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Programme for International Student Assessment: an Overview

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The OECD Programme for International Student Assessment (PISA) is a collaborative effort among OECD member countries to measure how well 15-year-old students approaching the end of compulsory schooling are prepared to meet the challenges of today's knowledge societies. The assessment is forward-looking: rather than focusing on the extent to which these students have mastered a specific school curriculum, it looks at their ability to use their knowledge and skills to meet real-life challenges. This orientation reflects a change in curricular goals and objectives, which are increasingly concerned with what students can do with what they learn at school.

PISA surveys take place every three years. The first survey took place in 2000 (followed by a further 11 countries in 2002), the second in 2003, the third in 2006, and the fourth in 2009; the results of these surveys have been published in a series of reports (OECD, 2001, 2003, 2004, 2007, 2010 - see Annex I) and a wide range of thematic and technical reports. The next survey will occur in 2012. For each assessment, one of science, reading and mathematics is chosen as the major domain and given greater emphasis. The remaining two areas, the minor domains, are assessed less thoroughly. In 2000 the major domain was reading; in 2003 it was mathematics; in 2006 it was science and in 2009 it was reading.

PISA is an age-based survey, assessing 15-year-old students in school in grade 7 or higher. These students are approaching the end of compulsory schooling in most participating countries, and school enrolment at this level is close to universal in almost all OECD countries.

The PISA assessments take a literacy perspective, which focuses on the extent to which students can apply the knowledge and skills they have learned and practised at school when confronted with situations and challenges for which that knowledge may be relevant. That is, PISA assesses: the extent to which students can use their reading skills to understand and interpret the various kinds of written material that they are likely to meet as they negotiate their daily lives; the extent to which students can use their mathematical knowledge and skills to solve various kinds of numerical and spatial challenges and problems; and the extent to which students can use their scientific knowledge and skills to understand, interpret and resolve various kinds of scientific situations and challenges. The PISA 2009 domain definitions are fully articulated in *PISA 2009 Assessment Framework – Key Competencies in Reading, Mathematics and Science* (OECD, 2010a).

PISA also allows for the assessment of additional cross-curricular competencies from time to time as participating countries see fit. For example, in PISA 2003, an assessment of general problem-solving competencies was included. A major addition for PISA 2009 was the inclusion of a computer-delivered assessment of digital reading which is also known as the digital reading assessment.

PISA also uses student questionnaires to collect information from students on various aspects of their home, family and school background, and school questionnaires to collect information from schools about various aspects of organisation and educational provision in schools. In PISA 2009, 14 countries¹ also administered a parent questionnaire to the parents of the students participating in PISA.

Using the data from student, parent and school questionnaires, analyses linking contextual information with student achievement could address:

- differences between countries in the relationships between student-level factors (such as gender and socio-economic background) and achievement;
- differences in the relationships between school-level factors and achievement across countries;
- differences in the proportion of variation in achievement between (rather than within) schools, and differences in this value across countries;
- differences between countries in the extent to which schools moderate or increase the effects of individual-level student factors and student achievement;
- differences in education systems and national context that are related to differences in student achievement across countries; and
- through links to PISA 2000, PISA 2003 and PISA 2006, changes in any or all of these relationships over time.

Through the collection of such information at the student and school level on a cross-nationally comparable basis, PISA adds significantly to the knowledge base that was previously available from national official statistics, such as aggregate national statistics on the educational programmes completed and the qualifications obtained by individuals. The framework for the PISA 2009 questionnaires is included in *PISA 2009 Assessment Framework – Key Competencies in Reading, Mathematics and Science* (OECD, 2010a).



PARTICIPATION

The first PISA survey was conducted in 2000 in 32 countries (including 28 OECD member countries) using written tasks answered in schools under independently supervised test conditions. Another 11 countries completed the same assessment in 2002. PISA 2000 surveyed reading, mathematical and scientific literacy, with a primary focus on reading.

The second PISA survey, conducted in 2003 in 41 countries, assessed reading, mathematical and scientific literacy, and problem solving with a primary focus on mathematical literacy. The third survey covered reading, mathematical and scientific literacy, with a primary focus on scientific literacy, and was conducted in 2006 in 57 countries. For a number of participants detailed analysis was also undertaken for sub-national regions. In all there were 24 sub-national regions for which sufficient data was collected and quality control mechanisms implemented to permit OECD endorsement of their results.

PISA 2009, the fourth PISA survey covered reading, mathematical and scientific literacy, with a primary focus on reading literacy, and was conducted in 65 countries. The participants in PISA 2009 are listed in Table 1.1. As with PISA 2006, detailed results were also presented for 17 sub-national regions for which sufficient data was collected and quality control mechanisms implemented to permit OECD endorsement of their results. Table 1.1 also indicates the 19 countries that participated in the computer-delivered assessment of digital reading.

This report is concerned with the technical aspects of PISA 2009.

Table 1.1 PISA 2009 participants

OECD countries	Partner countries/economies
Australia*	Albania
Austria*	Argentina
Belgium*	Azerbaijan
Canada	Brazil
Chile*	Bulgaria
Czech Republic	Colombia*
Denmark*	Croatia
Estonia	Dubai (UAE)
Finland	Hong Kong-China*
France*	Indonesia
Germany	Jordan
Greece	Kazakhstan
Hungary*	Kyrgyzstan
Iceland*	Latvia
Ireland*	Liechtenstein
Israel	Lithuania
Italy	Macao-China*
Japan*	Montenegro
Korea*	Panama
Luxembourg	Peru
Mexico	Qatar
Netherlands	Romania
New Zealand*	Russian Federation
Norway*	Serbia
Poland*	Shanghai-China
Portugal	Singapore
Slovak Republic	Chinese Taipei
Slovenia	Thailand
Spain*	Trinidad and Tobago
Sweden*	Tunisia
Switzerland	Uruguay
Turkey	
United Kingdom	
United States	

*These countries participated in the computer-delivered assessment of digital reading.



FEATURES OF PISA

The technical characteristics of the PISA survey involve a number of different challenges:

- the design of the test and the features incorporated into the test developed for PISA are critical;
- the sampling design, including both the school sampling and the student sampling requirements and procedures;
- the multilingual nature of the test, which involves rules and procedures designed to guarantee the equivalence of the different language versions used within and between participating countries, and taking into account the diverse cultural contexts of those countries;
- various operational procedures, including test administration arrangements, data capture and processing and quality assurance mechanisms designed to ensure the generation of comparable data from all countries; and
- scaling and analysis of the data and their subsequent reporting: PISA employs scaling models based on item response theory (IRT) methodologies. The described proficiency scales, which are the basic tool in reporting PISA outcomes, are derived using IRT analysis.

This report describes the above-mentioned methodologies as they have been implemented in PISA 2009. It also describes the quality assurance procedures that have enabled PISA to provide high quality data to support policy formation and review. Box 1.1 provides an overview of the central design elements of PISA 2009.

The ambitious goals of PISA come at a cost: PISA is both resource intensive and methodologically complex, requiring intensive collaboration among many stakeholders. The successful implementation of PISA depends on the use, and sometimes further development, of state-of-the-art methodologies.

Quality within each of these areas is defined, monitored and assured through the use of a set of technical standards. These standards have been endorsed by the PISA Governing Board, and they form the backbone of implementation in each participating country and of quality assurance across the project (see Annex G for the PISA 2009 Technical Standards).

MANAGING AND IMPLEMENTING PISA

The design and implementation of PISA for the 2000, 2003 and 2006 data collections was the responsibility of an international consortium led by the Australian Council for Educational Research (ACER) with Ray Adams as International Project Director. The other partners in this Consortium were the National Institute for Educational Measurement (Cito) in the Netherlands, the Unité d'analyse des systèmes et pratiques d'enseignement (aSPe) and cApStAn Linguistic Quality Control in Belgium, the Deutsches Institut für Internationale Pädagogische Forschung (DIPF) in Germany, Westat and the Educational Testing Service (ETS) in the United States, and the National Institute for Educational Policy Research (NIER) in Japan.

The responsibility for the implementation of PISA in 2009 was the shared responsibility of two consortia. One Consortium led by Cito was responsible for design, development and scaling of the contextual questionnaires – this Consortium included the University of Twente – Faculty of Behavioural Science in the Netherlands, the University of Jyväskylä – Institute for Educational Research in Finland and the Direction de l'Évaluation et de la Prospective, Ministère de l'Éducation Nationale in France. A second Consortium led by ACER was responsible for all remaining aspects of the 2009 data collection. Annex H lists the consortia staff and consultants who have made significant contributions to the development and implementation of the project.

PISA is implemented within a framework established by the PISA Governing Board (PGB) which includes representation from all participating countries at senior policy levels. The PGB established policy priorities and standards for developing indicators, for establishing assessment instruments, and for reporting results. Experts from participating countries served on working groups linking the programme policy objectives with the best internationally available technical expertise in the three assessment areas.

These expert groups were referred to as Subject Matter Expert Groups (SMEGs) (see Annex H for members). By participating in these expert groups and regularly reviewing outcomes of the groups' meetings, countries ensured that the instruments were internationally valid, that they took the cultural and educational contexts of the different OECD member countries into account, that the assessment materials had strong measurement potential, and that the instruments emphasised authenticity and educational validity.



Box 1.1 Key features of PISA 2009

Content

- The main focus of PISA 2009 was reading. The survey also updated performance assessments in mathematics and science. PISA considers students' knowledge in these areas not in isolation, but in relation to their ability to reflect on their knowledge and experience, and to apply them to real-world issues. The emphasis is on mastering processes, understanding concepts and functioning in various situations within each assessment area.
- For the first time, the PISA 2009 survey also assessed 15-year-old students' ability to read, understand and apply digital texts.

Methods

- Around 470 000 students completed the assessment in 2009, representing about 26 million 15-year-olds in the schools of the 65 participating countries and economies. Some 50 000 students took part in a second round of this assessment in 2010, representing about 2 million 15 year-olds from 9 additional partner countries and economies.
- Each participating student spent two hours carrying out pencil-and-paper tasks in reading, mathematics and science. In 19 countries, students were given additional questions via computer to assess their capacity to read digital texts.
- The assessment included tasks requiring students to construct their own answers as well as multiple-choice questions. The latter were typically organised in units based on a written passage or graphic, much like the kind of texts or figures that students might encounter in real life.
- Students also answered a questionnaire that took about 30 minutes to complete. This questionnaire focused on their personal background, their learning habits, their attitudes towards reading, and their engagement and motivation.
- School principals completed a questionnaire about their school that included demographic characteristics and an assessment of the quality of the learning environment at school.

Outcomes

PISA 2009 results provide:

- A profile of knowledge and skills among 15-year-olds in 2009, consisting of a detailed profile for reading, including digital literacy, and an update for mathematics and science.
- Contextual indicators relating performance results to student and school characteristics.
- An assessment of students' engagement in reading activities, and their knowledge and use of different learning strategies.
- A knowledge base for policy research and analysis.
- Trend data on changes in student knowledge and skills in reading, mathematics and science, on change in student attitudes and in socio-economic indicators, and also on the impact of some indicators on the performance results.

Future assessments

- The PISA 2012 survey will return to mathematics as the major assessment area; PISA 2015 will focus on science. Thereafter, PISA will turn to another cycle, beginning with reading again.
- Future tests will place greater emphasis on assessing students' capacity to read and understand digital texts and solve problems given in a digital format, reflecting the importance of information and computer technologies in modern societies.

Each of the participating countries appointed a National Project Manager (NPM), to implement PISA nationally. The NPMs ensured that internationally agreed common technical and administrative procedures were employed. These managers played a vital role in developing and validating the international assessment instruments and ensured that PISA implementation was of high quality. The NPMs also contributed to the verification and evaluation of the survey results, analyses and reports.

The OECD Secretariat was responsible for the overall management of the programme. It monitored its implementation on a day-to-day basis, served as the secretariat for the PGB, fostered consensus building between the countries involved, and served as the interlocutor between the PGB and the international consortia.



ORGANISATION OF THIS REPORT

This technical report is designed to describe the technical aspects of the project at a sufficient level of detail to enable review and, potentially, replication of the implemented procedures and technical solutions to problems. It, therefore, does not report the results of PISA 2009 which have been published in *PISA 2009 Results* (OECD, 2010b). A bibliography of other PISA related reports is included in Annex I.

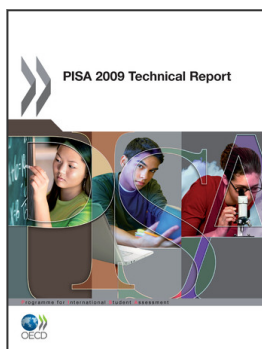
There are five sections in this report:

- *Section One – Instrument design*: describes the design and development of both the questionnaires and achievement tests.
- *Section Two – Operations*: gives details of the operational procedures for the sampling and population definitions, test administration procedures, quality monitoring and assurance procedures for test administration and national centre operations, and instrument translation.
- *Section Three – Data processing*: covers the methods used in data cleaning and preparation, including the methods for weighting and variance estimation, scaling methods, methods for examining inter-rater variation and the data cleaning steps.
- *Section Four – Quality indicators and outcomes*: covers the results of the scaling and weighting, report response rates and related sampling outcomes and gives the outcomes of the inter-rater reliability studies. The last chapter in this section summarises the outcomes of the PISA 2009 data adjudication; that is, the overall analysis of data quality for each country.
- *Section Five – Scale construction and data products*: describes the construction of the PISA 2009 described levels of proficiency and the construction and validation of questionnaire-related indices. The final chapter briefly describes the contents of the *PISA 2009 Database*.

Detailed annexes of results pertaining to the chapters of the report are also provided.

Note

1. The PISA 2009 Parent Questionnaire was administered in eight OECD countries – Chile, Denmark, Germany, Hungary, Italy, Korea, New Zealand and Portugal, and in six partner countries and economies – Croatia, Hong Kong-China, Lithuania, Macao-China, Panama and Qatar.



From:
PISA 2009 Technical Report

Access the complete publication at:
<https://doi.org/10.1787/9789264167872-en>

Please cite this chapter as:

OECD (2012), "Programme for International Student Assessment:: an Overview", in *PISA 2009 Technical Report*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/9789264167872-2-en>

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