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What is PISA?

The Programme for International Student Assessment (PISA) reviews the extent to which students near the end of compulsory education have acquired some of the knowledge and skills that are essential for full participation in modern society, particularly in mathematics, reading and science. This section offers an overview of the Programme, including which countries and economies participate and which students are assessed, what types of skills are measured, and how PISA 2012 differs from previous PISA assessments.



"What is important for citizens to know and be able to do?" That is the question that underlies the triennial survey of 15-year-old students around the world known as the Programme for International Student Assessment (PISA). PISA assesses the extent to which students near the end of compulsory education have acquired key knowledge and skills that are essential for full participation in modern societies. The assessment, which focuses on reading, mathematics, science and problem solving, does not just ascertain whether students can reproduce knowledge; it also examines how well students can extrapolate from what they have learned and apply that knowledge in unfamiliar settings, both in and outside of school. This approach reflects the fact that modern economies reward individuals not for what they know, but for what they can do with what they know.

PISA is an ongoing programme that offers insights for education policy and practice, and that helps monitor trends in students' acquisition of knowledge and skills across countries and in different demographic subgroups within each country. PISA results reveal what is possible in education by showing what students in the highest-performing and most rapidly improving education systems can do. The findings allow policy makers around the world to gauge the knowledge and skills of students in their own countries in comparison with those in other countries, set policy targets against measurable goals achieved by other education systems, and learn from policies and practices applied elsewhere. While PISA cannot identify cause-and-effect relationships between policies/practices and student outcomes, it can show educators, policy makers and the interested public how education systems are similar and different – and what that means for students.

PISA's unique features include its:

- **policy orientation**, which links data on student learning outcomes with data on students' backgrounds and attitudes towards learning and on key factors that shape their learning, in and outside of school, in order to highlight differences in performance and identify the characteristics of students, schools and education systems that perform well;
- **innovative concept of "literacy"**, which refers to students' capacity to apply knowledge and skills in key subjects, and to analyse, reason and communicate effectively as they identify, interpret and solve problems in a variety of situations;
- **relevance to lifelong learning**, as PISA asks students to report on their motivation to learn, their beliefs about themselves, and their learning strategies;
- **regularity**, which enables countries to monitor their progress in meeting key learning objectives; and
- **breadth of coverage**, which, in PISA 2012, encompasses the 34 OECD member countries and 31 partner countries and economies.

Box I.1.1. A test the whole world can take

PISA is now used as an assessment tool in many regions around the world. It was implemented in 43 countries and economies in the first assessment (32 in 2000 and 11 in 2002), 41 in the second assessment (2003), 57 in the third assessment (2006) and 75 in the fourth assessment (65 in 2009 and 10 in 2010). So far, 65 countries and economies have participated in PISA 2012.

In addition to OECD member countries, the survey has been or is being conducted in:

East, South and Southeast Asia: Himachal Pradesh-India, Hong Kong-China, Indonesia, Macao-China, Malaysia, Shanghai-China, Singapore, Chinese Taipei, Tamil Nadu-India, Thailand and Viet Nam.

Central, Mediterranean and Eastern Europe, and Central Asia: Albania, Azerbaijan, Bulgaria, Croatia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Liechtenstein, Lithuania, the former Yugoslav Republic of Macedonia, Malta, Moldova, Montenegro, Romania, the Russian Federation and Serbia.

The Middle East: Jordan, Qatar and the United Arab Emirates.

Central and South America: Argentina, Brazil, Colombia, Costa Rica, Netherlands-Antilles, Panama, Peru, Trinidad and Tobago, Uruguay and Miranda-Venezuela.

Africa: Mauritius and Tunisia.

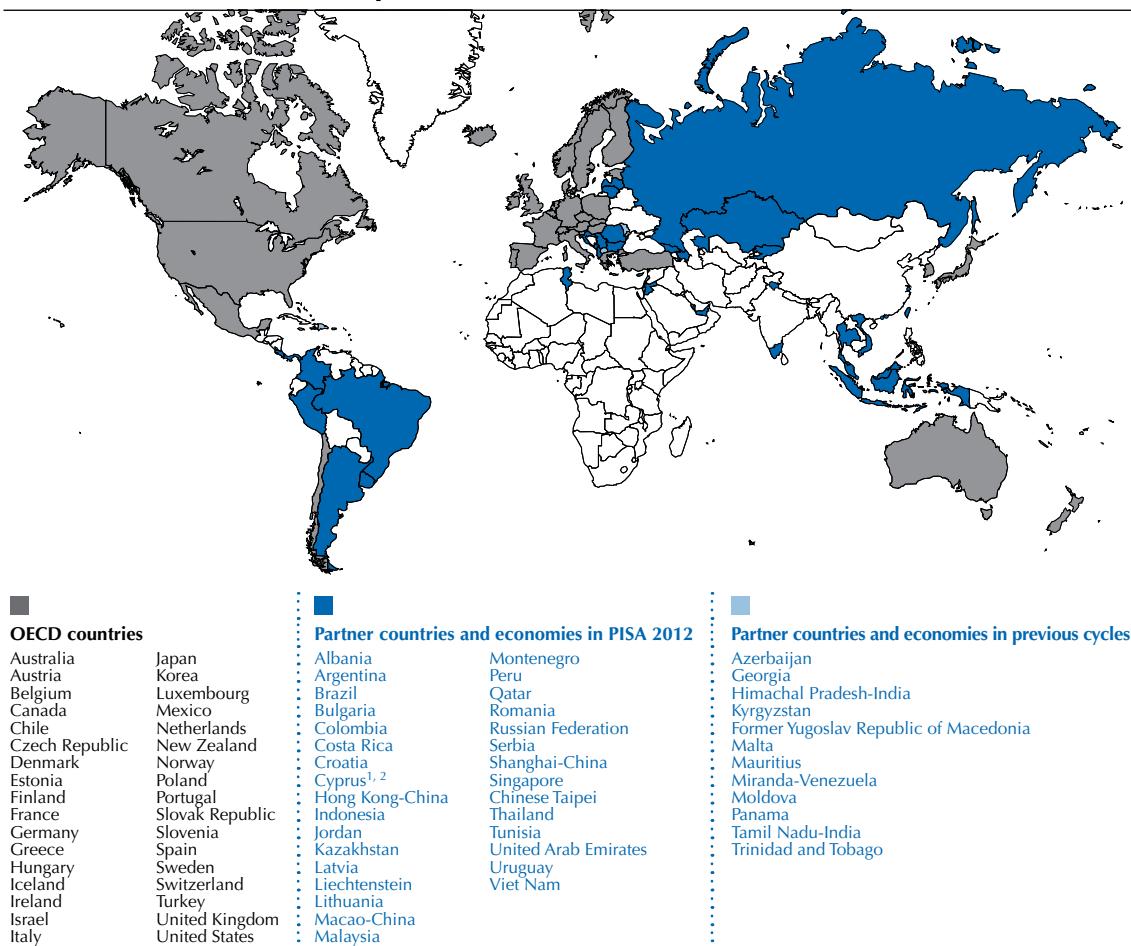
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Decisions about the scope and nature of the PISA assessments and the background information to be collected are made by leading experts in participating countries. Considerable efforts and resources are devoted to achieving cultural and linguistic breadth and balance in assessment materials. Since the design and translation of the test, as well as sampling and data collection, are subject to strict quality controls, PISA findings are considered to be highly valid and reliable.

■ Figure I.1.1 ■

Map of PISA countries and economies



1. Note by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

2. Note by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

WHAT DOES THE PISA 2012 SURVEY MEASURE?

The PISA 2012 survey focuses on mathematics, with reading, science and problem solving as minor areas of assessment. For the first time, PISA 2012 also included an assessment of the financial literacy of young people, which was optional for countries.

For PISA, mathematics proficiency means the capacity of individuals to formulate, employ and interpret mathematics in a variety of contexts. The term describes the capacities of individuals to reason mathematically and use mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. Mathematics literacy is not an attribute that an individual either has or does not have; rather, it is a skill that can be developed over a lifetime.



The 2012 survey is the fifth round of assessments since PISA began in 2000, and the second, after the 2003 survey, that focuses on mathematics. As such, PISA 2012 provides an opportunity to evaluate changes in student performance in mathematics since 2003, and to view those changes in the context of policies and other factors.

For the first time, PISA 2012 includes an optional computer-based assessment of mathematics. Specially designed PISA questions are presented on a computer, and students respond on the computer, although they can also use pencil and paper as they think through the test questions.

Box I.1.2. Key features of PISA 2012

The content

- The PISA 2012 survey focused on mathematics, with reading, science and problem solving as minor areas of assessment. For the first time, PISA 2012 also included an assessment of the financial literacy of young people, which was optional for countries and economies.
- PISA assesses not only whether students can reproduce knowledge, but also whether they can extrapolate from what they have learned and apply their knowledge in new situations. It emphasises the mastery of processes, the understanding of concepts, and the ability to function in various types of situations.

The students

- Around 510 000 students completed the assessment in 2012, representing about 28 million 15-year-olds in the schools of the 65 participating countries and economies.

The assessment

- Paper-based tests were used, with assessments lasting a total of two hours for each student. In a range of countries and economies, an additional 40 minutes were devoted to the computer-based assessment of mathematics, reading and problem solving.
- Test items were a mixture of multiple-choice items and questions requiring students to construct their own responses. The items were organised in groups based on a passage setting out a real-life situation. A total of about 390 minutes of test items were covered, with different students taking different combinations of test items.
- Students answered a background questionnaire, which took 30 minutes to complete, that sought information about themselves, their homes and their school and learning experiences. School principals were given a questionnaire, to complete in 30 minutes, that covered the school system and the learning environment. In some countries and economies, optional questionnaires were distributed to parents, who were asked to provide information on their perceptions of and involvement in their child's school, their support for learning in the home, and their child's career expectations, particularly in mathematics. Countries could choose two other optional questionnaires for students: one asked students about their familiarity with and use of information and communication technologies, and the second sought information about their education to date, including any interruptions in their schooling and whether and how they are preparing for a future career.

WHO ARE THE PISA STUDENTS?

Differences between countries in the nature and extent of pre-primary education and care, in the age of entry into formal schooling, in the structure of the education system, and in the prevalence of grade repetition mean that school grade levels are often not good indicators of where students are in their cognitive development. To better compare student performance internationally, PISA targets a specific age of students. PISA students are aged between 15 years 3 months and 16 years 2 months at the time of the assessment, and have completed at least 6 years of formal schooling. They can be enrolled in any type of institution, participate in full-time or part-time education, in academic or vocational programmes, and attend public or private schools or foreign schools within the country. (For an operational definition of this target population, see Annex A2.) Using this age across countries and over time allows PISA to compare consistently the knowledge and skills of individuals born in the same year who are still in school at age 15, despite the diversity of their education histories in and outside of school.



The population of participating students is defined by strict technical standards, as are the students who are excluded from participating (see Annex A2). The overall exclusion rate within a country was required to be below 5% to ensure that, under reasonable assumptions, any distortions in national mean scores would remain within plus or minus 5 score points, i.e. typically within the order of magnitude of 2 standard errors of sampling. Exclusion could take place either through the schools that participated or the students who participated within schools (see Annex A2, Tables A2.1 and A2.2).

There are several reasons why a school or a student could be excluded from PISA. Schools might be excluded because they are situated in remote regions and are inaccessible, because they are very small, or because of organisational or operational factors that precluded participation. Students might be excluded because of intellectual disability or limited proficiency in the language of the assessment.

In 28 out of the 65 countries participating in PISA 2012, the percentage of school-level exclusions amounted to less than 1%; it was less than 5% in all countries. When the exclusion of students who met the internationally established exclusion criteria is also taken into account, the exclusion rates increase slightly. However, the overall exclusion rate remains below 2% in 30 participating countries and economies, below 5% in 57 participating countries, and below 7% in all countries except Luxembourg (8.4%). In 11 out of the 34 OECD countries, the percentage of school-level exclusions amounted to less than 1% and was less than 3% in 30 OECD countries. When student exclusions within schools were also taken into account, there were 11 OECD countries below 2% and 26 OECD countries below 5%.

Restrictions on the level of exclusions in PISA 2012:

- School-level exclusions for inaccessibility, feasibility or other reasons were required not to exceed 0.5% of the total number of students in the international PISA target population. Schools on the sampling frame that had only one or two eligible students were not allowed to be excluded from the frame. However, if, based on the frame, it was clear that the percentage of students in these schools would not cause a breach of the allowable limit, then those schools could be excluded from the field, if at that time, they still had only one or two students who were eligible for PISA.
- School-level exclusions for students with intellectual or functional disabilities, or students with limited proficiency in the language of the PISA assessment, were required not to exceed 2% of students.
- Within-school exclusions for students with intellectual or functional disabilities, or students with limited language proficiency were required not to exceed 2.5% of students.

Students who could be excluded from PISA 2012 were:

- Intellectually disabled students, defined as students who are considered, in the professional opinion of the school principal, or by other qualified staff members, to be intellectually disabled, or who have been assessed psychologically as such. This category includes students who are emotionally or mentally unable to follow even the general instructions of the assessment. Students were not to be excluded solely because of poor academic performance or common discipline problems.
- Students with functional disabilities, defined as students who are permanently physically disabled in such a way that they cannot perform in the PISA testing situation. Students with functional disabilities who could perform were to be included in the testing.
- Students with limited proficiency in the language of the PISA assessment, defined as students who had received less than one year of instruction in the language of the assessment.

(For more detailed information about the restrictions on the level of exclusions in PISA 2012, see Annex A2.)

WHAT IS THE TEST LIKE?

For each round of PISA, one subject is tested in detail, taking up nearly two-thirds of the total testing time. The major subject was reading in 2000 and 2009, mathematics in 2003 and 2012, and science in 2006. As in previous PISA assessments, the paper-based assessment was designed as a two-hour test comprising four 30-minute clusters of test material from one or more subjects. Information was obtained from about 390 minutes worth of test items. For each country, the total set of questions was packaged into 13 linked test booklets. Financial literacy, an option in the paper-based assessment, was allocated two clusters (that is, 60 minutes of testing time) in the 2012 survey.

Each booklet was completed by a sufficient number of students so that reliable estimates could be made of the level of achievement among students in each country and in relevant subgroups – such as boys and girls, and students with different socio-economic status – within a country. Students also spent 30 minutes answering a background questionnaire. Some questions were answered by all students, as in previous assessments; some were answered by subsamples of students.

In addition to this core assessment, 44 countries and economies participated in a computer-based assessment of problem solving; 32 of them also participated in a computer-based assessment of reading and mathematics. The PISA 2012 computer-delivered assessment lasted 40 minutes. A total of 80 minutes of problem-solving material was organised into four 20-minute clusters. Students from countries not participating in the optional computer-based assessment of mathematics and digital reading completed two of the clusters. Students from countries that did participate in the optional computer-based assessment of mathematics and digital reading completed two, one or none of the four problem-solving clusters. The optional computer-based component contained a total of 80 minutes of mathematics material and 80 minutes of reading material.

■ Figure I.1.2 ■
Summary of the assessment areas in PISA 2012

	MATHEMATICS	READING	SCIENCE
Definitions	An individuals' capacity to formulate, employ, and interpret mathematics in a variety of contexts. It includes reasoning mathematically and using mathematical concepts, procedures, facts and tools to describe, explain and predict phenomena. It assists individuals in recognising the role that mathematics plays in the world and to make the well-founded judgements and decisions needed by constructive, engaged and reflective citizens.	An individual's capacity to understand, use, reflect on and engage with written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society.	An individual's scientific knowledge and use of that knowledge to identify questions, to acquire new knowledge, to explain scientific phenomena, and to draw evidence-based conclusions about science-related issues. It includes understanding the characteristic features of science as a form of human knowledge and enquiry, awareness of how science and technology shape our material, intellectual, and cultural environments, and willingness to engage in science-related issues, and with the ideas of science, as a reflective citizen.
Contents	Four overarching ideas that relate to numbers, algebra and geometry: ■ quantity ■ space and shape ■ change and relationships ■ uncertainty and data	The form of reading materials includes: ■ continuous texts or prose organised in sentences and paragraphs (e.g. narration, exposition, argumentation, description, instruction) ■ non-continuous texts that present information in other ways, such as in lists, forms, graphs, or diagrams	Scientific knowledge or concepts are related to physics, chemistry, biological sciences and earth and space sciences, but they are applied to the content of the items and not just recalled.
Processes	■ formulating situations mathematically ■ employing mathematical concepts, facts, procedures and reasoning ■ interpreting, applying and evaluating mathematical outcomes (referred to in abbreviated form as "formulate, employ and interpret")	■ accessing and retrieving information ■ forming a broad general understanding of the text ■ interpreting the text ■ reflecting on the content and the form and features of the text	■ describing, explaining and predicting scientific phenomena ■ understanding scientific investigation ■ interpreting scientific evidence and conclusions
Contexts	The situations in which mathematics literacy is applied: ■ personal ■ occupational ■ societal ■ scientific	The use for which a text is constructed: ■ personal ■ educational ■ occupational ■ public	The situations in which science literacy is applied: ■ personal ■ social ■ global For some applications of science: ■ life and health ■ earth and environment ■ technology



The material for each subject was arranged in four clusters of items, with each cluster representing 20 minutes of testing time. All material that was presented on a computer was arranged in a number of test forms, with each form containing two clusters. Each student did one form, representing a total testing time of 40 minutes.

HOW IS THE TEST CONDUCTED?

When a school participates in PISA, a school co-ordinator is appointed. The school co-ordinator compiles a list of all 15-year-olds in the school and sends this list to the PISA National Centre in the country, which randomly selects 35 students to participate. The school co-ordinator then contacts the students who have been selected and obtains the necessary permission from parents.

The testing session is usually conducted by a test administrator who is trained and employed by the National Centre. The test administrator contacts the school co-ordinator to schedule administration of the assessment. The school co-ordinator ensures that the students, who may come from different grades and different classes, attend the testing sessions. The test administrator's primary tasks are to ensure that each test booklet is distributed to the correct student and to introduce the tests to the students. After the test is over, the test administrator collects the test booklets and sends them to the National Centre for coding.

In PISA 2012, at least 13 different test booklets were used in each country. With 13 different booklets for each group of 35 students, no more than 3 students were given the same booklet. Booklets were allocated to individual students according to a random selection process. The test administrator's introduction came from a prescribed text so that all students in different schools and countries received exactly the same instructions. Before starting the test, the students were asked to do a practice question from their booklets. The testing session was divided into two parts: the two-hour test to assess their knowledge and skills, and the 30-minute questionnaire session to collect data on their personal background. Students were usually given a short break half-way through the test and again before they completed the questionnaire.

WHAT KINDS OF RESULTS DOES THE TEST PROVIDE?

The PISA assessment provides three main types of outcomes:

- basic indicators that provide a baseline profile of students' knowledge and skills;
- indicators that show how skills relate to important demographic, social, economic and educational variables; and
- indicators on trends that show changes in student performance and in the relationships between student-level and school-level variables and outcomes.

Although indicators can highlight important issues, they do not provide answers to policy questions. To respond to this, PISA also developed a policy-oriented analysis plan that uses the indicators as a basis for policy discussion.

WHERE CAN YOU FIND THE RESULTS?

This is the first of six volumes that presents the results from PISA 2012. It begins by discussing student performance in mathematics in PISA 2012 and examines how that performance has changed over previous PISA assessments. Chapter 3 examines how opportunities to learn are associated with mathematics performance. Chapters 4 and 5 provide an overview of student performance in reading and science, respectively, and describe the evolution of performance in these subjects over previous PISA assessments. Chapter 6 discusses the policy implications based on analyses of the results of the preceding chapters and on the policy-reform experience of some countries that have improved during the participation in PISA.

The other five volumes cover the following issues:

Volume II, Excellence through Equity: Giving Every Student the Chance to Succeed, defines and measures equity in education and analyses how equity in education has evolved across countries between PISA 2003 and 2012. The volume examines the relationship between student performance and socio-economic status, and describes how other individual student characteristics, such as immigrant background and family structure, and school characteristics, such as school location, are associated with socio-economic status and performance. The volume also reveals differences in how equitably countries allocate resources and opportunities to learn to schools with different socio-economic profiles. Case studies, examining the policy reforms adopted by countries that have improved in PISA, are highlighted throughout the volume.

Volume III, Ready to Learn: Students' Engagement, Drive and Self-Beliefs, explores students' engagement with and at school, their drive and motivation to succeed, and the beliefs they hold about themselves as mathematics learners.



The volume identifies the students who are at particular risk of having low levels of engagement in, and holding negative dispositions towards, school in general and mathematics in particular, and how engagement, drive, motivation and self-beliefs are related to mathematics performance. The volume identifies the roles schools can play in shaping the well-being of students and the role parents can play in promoting their children's engagement with and dispositions towards learning. Changes in students' engagement, drive, motivation and self-beliefs between 2003 and 2012, and how those dispositions have changed during the period among particular subgroups of students, notably socio-economically advantaged and disadvantaged students, boys and girls, and students at different levels of mathematics proficiency, are examined when comparable data are available. Throughout the volume, case studies examine in greater detail the policy reforms adopted by countries that have improved in PISA.

Volume IV, What Makes Schools Successful? Resources, Policies and Practices, examines how student performance is associated with various characteristics of individual schools and of concerned school systems. It discusses how 15-year-old students are selected and grouped into different schools, programmes, and education levels, and how human, financial, educational and time resources are allocated to different schools. The volume also examines how school systems balance autonomy with collaboration, and how the learning environment in school shapes student performance. Trends in these variables between 2003 and 2012 are examined when comparable data are available, and case studies, examining the policy reforms adopted by countries that have improved in PISA, are highlighted throughout the volume.

Volume V, Skills for Life: Student Performance in Problem Solving, presents student performance in the PISA 2012 assessment of problem solving, which measures students' capacity to respond to non-routine situations in order to achieve their potential as constructive and reflective citizens. It provides the rationale for assessing problem-solving skills and describes performance within and across countries. In addition, the volume highlights the relative strengths and weaknesses of each school system and examines how they are related to individual student characteristics, such as gender, immigrant background and socio-economic status. The volume also explores the role of education in fostering problem-solving skills.

Volume VI, Students and Money: Financial Literacy Skills for the 21st Century, examines 15-year-old students' performance in financial literacy in the 18 countries and economies that participated in this optional assessment. It also discusses the relationship of financial literacy to students' and their families' background and to students' mathematics and reading skills. The volume also explores students' access to money and their experience with financial matters. In addition, it provides an overview of the current status of financial education in schools and highlights relevant case studies.

The frameworks for assessing mathematics, reading and science in 2012 are described in *PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy* (OECD, 2013). They are also summarised in this volume.

Technical annexes at the end of this report describe how questionnaire indices were constructed and discuss sampling issues, quality-assurance procedures, the reliability of coding, and the process followed for developing the assessment instruments. Many of the issues covered in the technical annexes are elaborated in greater detail in the *PISA 2012 Technical Report* (OECD, forthcoming).

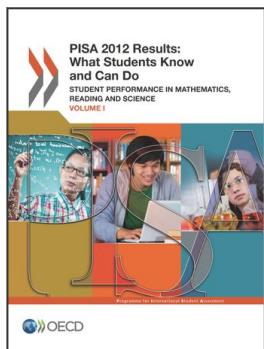
All data tables referred to in the analysis are included at the end of the respective volume in Annex B1, and a set of additional data tables is available online (www.pisa.oecd.org). A Reader's Guide is also provided in each volume to aid in interpreting the tables and figures that accompany the report. Data from regions within the participating countries are included in Annex B2. Results from the computer-based assessment of mathematics and reading are presented in Annex B3.

References

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OECD (2013), *PISA 2012 Assessment and Analytical Framework: Mathematics, Reading, Science, Problem Solving and Financial Literacy*, PISA, OECD Publishing.

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