0	c
	Liechtenstein	0.6	(0.6)	15.0	(1.5)	74.0	(1.2)	10.4	(1.6)	0.0	c	0.0	c
	Lithuania	0.3	(0.1)	8.1	(0.8)	81.9	(0.9)	9.6	(0.7)	0.0	(0.0)	0.0	c
	Macao-China	4.4	(0.1)	16.3	(0.2)	34.9	(0.2)	43.9	(0.2)	0.5	(0.1)	0.0	c
	Montenegro	0.0	c	2.0	(1.4)	80.3	(1.3)	17.8	(0.4)	0.0	c	0.0	c
	Panama	2.4	(0.6)	7.7	(1.1)	28.7	(3.0)	53.8	(4.0)	7.5	(1.6)	0.0	c
	Peru	3.2	(0.4)	6.5	(0.6)	15.4	(0.8)	47.0	(1.2)	27.9	(1.2)	0.0	c
	Qatar	1.4	(0.1)	3.0	(0.1)	12.1	(0.2)	64.9	(0.2)	18.1	(0.2)	0.5	(0.1)
	Romania	0.0	c	8.1	(1.5)	87.3	(1.5)	4.7	(0.6)	0.0	c	0.0	c
	Russian Federation	0.5	(0.1)	9.7	(0.8)	59.0	(2.0)	29.8	(1.8)	1.0	(0.2)	0.0	c
	Serbia	0.1	(0.1)	1.4	(0.5)	96.4	(0.6)	2.0	(0.2)	0.0	c	0.0	c
	Shanghai-China	0.8	(0.2)	3.0	(0.4)	36.1	(1.0)	59.5	(1.0)	0.6	(0.2)	0.0	(0.0)
	Singapore	1.2	(0.2)	2.3	(0.3)	33.7	(0.5)	62.7	(0.4)	0.0	c	0.0	(0.0)
	Chinese Taipei	0.0	c	0.0	(0.0)	33.7	(1.5)	66.3	(1.5)	0.0	(0.0)	0.0	c
	Thailand	0.0	c	0.3	(0.1)	20.9	(1.4)	75.8	(1.4)	3.0	(0.4)	0.0	c
	Trinidad and Tobago	1.5	(0.3)	6.9	(0.5)	22.3	(0.6)	61.0	(0.6)	8.3	(0.4)	0.0	c
	Tunisia	4.2	(0.4)	10.3	(0.5)	23.4	(1.0)	56.1	(1.4)	6.0	(0.5)	0.0	c
	Uruguay	5.4	(0.6)	9.4	(0.5)	18.5	(0.9)	61.4	(1.2)	5.4	(0.6)	0.0	c

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The overall sample size requirement for the digital reading assessment was 1200 assessed students, within each country. The recommended Target Cluster Size (TCS) for the digital reading assessment was 14 students per sampled school. While 14 students for each of 150 schools (the typical number of PISA schools) would potentially yield 2100 students, the large TCS was chosen to account for the fact that some schools would not have adequate computer resources. The TCS of 14 also accounted for the loss in the digital reading assessment sample that would accrue from prior losses in the paper-based PISA sample. It was a requirement that all students who participated in the digital reading assessment also took part in the paper-based PISA assessment. The student sample for the digital reading assessment was selected at the same time that the paper-based PISA student sample was selected in each school by the student sampling software, KeyQuest. Therefore, any student sampled for both assessments who did not provide responses to the paper-based PISA assessment was an automatic loss to the digital reading assessment. There would be additional loss to the digital reading assessment due to refusals, or other absences. The TCS of 14 guarded against these losses. It was possible to vary this target cluster size for the digital reading assessment if more than the usual number of schools were sampled for the paper-based PISA.

The actual student sample size at each school for the digital reading assessment was calculated with KeyQuest, as the minimum of the TCS, and the number of sampled PISA students. Arrangements had to be made to either bring in laptops or to have extra sessions to alleviate any computer-resource problems.

Countries with a large paper-based sample could also subsample those schools where student sampling for the digital reading assessment would be done. Only two countries, Spain and Colombia, chose to do so.

The schools in Spain and Colombia were subsampled with equal probability from the paper-based PISA sampled schools in each explicit stratum. The number to subsample for the digital reading assessment in each stratum was based on how many schools would have been needed from each explicit stratum for a school sample of 150 schools. Any schools selected with certainty for the large national school sample and placed in their own stratum were added back to their original strata for the subsampling of schools for the digital reading assessment.

Sampling outcomes for the digital reading assessment

No non-response adjustments were made for schools or students sampled for the digital reading assessment which did not participate. Since the digital reading assessment was being treated as a domain such as mathematics and science, students that absent for the digital reading assessment were treated in the same manner as a student not assigned a booklet containing items in the mathematics or science domain. Plausible values were generated for these students subsampled for the digital reading assessment, as well as for all other students who had not been subsampled for the digital reading assessment.

In Spain and Colombia, the second level of sampling for the digital reading assessment needed to be accounted for in weighting, via an additional weight component. Thus, schools subsampled for the digital reading assessment in Spain and Colombia had their own weighting stream, separate from the weighting stream for the large national samples in these countries. Once in their own weighting stream, weighting procedures for these schools and students subsampled for the digital reading assessment were the same as the weighting procedures used for all other countries that participated in the digital reading assessment.

[Part 1/1]

Table A2.5 Student response rates (digital reading assessment)

		Number of students included in the digital reading assessment database	Weighted number of students included in the digital reading assessment database	Number of students sampaled for the digital reading assessment	Weighted number of students sampled for the digital reading assessment	Number of students participated in the digital reading assessment	Weighted number of students participated in the digital reading assessment	Unweighted student response rate for the digital reading assessment (unweighted) (%)
OECD	Australia	14 251	240 851	3 673	59 464	2 990	49 779	81
	Austria	6 590	87 326	3 187	43 001	2 622	34 754	82
	Belgium	8 501	119 140	3 161	47 254	2 796	41 556	88
	Chile	5 669	247 270	2 131	94 433	1 699	75 482	80
	Denmark[1]	5 924	60 854	1 830	19 564	1 270	13 753	69
	France	4 298	677 620	1 730	276 591	1 301	207 231	75
	Hungary	4 605	105 611	2 022	49 903	1 792	44 398	89
	Iceland	3 646	4 410	1 273	1 532	960	1 155	75
	Ireland	3 937	52 794	1 710	22 874	1 407	18 851	82
	Japan[1]	6 088	1 113 403	6 088	1 113 403	3 429	622 985	56
	Korea	4 989	630 030	1 508	189 368	1 477	185 078	98
	New Zealand	4 643	55 129	2 180	25 953	1 752	21 137	80
	Norway	4 660	57 367	2 268	28 309	1 972	24 268	87
	Poland	4 917	448 866	2 072	185 403	1 986	177 008	96
	Spain	4 748	385 725	1 989	165 230	1 681	140 449	85
	Sweden	4 567	113 054	2 249	55 563	1 921	47 350	85
Partners	Colombia	4 572	515 130	1 957	223 457	1 478	163 491	76
	Hong Kong-China	4 837	75 548	1 661	25 914	1 450	22 682	87
	Macao-China	5 952	5 978	2 540	2 555	2 519	2 534	99

1. These countries have lower response rates because of whole schools that were unable to participate because of technical difficulties.

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Sampling outcomes

Table A2.5 shows the student response rates for the digital reading assessment and Table A2.6 shows the school response rate for the digital reading assessment.

[Part 1/1]

Table A2.6 School response rates (digital reading assessment)

		Number of schools included in the digital reading assessment database	Weighted number of schools included in the digital reading assessment database	Number of schools sampled for the digital reading assessment	Weighted number of schools sampled for the digital reading assessment	Number of schools participated in the digital reading assessment	Weighted number of schools participated in the digital reading assessment	Unweighted school response rate for the digital reading assessment (%)
OECD	Australia	353	2 284	353	2 284	334	2 132	95
	Austria	282	2 758	273	2 535	256	2 231	94
	Belgium	278	1 687	262	1 531	247	1 378	94
	Chile	200	4 872	200	4 872	198	4 812	99
	Denmark[1]	285	1 686	285	1 686	220	1 236	77
	France	168	11 380	168	11 380	140	8 959	83
	Hungary	187	3 496	187	3 496	183	3 371	98
	Iceland	131	135	131	135	118	121	90
	Ireland	144	681	144	681	141	664	98
	Japan[1]	186	6 740	186	6 740	109	3 717	59
	Korea	157	4 265	157	4 265	156	4 254	99
	New Zealand	163	429	163	429	145	355	89
	Norway	197	1 120	197	1 120	180	916	91
	Poland	185	7 326	179	6 274	179	6 274	100
	Spain	168	7 109	168	7 109	163	6 959	97
	Sweden	189	1 989	189	1 989	179	1 842	95
Partners	Colombia	159	9 411	158	9 393	136	7 942	86
	Hong Kong-China	151	489	151	489	149	483	99
	Macao-China	45	45	44	44	44	44	100

1. These countries have lower response rates because of whole schools that were unable to participate because of technical difficulties.

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ANNEX A3
STANDARD ERRORS, SIGNIFICANCE TESTS AND SUBGROUP COMPARISONS

The statistics in this report represent estimates of national performance based on samples of students, rather than values that could be calculated if every student in every country had answered every question. Consequently, it is important to measure the degree of uncertainty of the estimates. In PISA, each estimate has an associated degree of uncertainty, which is expressed through a standard error. The use of confidence intervals provides a way to make inferences about the population means and proportions in a manner that reflects the uncertainty associated with the sample estimates. From an observed sample statistic and assuming a normal distribution, it can be inferred that the corresponding population result would lie within the confidence interval in 95 out of 100 replications of the measurement on different samples drawn from the same population.

In many cases, readers are primarily interested in whether a given value in a particular country is different from a second value in the same or another country, *e.g.* whether females in a country perform better than males in the same country. In the tables and charts used in this report, differences are labelled as statistically significant when a difference of that size, smaller or larger, would be observed less than 5% of the time, if there were actually no difference in corresponding population values. Similarly, the risk of reporting a correlation as significant if there is, in fact, no correlation between two measures, is contained at 5%.

Throughout the report, significance tests were undertaken to assess the statistical significance of the comparisons made.

Gender differences

Gender differences in student performance or other indices were tested for statistical significance. Positive differences indicate higher scores for boys while negative differences indicate higher scores for girls. Generally, differences marked in bold in the tables in this volume are statistically significant at the 95% confidence level.

Performance differences between the top and bottom quartiles of PISA indices and scales

Differences in average performance between the top and bottom quarters of the PISA indices and scales were tested for statistical significance. Differences marked in bold in the tables indicate that performance between the top and bottom quarters of students on the respective index is statistically significantly different at the 95% confidence level.

Change in the performance per unit of the index

For many tables, the difference in student performance per unit of the index shown was calculated. Differences in bold in the tables indicate that the differences are statistically significantly different from 0 at the 95% confidence level.

Relative risk or increased likelihood

The relative risk is a measure of association between an antecedent factor and an outcome factor. The relative risk is simply the ratio of two risks, *i.e.* the risk of observing the outcome when the antecedent is present and the risk of observing the outcome when the antecedent is not present. Figure A3.1 presents the notation that is used in the following.

■ Figure VI.A3.1 ■

Labels used in a two-way table

p_{11}	p_{12}	$p_{1.}$
p_{21}	p_{22}	$p_{2.}$
$p_{.1}$	$p_{.2}$	$p_{..}$

$p_{..}$ is equal to $\frac{n_{..}}{n_{..}}$, with $n_{..}$ the total number of students and $p_{..}$ is therefore equal to 1, $p_{i.}$, $p_{.j}$ respectively represent the marginal probabilities for each row and for each column. The marginal probabilities are equal to the marginal frequencies divided by the total number of students. Finally, the p_{ij} represent the probabilities for each cell and are equal to the number of observations in a particular cell divided by the total number of observations.

In PISA, the rows represent the antecedent factor with the first row for "having the antecedent" and the second row for "not having the antecedent" and the columns represent the outcome with, the first column for "having the outcome" and the second column for "not having the outcome". The relative risk is then equal to:

$$RR = \frac{(p_{11} / p_{1.})}{(p_{21} / p_{2.})}$$

Values in bold in the tables presented in Annex B of this report indicate that the relative risk is statistically significantly different from 1 at the 95% confidence level.

Difference in digital reading performance between native students and students with an immigrant background

Differences in performance between native and non-native students were tested for statistical significance. For this purpose, first-generation and second-generation students were jointly considered as students with an immigrant background. Positive differences represent higher scores for native students, while negative differences represent higher scores for first-generation and second-generation students. Figures in bold in data tables presented in this volume indicate statistically significantly different scores at the 95% confidence level.

Effect sizes

Sometimes it is useful to compare differences in an index between groups, such as boys and girls, across countries. A problem that may occur in such instances is that the distribution of the index varies across groups or countries. One way to resolve this is to calculate an effect size that accounts for differences in the distributions. An effect size measures the difference between, say, the self-efficacy in reading of male and female students in a given country, relative to the average variation in the index of self-efficacy in reading of those two groups of students in the country.

An effect size also allows a comparison of differences across measures. For example, it is possible to compare effect sizes between the PISA indices and the PISA test scores, as when, for example, gender differences in performance in reading are compared with the gender differences in several of the indices.

In accordance with common practices, effect sizes less than 0.20 are considered small in this volume, effect sizes in the order of 0.50 are considered medium, and effect sizes greater than 0.80 are considered large. Many comparisons in this report consider differences only if the effect sizes are equal to or greater than 0.20, even if smaller differences are still statistically significant; figures in bold in data tables presented in Annex B of this report indicate values equal to or greater than 0.20. Values smaller than 0.20 but that due to rounding are shown as 0.20 in tables and figures have not been highlighted. Light shading represents the absolute value of effect size is equal or more than 0.2 and less than 0.5; medium shading represents the absolute value of effect size is equal or more than 0.5 and less than 0.8; and dark shading represents the absolute value of effect size is equal or more than 0.8.

The effect size between two sub-groups is calculated as:

$$\frac{m_1 - m_2}{\sqrt{\frac{\sigma_1^2 + \sigma_2^2}{2}}}, \text{ i.e.}$$

m_1 and m_2 respectively represent the mean values for the sub-groups 1 and 2. σ_1^2 and σ_2^2 respectively represent the values of variance for the sub-groups 1 and 2. The effect size between the two sub-groups 1 and 2 is calculated as dividing the mean difference between the two sub-groups ($m_1 - m_2$), by the square root of the sum of the sub-group's variance ($\sigma_1^2 + \sigma_2^2$) divided by 2.

Range of ranks

To calculate the range of ranks for countries, data are simulated from the distribution using the mean and standard deviation for each relevant country. Some 10 000 simulations are implemented and, based on these values, 10 000 rankings for each country are produced. For each country, the counts for each rank are aggregated from largest to smallest until they equal 9 500 or more. Then the range of ranks per country is reported, including all the ranks that have been aggregated. This means that there is at least 95% confidence about the range of ranks, and it is safe to assume unimodality in this distribution of ranks. This method has been used in all cycles of PISA since 2003, including PISA 2009.

The main difference between the range of ranks (*e.g.* Figure VI.2.28) and the comparison of countries' performance (*e.g.* Figure VI.2.27) is that the former takes account of the asymmetry of the rank distribution, while the latter does not. Therefore, sometimes there is a slight difference between the range of ranks and counting the number of countries above a given country, based on a comparison of the selected countries' performance. For example, Australia is ranked between 2nd and 3rd and Japan is ranked 4th among OECD countries in Figure VI.2.28, while in Figure VI.2.27 Japan is counted as 3rd among OECD countries, as the mean scores of Australia and Japan are not statistically significantly different. Since it is safe to assume unimodality in this distribution of ranks, the results of range of ranks for countries should be used when examining countries' rankings.

ANNEX A4
QUALITY ASSURANCE FOR THE DIGITAL READING ASSESSMENT

Quality assurance procedures were implemented in all parts of PISA 2009, as was done for all previous PISA surveys.

Quality assurance prior to data collection

The quality and linguistic equivalence of the PISA 2009 digital reading instruments were ensured by providing countries with a source version of the material in English and requiring countries (other than those assessing students in English) to prepare and consolidate two independent translations of the source version. Precise translation and adaptation guidelines were supplied, including instructions for selecting and training the translators. For each country, the translation and format of the assessment instruments, including test materials and marking guides, were verified by expert translators appointed by the PISA Consortium before they were used in the PISA 2009 field trial and main study. These translators' mother tongue was the language of instruction in the country concerned and they were knowledgeable about their respective education systems. For further information on the PISA translation procedures, see the *PISA 2009 Technical Report* (OECD, forthcoming).

The digital reading tests were mostly administered using schools' computers. Therefore, to ensure equivalence in the quality of the test experience it was essential to ensure minimum hardware requirements. These included the computers meeting four criteria: they must

- be manufactured in 2001 or later;
- have a keyboard and a pointing device (*e.g.* a mouse);
- have a 15-inch or larger colour display; and
- have at least one accessible USB port.

The computers had to be located so that the test could be supervised by a single test administrator, and in such a way that students could not easily observe each others' screens.

To determine a computer's suitability for delivering the digital reading assessment in the main survey, a hardware diagnostic tool was distributed to participating schools prior to the assessment. The digital reading assessment hardware diagnostic was provided in the form of software loaded onto a USB drive and was designed to emulate the test-delivery system and provide feedback on the suitability of the computer's memory, processing power and screen resolution.

Quality assurance during data collection

The survey was implemented through standardised procedures. The PISA Consortium provided comprehensive manuals that explained the implementation of the survey, including precise instructions for the work of school co-ordinators and scripts for test administrators to use during the assessment sessions. Proposed adaptations to survey procedures, or proposed modifications to the assessment session script, were submitted to the PISA Consortium for approval prior to verification. The PISA Consortium then verified the national translation and adaptation of these manuals. The workflows of the translation and verification processes were facilitated with an online translation-management system (TMS) developed by the Consortium.

To establish the credibility of PISA as valid and unbiased and to encourage uniformity in administering the assessment sessions, test administrators in participating countries were selected using the following criteria:

- It was required that the test administrator not be the reading instructor of any students in the digital reading sessions he or she would administer for PISA.
- It was recommended that the test administrator not be a member of the staff of any school where he or she would administer for PISA.
- It was considered preferable that the test administrator not be a member of the staff of any school in the PISA sample.

Participating countries organised an in-person training session for test administrators and ensured that: test administrators worked with the school co-ordinator to prepare the assessment session, including updating student tracking forms and identifying excluded students; test administrators recorded the student participation status on the student tracking forms and filled in a session report form; no digital reading instrument was permitted to be photographed; and no digital reading instrument could be viewed by school staff before the assessment session.

Timing of the digital reading assessment sessions (40 minutes) was uniformly applied by the test-delivery software.

Finally, quality monitors from the PISA Consortium visited a sample of 15 schools during the assessment. For further information on the field operations, see the *PISA 2009 Technical Report* (OECD, forthcoming).

Quality assurance following data collection

Coding procedures were designed to ensure consistent and accurate application of the coding guides outlined in the PISA Operations manuals. National Project Managers were required to submit proposed modifications to these procedures to the PISA Consortium for approval.

Most digital reading items (21 of the 29) were of types for which the responses could be coded automatically on receipt of the student response datafiles. The remaining open-constructed response items (eight items) were collated from the raw results datafiles, and then inserted into an Online Coding System (OCS) that was developed by the PISA Consortium, to be coded by experts trained within each national centre.

The quality of coding was monitored by double-coding a minimum of 25% of responses for each item. Any response given a different code in second coding to that given in first coding was coded a third time by a leading coder (this is known as discrepancy coding) and that became the final code. Second coders were not made aware of the code already assigned to the response.

In addition, during first coding of items, leading coders spot-checked the work of coders each day. Spot checking involved a review of codes assigned to responses. It was suggested that about 2.5% of first codings should be spot-checked.

If a coder was uncertain about the code to assign to a particular response, the response could be marked for review and it would be sent automatically to a leading coder for advice.

The OCS provided several reports to help the coding supervisor manage the quality and workflow of the coding process, including discrepancy reports giving the total number of responses first coded by each coder that were second coded, the number that required third coding (*i.e.* the number of discrepancies), the number of times the third code agreed with the first code, and the accuracy percentage.

For a more detailed description of the quality-assurance procedures and the mechanism with which they were applied in the digital reading assessment, see the *PISA 2009 Technical Report* (OECD, forthcoming).

For the PISA 2009 assessment in Austria, a dispute between teachers' unions and the education minister led to the announcement of a boycott of PISA, which was withdrawn after the first week of testing. The boycott required the OECD to remove identifiable cases from the dataset. Although the Austrian dataset met the PISA 2009 technical standards after the removal of these cases, the negative atmosphere in regard to educational assessment affected the conditions under which the assessment was administered and could have adversely affected student motivation to respond to the PISA tasks. Therefore, the comparability of the 2009 data with data from earlier PISA assessments cannot be ensured, and data for Austria have been excluded from trend comparisons.

ANNEX A5
DEVELOPMENT OF THE PISA ASSESSMENT INSTRUMENTS FOR PRINT AND DIGITAL READING

The development of the PISA 2009 assessment instruments for both print and digital reading was an collaborative process between the PISA Consortium, various international expert groups working under the auspices of the OECD, the PISA Governing Board and national experts.

For all PISA assessment domains, a panel of international experts, in close consultation with participating countries, identifies the range of skills and competencies in the relevant domain that are considered to be crucial for an individual's capacity to fully participate in and contribute to modern society. A description of the assessment domains – the assessment framework – is then used by participating countries and other test-development professionals as they contribute assessment materials. The development of this assessment framework involves the following steps:

- developing a working definition for the assessment area and description of the assumptions that underlay that definition;
- evaluating how to organise the set of tasks constructed in order to report to policy makers and researchers on 15-year-old students' performance in each assessment area in participating countries;
- identifying a set of key characteristics to be taken into account when assessment tasks were constructed for international use;
- operationalising the set of key characteristics to be used in test construction, with definitions based on existing literature and the experience of other large-scale assessments;
- validating the variables and assessing the contribution that each made to understanding task difficulty in participating countries; and
- preparing an interpretative scheme for the results.

Since a framework for PISA reading had been developed for the first PISA survey in 2000, the PISA 2009 work began with a review of the existing framework at the initial Reading Expert Group (REG) meeting in October 2006. It was agreed that much of the substance of the PISA 2000 framework should be retained for PISA 2009, but new elements were to be added or given additional emphasis – notably, the incorporation of digital reading. The reading framework was agreed at both scientific and policy levels and subsequently provided the basis for the development of the print and digital reading assessment instruments. The reading framework is described in *PISA 2009 Assessment Framework: Key Competencies in Reading, Mathematics and Science* (OECD, 2009b). It provided a common language and a vehicle for participating countries to develop a consensus as to the measurement goals of PISA.

Assessment items were then developed to reflect the intentions of the framework and were piloted in a field trial in all participating countries before a final set of items was selected for the PISA 2009 main survey. Tables A5.1 and A5.2 show the distribution of PISA 2009 assessment items according to the various dimensions of the PISA frameworks.

Due attention was paid to reflecting the national, cultural and linguistic variety among OECD countries. As part of this effort, the PISA Consortium used professional test item-development teams in several countries. In addition to the items that were developed by the international experts working with the PISA Consortium, assessment material was contributed by participating countries. The Consortium's multi-national team of test developers deemed a substantial amount of this submitted material as appropriate, given the requirements laid out by the PISA assessment frameworks. As a result, the item pool for print reading included assessment items from Australia, Belgium, Canada, China, Colombia, Finland, France, Germany, Greece, Hungary, Japan, Korea, Mexico, the Netherlands, New Zealand, Norway, Portugal, Serbia, Spain, Sweden, Switzerland and the United States. The smaller item pool for digital reading comprised material originating from Consortium test-development teams and national centres in Australia, Belgium, Canada and Germany.

Each item included in the assessment pool was rated by each country: for potential cultural, gender or other bias; for relevance to 15-year-olds in school and non-school contexts; and for familiarity and level of interest. For digital reading items, countries were also asked to comment on whether the level of ICT demand of each item was appropriate. A first consultation of countries on the item pool was undertaken as part of the process of developing the field trial assessment instruments. A second consultation was undertaken after the field trial to assist in the final selection of items for the main survey. For print reading, countries were invited to submit their item reviews using a customised spreadsheet. For digital reading, item reviews were collected via an online survey, using a secure online review system developed by the Consortium. Each national centre was provided with one primary account to securely view, rate and comment upon each item. Several secondary accounts (as many as requested) were also provided to national experts for the same purpose.

Following the field trial, in which all items were tested in all participating countries, test developers and expert groups considered a variety of aspects in selecting the items for the main survey: the results from the field trial, the outcome of the item review from countries, and queries received during the field trial coding process. The test developers and expert groups selected a final set of items in September 2008 which was adopted by participating countries at both scientific and policy levels following a period of negotiation.

[Part 1/1]

Table A5.1 Distribution of items by the dimensions of the PISA framework for the assessment of print reading

	Number of items	Number of multiple-choice items	Number of complex multiple-choice items	Number of closed-constructed response items	Number of open-constructed response items	Number of short-response items
Distribution of reading items by text format						
Continuous	81	36	6	4	31	4
Non-continuous	38	10	3	7	12	6
Mixed	7	4	1	0	1	1
Multiple	5	2	0	2	1	0
Total	131	52	10	13	45	11
Distribution of reading items by aspect						
Access and retrieve	31	6	3	9	3	10
Integrate and interpret	67	38	6	4	18	1
Reflect and evaluate	33	8	1	0	24	0
Total	131	52	10	13	45	11
Total	131	52	10	13	45	11
Distribution of reading items by situation						
Personal	37	10	2	5	17	3
Public	35	19	2	2	10	2
Occupational	21	4	3	3	10	1
Educational	38	19	3	3	8	5
Total	131	52	10	13	45	11

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[Part 1/1]

Table A5.2 Distribution of items by the dimensions of the PISA framework for the assessment of digital reading

	Number of items	Number of multiple-choice items	Number of complex multiple-choice items	Number of open-constructed response items
Distribution of digital reading items by environment				
Authored	19	14	0	5
Message-based	8	4	3	1
Mixed	2	0	0	2
Total	29	18	3	8
Distribution of digital reading items by text format				
Continuous	2	2	0	0
Non-continuous	3	2	0	1
Mixed	2	1	0	1
Multiple	22	13	3	6
Total	29	18	3	8
Distribution of digital reading items by text type				
Argumentation	6	4	0	2
Description	9	6	1	2
Exposition	9	7	0	2
Transaction	4	1	2	1
Not specified	1	0	0	1
Total	29	18	3	8
Distribution of digital reading items by aspect				
Access and retrieve	7	7	0	0
Integrate and interpret	10	9	1	0
Reflect and evaluate	6	2	0	4
Complex	6	0	2	4
Total	29	18	3	8
Distribution of digital reading items by situation				
Personal	6	2	2	2
Public	13	10	0	3
Occupational	7	4	1	2
Educational	3	2	0	1
Total	29	18	3	8

StatLink http://dx.doi.org/10.1787/888932435549

The main survey included 37 print reading units with 131 test items. Nineteen of these units originated from material submitted by participating countries. Sixteen of the units came from one or the other of the Consortium teams, and two originated as IALS material. The digital reading item pool for the main survey comprised nine units with 29 test items. One of the units originated from a national centre, the others from Consortium teams.

Five item types were used in the PISA print reading assessment:

- *Open-constructed response items:* These items required students to construct a longer response, allowing for the possibility of a broad range of divergent, individual responses and differing viewpoints. These items sometimes asked students to relate information or ideas in the stimulus text to their own experience or opinions, with the acceptability depending on the student's ability to use what he or she had read when justifying or explaining that position, rather than on the position taken by the student. Other items in this format asked students to interpret or integrate information provided in the text, or to summarise part of a text in their own words. For selected items, partial credit was awarded for partially correct or less complete answers. All of these items were coded by hand.
- *Closed-constructed response items:* These items required students to construct their own responses, with a limited range of acceptable answers. Most of these items were scored dichotomously, by hand.
- *Short-response items:* These items required students to provide a brief answer, as in the closed-constructed response items, but there was a wider range of possible answers here. These items were coded by hand, thus allowing for partial credit as well as dichotomous scoring.
- *Complex multiple-choice items:* These items required students to make a series of choices, usually binary. Students indicated their answer by circling a word or short phrase (for example "yes" or "no") for each point. These items were scored dichotomously for each choice, yielding the possibility of full or partial credit for the whole item.
- *Multiple-choice items:* These items required students to circle a letter to indicate one choice among four or five alternatives, each of which might be a number, a word, a phrase or a sentence. They were scored dichotomously.

The digital reading assessment employed three of these item formats: open-constructed response, complex multiple choice and multiple choice. Most of the items were presented in formats similar to the paper-based versions, adapted to the digital environment, with open-constructed response items involving text entry in a designated text box, and multiple choice requiring clicks on radio buttons. However, there were a few variations to simulate and take advantage of the digital medium. A variation on the open-constructed response type was items requiring the construction of an e-mail message. For some multiple-choice items, instead of the conventional format, the items required the student to select an option from a dropdown menu within a simulated web page. All responses to the digital reading assessment were collected electronically. The open-constructed response items were scored by hand, using an online scoring system that displayed responses to the coders and allowed them to enter their scores electronically. The multiple-choice and complex multiple-choice items were automatically scored.

PISA 2009 was designed to yield group-level information in a broad range of content. The PISA assessment of print reading included material allowing for a total of 270 minutes of assessment time, made up of nine 30-minute clusters. The mathematics and science assessments each comprised 90 minutes of assessment time, each made up of three 30-minute clusters. Each student sat a paper-based assessment lasting a total of 120 minutes, which could include material from reading, mathematics and science. Since reading was the major domain in PISA 2009, every student was administered some reading items as part of the assessment.

This assessment design was balanced so that each item cluster appeared four times, once in each of four possible locations in a booklet. Further, each cluster appeared once with each other cluster. The final design, therefore, ensured that a representative sample responded to each cluster of items.

The main survey assessment of digital reading included material allowing for a total of 60 minutes of assessment time, made up of three 20-minute clusters. The items were presented to students in six test forms, with each form being composed of two clusters: that is, 40 minutes of testing time per student. Each cluster was paired with each of the other clusters in two forms, once in the first position and once in the second position, and each sampled student was randomly assigned one of the six forms.

For further information on the development of the PISA assessment instruments and the PISA assessment design, see the *PISA 2009 Technical Report* (OECD, forthcoming).

ANNEX A6
TABLES SHOWING THE RELATIONSHIPS BETWEEN ICT ACTIVITIES AND PERFORMANCE IN PRINT READING, MATHEMATICS AND SCIENCE

Annex A6 is available on line at *www.pisa.oecd.org*.