How The European Schools Compare Internationally

PISA for Schools

2022

OECD

BETTER POLICIES FOR BETTER LIVES

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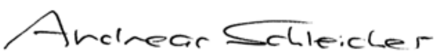
Foreword

Teachers and educational leaders need meaningful and reliable information to assess how well their students are prepared for life and work. Many administrators evaluate student learning based upon local or countrywide expectations. In a global economy, however, the benchmark for educational success is no longer national standards alone, but those set by the world's best performing schools and education systems.

Over the past 20 years, the OECD Programme for International Student Assessment (PISA) has evaluated the quality, equity and efficiency of school systems in over 80 countries and economies that, together, comprise nine-tenths of the world economy. Through PISA, schools and countries can learn from each other. Those education systems that have been able to secure strong and equitable learning outcomes and mobilise rapid improvements show others what is possible.

Similar to the international PISA assessment, the PISA-based Test for Schools measures 15-year-old students' knowledge and competencies in reading, mathematics and science. It also assesses their attitudes towards learning and school and the learning environments of the schools themselves. Importantly, these assessments measure not just whether students can reproduce what they have learned, but how well students can extrapolate from what they know and apply their knowledge creatively in novel contexts. The PISAbased Test for Schools is a unique tool designed for individual schools to compare their students' learning outcomes and benchmark them globally in innovative ways.

This report provides results from the PISA-based Test for Schools for the European Schools. But data is only the first step to deeper understanding and is only useful if it paves the way to action. You also have the opportunity to exchange with and learn from the strategies, policies and practices of other participating schools around the world who share your commitment to peer-learning, critical reflection and school improvement. The OECD stands ready to support all those involved in delivering "better policies for better schools and better lives."



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Acknowledgments

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This digital assessment is provided by Janison Solutions Pty Ltd, which serves as the International Platform Provider for the PISA-based Test for Schools, in partnership with the OECD.

Strategic guidance and oversight of the PISA for Schools project is provided by Andreas Schleicher and Yuri Belfali with Joanne Caddy.

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1. Executive Summary

	Reading	Mathematics	Science
Average performance of the European Schools	**546** which is **higher** than the EU **483** OECD **487**	**547** which is **higher** than the EU **490** OECD **489**	**543** which is **higher** than the EU **485** OECD **489**
Gender differences in performance	**Girls** outperform boys by **15 points**	**Boys** outperform girls by **27 points**	**Boys** outperform girls by **13 points**
Socio-economic differences in performance	Most advantaged students outperform least advantaged students by **37 points**	Most and least advantaged students **perform similarly**	Most advantaged students outperform least advantaged students by **25 points**

Student engagement and feelings

- **68%** Believe what they learn in science is important for their future.
- **47%** Observe their teachers providing individual help to struggling students.
- **36%** Experience noise and disorder.

Social and emotional skills

The strongest relationships between social and emotional skills and life outcomes were observed for:

- Classroom disciplinary climate ↔ Optimism
- Students' perceived health ↔ Optimism
- Students' overall life satisfaction ↔ Optimism

2. WHAT THE EUROPEAN SCHOOLS CAN LEARN FROM THE PISA-BASED TEST FOR SCHOOLS

2.

> While PISA is intended to deliver national results, the PISA-based Test for Schools (PBTS) is designed to deliver school-level results for school improvement and benchmarking purposes.

By administering the PISA-based Test for Schools in the European Schools, you have access to internationally comparable estimates of performance of your students and information about their learning environment and attitudes.

Furthermore, the PBTS also provides you with some insights concerning your students' social and emotional skills, an increasingly important aspect in education and that is believed to be core in the capacity of students to be able to adapt and navigate the fast-paced changing world that we live in.

Given our global, knowledge-based economy, it has become more important than ever before to compare students not only to local or national standards, but also to the performance of the world's top-performing school systems.

Because both PISA and PBTS are based on the same framework, their results are comparable, meaning that you will be able to benchmark the performance of the European Schools with that of national education systems from around the world. This will allow you to both gauge how prepared your students are to participate in a globalised society and set goals against the best school systems worldwide.

The PBTS also provides you with a better understanding of the challenges faced by low-performing students in the European Schools, thus allowing you to put in place specific targeted measures and practices aimed at reducing all achievement and developmental gaps that may exist.

Cognitive skills: What students in the European Schools know and can do: this chapter displays your students' performance in reading, mathematics and science and how the European Schools' results map onto the PISA proficiency levels. It also explores any performance gaps between the highest- and lowest-performing students, between genders and between students with high or low socio-economic backgrounds.

Student voice: Exploring student engagement and how students feel at school: this chapter investigates your students' self-reported motivation for learning, their beliefs in their own self-efficacy, and their perception of the teaching practices adopted in their classrooms, of their learning environment and of their relations with their peers.

Insights on students' social and emotional skills: this chapter sheds light on your students' social and emotional skills as measured by statements about five sub-domains linked to the Big Five dimensions (emotional regulation, engaging with others, collaboration, task performance and open-mindedness).

Finally, the OECD encourages you to take advantage of the opportunity for peer-learning by participating in the PISA for Schools Community. This online, multilingual forum enables all schools who have received PBTS results to share good practice, pose questions, obtain advice from peers, co-create teaching resources, and participate in webinars and discussions on selected themes moderated by the OECD or national actors.

"What is important for citizens to know and be able to do?" In response to that question and to the need for internationally comparable evidence on student performance, the Organisation for Economic Co-operation and Development (OECD) launched the triennial survey of 15-year-old students around the world known as the **OECD Programme for International Student Assessment**, or **PISA**. PISA assesses the extent to which 15-year-old students have acquired key knowledge and skills that are essential for full participation in modern societies.

In each round of PISA, one of the three core domains is tested in detail, requiring nearly half of the total testing time.

The major domain in 2018 was reading, as it was in 2009. Science was the major domain in 2015 and 2006, and mathematics was the major domain in 2003 and 2012 (and will be again in 2022).

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 and in their schools in comparison with those in other countries.

Read more
About PISA
oe.cd/PISA

2.1 Your sample and your participation

Figure 2.1 provides a short summary of the European Schools' participation in the PBTS, including both sample characteristics and information about the logistics of your participation.

The accompanying Reader's Guide (www.oecd.org/pisa/pisa-for-schools) provides additional information about the eligibility of schools to participate in the PBTS and the sampling procedures that are used to select schools and students.

Figure 2.1 Participation summary

	Your Group	EU	OECD
Schools tested	**13**	**7,377**	**11,327**
Students sampled	**2,114**	**210,110**	**328,281**
Students tested	**1,909**	**188,660**	**292,999**
Average age of tested students	**15.71**	**15.78**	**15.71**
Share of girls among tested students	**50%**	**49%**	**50%**
Share of boys among tested students	**50%**	**51%**	**50%**
Average social and cultural status of tested students	**0.97**	**-0.03**	**-0.03**
PBTS test date(s)	**2022**		

Source: data for the European Union and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

The PISA for Schools Community aims to support educators from participating schools in the following ways:

- **Give and receive support:** Educators can get their questions answered and share their ideas, concrete practices and materials for the areas of improvement.
- **Enhance professional knowledge and skills:** Educators can improve their knowledge in the subject matter as well as pedagogical skills. They can also further develop skills in coaching peers.
- **Establish an international professional network:** Educators can build their network with international educators. They can also develop their reputation and gain recognition from an international audience.
- **Stay informed of latest research on education and interact with OECD personnel and experts:** through regular webinars and alerts for new OECD publications, educators can stay updated with the latest research in education and benefit from the interaction with OECD personnel and experts.

Read more about
The PISA for Schools Community
www.oecdpisaforschools.org

2.2 Understanding the European Schools' results

This report presents the results for the European Schools based on their participation in the PISA-based Test for Schools (PBTS) in 2022. The assessment measures 15-year-old students' competences in reading, mathematics and science. Because the PBTS is based on the Programme for International Student Assessment (PISA), the European Schools can compare their results with those from over 80 countries and economies that have participated in the various cycles of PISA.

The accompanying Reader's Guide (www.oecd.org/pisa/pisa-for-schools) represents a useful toolkit to better understand the results. Throughout the report, links are available to gain additional insights based on OECD and PISA evidence.

In interpreting the average results in reading and science in the following chapters, it is important to bear in mind the unique testing conditions in the European Schools. The European Schools administered the PBTS in three different languages: English, French and German. In each of the three test languages, there were students for whom administrative data indicated the test was in their first language (L1) and students for whom the test was in their first foreign language, which is also commonly referred to as second language (L2), even when a student speaks more than two languages.

The OECD assigned test languages to students. The goal was to ensure a minimum of 500 students took each test language and to ensure a balance of L1 and L2 as much as possible in each school in order to obtain reliable statistics of the aggregated results. This requirement is important in order to ensure the reliability of analysis. The OECD did the language assignment in five steps, based on the school administrative data. The steps are summarised below:

1) All students who were able to take the test in only one of the three available languages, because their L1 or their L2 was a language other than one of the three test languages, were assigned to the only test language they were capable of sitting.

2) Students whose L1 was German or French and L2 was English were assigned to be tested in their L1.

3) Students whose L1 was French and L2 was German, were assigned to be tested in German.

4) Students whose L1 was English or German and L2 was French were assigned to be tested in their L1.

5) Students whose L1 was English and L2 was German, were assigned to be tested in German.

Table 2.1 shows how many valid student responses were recorded for each test language, by whether they were part of the L1 or the L2 language group. The largest group were students for whom English is not their first language, taking the test in English. The largest L1 group were French-speakers. It can be observed that the targeted minimum of 500 students for each test language was achieved for all three languages.

Table 2.1 Number of students by language and language group

	L1	L2	Total
English	175	538	713
French	434	186	620
German	257	253	510

One necessary condition to make sure a test question is valid, is to ensure it is equivalently difficult for all students of the same ability level, regardless of the language the test question is presented in, and regardless of any personal attributes of the test-taker other than their ability in the domain of interest. To ensure the items had stable difficulties when being attempted by L1 and L2 students, and by students taking the test in each of the three languages, psychometric analyses were carried out. Test questions which showed instability in their difficulties were accounted for in the calculation of student-level scores, making it possible to still report scores on the PISA international scale with no bias due to language or language background.

However, even though the test questions are equally difficult for L1 and L2 students of the same proficiency level, students' proficiency *in the language of the test* is likely to still be a factor that affects their performance in domains that rely heavily on language. Chapter 5 examines this subject, and reports that Reading and Science scores for L2 students are likely to have been affected by the students' levels of proficiency in the language of the test.

The essential point to note when reading all of the reported average scores in this report for Reading, Mathematics and Science, is that the scores accurately represent the average proficiency of 15-year-old students in the European Schools, in Reading, Mathematics, and Science in the language of the test. Had the L2 students been tested in their L1 in Reading and Science, the average proficiency scores may well have been different for that group - probably higher - and then the average scores for the European Schools in Reading and Science would also have been higher. In Mathematics, this is not the case, as it is shown in Chapter 5 that the L1 and L2 students performed similarly, indicating language proficiency was not a factor that affected how students performed in the test.

3. COGNITIVE SKILLS:

WHAT STUDENTS IN THE EUROPEAN SCHOOLS KNOW AND CAN DO

3.

This chapter provides an overview of the European Schools' performance on the PISA-based Test for Schools. It focuses on the performance of different groups of students in the European Schools and the kinds of tasks that they can perform in each domain.

3.1 Analysing student performance in the European Schools

Are 15-year-old students in the European Schools prepared to meet the challenges that the future holds? Can they analyse, reason and communicate their ideas effectively? Have they developed the competencies, skills and knowledge that are essential in order to successfully participate in 21st century societies?

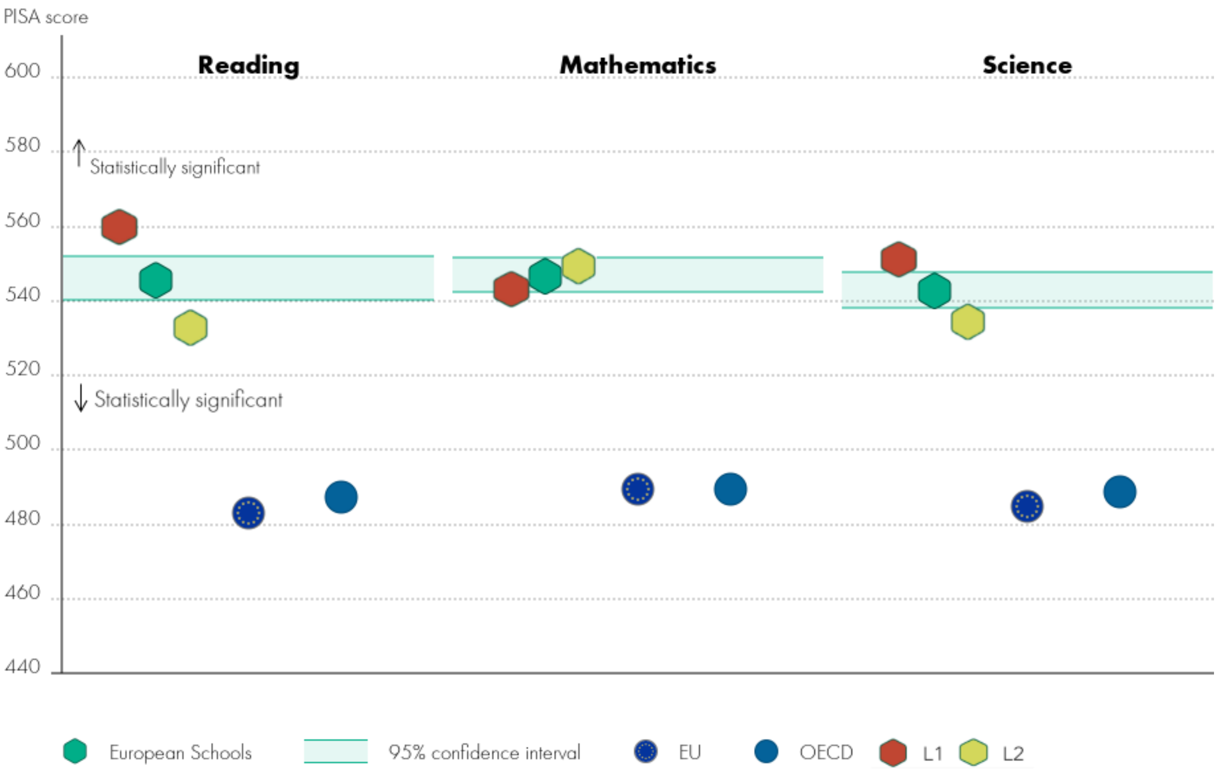
PISA measures the competencies, skills and knowledge of 15-year-old students in reading, mathematics and science around the world. The PISA-based Test for Schools (PBTS) results of the European Schools allow you to compare your students' levels of proficiency in these three domains with the levels of other students in the European Union (EU) and in school systems around the world. The results can be used as a gauge of how prepared students in the European Schools are to succeed in a global economy.

In the European Schools, in order to keep comparability of the average scores across the schools, student weights are applied when calculating statistics. It enables us to cancel out the influence of the different proportions of the L1 and the L2 students across the schools. Therefore, the student performances of the European Schools shown in this report are the weighted average of the L1 and the L2 students.

Figure 3.1 Student performance in reading, mathematics and science

The EU statistics in this report were calculated by taking the simple average of the set of corresponding statistics computed in each of the 27 member countries of the EU that have data reported for PISA 2018 [https://www.oecd.org/pisa/publications/pisa-2018-results.htm]. No weighting was applied, so each country contributed equally to the EU average. Standard errors (SE) were calculated in a similar way applying a formula combining standard errors from each country.

Figure 3.1 displays the results of the European Schools in the three domains – reading, mathematics and science – next to the ones of the EU and of the OECD in PISA 2018. It also shows the averages for the L1 and L2 groups. For each of the European Schools' average values, the figure also shows its 95% confidence interval. If the respective score of the EU, the OECD, or the L1 or L2 group is not comprised in the interval, then the difference between this score and the score of the European Schools can be assumed to be statistically significant.



	European Schools score		EU score		OECD score
Reading	**546**	which is significantly **higher than**	**483**	and significantly **higher than**	**487**
Mathematics	**547**	which is significantly **higher than**	**490**	and significantly **higher than**	**489**
Science	**543**	which is significantly **higher than**	**485**	and significantly **higher than**	**489**

Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

As stated previously in Section 2.2, the average scores for the European Schools in reading and science should be interpreted in the knowledge that not all students were tested in their L1. The averages, then, represent the average performance of 15-year-old students in the European Schools in the language of the test.

The extent to which this has affected the European Schools average is difficult to estimate precisely. However, a comparison of the group means for the L1 and L2 subgroups to the European Schools average may give some indication. Table 3.1 reports the average scores for the L1 and L2 groups in each domain, with the European Schools average for reference.

Table 3.1 Average scores in reading, mathematics and science for the European Schools, and the L1 and L2 sub-groups

Averages	Reading	SE	Maths	SE	Science	SE
European Schools	546	(2.95)	547	(2.33)	543	(2.41)
L1	561	(4.27)	545	(3.37)	553	(3.65)
L2	534	(4.03)	549	(3.04)	535	(3.08)

It can be observed that in reading, the L1 group average is 15 scale score points higher than the European Schools average, while the L2 average is 12 scale score points lower. In science, the L1 average is 10 points higher than the European Schools average and the L2 group mean 8 points lower. These differences are statistically significant with a 95% confidence level.

If one was to extrapolate from the averages of the L1 group, then it is possible that were all students in the European Schools tested in their L1, the reading and science averages for the European Schools could have been 10 to 15 points higher.

3.

Results from PISA indicate the quality and equity of learning outcomes attained around the world, and allow educators and policy makers to learn from the policies and practices applied in other countries. **The results of the PISA 2018 survey**, the seventh round of the triennial assessment, can be found in its six volumes:

- **Volume I, What Students Know and Can Do**, provides a detailed examination of student performance in reading, mathematics and science, and describes how performance has changed since previous PISA assessments.
- **Volume II, Where All Students Can Succeed**, examines gender differences in student performance, and the links between students' socio-economic status and immigrant background, on the one hand, and student performance and well-being, on the other.
- **Volume III, What School Life Means for Students' Lives**, focuses on the physical and emotional health of students, the role of teachers and parents in shaping the school climate, and the social life at school. The volume also examines indicators of student well-being, and how these are related to the school climate.
- **Volume IV, Are Students Smart about Money?**, examines 15-year-old students' understanding about money matters in the 21 countries and economies that participated in this optional assessment.
- **Volume V, Effective Policies, Successful Schools**, analyses the policies and practices used in schools and school systems, and their relationship with education outcomes more generally.
- **Volume VI, Are Students Ready to Thrive in Global Societies?**, explores students' ability to examine local, global and intercultural issues, understand and appreciate different perspectives and world views, interact respectfully with others, and take responsible action towards sustainability and collective well-being.

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PISA Volumes
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3.2 Student performance in reading

The PBTS assesses several different cognitive processes, or elements, involved in reading. These elements represent the mental strategies, approaches or purposes that readers use to negotiate their way into, around and between texts.

> Five elements guide the development of the reading literacy assessment tasks in PISA: retrieving information, forming a broad understanding, developing an interpretation, reflecting on and evaluating the content of a text, and reflecting on and evaluating the form of a text.

As it is not possible to include sufficient items in the PBTS to report on each element as a separate sub-scale, these five elements are organised into three sub-scales for reporting on reading literacy:

- **Locating information:** this element involves going to the information space provided and navigating in that space to locate and retrieve one or more distinct pieces of information.
- **Understanding:** this element involves processing what is read to make internal sense of a text, whether this is clearly stated or not.
- **Evaluating and reflecting:** this element involves drawing upon knowledge, ideas or attitudes beyond the text in order to relate the information provided within the text to one's own conceptual and experiential frames of reference.

The PISA assessment frameworks define competence as far more than the capacity to reproduce accumulated knowledge.

> According to PISA, competence is the ability to successfully meet complex demands in varied contexts through the mobilisation of psychosocial resources, including knowledge and skills, motivation, attitudes, emotions and other social and behavioural components.

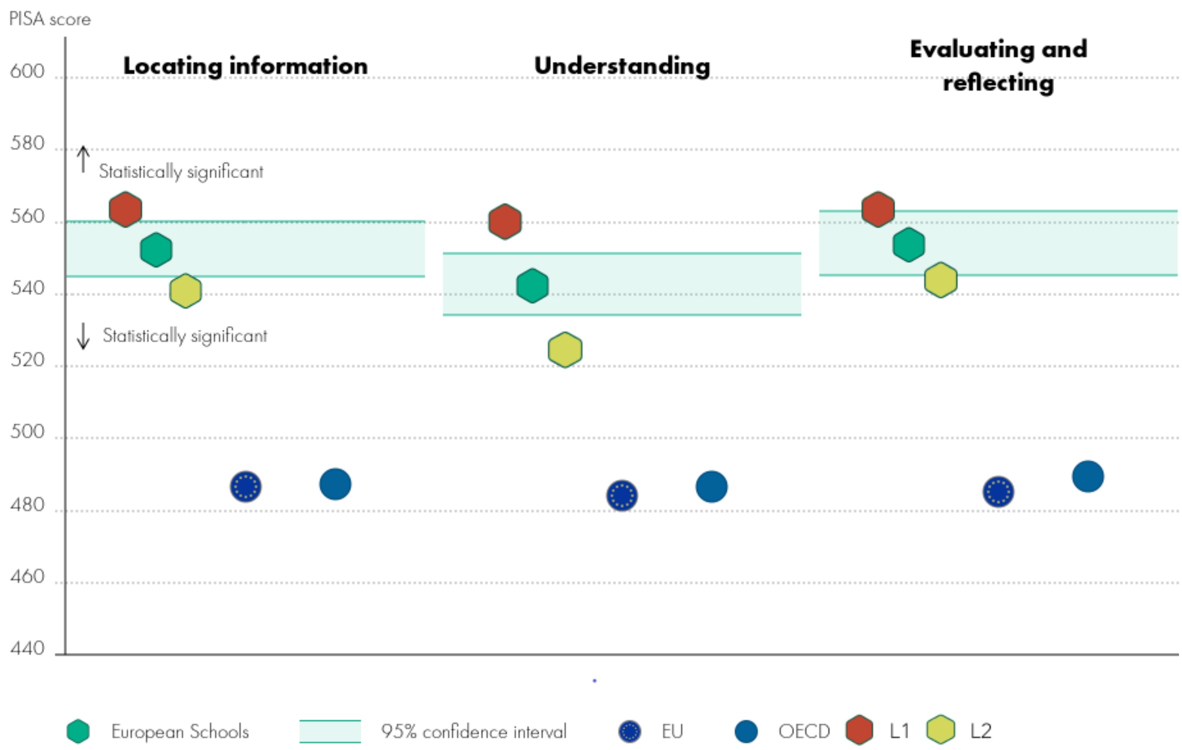
Rather than assessing whether students can reproduce what they have learned, PISA measures whether students can extrapolate from what they have learned and apply their competences in novel situations.

Tasks that can be solved through simple memorisation or with pre-set algorithms are those that are also easiest to digitise and automate. These types of skills, therefore, will be less relevant in a modern knowledge-based society and are not the focus of PISA.

Read more about
The PISA Assessment Frameworks
oe.cd/publications

Figure 3.2 Student performance in sub-scales of reading

While not all PBTS tasks engage students in every sub-scale, items can be classified according to the dominant process. Figure 3.2 shows the results of the European Schools in the three sub-scales of reading, next to the results of the European Union and of the OECD in PISA 2018. For each of the European Schools' values, the figure also shows its 95% confidence interval. If the respective score of the European Union – or of the OECD – is not comprised in the interval, then the difference between this score and the score of the European Schools can be assumed to be statistically significant.



	European Schools score		EU score		OECD score
Locating information	**553**	which is significantly **higher than**	**487**	and significantly **higher than**	**487**
Understanding	**543**	which is significantly **higher than**	**484**	and significantly **higher than**	**487**
Evaluating and reflecting	**554**	which is significantly **higher than**	**485**	and significantly **higher than**	**489**

Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

The averages for the European Schools represent the population tested, that includes students testing in their L1 and students tested in their L2. The averages for these two groups in the sub-scales of reading literacy are reported in Table 3.2, and they reveal the same pattern as the overall average: L2 students have a lower level of proficiency in the language of the test than their L1 peers. The differences are all statistically significant at the 95% level. In particular, note that the L2 score in Understanding is 40 points below the L1 score. This is a large difference, and suggests that L2 students found that skill particularly difficult to demonstrate in the language of the test.

Table 3.2 Average scores in reading sub-scales for the L1 and L2 groups

Group	Locating Information	SE	Understanding	SE	Evaluating and reflecting	SE
L1	566	(4.99)	561	(5.57)	564	(7.44)
L2	542	(4.58)	528	(5.47)	546	(5.34)

3.3 Student performance in mathematics

The PISA mathematics framework defines the theoretical underpinnings of the PISA mathematics assessment based on the fundamental concept of mathematical literacy, relating mathematical reasoning and three processes, or elements, of the problem-solving (mathematical modeling) cycle.

The PBTS assessment measures how effectively schools are preparing students to use mathematics in every aspect of their personal, civic and professional lives, as constructive, engaged and reflective 21st century citizens.

The framework schematises three elements of the mathematical modeling cycle: formulate, employ and interpret.

Each of these elements draws on fundamental mathematical capabilities, and, in turn, on the problem-solver's detailed mathematical knowledge, as detailed below:

- **Formulate:** the action begins with the "problem in context." The problem-solver tries to identify the mathematics relevant to the problem situation, formulates the situation mathematically according to the concepts and relationships identified, and makes assumptions to simplify the situation. The problem-solver thus transforms the "problem in context" into a "mathematical problem" that can be solved using mathematics.
- **Employ:** to solve the problem using mathematics, the problem-solver employs mathematical concepts, facts, procedures and reasoning to obtain the "mathematical results." This stage usually involves mathematical manipulation, transformation and computation, with and without tools.
- **Interpret outcomes:** the "mathematical results" then need to be interpreted in terms of the original problem to obtain the "results in context." The problem-solver thus must interpret, apply and evaluate mathematical outcomes and their reasonableness in the context of a real-world problem.

Figure 3.3 Student performance in sub-scales of mathematics

While not all PBTS tasks engage students in every stage of the modeling cycle, items can be classified according to the dominant process. Figure 3.3 shows the results of the European Schools in the three sub-scales of mathematics, next to the results of the European Union and of the OECD in PISA 2012. For each of the European Schools' values, the figure also shows its 95% confidence interval. If the respective score of the European Union – or of the OECD – is not comprised in the interval, then the difference between this score and the score of the European Schools can be assumed to be statistically significant.

	European Schools score		EU score		OECD score
Formulate	**541**	which is significantly **higher than**	**488**	and significantly **higher than**	**492**
Employ	**547**	which is significantly **higher than**	**492**	and significantly **higher than**	**493**
Interpret outcomes	**562**	which is significantly **higher than**	**493**	and significantly **higher than**	**497**

Source: data for the EU and the OECD were obtained from OECD (2013), PISA 2012 database, oecd.org/pisa/data

The averages for the European Schools represent the population tested, that includes students testing in their L1 and students tested in their L2. The averages for these two groups in the sub-scales of mathematics are reported in Table 3.3. The differences between the L1 and L2 groups in Formulate and Interpret outcomes are not statistically significant at the 95% level, so no inferences should be drawn from them. However, the difference in the Employ sub-scale is statistically significant at the 95% level, with the L2 group having a higher average proficiency than the L1 group. This is an interesting finding, but the difference is approximately 0.1 of a standard deviation, and so the magnitude of the difference is relatively modest.

Table 3.3 Average scores in mathematics sub-scales for the L1 and L2 groups

Group	Formulate	SE	Employ	SE	Interpret Outcomes	SE
L1	537	(7.74)	541	(4.43)	563	(7.81)
L2	543	(4.74)	552	(4.19)	561	(7.11)

Learning happens well before children start school and continues throughout adulthood. It happens in the family, the neighborhood and in isolation. Above all, it happens in the classroom. It is in schools where students most strongly experience the joys and frustrations that come along with learning, and where many of them, mostly inadvertently, learn how to learn. Even if most education systems focus on "what" is learned, rather than "how" students learn, most students inevitably develop particular learning strategies to complete school assignments and prepare for exams. Which strategies they adopt can make all the difference in their learning.

As an integral part of the learning process, students' learning strategies have a direct influence on academic performance and thus have an impact on students' daily lives. In addition to this immediate influence, learning strategies can also have long-term consequences for students. Rote learning, for instance, can be useful in certain school environments, but relying on that strategy alone may seriously penalise students later on in their educational career or in many work situations where simply storing and reproducing information may not be enough to get a job done. Sooner or later, a lack of deep, critical, creative and flexible thinking becomes a problem, particularly in innovative societies where the demand for non-routine skills is rising.

Learning strategies are defined as cognitive and metacognitive processes employed by students as they attempt to learn something new. In PISA, the main strategies students use to learn mathematics are grouped into three broad approaches: memorisation, elaboration and control strategies.

Students differ in how intensively they use these types of learning strategies. Some feel more comfortable with particular strategies; others may adopt different strategies depending on their teachers' expectations, their motivation, the type of task and, more generally, on their learning environment. Students may also give different weight to particular learning strategies when they are faced with new information, depending on in which phase of the learning process they find themselves: identification, comprehension, retention or retrieval. After all, "no single strategy is a panacea".

Read more about
Students' learning strategies in Mathematics
oe.cd/il/teach

3.4 Student performance in science

Performance in science requires three elements of knowledge: scientific competences, knowledge of the standard methodological procedures used in science, and knowledge of science subject content.

These three elements are interconnected. Explaining scientific and technological phenomena, for instance, demands knowledge of the content of science. Evaluating scientific inquiry and interpreting evidence scientifically also require an understanding of how scientific knowledge is established and the degree of confidence with which it is held.

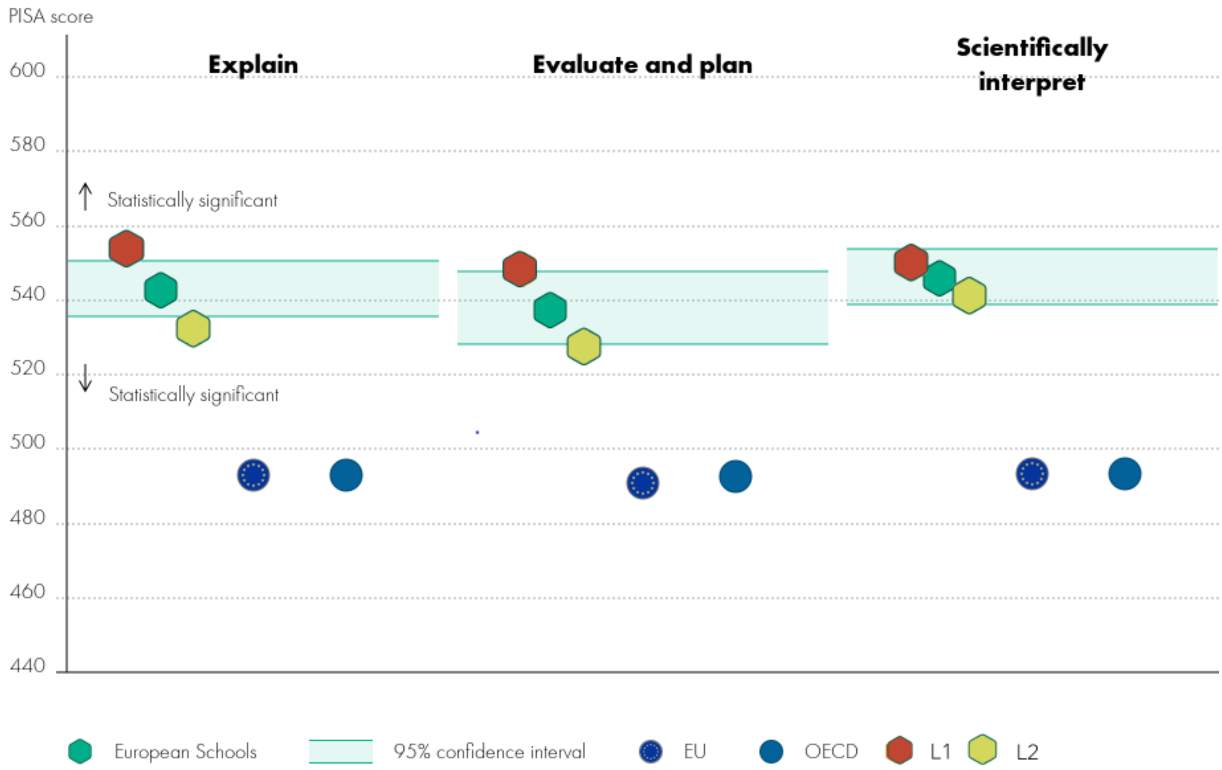
According to the PISA definition, a science-literate person is able and willing to engage in reasoned discourse about science and technology.

This requires the necessary competences to successfully:

- **Explain:** this element implies being able to recognise, offer and evaluate scientific explanations for a range of natural and technological phenomena.
- **Evaluate and plan:** this element implies being able to describe, design and appraise scientific investigations and propose ways of addressing questions scientifically.
- **Scientifically interpret:** this element implies being able to analyse and evaluate data, claims and arguments in a variety of representations, and draw appropriate scientific conclusions.

Figure 3.4 Student performance in sub-scales of science

While not all PBTS tasks require all of these competences, items can be classified according to the dominant one. Figure 3.4 shows the results of the European Schools in the three sub-scales of science, next to the results of the European Union and of the OECD in PISA 2015. For each of the European Schools' values, the figure also shows its 95% confidence interval. If the respective score of the European Union – or of the OECD – is not comprised in the interval, then the difference between this score and the score of the European Schools can be assumed to be statistically significant.



	European Schools score		EU score		OECD score
Explain	**543**	which is significantly **higher than**	**493**	and significantly **higher than**	**493**
Evaluate and plan	**538**	which is significantly **higher than**	**491**	and significantly **higher than**	**493**
Scientifically interpret	**546**	which is significantly **higher than**	**493**	and significantly **higher than**	**493**

Source: data for the EU and the OECD were obtained from OECD (2016), PISA 2015 database, oecd.org/pisa/data

The averages for the European Schools represent the population tested, that includes students testing in their L1 and students tested in their L2. The averages for these two groups in the sub-scales of science are reported in Table 3.4, and they reveal the same pattern as the overall average: L2 students have demonstrated a lower level of proficiency in science. The differences are all statistically significant at the 95% level. The differences are likely due to L2 students having a lower level of proficiency in the language of the test than their L1 peers.

Table 3.4 Average scores in science sub-scales for the L1 and L2 groups

Group	Explain	SE	Evaluate and Plan	SE	Scientifically Interpret	SE
L1	549	(8.54)	555	(5.61)	552	(4.49)
L2	529	(7.15)	533	(5.03)	541	(4.91)

Science permeates all aspects of modern life. It is all around us, from the humble toaster to the mighty rocket putting satellites into orbit. Science's record in improving our living circumstances through medicine, communication, transport and many other fields is undeniable.

In today's world, proficiency in science is not a luxury but a necessity. According to the United States Bureau of Labour Statistics, in 2015, 8,6 million jobs in the United States (representing 6,2% of all jobs) were in fields related to science, technology, engineering and mathematics. Jobs in science and mathematics, in particular, are expected to grow at an unprecedented rate of 28,2% between 2014 and 2024, compared to 6,5% growth in all other professions.

This rise will be accompanied by the progressive automation of routine and low-skilled jobs. Figures from the World Bank show that a wide range of jobs – from truck drivers to finance professionals – have a high probability of being automated in the coming years, with technology entirely or largely replacing routine tasks performed by human workers. This evidence underscores the importance of science in the future, as students who perform well in science are more likely to pursue careers in this field and to find good jobs.

Several studies indicate that instructional practices in science could have a more significant effect on students' science performance and attitudes than teachers' experience and advanced degrees. Indeed, what teachers enact in the classroom has the potential to engage students with science or alienate them from it. This, in turn, highlights the need to identify the core teaching practices that have a positive impact on students' science performance and attitudes.

OECD work shows that the negative association between inquiry-based science teaching and science performance is greatly attenuated when lessons are delivered in disciplined science classes. This approach could help close the gender gap between girls and boys when it comes to attitudes towards science and to the decision to pursue a career in STEM-related fields.

The work also shows that teacher-directed instruction is a reliable strategy that is positively associated with students' science outcomes regardless of school climate and resources. Adaptive teaching is positively correlated with science performance in the majority of countries, particularly in countries known for the use of personalised learning approaches, while teacher feedback is weakly but positively associated with science performance once students' achievement in mathematics and reading is accounted for.

Read more about
The relationship between science teaching strategies and students' science-related outcomes
oe.cd/il/scienceteaching

3.

3.5 Performance in reading, mathematics and science by school

One of the unique aspects of the European Schools is the geographical distribution of the schools across six different countries. Each country where there is one or more European School also participates in PISA, so there are some comparisons that can be made between the schools and the performance of the national education systems of the country in which they are located. Table 3.5 presents the average reading, science and mathematics score for each European School along with the averages (from PISA 2018) for the countries in which the schools are located, the EU averages, the European Schools averages, and the OECD averages.

This information is provided as a means of observing the high-performing nature of the schools in their country contexts, as well as in the context of the EU more broadly. It is not provided for the purposes of ranking the individual European Schools by performance – such 'league tables' are explicitly discouraged in accordance with the Guidelines for the Availability and Use of the PISA-based Test for Schools.

Table 3.5 Average scores in reading, mathematics and science for the European Schools, selected countries, the EU and the OECD

European School	Country	Reading	Mathematics	Science
	Belgium	**493**	**508**	**499**
Brussels I	Belgium	562	555	543
Brussels II	Belgium	545	540	541
Brussels III	Belgium	545	545	544
Brussels IV	Belgium	543	538	548
Mol	Belgium	533	518	528
	Germany	**498**	**500**	**503**
Frankfurt	Germany	552	575	546
Karlsruhe	Germany	519	527	528
Munich	Germany	583	570	564
	Italy	**476**	**487**	**468**
Varese	Italy	518	525	540
	Luxembourg	**470**	**483**	**477**
Kircher	Luxembourg	544	549	541
Mamer	Luxembourg	539	555	529
	Netherlands	**485**	**519**	**503**
Bergen	Netherlands	549	542	561
	Spain	**477***	**481**	**483**
Alicante	Spain	523	542	540
European Schools		**546**	**547**	**543**
EU		**483**	**490**	**485**
OECD		**487**	**489**	**489**

Source: data for the EU and the OECD were obtained from PISA 2018.
*For the comparability of Spain's Reading score, see PISA 2018 Results (Volume I): What Students Know and Can Do, Annex A9.

3.

3.6 The European Schools' results across PISA proficiency levels

In order for students to thrive in the 21st century, it is paramount that they are able to demonstrate skills and competences that will allow them to participate productively in life as they continue their studies and enter the labour force. According to PISA, different levels of skills and competences at age 15 can be associated with different labour outcomes.

PISA results group student performance according to six proficiency levels for each subject, from the best performing students (Level 6) to the lowest performing ones (Below Level 2).

Level 2 is used as a reference and baseline group, and represents the level of proficiency at which students begin to demonstrate the competences that will enable them to participate effectively and productively in life as continuing students, workers and citizens.

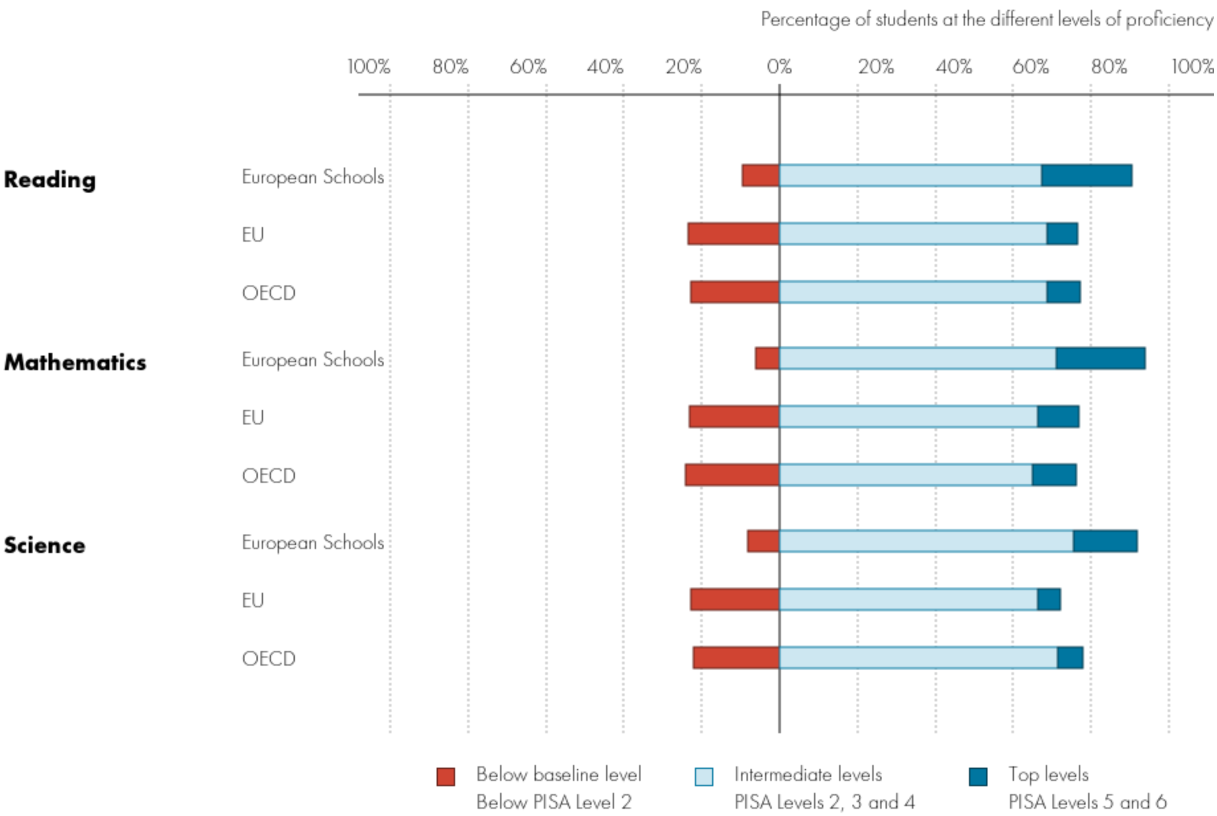
Students who reach the top levels (Levels 5 and 6) are well on their way to becoming the skilled knowledge workers of tomorrow.

Students who perform at the intermediate levels (Levels 2, 3 and 4) are able to demonstrate skills and competences that will allow them to participate productively in life as they continue their studies and enter the labour force. However, students who perform below baseline Level 2 are at risk of poor educational and labour-market outcomes.

According to the domain, PISA data allow for additional breakdowns of proficiency levels for students performing below Level 2. For the purpose of this report, though, this additional itemisation has not been included in the analysis.

Figure 3.5 Student proficiency levels in reading, mathematics and science

Figure 3.5 summarises how students in the European Schools perform in terms of proficiency levels. The results of the European Schools are shown next to the mean performance obtained by students across schools in the European Union and in the OECD in PISA 2018.



Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

The OECD collected many videos profiling specific policies and practices from strong-performing or improving countries and economies.
Would you like to know more from their experiences? Here you can find some!
oe.cd/strongperf

Reading: The reading domain of the assessment measures the active, purposeful and functional application of reading in a range of situations and for various purposes. Students who are proficient at the highest levels are capable of critically evaluating unfamiliar texts and building hypotheses about them, drawing on specialised knowledge and accommodating concepts that may be contrary to expectations.

At the other end of the performance scale, PISA has defined Level 2 as a baseline level of proficiency at which students begin to demonstrate the reading competences that will enable them to participate effectively and productively in life.

Mathematics: The mathematics part of the assessment measures student capacity to formulate, employ and interpret mathematics in a variety of contexts. Students who reach Levels 5 and 6 in mathematics are capable of developing and working with models in complex situations, identifying constraints and specifying assumptions.

Students who perform at the baseline level of mathematics proficiency (Level 2) can employ basic algorithms, formulae, procedures or conventions and they can interpret and recognise situations that require no more than direct inference.

Science: The science domain measures student ability to explain phenomena scientifically, evaluate and design scientific inquiry, and interpret data and evidence scientifically. Students at the highest levels of science proficiency are sufficiently skilled in and knowledgeable about science to be able to creatively and autonomously apply their knowledge and skills to various situations, including unfamiliar ones.

At the baseline level of proficiency in science (Level 2), students can draw on everyday content knowledge to identify an appropriate scientific explanation, demonstrating the competences that will enable them to participate actively in situations related to science and technology.

3.7 Exploring the performance of girls and boys

PISA 2018 data show that within-schools, on average, girls perform slightly – albeit significantly – better than boys in reading, while boys perform slightly – albeit significantly – better than girls in mathematics and science. These results however, vary across countries and economies.

A comparison of results in reading performance between 2009, when reading was also the main subject assessed in PISA, and 2018 shows that the gender gap in reading performance narrowed over time in 36 countries and economies. However, in 11 of these countries the narrowing of the gender gap in reading was due not to an improvement in boys' performance but to a decline in girls' performance.

Are there achievement gaps according to gender in the European Schools? How might those gaps compare to gaps in the European Union and around the world?

3.

Among the subjects of science, mathematics and reading, science is the one where average gender differences in performance in PISA are smallest.

However, overall similar average performance in science does not reflect the many girls who have difficulty achieving at the highest levels of proficiency – and the large number of boys who struggle to acquire basic skills. In all three domains, boys show larger variation in performance than girls, meaning that the best-performing boys are far ahead of the lowest-achieving boys. Among girls, the difference between the top and lowest performers is narrower.

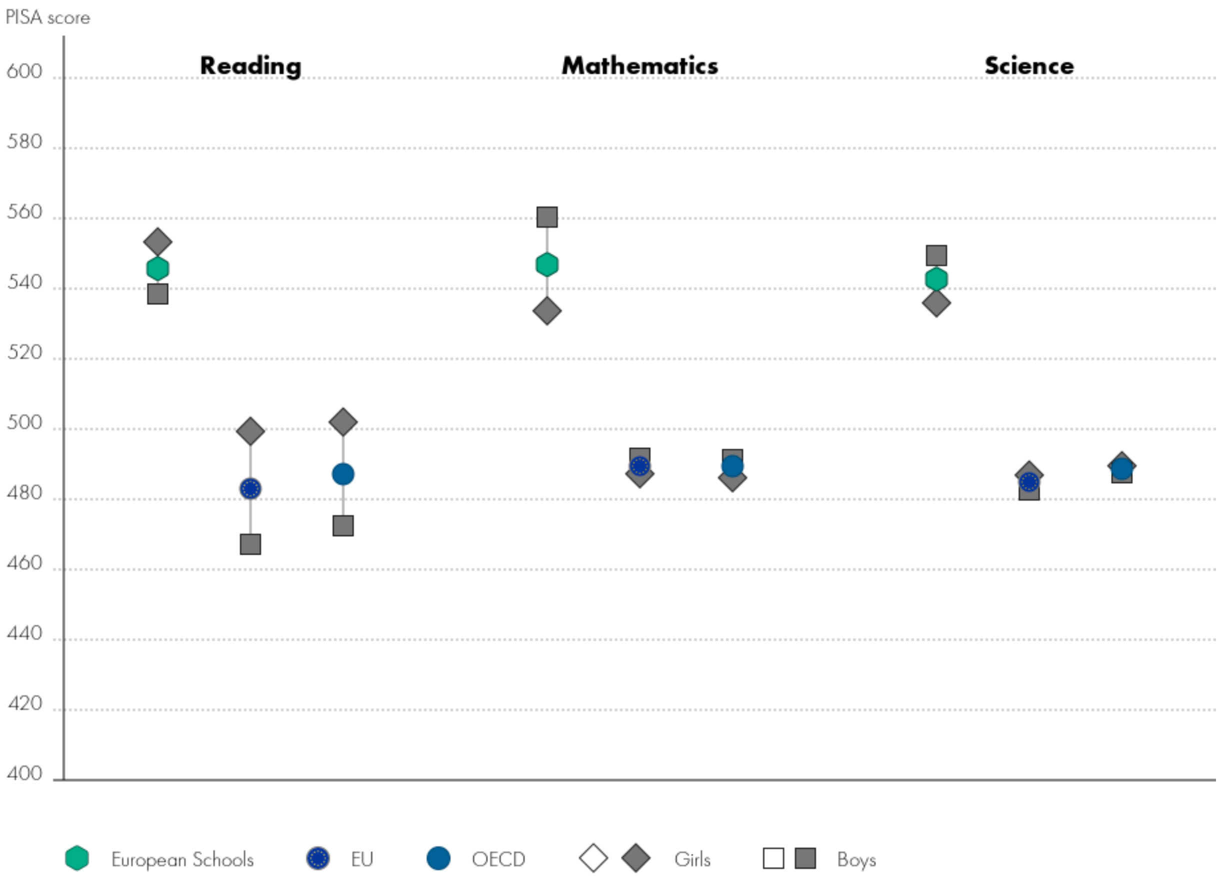
But for each of these findings, there are considerable variations across countries and years. This indicates that gender disparities in performance do not stem from innate differences in aptitude, but rather from factors that parents, teachers, policy makers and opinion leaders can influence.

A collective effort to encourage student attitudes that are conducive to success, among both boys and girls, and to change the behaviours that impede learning can give boys and girls equal opportunities to realise their full potential and to contribute to society with their unique, individual capacities.

Read more about
The policy implications of gender difference in performance
oe.cd/il/PISA15vol1

Figure 3.6 Student performance in reading, mathematics and science for girls and boys

Figure 3.7 shows how girls and boys perform in reading, mathematics and science in the European Schools, compared with students in other schools in the European Union and in the OECD in PISA 2018. There are three sets of charts, one for each domain. Markers with a solid fill indicate that the achievement gap between the two genders is statistically significant with a 95% confidence level.



Note: statistically significant differences are shown by filled shapes.
Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Figure 3.7 shows that there are statistically significant gaps in performance between girls and boys in all three domains. The Reading and Mathematics results are consistent with the PISA 2018 results, and the direction of the differences is also the same: girls outperform boys in Reading, and boys outperform girls in Mathematics. In Science, boys in the European Schools have performed higher than girls, which is different from trends in the EU and the OECD.

For the L1 and L2 groups, the directions of the gender gaps are consistent with the figure above, as can be seen in Table 3.6. Girls outperform boys in Reading in both the L1 and L2 groups; boys outperform girls in Mathematics and Science in both the L1 and L2 groups. All of the differences between boys and girls are statistically significant with a 95% confidence level.

Table 3.7 Average scores in reading, mathematics and science for Girls and Boys by L1 and L2 groups.

Gender	Reading				Maths				Science			
	L1	SE	L2	SE	L1	SE	L2	SE	L1	SE	L2	SE
Girls	567	(5.47)	541	(5.56)	533	(4.50)	534	(4.35)	547	(4.82)	527	(4.49)
Boys	555	(5.36)	526	(5.19)	557	(4.40)	563	(4.90)	559	(4.71)	543	(5.07)

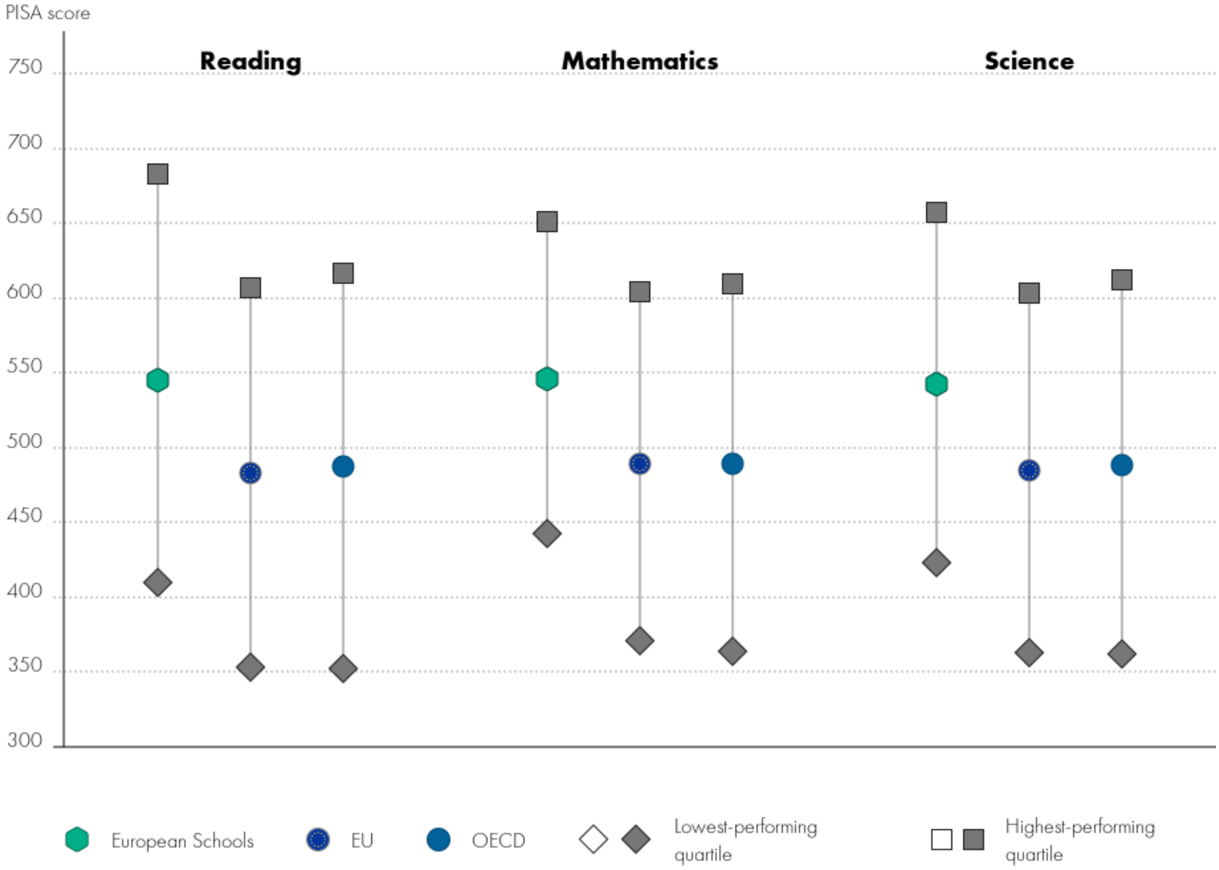
3.8 Measuring the performance gap between the highest- and lowest-performing students

This and the following sections of the European Schools' report focus on equity, with special attention to the results of specific groups of students within the European Schools. Thus, these sections will primarily compare the European Schools' results with within-schools results, and not within-country results, from other countries and economies. Unlike a within-country result, a within-schools result is a "mean of means" that represents all schools in a country or economy.

If, for example, an entity's result refers to the scores of the top 25% of students within-schools in terms of socio-economic status, this result is produced by calculating the average score of the top 25% of students in terms of socio-economic status in each school in a country or economy. The mean scores from each school are then averaged to produce the mean score within-schools of the top 25% of students in terms of socio-economic status in a country or economy. In effect, the information represents the results of the average school in a country or economy.

Figure 3.7 Student performance in reading, mathematics and science for the highest- and lowest-performing students

Figure 3.8 shows the difference in performance between the top and bottom quartiles of students in the European Schools. There are three sets of charts, one for each domain. In each set of charts, the European Schools' result is displayed next to the average within-school results of the European Union and the OECD in PISA 2018. For each domain, the top marker represents the average performance among the top 25% of students in the European Schools (highest-performing students). The bottom marker, instead, represents the average performance among the bottom 25% of students in the European Schools perform (lowest-performing students). Markers with a solid fill indicate that the achievement gap between highest- and lowest-performing student quartiles is statistically



Note: statistically significant differences are shown by filled shapes.
Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Additional investigation was conducted into the proportions of L1 and L2 students in the top quartile of each domain. PISA for Schools does not produce individual student ability estimates, so a proxy measure was used (an estimate of the mean of each student's posterior proficiency distribution). There are caveats when using this approach, but for the purpose of initial investigation in order to identify whether there may be a need for more precise analysis, the methodology is acceptable since the sample size is sufficiently large to perform this analysis. Within the top 25% of students in Mathematics, 57% were L2 students. In Reading the percentage was 50% and in Science: 54%. So, in the top quartiles of students, the proportion of L2 students to L1 students was noticeably larger in Mathematics, slightly larger in Science, and equal in Reading. In the bottom quartile, however, the percentages of L2 students were: Mathematics 55%, Science 63%, Reading 64%. This is likely to indicate that proficiency in the language of the test is a confounding variable for students below a certain level of proficiency (because the difference is not observable in the top quartile). In Chapter V, there is a more thorough investigation of the distribution of proficiency in the L1 and L2 groups, as well as an examination of how the effect applies across the distribution through an equipercentile comparison.

Analyses show that poor performance at age 15 is not the result of any single risk factor, but rather of a combination and accumulation of various barriers and disadvantages that affect students throughout their lives.

While these background factors can affect all students, among low performers the combination of risk factors is more detrimental to disadvantaged than to advantaged students. Indeed, most demographic characteristics, as well as the lack of pre-primary education, increase the probability of low performance by a larger margin among disadvantaged than among advantaged students, on average across OECD countries.

Low-performing students tend to have less perseverance, motivation and self-confidence in mathematics than better-performing students, and they skip classes or days of school more. Students who have skipped school at least once in the two weeks prior to the PISA test are almost three times more likely to be low performers in mathematics than students who did not skip school.

Students attending schools where teachers are more supportive and have better morale are less likely to be low performers, while students whose teachers have low expectations for them and are absent more often are more likely to be low performers in mathematics, even after accounting for the socio-economic status of students and schools.

In addition, in schools with larger concentrations of low performers, the quality of educational resources is lower, and the incidence of teacher shortage is higher, on average across OECD countries, even after accounting for students' and schools' socio-economic status.

In countries and economies where educational resources are distributed more equitably across schools, there is less incidence of low performance in mathematics, and a larger share of top performers, even when comparing school systems whose educational resources are of similar quality.

The first step for policy makers is to make tackling low performance a priority in their policy agenda and translate it into additional resources.

An agenda to reduce the incidence of low performance can include several actions, such as:

- creating demanding and supportive learning environments at school;
- providing remedial support as early as possible;
- identifying low performers and designing a tailored policy strategy;
- offering special programs for immigrant, minority-language and rural students; and
- reducing inequalities in access to early education.

Read more about
Why low-performing students fall behind and how to help them succeed
oe.cd/lowperf

3.9 Exploring the effect of socio-economic status on student performance in the European Schools

To what extent do students in the European Schools show gaps in performance according to socio-economic status? And how do the European Schools' socio-economic performance gaps compare with those of schools in other countries and economies?

PISA data shows that in many countries, even those that perform well in PISA, students' backgrounds continue to influence their opportunities to benefit from education and develop their skills.

High income families often invest in buying books, high-quality pre-schooling and daycare, enrichment activities, and private tutoring if needed. Low incomes adversely affects parents' ability to nurture and provide for their children's needs, and the experience of poverty during childhood and adolescence is often associated with slower cognitive development and poorer health.

That is why equity in education – ensuring that education outcomes are the result of students' abilities, will and effort, rather than their personal circumstances – lies at the heart of ensuring opportunities for all and inclusive growth.

Ensuring that the most talented, rather than the wealthiest, students obtain access to the best education opportunities is also a way to use resources effectively and raise education and social outcomes in general.

Socio-economic status is a broad concept that summarises many different aspects of a student, school or school system. In PISA and in the PBTS, this concept is measured using information gathered from a questionnaire that asks students about their family background. Different variables from the student questionnaire – parents' education, parents' occupations, home possessions representing material wealth, and the number of books and other educational resources available in the home – make up the PISA index of economic, social and cultural status (ESCS) which is also used in the PBTS.

As a general reference, the ESCS index is usually comprised between -3,5 and +2,0 at a country level, with lower values indicating lower socio-economic status. The ESCS index is built in a way that the value of 0,0 corresponds to the average OECD economic, social and cultural status, and is standardised so that a value of 1 equals a difference of 1 standard deviation from the OECD average of 0,0. For additional details about the ESCS index, readers can consult the Reader's Guide and the PBTS Technical Report.

PISA results show that educational excellence and equity can be achieved within the same school system. That is, students can be high-achievers on average while the influence of socio-economic status on their performance can be relatively small.

Equity in education is a matter of design and concerted policy efforts. Achieving greater equity in education is not only a social justice imperative, it is also a way to use resources more effectively, increase the supply of skills that fuel economic growth, and promote social cohesion. As such, equity should be one of the key objectives in any strategy to improve an education system.

PISA shows that, in most participating countries and economies, socio-economic status and an immigrant background are associated with significant differences in student performance. Yet PISA also shows that the relationship between students' background and their outcomes in education varies widely across countries.

In some high-performing countries, this relationship is weaker than average – implying that high achievement and equity in education outcomes are not mutually exclusive. This underlines PISA's definition of equity as high performance for students from all backgrounds, rather than as small variations in student performance only.

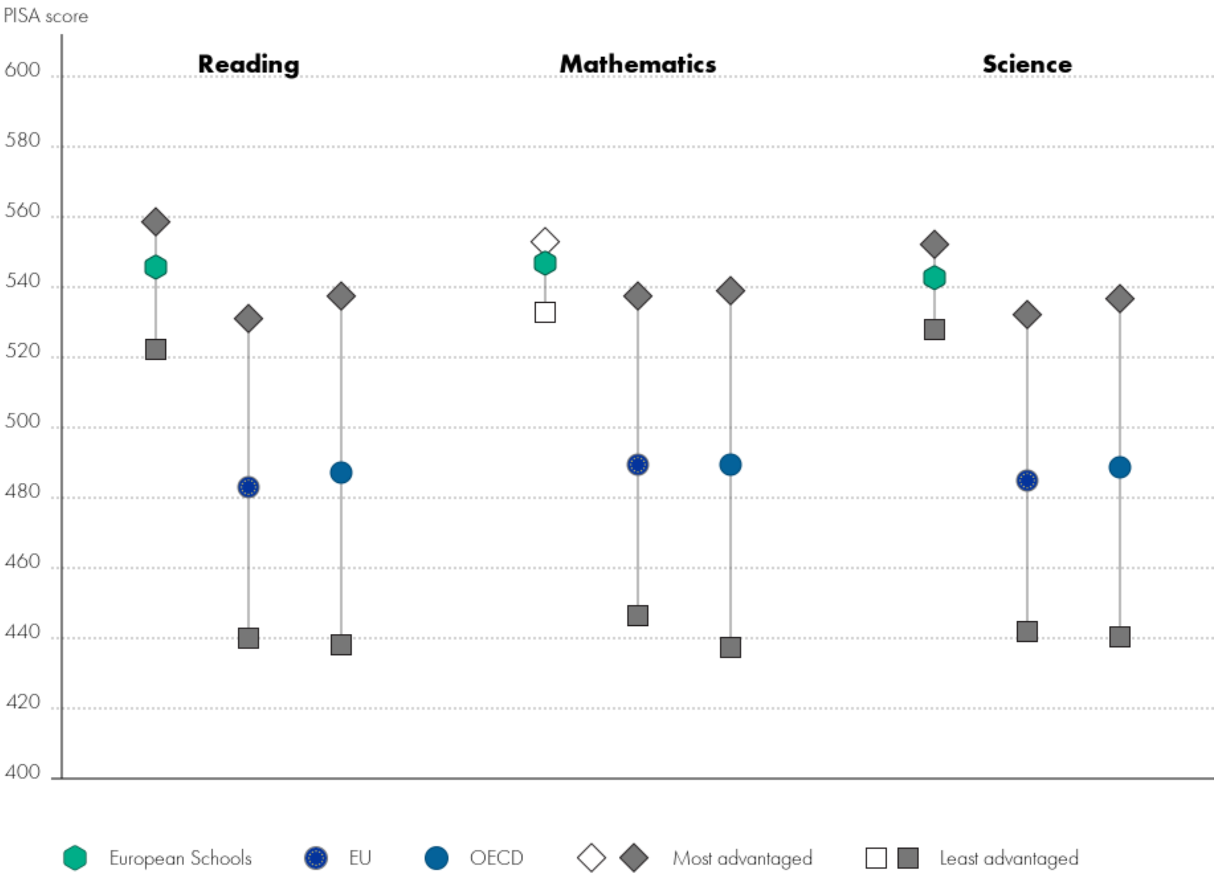
PISA is an assessment of the cumulative learning that has occurred since birth. Investments in early childhood education bring relatively large returns as children progress through school. By contrast, intervening when students have already fallen behind is often more expensive and less effective, even if skills can be developed at all ages.

For most countries, comprehensive education policy must also focus on increasing socio-economic inclusion and enabling more families to provide better support for their children's education. For others, it may also mean improving school offerings and raising the quality of education across the board. And most importantly, high levels of equity and performance should be seen as complementary rather than competing objectives.

Read more about
The policy implications of differences in equity
oe.cd/il/PISA15vol1

Figure 3.8 Student performance in reading, mathematics and science for the most and the least socio-economically advantaged student quartiles

Figure 3.9 shows the difference in performance between the most and the least socio-economically advantaged students in the European Schools next to corresponding, within-school results of the European Union and the OECD in PISA 2018. For each domain, the figure presents for the European Schools, the European Union and the OECD the average performance of all students and of the top and bottom 25% of students according to their ESCS index (the most and the least socio-economically advantaged students). Markers with a solid fill indicate that the achievement gap between the two groups is statistically significant with a 95% confidence level.



Note: statistically significant differences are shown by filled shapes.
Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Equity in education is promoted by removing obstacles to the development of talent that stem from economic and social circumstances over which individual students have no control, including unequal access to educational resources in their family and school environments.

One of the ways PISA examines equity is by looking at how well a student's socio-economic status predicts his or her performance (what PISA calls the strength of the socio-economic gradient).

Recent trends in equity are best analysed by comparing the evolution of this indicator between PISA 2006 and PISA 2015, two rounds of PISA when science was the focus of the assessment.

Over the past decade, equity improved modestly in many PISA-participating countries and economies. In 2006, on average across OECD countries, 14% of the variation in students' science performance could be explained by students' socio-economic status; by 2015, 13% of the variation in performance could be so explained. But in a few countries the socio-economic gradient weakened by between 2 and 7 percentage points. Progress towards greater equity in education is even more commendable as many of these countries saw rising income inequality over the same period.

Trends in equity are also reflected in changes in the average impact of socio-economic status on performance. Over the past decade, the average difference in performance observed between students from different socio-economic groups decreased by between 5 and 13 score points in several countries.

Was progress in equity driven by improvements in performance among disadvantaged students? Trends in student "resiliency" suggest that, in many countries, this was the case. Resilient students are those from disadvantaged backgrounds who beat the odds against them and perform at high levels when compared with students of the same socio-economic status from around the world.

Read more about
Where equity in education improved over the past decade
oe.cd/il/equity

3.10 The European Schools' performance in the socio-economic context of the European Union

Figure 3.10 shows the European Schools' results in the socio-economic context of all schools from the European Union that participated in PISA 2018 for the reading domain. The scale on the left side of the figure (the y-axis) represents the performance on the PISA reading scale. The scale on the bottom (the x-axis) refers to the socio-economic status of students as measured by the PISA index of economic, social and cultural status (ESCS).

What is important to keep in mind when reading this chart is that as values increase (from left to right), the average socio-economic status of students increases. Thus, schools that are plotted towards the lower end of the scale (-1,5 for example) will appear on the left side of the figure, and one may conclude that students in these schools, on average, come from more disadvantaged backgrounds. Schools plotted with higher ESCS values, such as +1,0 or higher, (towards the right side of the x-axis) serve students primarily from more advantaged backgrounds.

The diagonal line in the figure (which is the regression line) indicates the relationship between socio-economic status and performance based on the performance of all schools participating in PISA 2018. Schools well above the diagonal line perform better than what would reasonably be expected in the European Union given the socio-economic status of their students, while those well below do not perform as well as what would reasonably be expected.

There are also two shaded areas in each figure. The horizontal shaded area represents the confidence interval around the European Schools' score on the PISA scale for reading. The vertical shaded area represents the confidence interval around the European Schools' value on the ESCS index. Where they overlap represents the area in which the European Schools' results would be expected to be 95% of the time if the PBTS were administered continuously in the European Schools.

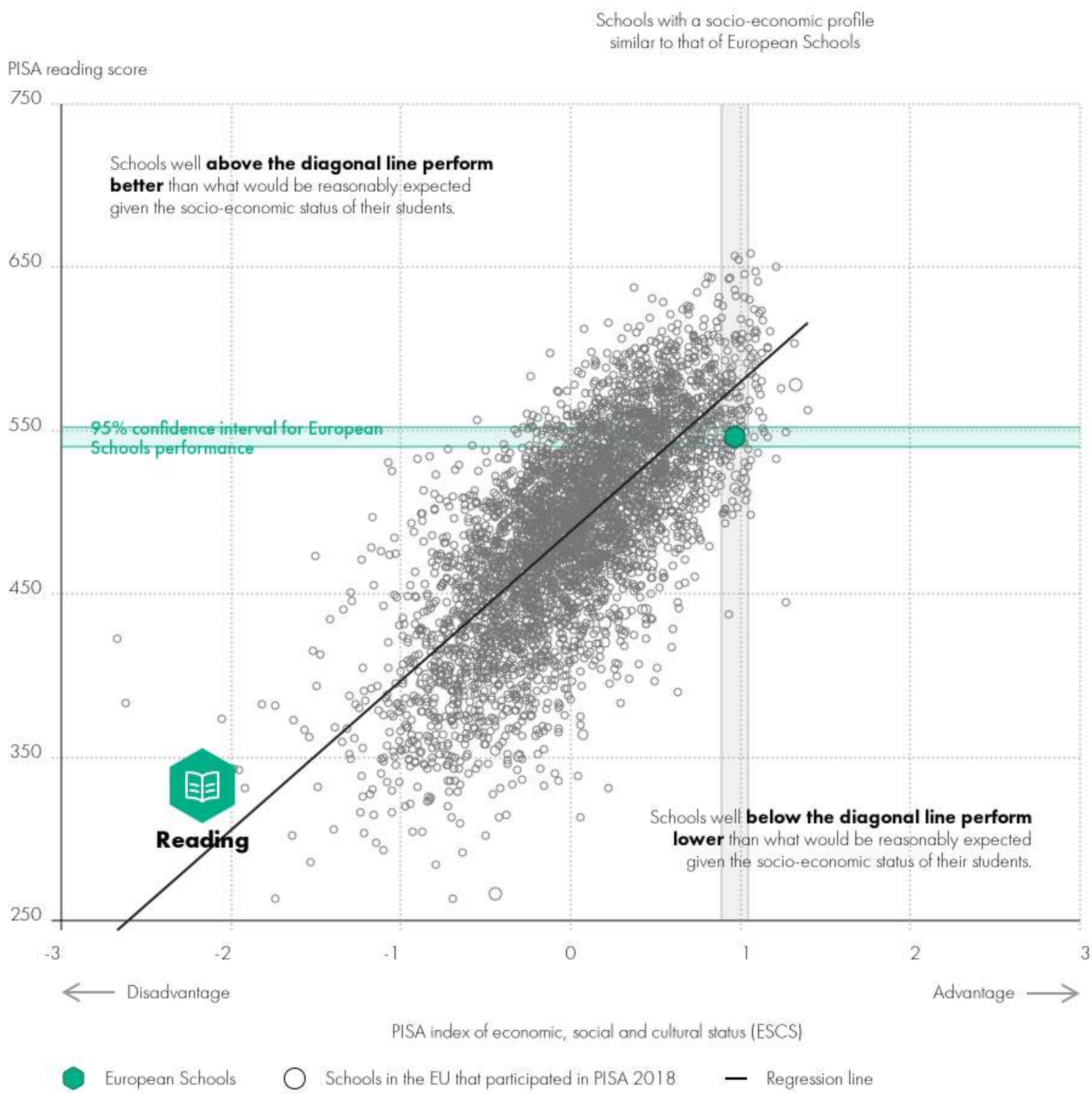
It is useful to compare the European Schools' results not only with all schools from the European Union in PISA 2018, but in particular with those whose students come from similar socio-economic backgrounds as yours. These can be found throughout the vertical shaded area.

> What is the performance of the European Schools compared with the other schools in this shaded area? How does the performance of the European Schools compare with its expected performance (the diagonal line) given the socio-economic background of your students?

Furthermore, it can be helpful to compare the European Schools' results with schools in the horizontal shaded area whose students perform similarly but come from different socio-economic backgrounds. Is the European Schools achieving comparable performance with more or less advantaged students?

In reading the following figures, note that the average for the European Schools that is shown is the overall estimate, that includes both the students who took the test in their L1 and the students who took the test in their L2. As reported earlier in this chapter, had all students been testing in their L1, the averages may well have been higher in the Reading and Science domains only (Mathematics is not affected by L1/L2). If we use the L1 means as an indicator of what could have been, the Reading estimate may have been about 15 points higher, and the Science mean may have been about 10 points higher.

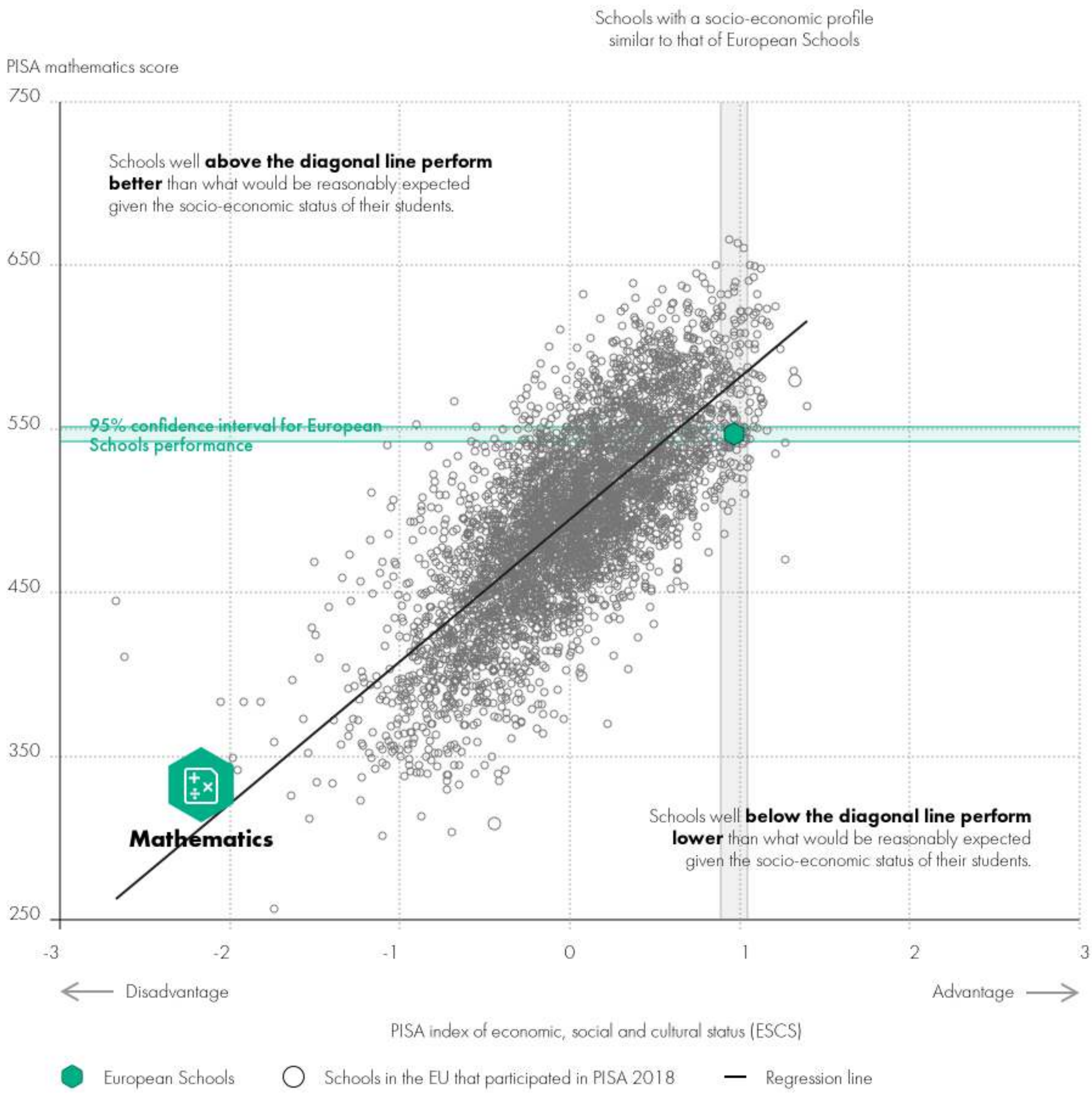
Figure 3.9 How the European Schools' results in reading compare with schools in the European Union in PISA 2018



Note: size of the dot is proportional to the number of students enrolled at the school.

Source: data for schools in the European Union were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

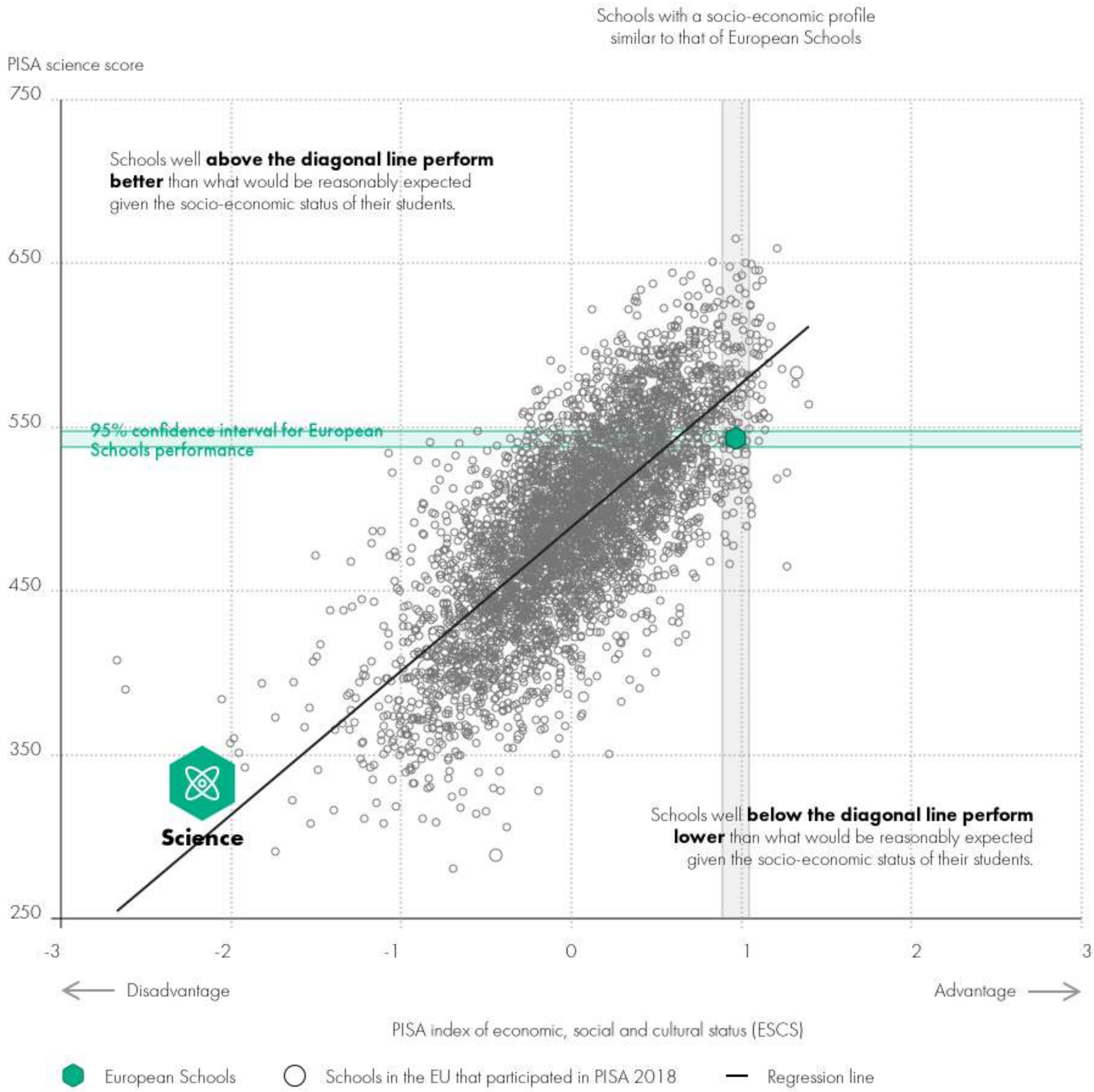
Figure 3.10 How the European Schools' results in mathematics compare with schools in the European Union in PISA 2018



Note: size of the dot is proportional to the number of students enrolled at the school.

Source: data for schools in the European Union were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Figure 3.11 How the European Schools' results in science compare with schools in the European Union in PISA 2018



Note: size of the dot is proportional to the number of students enrolled at the school.

Source: data for schools in the European Union were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

3.

According to PISA definitions, "academically resilient" students are those who are among the 25% most socio-economically disadvantaged students in their country but are able to score at Level 3 or above in all PISA subjects.

The variation in the share of academically resilient students across countries and time largely reflects differences in the outcomes achieved by all students, on average. The smallest shares of resilient students are found in countries where average performance is low, even among more advantaged students. But this variation also reflects disparities in how equitably learning opportunities are distributed.

> PISA data show that several countries have been able to increase the share of academically resilient students among those in the bottom quarter of socio-economic status.

The likelihood that disadvantaged students are academically resilient varies not only across countries, but also within each education system, depending on the school these students attend. An in-depth analysis of PISA data from 2012 and 2015 focused on the subset of countries and economies where at least 5% of disadvantaged students are academically resilient.

The analysis identified some traits common to school environments in which disadvantaged students succeed.

Across the vast majority of education systems examined, the likelihood that disadvantaged students are resilient is higher in schools where students reported a good disciplinary climate, compared to schools with more disruptive environments, even after accounting for differences in students' and schools' socio-economic profile and other individual characteristics associated with resilience.

Attending orderly classes, in which students can focus and teachers provide well-paced instruction, is beneficial for all students, but particularly so for the most vulnerable. A similar relationship is found with the share of students who did not skip days of schools during the two weeks prior to the PISA test, another indicator of (a positive) school climate.

By contrast, the likelihood of resilience among disadvantaged students is only weakly related to the amount of human and material resources available in their schools.

Read more about
Countries and schools where disadvantaged students succeed
oe.cd/il/succeed

4. STUDENT VOICE:

EXPLORING STUDENT ENGAGEMENT AND HOW STUDENTS FEEL AT SCHOOL

4.

This chapter provides an overview of your students' motivation to achieve, attitudes towards learning and perceptions about their learning environment. PISA results show that understanding what students feel at school and in life could explain their performance and future life outcomes.

How are student attitudes and perceptions associated with their performance?

Students in the European Schools responded to several questions regarding their perceptions of how useful reading, mathematics and science are for their study and career plans. These questions can be an important predictor for course selection, career choice and job performance, and provide an interesting insight on students' motivation to achieve. Furthermore, PISA data show that low levels of motivation are associated with lower performance.

Additionally, students also responded to several questions concerning their "self-efficacy", which is a term used to describe students' belief that, through their actions, they can produce desired effects, such as solving a difficult problem or achieving a personal goal. This, in turn, is a powerful incentive to act or to persevere in the face of difficulties.

Successful learners often believe in their own self-efficacy, or how confident they are in their ability to read effectively.

> One might ask if students' beliefs about their abilities simply mirror their performance. However, research shows that confidence helps to drive learning success, rather than simply reflecting it.

Students need to believe in their own capacities before making the necessary investments in learning strategies that will help them achieve higher performance. In fact, greater self-efficacy (corresponding to a one-unit increase in the index of self-efficacy) was associated with a 9-point increase on the PISA reading scale across OECD countries in 2018.

Furthermore, students' self-efficacy in mathematics was one of the strongest predictors of their mathematics performance in 2012 (the latest year available for this index), as it explained on average 28% of its variance across OECD countries and was associated with a 49-point increase on the PISA mathematics scale – the equivalent of an additional year of school.

Finally, students in the top quartile in their country in terms of self-efficacy in science scored 41 points higher than the average in 2015 (the latest year available for this index), although self-efficacy in science explained only 6% of the variation in students' science performance.

In the following sections, you can see the results of the European Schools in terms of motivation for learning and of self-efficacy in science and mathematics.

> One of the most important factors related to achievement, both in school and in life, is the motivation to achieve. In many cases, people with less talent, but greater motivation to reach their goals, are more likely to succeed than those who have talent but are not capable of setting goals for themselves and staying focused on achieving them.

This drive may come from an internal or external source. Achievement motivation is intrinsic when it is sparked by an interest or enjoyment in the task itself. It is organic to the person, not a product of external pressure or a drive for external rewards. Achievement motivation is extrinsic when it comes from outside the person. Extrinsic motivation may come from social concerns, such as not wanting to disappoint a parent, or from a craving for rewards, like good marks or praise from teachers.

Research shows that internal motivation and achievement are mutually reinforcing. Intrinsic motives increase engagement and may be related to the concept of work mastery, defined as the desire to work hard to master tasks.

By contrast, external motivation has an ambiguous impact on achievement. For instance, excessive emphasis on competition may undermine intrinsic motivation and generate anxiety. The pressure to get higher marks and the concern about receiving poor grades are some of the sources of stress most often cited by school-age children and adolescents.

The degree to which students are motivated by intrinsic or extrinsic drives may vary depending on gender. Girls usually report greater enjoyment of reading, a component of intrinsic motivation. Meanwhile, boys tend to hold more positive attitudes towards competition.

Empirical evidence indicates that gender differences in attitudes towards competition may be formed early and persist, even if the magnitude of these differences in attitudes towards competition is related to the prevailing social norms in a country/economy.

Read more about
Student motivation to master tasks
oe.cd/il/PISA18vol2

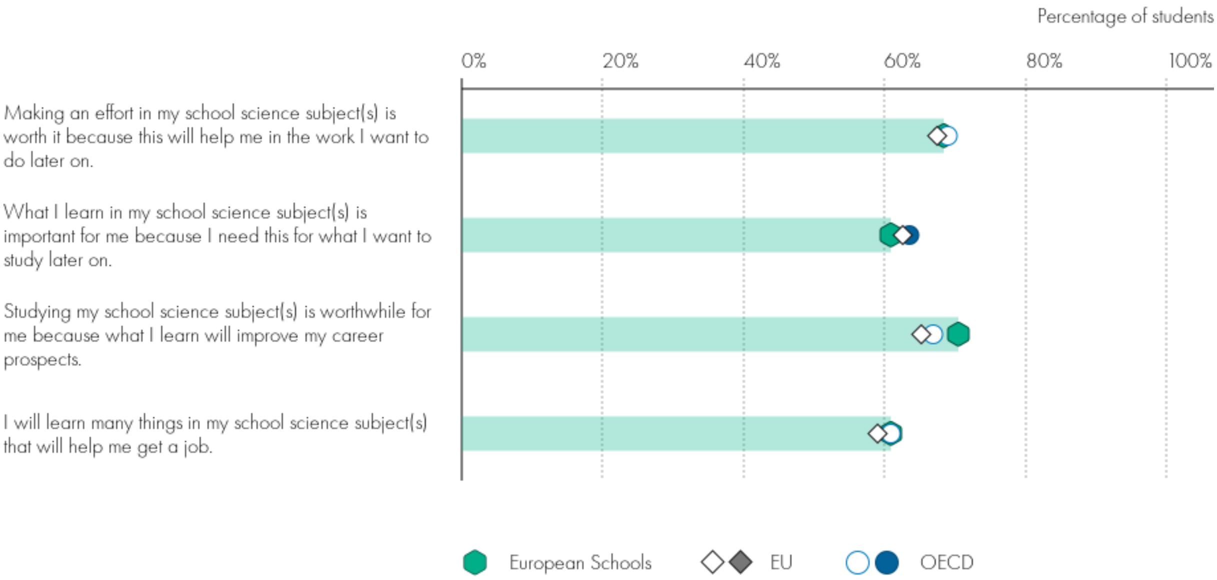
4.1 Motivation for learning science

Motivation for learning science refers to the extent to which students believe science is relevant for their future careers and studies, and is found to be consistently related to science performance.

Figure 4.1 shows how students in the European Schools responded to four questions regarding their motivation for learning science. The questions focus on how important they see science to be for their own lives as they move on to further studies and the labour market.

The bars represent the percentage of students in the European Schools who strongly agree or agree with each statement. The figure also shows the average responses from students in the European Union and in the OECD in PISA 2015 (the latest year available for these items). Markers with a solid fill for the European Union or the OECD indicate that the difference between them and the European Schools is statistically significant with a 95% confidence level.

Figure 4.1 Student motivation for learning science (students strongly agree or agree)



Note: statistically significant differences are shown by filled shapes.

Source: data for the EU and the OECD were obtained from OECD (2016), PISA 2015 database, oecd.org/pisa/data

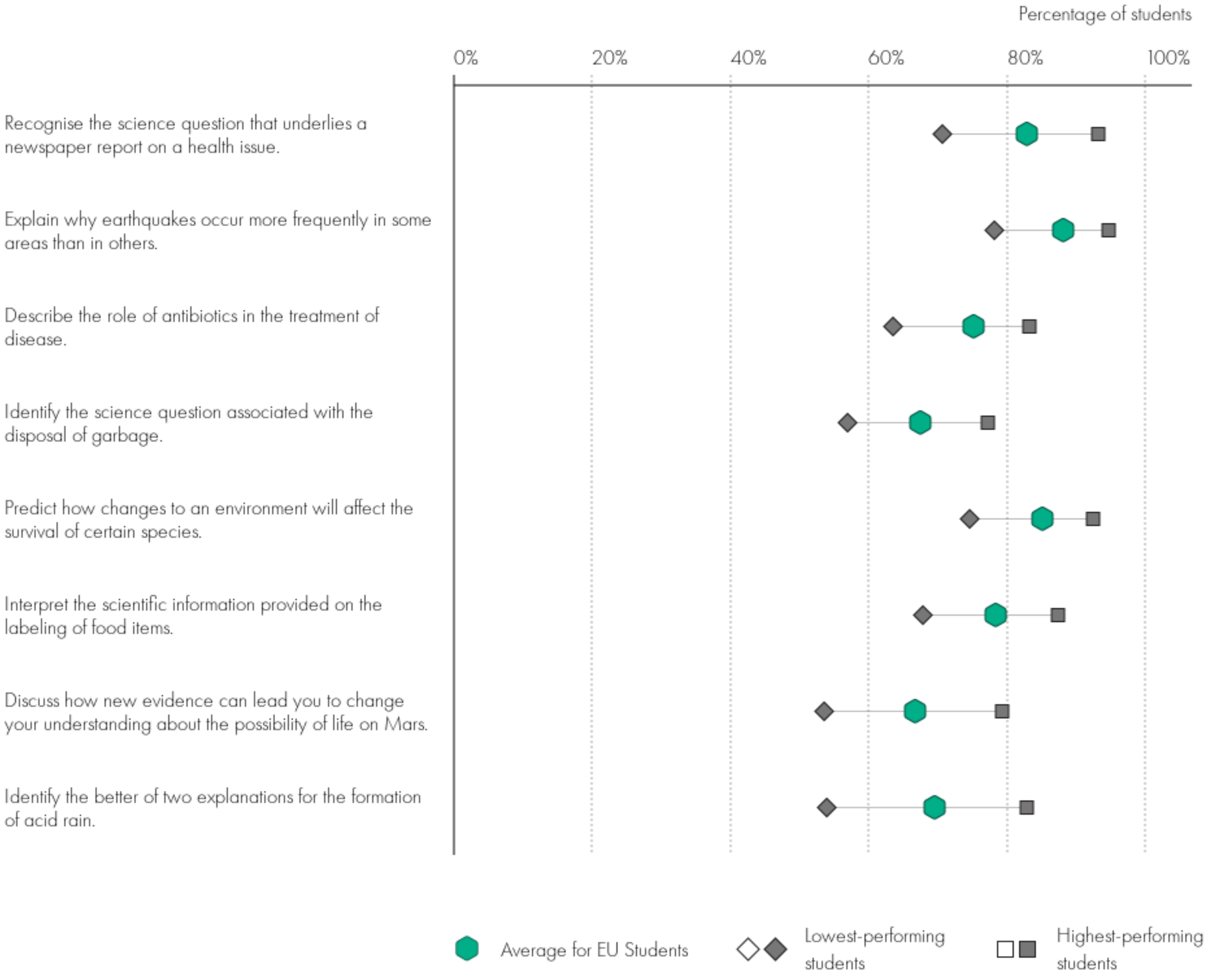
4.2 Student beliefs in their own self-efficacy in science

Figure 4.2 shows how students in the European Schools responded to eight questions regarding their self-efficacy in science. They were asked how confident they feel about having to do each of the science tasks mentioned in the figure. The values reported by the figure represent the percentage of students who responded they could perform the tasks easily or with a bit of effort.

To illustrate the relationship between self-efficacy in science and performance in science, separate results are shown for the highest- and lowest-performing students in science (i.e. the top 25% and bottom 25% of students based on their score in science).

While students' responses to the different items are used to create the index of science self-efficacy, Figure 4.2 presents them item by item to show how, in most cases, the confidence of students from the lowest- and highest-performing quartiles is similar when items define clear scientific problems (e.g. explaining what earthquakes occur more frequently in some areas than in others). Nonetheless, when students have to apply their scientific knowledge to different contexts – which corresponds to the competences framework behind the test, the lowest-performing students show dramatically lower confidence. Markers with a solid fill indicate that the difference between highest- and lowest-performing student quartiles is statistically significant with a 95% confidence level.

Figure 4.2 Student beliefs in their own self-efficacy in science, in the European Schools and for the highest- and lowest-performing students (students believe they can perform the task easily or with a bit of effort)



Note: statistically significant differences are shown by filled shapes.

Science self-efficacy refers to future-oriented judgments about one's competence in accomplishing particular goals in a specific context, where meeting these goals requires scientific abilities, such as explaining phenomena scientifically, evaluating and designing scientific inquiry, or interpreting data and evidence scientifically.

Better performance in science leads to higher levels of self-efficacy, through positive feedback received from teachers, peers and parents, and the positive emotions associated with it. At the same time, students who have low self-efficacy are at high risk of underperforming in science, despite their abilities.

> If students do not believe in their ability to accomplish particular tasks, they may not exert the effort needed to complete the task, and a lack of self-efficacy becomes a self-fulfilling prophecy. Self-efficacy in science has been related to students' performance, but also to their career orientation and their choice of courses.

While younger children have often been found to hold more positive beliefs about their general ability than older children, domain-specific self-efficacy tends to increase with age. This can reflect the fact that as children become better at understanding and interpreting the feedback received from parents, peers or teachers, they become more accurate and realistic in their self-assessments.

PISA data show that students' average science self-efficacy is not associated with a country's mean science performance, but levels of self-efficacy tend to be positively associated with the percentage of students expecting a career in science-related occupations. Furthermore, data show that girls are more likely than boys to have low science self-efficacy.

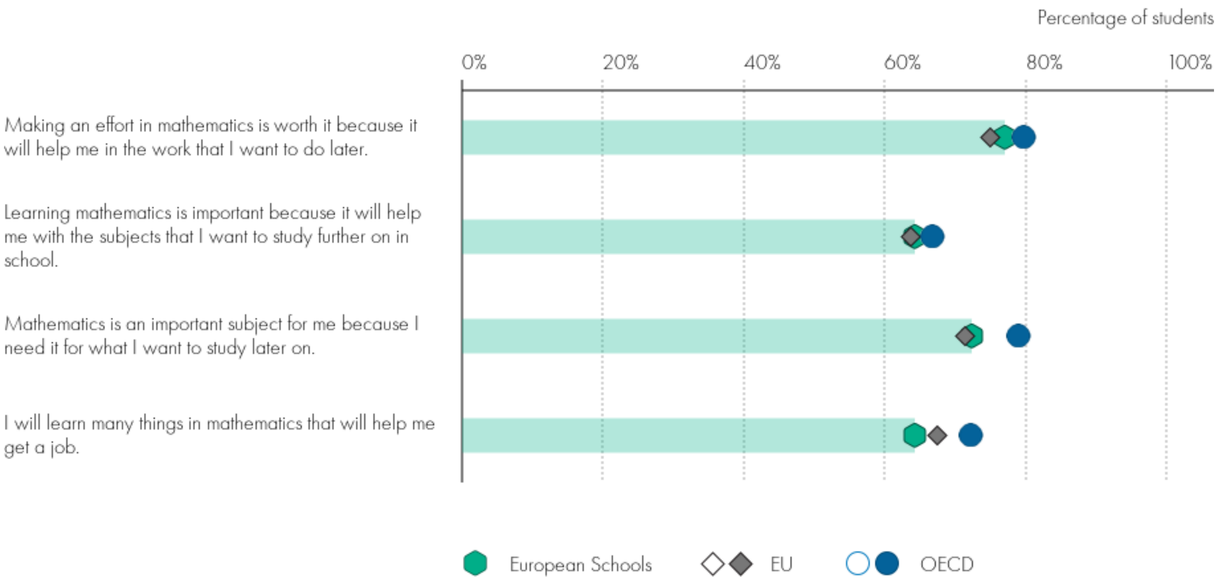
Read more about
Science self-efficacy
oe.cd/il/PISA15vol1

4.3 Motivation for learning mathematics

Figure 4.3 shows how students in the European Schools responded to statements about their motivation for learning mathematics and how these responses compare with other students in the European Union and in the OECD. The bars represent the percentage of students in the European Schools who strongly agree or agree with each statement.

The figure also shows the average responses from students in the European Union and in the OECD in 2012 (the latest year available for these items). Markers with a solid fill for the European Union or the OECD indicate that the difference between them and the European Schools is statistically significant with a 95% confidence level.

Figure 4.3 Student motivation for learning mathematics (students strongly agree or agree)



Note: statistically significant differences are shown by filled shapes.
Source: data for the EU and the OECD were obtained from OECD (2013), PISA 2012 database, oecd.org/pisa/data

PISA data show that large differences in motivation to achieve exist across countries, even if they may reflect more than just disparities in motivation. They may also reflect, for example, differences between countries in how socially acceptable it is to acknowledge ambition and seek individual success, or differences between countries in what behaviours are considered to reflect high and low motivation.

Across countries, motivation is not strongly related to performance. Within almost every education system, however, motivation is positively associated with performance.

In addition to being associated with better performance, greater motivation is associated with higher anxiety. The relationship between motivation and anxiety is also observed within countries. Greater motivation to achieve is often related to higher levels of schoolwork-related anxiety.

In almost all countries and economies, students reporting that they want top grades in most or all of their courses are also more likely to report feeling very anxious even if they are well-prepared for a test.

The association between students' motivation and anxiety may depend on the nature of this motivation.

Students who are extrinsically motivated want to do well because their parents, teachers and peers hold high expectations for them; students who are intrinsically motivated hold high expectations for themselves and want to realise those expectations for themselves, not for others.

Students can hold both kinds of motivation simultaneously; indeed some students may internalise extrinsic motivation to the extent that they claim as their own the expectations that others have of them. But external motivation can lead to stress and anxiety as students fear shame and censure from others if they fail. These students may develop perfectionist tendencies and eventually suffer from discouragement, a lack of confidence and burnout.

Read more about

How student motivation is related to performance and anxiety

oe.cd/il/motivation

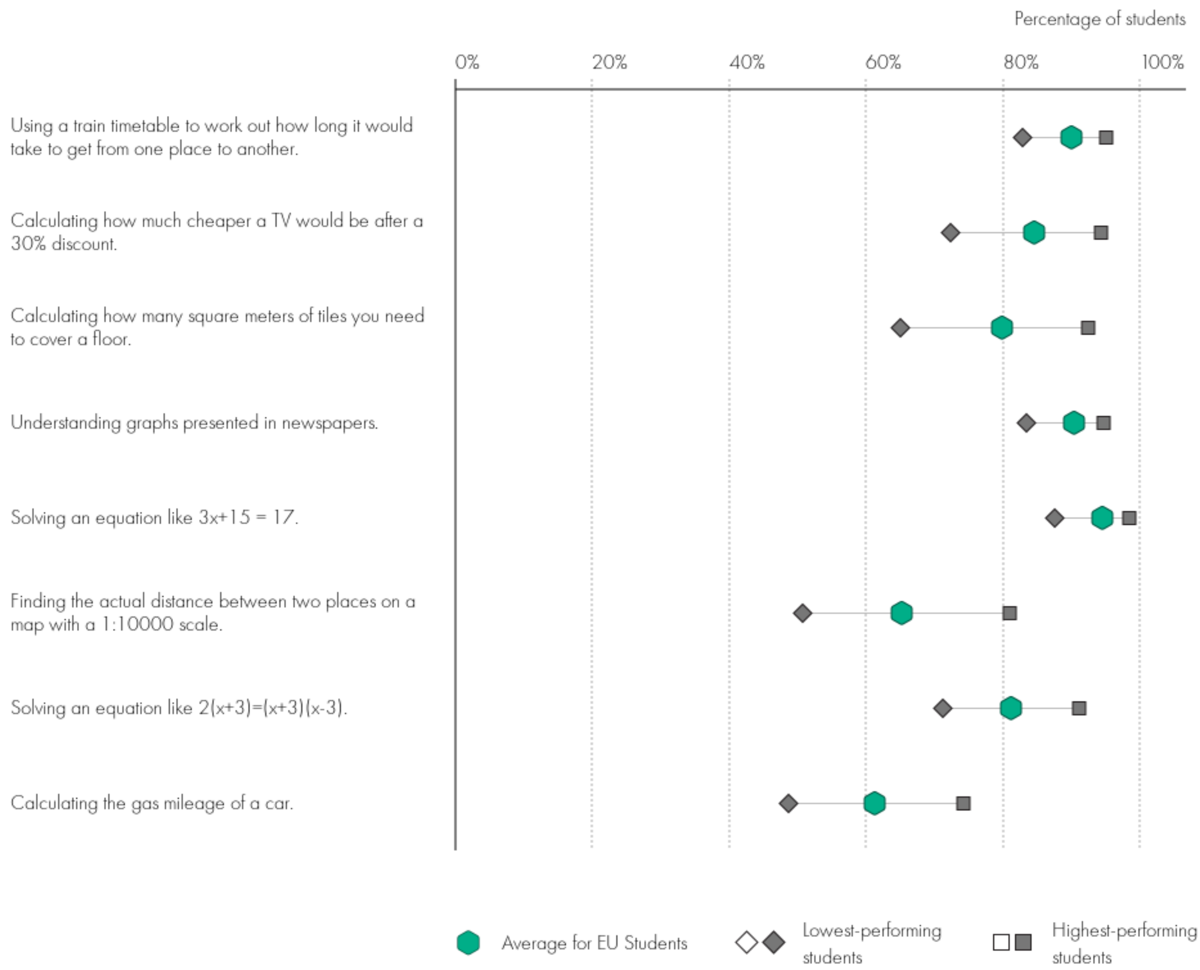
4.4 Student beliefs in their own self-efficacy in mathematics

Figure 4.4 shows how students in the European Schools responded to eight items about their self-efficacy in mathematics. They were asked how confident they would feel if asked to complete each of the mathematics tasks mentioned in the figure. The values in the figure represent the percentage of students who responded they are very confident or confident about having to do the task.

To illustrate the relationship between self-efficacy in mathematics and performance in mathematics, separate results are shown for the highest- and lowest-performing students in mathematics (i.e. the top 25% and bottom 25% of students based on their score in mathematics).

While students' responses to the different items are used to create the index of mathematics self-efficacy, Figure 4.4 presents them item by item to show how, in most cases, the confidence of students from the lowest- and highest-performing quartiles is similar when items define clear mathematical problems (e.g. solving an equation). Nonetheless, when students have to apply their mathematical knowledge to different contexts – which corresponds to the competences framework behind the test, the lowest-performing students show dramatically lower confidence. Markers with a solid fill indicate that the difference between highest- and lowest-performing student quartiles is statistically significant with a 95% confidence level.

Figure 4.4 Student beliefs in their own self-efficacy in mathematics, in the European Schools and for the highest- and lowest-performing students (students feel very confident or confident about having to do the task)



Note: statistically significant differences are shown by filled shapes.

4.5 Students' career expectations

Student expectations about their future career paths are shaped by two forces: how students think about themselves – what they think they are good at and what they think is good for them, and student attitudes towards those activities – whether they perceive them as important, enjoyable and useful.

In the PBTS, students were asked what occupation they expect to be working in when they are 30 years old. Students could enter any job title or description in an open-entry field. Their answers were classified according to the International Standard Classification of Occupations, 2008 edition (ISCO-08).

In some countries and economies, many students did not answer this question, gave vague answers (such as "a good job", "in a hospital") or explicitly indicated that they were undecided ("I do not know"). This is not surprising, as many 15-year-old students are still undecided about their future: they may be weighing two or more options, or they may feel that they have insufficient knowledge about careers to answer this question in anything but the most general terms.

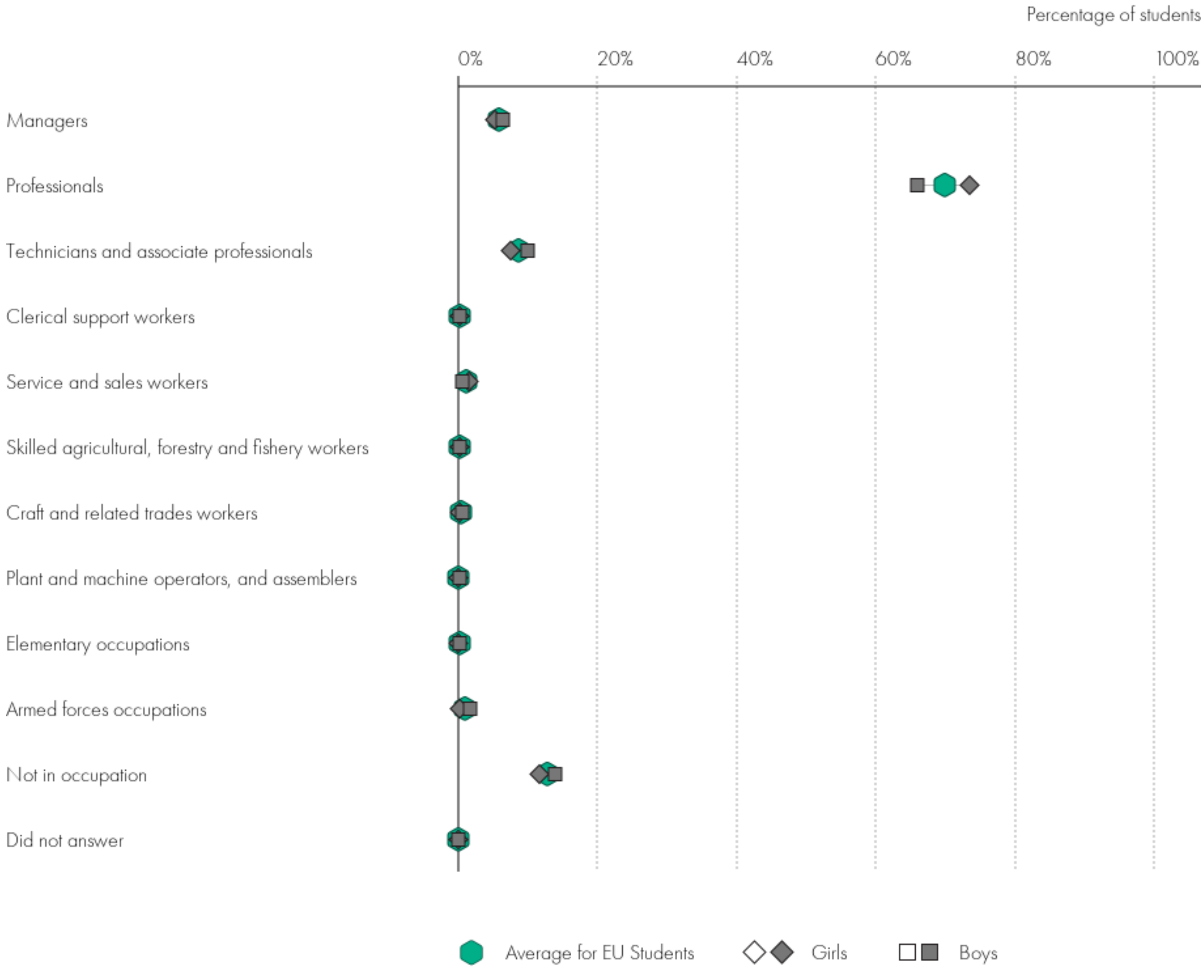
Results from PISA show that the career aspirations of young people are no simple reflection of teenage academic ability. Rather, they reflect complex lives. Analyses show that even after controlling for proficiency levels, the children of more advantaged families are more likely to want to go on to university than working class kids. Similarly, career thinking is often driven by gender and immigrant background as well as socio-economic status. Disadvantaged young people are at clear risk of career confusion. It is neither equitable, nor efficient, for students to move through education with blinkered views of both the breadth of the labour market and their own potential.

To an important extent, schools can replicate positive benefits linked to first-hand exposure to the working world through programmes of career development activities, particularly where they include workplace experience. Effective career guidance encourages students to reflect on who they are and who they want to become, and to think critically about the relationships between their educational choices and future economic life.

Experience of the world of work gives young people the opportunity to apply their skills and knowledge in unfamiliar situations. It challenges them to understand what it means to be personally effective (and attractive to employers) in distinct workplaces while providing a unique opportunity to develop social networks of value. Through exposure to the people who do different jobs, young people have the chance to challenge gender- and class-based stereotyping and broaden their aspirations, easing ultimate entry into the labour market.

Figure 4.5 Students' career expectations by gender

Figure 4.5 shows the career expectations of the students in the European Schools, by gender. The figure displays the percentage of students who expect to work in the different occupational groups identified by ISCO-08 when they will be around 30. It also shows this percentage for girls and boys. Markers with a solid fill indicate that the difference between the two genders is statistically significant with a 95% confidence level.

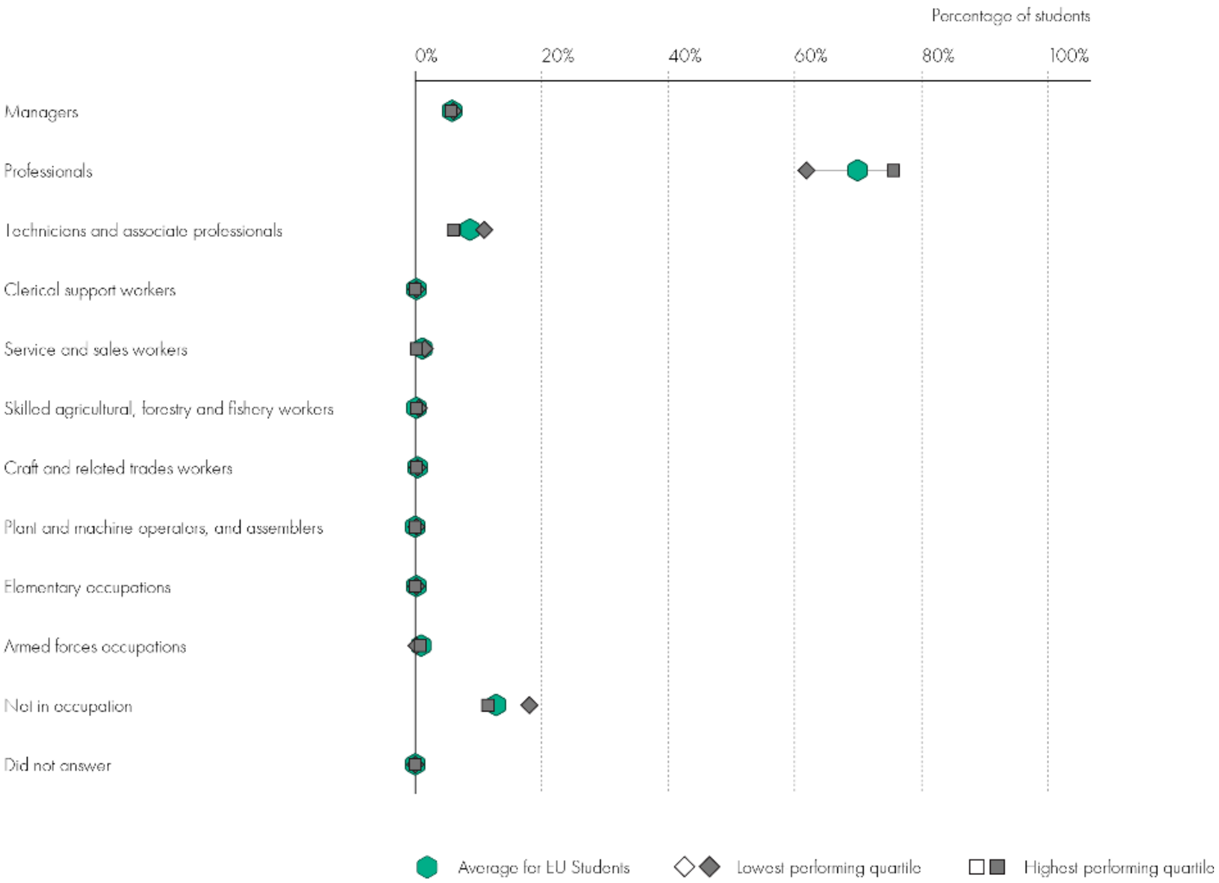


Note: statistically significant differences are shown by filled shapes.

To an important extent, schools can replicate positive benefits linked to first-hand exposure to the working world through programmes of career development activities, particularly where they include workplace experience. Effective career guidance encourages students to reflect on who they are and who they want to become, and to think critically about the relationships between their educational choices and future economic life. Experience of the world of work gives young people the opportunity to apply their skills and knowledge in unfamiliar situations. It challenges them to understand what it means to be personally effective (and attractive to employers) in distinct workplaces while providing a unique opportunity to develop social networks of value. Through exposure to the people who do different jobs, young people have the chance to challenge gender- and class-based stereotyping and broaden their aspirations, easing ultimate entry into the labour market.

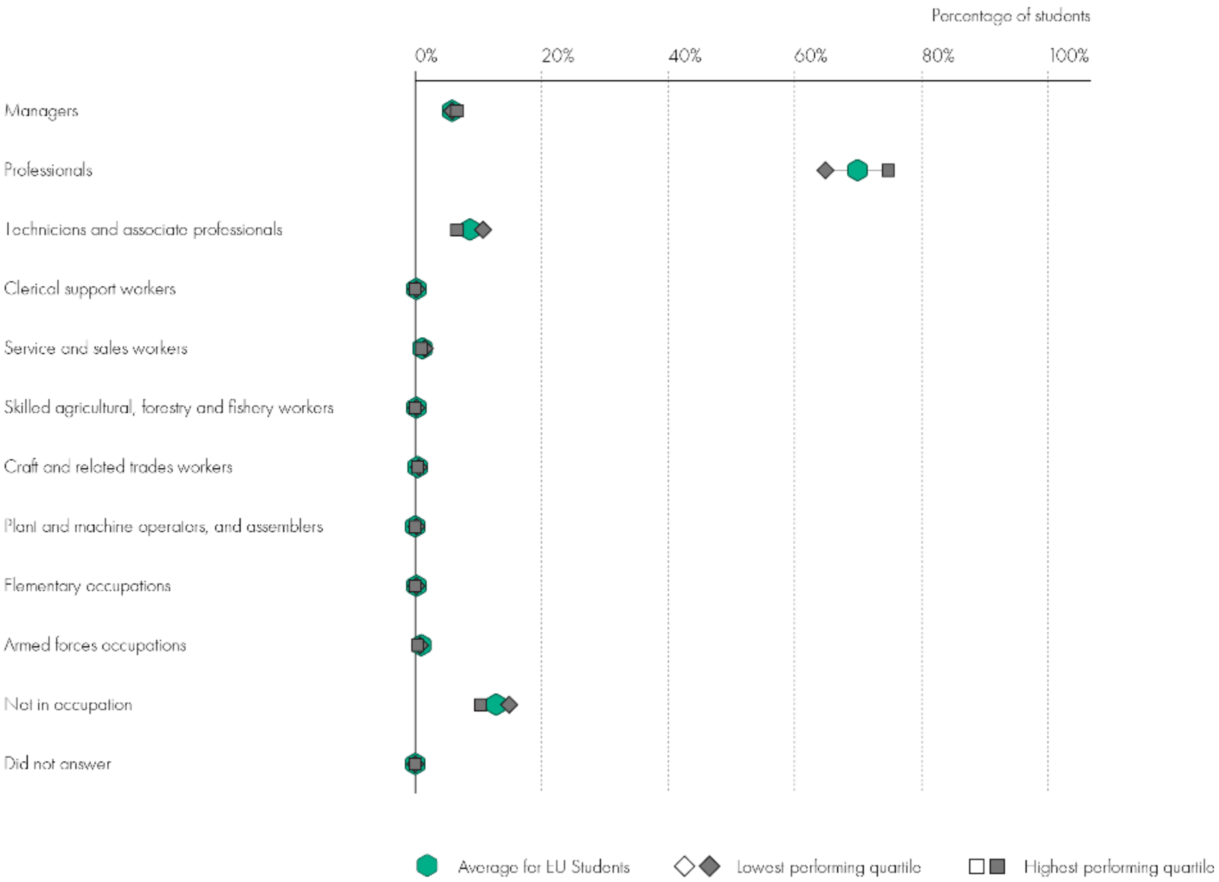
Figures 4.6, 4.7 and 4.8 show the career expectations of the students in the European Schools, according to their performance in reading, mathematics and science. For each domain, the figures display the percentage of students who expect to work in the different occupational groups identified by ISCO-08 when they will be around 30. They also show this percentage for the highest- and lowest-performing students in the different domains (i.e. the top 25% and bottom 25% of students based on their score in each domain). Markers with a solid fill indicate that the difference between highest- and lowest-performing student quartiles is statistically significant with a 95% confidence level.

Figure 4.6 Students' career expectations by student performance in reading



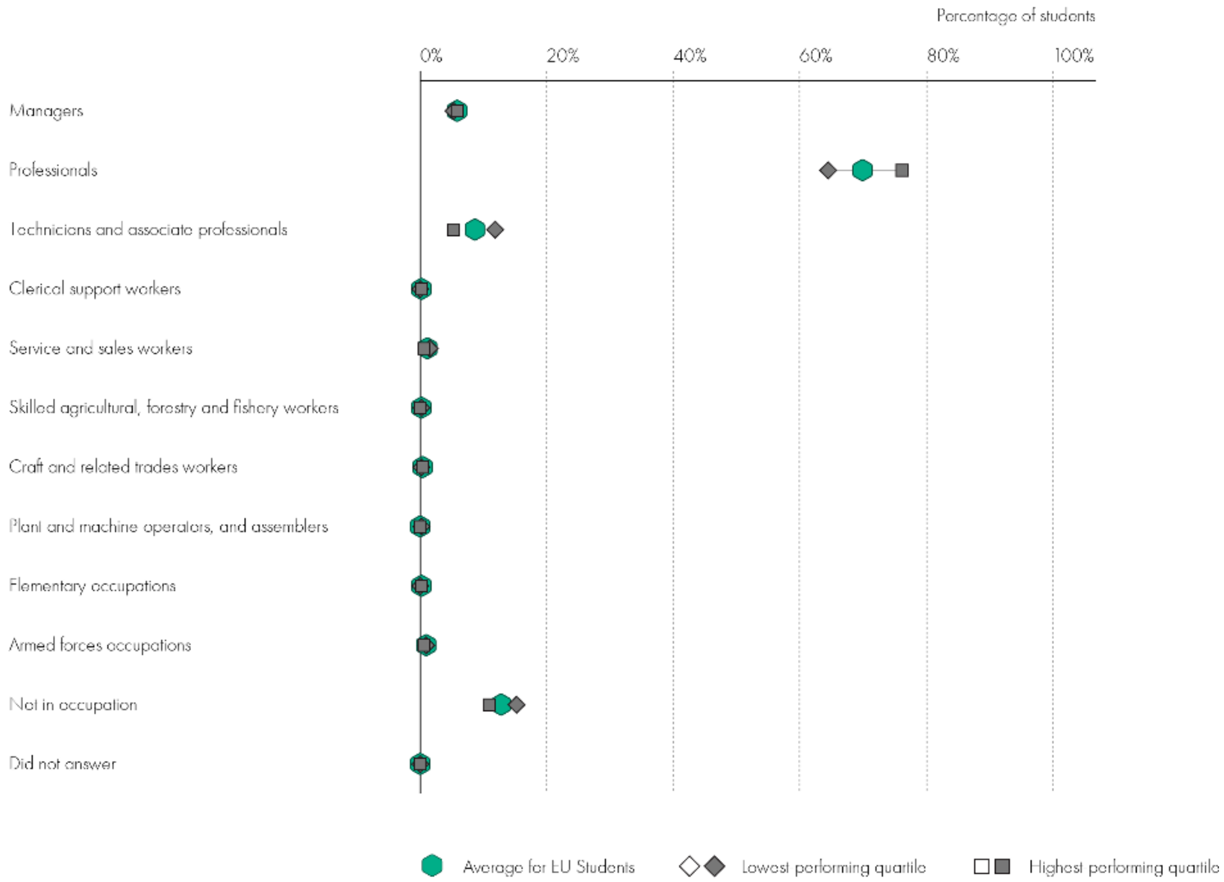
Note: statistically significant differences are shown by filled shapes.

Figure 4.7 Students' career expectations by student performance in mathematics



Note: statistically significant differences are shown by filled shapes.

Figure 4.8 Students' career expectations by student performance in science



Note: statistically significant differences are shown by filled shapes.

Across the world, the young people who leave education today are, on average, more highly qualified than any preceding generation in history. They often enter the working world with considerably more years of schooling than their parents or grandparents. This is an enormous achievement of which the global education community can be trully proud.

And yet, in spite of completing an unprecedented number of years of formal education, young people continue to struggle in the job market, and governments continue to worry about the mismatch between what societies and economies demand and education systems supply. The coexistence of unemployed university graduates and employers who say they cannot find people with the skills they need, shows that more education does not automatically mean better jobs and better lives. For many young people, academic success alone has proved an insufficient means of ensuring a smooth transition into good employment.

With the world of work changing so quickly, there is strong reason to believe that schools need to look afresh at how they can better prepare young people for their lives. In this age of accelerations, we need to think harder about how we complement, not substitute, the artificial intelligence we have created in our computers, and how we build a culture that facilitates learning, unlearning and re-learning throughout life.

The new generation of citizens requires not just strong academic skills, but also curiosity, imagination, empathy, entrepreneurship and resilience. They need confidence and determination to create their own employment and to manage their careers in new ways. Effective education systems will go beyond traditional teaching techniques. Not only will they provide learners with knowledge relevant to future employment, they will also develop the ability of learners to be personally effective in applying that knowledge in changing situations.

Staying longer in education than ever before, today's young people must make more decisions about what, where and how hard they will study. These are investment decisions that are becoming increasingly difficult because technology is changing the working world itself so quickly. Good schools will respond by helping young people to become critical thinkers about the labour market and how it relates to their learning. Never before has effective career guidance been so important and never before has there been a greater onus on employers to step up and work with schools to help young people understand jobs and careers and help teachers bring learning to life.

Read more about
Teenagers' career aspirations and the future of work
oe.cd/futureofwork

4.9 Student perceptions of teaching practices

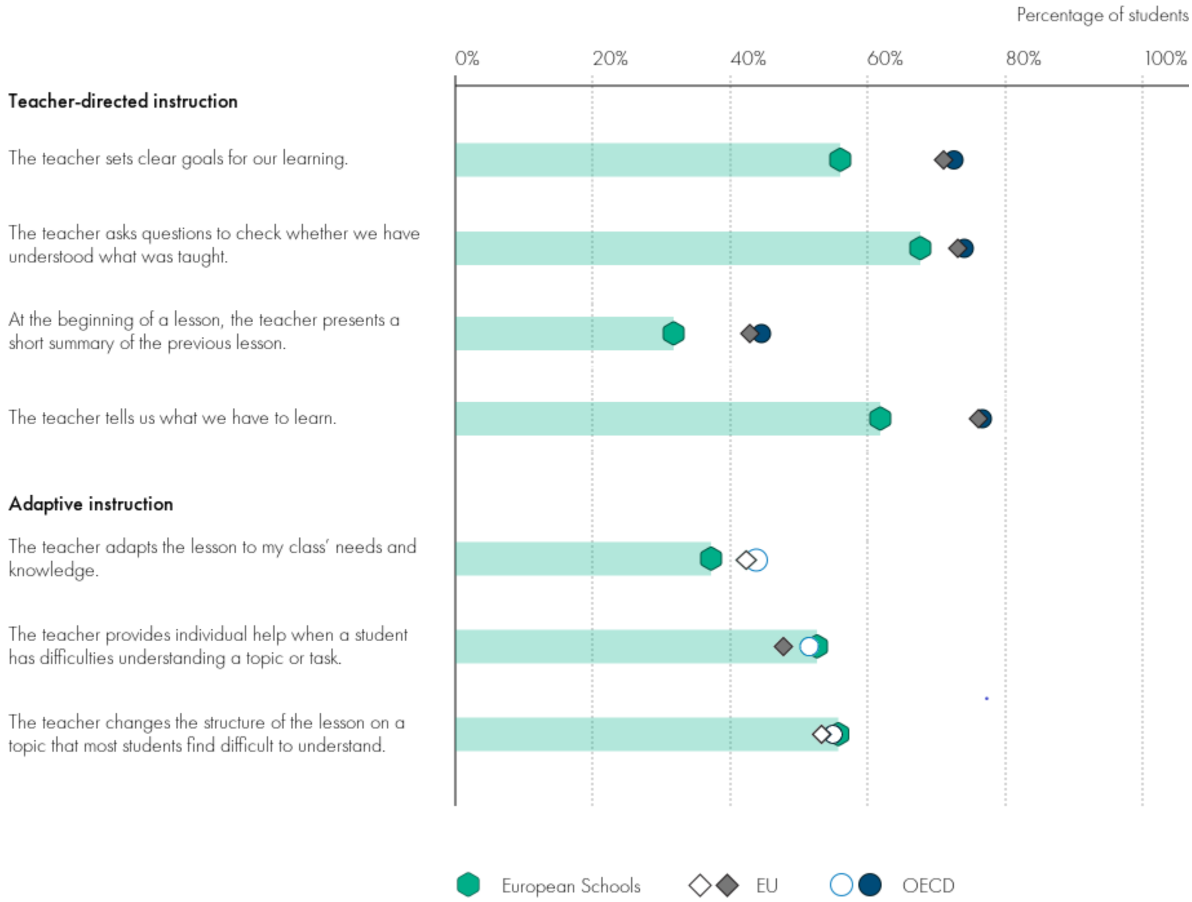
Even if there is no single "best" way of teaching, teachers need to decide which instructional practices they use in their lessons and how much time they allocate to each of them. Teachers need to consider, for example, how much time they will devote to setting goals, explanations and questions; how much time they will spend supporting struggling students and providing feedback; how much emphasis will be given to stimulating students; and how flexible their lessons will be. Moreover, teachers need to decide how much and when to combine different teaching approaches: all teaching strategies can be combined over the course of a semester; some may even be combined during a single lesson.

Figure 4.9 shows the percentage of students who reported that the frequency of specific teaching practices occurred in every lesson or many lessons during their language-of-instruction classes. The figure also groups the practices into two clusters, one characterising adaptive instruction and another one characterising teacher-directed instruction. To contextualise the European Schools' results, the figure also shows how students in other schools in the European Union and in the OECD responded to the same questions in PISA 2018. Markers with a solid fill for the European Union or the OECD indicate that the difference between them and the European Schools is statistically significant with a 95% confidence level.

There is a noticeable difference between the European Schools and the international benchmarks in Teacher-directed instruction. This is not cause for alarm. Rather, it may be a reflection of a different pedagogical emphasis across the European Schools. In many schools across the world, approaches such as student-centred learning and project-based learning are employed, rather than direct-instruction or other teacher-centred approaches. Often, the choice of dominant pedagogical approach reflects educators' deep understanding of the students in their schools and the broader context in which the students live, and a range of pedagogical approaches are used in response to students' needs at a given point in their learning.

It should be reiterated that Figure 4.9 represents the percentage of responses for students in the language-of-testing. In the questionnaire, L2 students responded to the same questions as L1 students, and yet L2 students are likely to have been reflecting on classes teaching the language as a second or foreign language. It is not unreasonable to assume that teaching practices in a second/foreign language classroom are different from teaching practices adopted in a classroom where students are already fluent in the language.

Figure 4.9 Teaching practices
(students observe these behaviours in all lessons or many lessons)



Note: statistically significant differences are shown by filled shapes.

Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Table 4.1 Teaching practices in language-of-instruction classes (students observe these behaviours in all lessons or many lessons)

To provide a clearer picture, Table 4.1 reports the percentages for only those students who sat a test in their L1, by language. For L1 students, the language-of-testing is assumed to be their language-of-instruction, and so the interpretation of the data is more straightforward.

	Percentage of students observing these behaviours in *all lessons* or *many lessons*		
Teacher-directed instruction	**English**	**French**	**German**
The teacher sets clear goals for our learning.	44.57	61.75	49.03
The teacher asks questions to check whether we have understood what was taught.	69.71	61.75	62.65
At the beginning of a lesson, the teacher presents a short summary of the previous lesson.	17.14	44.70	29.57
The teacher tells us what we have to learn.	51.43	65.21	59.14
Adaptive Instruction			
The teacher adapts the lesson to my class's needs and knowledge.	52.57	51.61	58.75
The teacher provides individual help when a student has difficulties understanding a topic or task.	54.29	49.31	46.30
The teacher changes the structure of the lesson on a topic that most students find difficult to understand.	33.71	41.71	31.91

PISA data suggests that positive and constructive teacher-student relations are associated with better performance in mathematics – and can be a key vehicle through which schools can foster the social and emotional well-being of students.

On average across OECD countries, when comparing students with similar socio-economic status and performance in mathematics, students who reported that they enjoy good relations with their teachers were more likely to report that they are happy at school, that they make friends easily at school, that they feel like they belong, and that they are satisfied with their school. They are also less likely to report that they feel lonely at school, or that they feel like an outsider or awkward and out of place in school.

In schools with better teacher-student relations, students were also less likely to report that they arrived late for school or skipped classes or days of school during the two weeks prior to the PISA test.

For example, in almost all countries and economies, among students who were similarly proficient in mathematics and came from similar socio-economic status, students who attended schools where relations between teachers and students were better were less likely to have reported that they arrived late during the two weeks before the PISA test.

PISA data reveal that most students are in schools where teachers believe that the social and emotional development of their students is as important as the acquisition of subject-specific knowledge and skills. However, large differences exist among countries and economies, especially. Specifically, this tends to be less true in OECD countries than it is in both high- and low-achieving partner countries and economies.

Read more about
How teacher-student relations affect student well-being at school
oe.cd/il/wellbeing

4.7 Classroom disciplinary climate

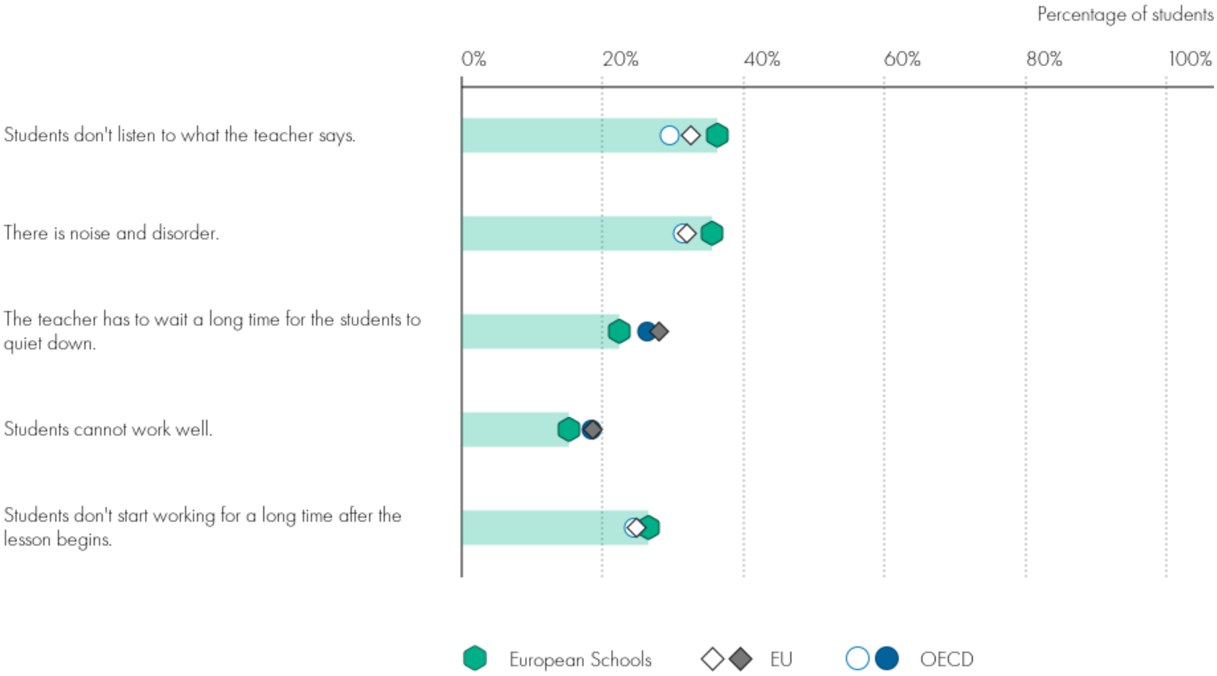
PISA shows that a strong and supportive learning environment is consistently and robustly associated with better student performance. In school systems around the world, students tend to perform better when classrooms are well disciplined and relations between students and teachers are amiable and supportive.

Is the climate in the European Schools conducive to learning?

Students who sat the PBTS were asked several questions about their school environment. One set of items collected information about the classroom disciplinary climate in the European Schools during language-of-instruction lessons. In PISA, classroom disciplinary climate refers to keeping noise and disorder to a minimum, making sure that students can listen to what the teacher (and other students) say and that they can concentrate on academic tasks.

Figure 4.10 shows how students in the European Schools responded to five questions about the classroom disciplinary climate in their language-of-instruction lessons compared with the students in the European Union and in the OECD in PISA 2018. This figure shows the percentage of students who reported that the frequency of specific incidents occurred in all lessons or most lessons during their language-of-instruction classes. Markers with a solid fill for the European Union or the OECD indicate that the difference between them and the European Schools is statistically significant with a 95% confidence level.

Figure 4.10 Disciplinary climate in language-of-instruction lessons (in all lessons or most lessons)



Note: statistically significant differences are shown by filled shapes.
Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Table 4.2 Classroom disciplinary climate in language-of-instruction classes (students observe these behaviours in all lessons or many lessons)

Figure 4.10, above, represents the percentage of responses for students in the language-of-testing. As noted in the previous section, L2 students responded to the same questions as L1 students in the questionnaire and yet L2 students are likely to have been reflecting on classes teaching the language as a second or foreign language. It is not unreasonable to assume that classroom climate in a second/foreign language classroom is different from a classroom where students are already fluent in the language. So, Table 4.1 reports the percentages for only those students who sat a test in their L1, by language. For L1 students, the language-of-testing is assumed to be their language-of-instruction, and so the interpretation of the data is more straightforward.

	Percentage of students observing these behaviours in *all lessons* or *many lessons*)		
	English	**French**	**German**
Students don't listen to what the teacher says.	33.14	39.40	33.46
There is noise and disorder.	34.86	45.16	20.23
The teacher has to wait a long time for the students to quiet down.	18.86	24.88	20.23
Students cannot work well	16.57	17.74	11.67
Students don't start working for a long time after the lesson begins.	24.00	35.71	25.68

PISA data shows that about one-third of the variation in performance among students within each country lies between schools, and two-thirds lie within schools. That schools differ within a given country is also apparent from PISA variables measuring whether the classroom disciplinary climate is conducive to learning. The index of disciplinary climate was constructed from students' reports, and higher values of the index correspond to reports of a better classroom climate in science lessons.

On average, about one tenth (9%) of the overall variation in students' reports of disciplinary climate lies between schools, with the remaining variation reflecting different reports by students from the same school (but perhaps from different classes). Interestingly, countries where reports of the classroom climate in science lessons vary the most across schools are not necessarily the same countries where performance varies the most.

Research studies indicate that experienced teachers are more effective, but also suggest multiple explanations why this might be the case – whether because teachers gain valuable skills on the job and through formal professional development opportunities, or because the least effective teachers tend to quit teaching earlier, while more effective teachers remain in the profession.

Each of these possible reasons has distinct implications for policy: from increasing hiring standards, improving teacher training and raising the attractiveness of the teaching profession, to ensuring that novice teachers receive the necessary support to quickly learn the tools of the trade and taking measures to prevent good teachers from dropping out of the profession.

Read more about
How school performance and school climate are related to teachers' experience
oe.cd/il/schoolclimate

4.8 Student experience of bullying

> Bullying at school can have long-lasting consequences for the psychological well-being of students (both victims and bullies), their families and the school community.

Adolescents engaged in bullying as perpetrators, victims, or both are more likely to skip classes, drop out of school, and perform worse academically than schoolmates who have no conflictual relationships with their peers. Furthermore, they are also more likely to show symptoms of depression and anxiety, have low self-esteem, feel lonely, change their eating patterns, and lose interest in activities.

Students who sat the PBTS were asked several questions about their school environment. One set of items collected information about different types of bullying which they may have experienced at school. Bullying can take different forms.

Physical (hitting, punching or kicking) and verbal (name-calling or mocking) bullying refers to direct forms of abuse.

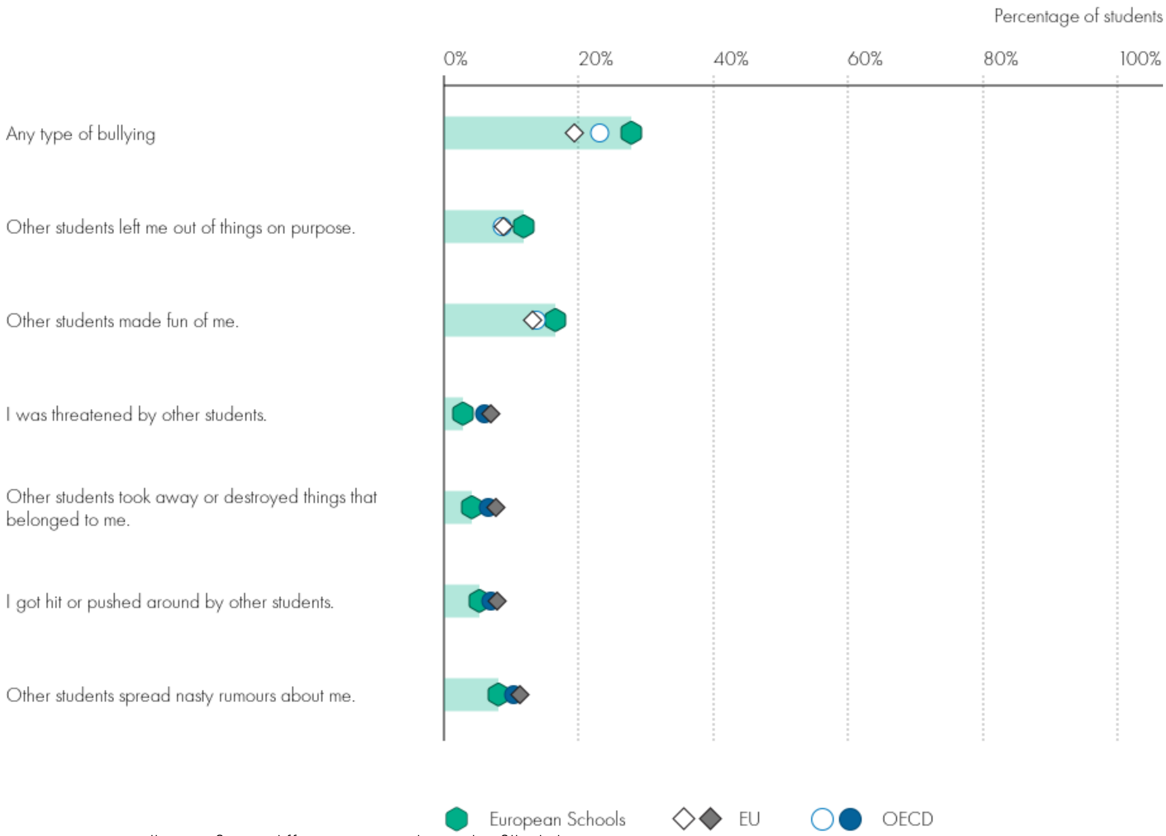
Relational bullying refers to the phenomenon of social exclusion, where some children are ignored, excluded from games or parties, rejected by peers, or are the victims of gossip and other forms of public humiliation and shaming.

As teenagers use electronic communications more and more, cyberbullying has become a new form of aggression expressed via online tools, particularly mobile phones (e.g. instant messaging, social networks and e-mails).

These different types of bullying tend to occur concurrently. In PISA, bullying episodes are defined as "frequent" if they happen at least a few times per month.

Figure 4.11 Bullying at school (happening a few times a month or once a week or more)

Figure 4.11 shows how students in the European Schools responded to six questions about bullying at school compared with the students in the European Union and in the OECD in PISA 2018. This figure shows the percentage of students who reported that the frequency of specific incidents occurred a few times a month or once a week or more. The figure also shows the percentage of students who reported to have experienced at least one of these incidents at least a few times a month or once a week or more. Markers with a solid fill for the European Union or the OECD indicate that the difference between them and the European Schools is statistically significant with a 95% confidence level.



Note: statistically significant differences are shown by filled shapes.

Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Teachers and school staff are in a unique position to promote healthy relationships among students, intervene in instances of bullying and, with parents, help bullies and their victims learn how to build, or re-build, strong and healthy relationships with their peers. Protecting children from abuse is the responsibility of all the adults in their lives, primarily parents and teachers. Close communication among these adults is essential for conveying consistent messages and supporting children in all the contexts in which they live, work and play.

> Young people who are more connected with their teachers and parents are less likely to be bullied; and even if they are bullied, they are less likely to develop crippling psychological problems as a result.

Educators can reduce aggression and victimisation by creating a climate of support and empathy both in and outside of the classroom. A school's disciplinary structure and adult support of students are the two key components of a positive school climate to counter bullying. Disciplinary structure refers to the idea that school rules are perceived as strict but fairly enforced.

Adult support refers to students' perceptions that their teachers and other school staff members treat them with respect and want them to be successful. Schools with a low incidence of physical and relational violence tend to have more students who are aware of school rules, believe that these rules are fair, and have positive relations with their teachers.

One of the common factors related to a lower incidence of bullying and victimisation is class and school discipline. When they work in a structured and orderly environment, students feel more secure, become more engaged with school work, and are less inclined to engage in high-risk behaviours.

On average across OECD countries, the proportion of frequently bullied students is about 6 percentage points larger in schools with a poor disciplinary climate (worse than the country average) than the proportion in schools with a good disciplinary climate (better than the country average), after accounting for students' and schools' socio-economic profile.

Read more about
How schools, teachers and parents can help reduce the incidence of bullying
oe.cd/il/PISA15vol3

5. INSIGHTS ON LEARNING AND ASSESSMENT IN A SECOND LANGUAGE

5.

This chapter reports on the interaction between language proficiency and performance in the cognitive domains. It compares the performance of students who sat the test in their first-language and those for whom the test was not in their first language.

5.1 Comparing proficiency distributions of L1 and L2 student populations

Psychometric analyses were undertaken to investigate whether test questions were equally difficult for all test takers of the same ability level, regardless of their first language and the language in which the test was taken. When comparing the L1 and L2 student groups, only one item showed a difference: it slightly advantaged L2 students. When comparing the three languages the test was administered in, the analysis found 27 out of the 140 test questions performed differently in at least one language. These items were adjusted in the calculation of student-level scores, making it possible to still report scores on the PISA international scale.

However, even though the items are equally difficult for L1 and L2 students, students' proficiency in the language of the test is likely to still be a factor that affects performance. It is a logical hypothesis that students who do not understand the items and their context well will not be able to demonstrate the same level of proficiency in the domain as they would if they had taken the test in their first language.

Since the item function of the items are verified, it is possible to compare the mean proficiency of L1 and L2 students and the distribution of proficiencies in the two groups. Figures 5.1, 5.2, and 5.3 show density plots of the proficiency distributions for the L1 and L2 groups in Mathematics, Reading and Science respectively, along with the group means plotted as vertical dashed lines.

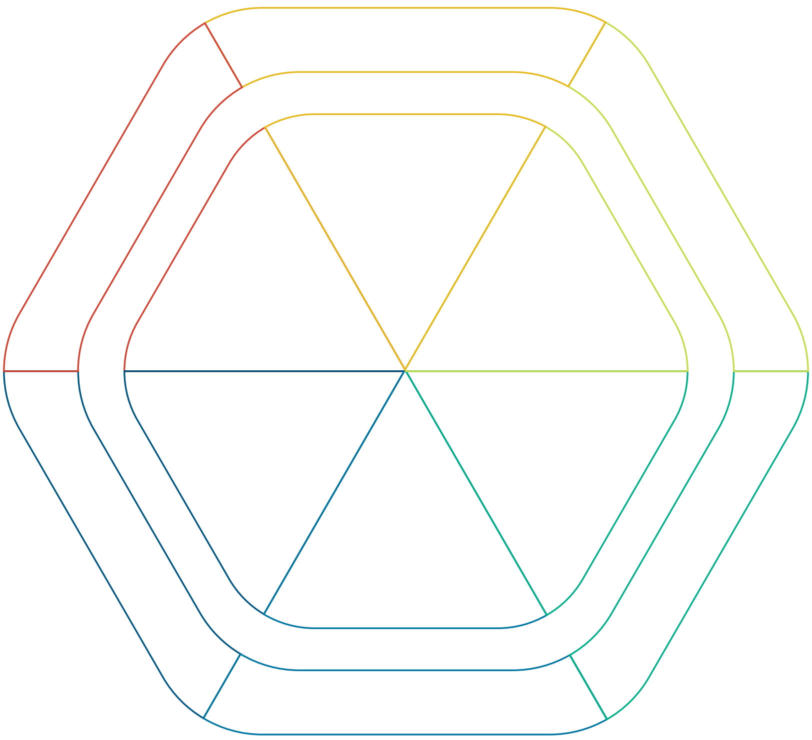


Figure 5.1 L1 and L2 mathematics proficiency distributions and means

It is clear in Figure 5.1 that there is very little difference in the mean proficiency of the L1 and L2 groups in maths and the distribution of proficiencies is very similar. The L2 mean (blue dotted line) appears a little higher than the L1 mean (red dotted line), but in fact there is a margin of error around each mean, so there is not likely to be a significant difference between them: the means are essentially the same. This is fairly intuitive, as one would not expect a student's mother tongue to have a large effect on their ability to understand and express skills and knowledge about numbers and numerical information. So, language proficiency ought to be largely irrelevant to a mathematics test, and the figure suggests that this is very likely to be the case.

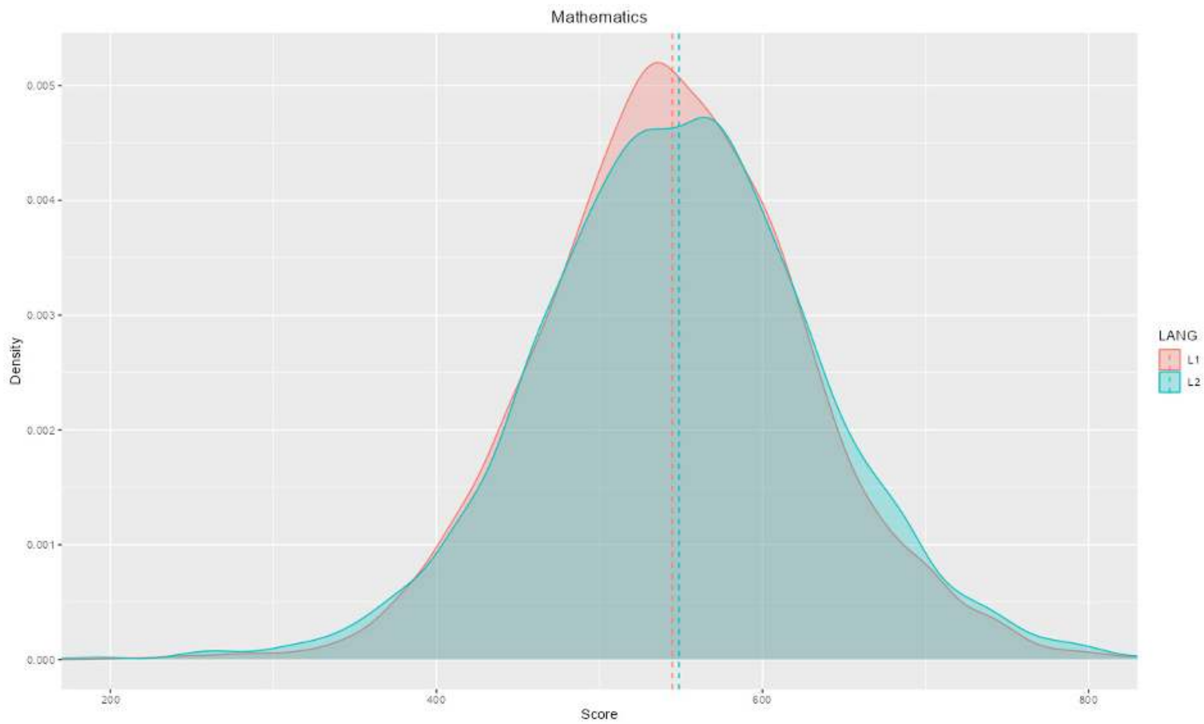


Figure 5.2 L1 and L2 reading proficiency distributions and means

The PBTS reading instrument measures reading proficiency in the language of instruction, so it is a logical expectation that language proficiency is the most important factor that affects students' scores. It can be observed in Figure 5.2 that the L2 group mean is lower than the L1 mean. In fact, the difference is approximately 28 score points. The L1 mean is 561.44, with a standard error (SE) of 4.27. The L2 mean is 533.76 with SE 4.025. As a whole, the L2 group's proficiency distribution is lower than the L1 group. As the test has been shown empirically to not disadvantage L2 students, it is likely to be true that L2 students have, on average, lower levels of proficiency in reading in the language of the test. It is important to reiterate that it is entirely reasonable to assume that L2 students' have, in general, a lower level of proficiency in reading a given language than for a group of L1 students. So, the difference in proficiency in the language of the test is 'real'.

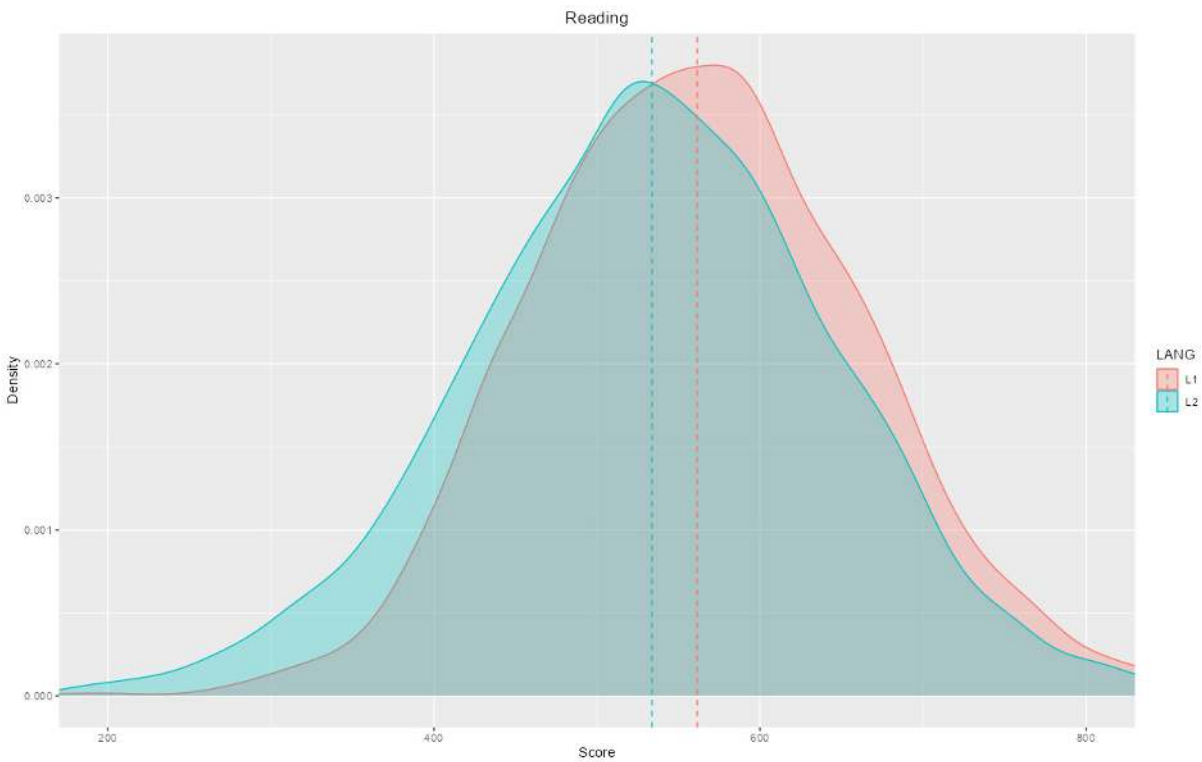


Figure 5.3 L1 and L2 science proficiency distributions and means

In science, shown in Figure 5.3, there is a difference between the group means of approximately 18 points (L1 mean: 552.54, SE 3.65; L2 Mean 535.31, SE 3.08). Science is a domain where language skills are likely to have some impact: less than reading and more than mathematics. A likely explanatory hypothesis is that language proficiency is limiting L2 students' ability to demonstrate their knowledge and skills in the science test, in the same way as is likely in reading. Again, this is not unexpected. The nature of the Science test requires students to read information and scenarios that contextualise the questions. So, a student's language proficiency is a likely confounding variable; it affects their proficiency score. However, as explained elsewhere, this is not because the test is disadvantaging the student: the items have been empirically shown not to differ in difficulty for students of the same proficiency level. This is a student-related variable confounding the proficiency measurement, and not an effect caused by the measurement instrument.

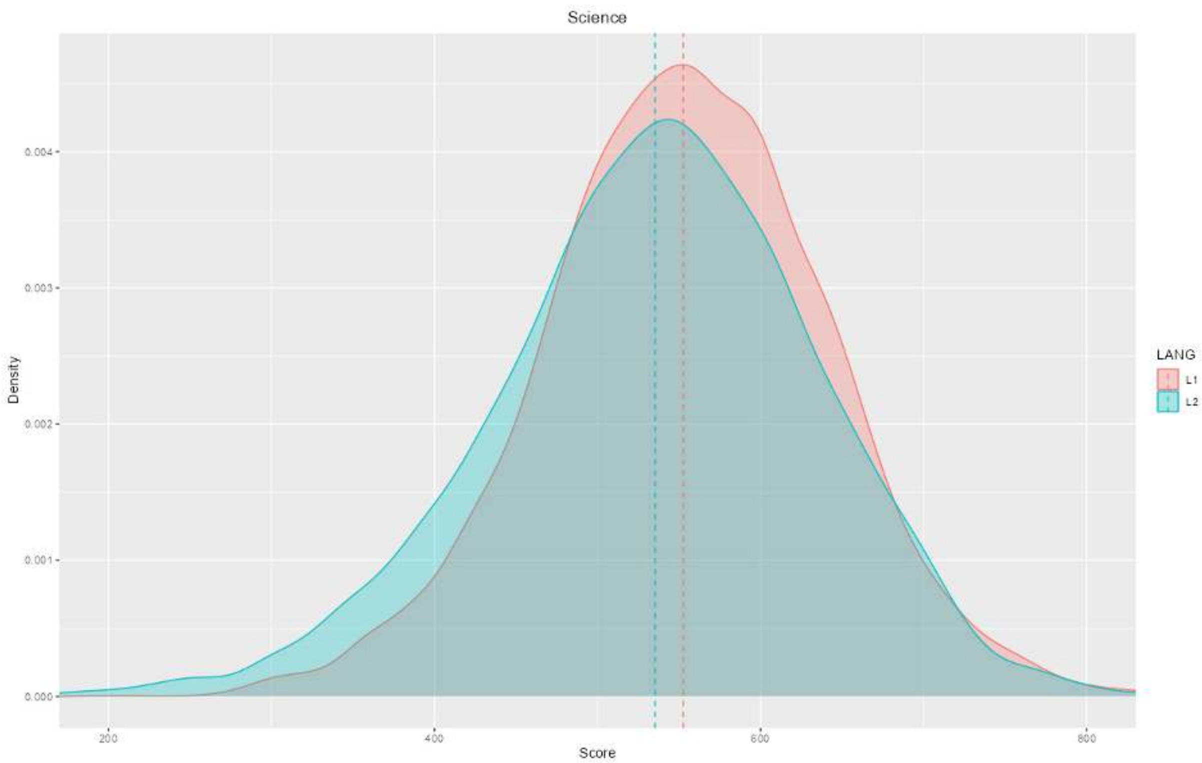


Table 5.1 Average proficiency by language group and gender

In summary, a student's first language appears to have little effect on their mathematics proficiency, a fairly large effect in reading, and a moderate effect in science. The consistency of these observations with common sense hypotheses, supports the main finding of the Validation Study Report for European Schools, provided to the NSP, that the test instruments are validly measuring the intended constructs.

An additional analysis was run, examining whether there was a difference within the L1 and L2 groups according to the gender of the students. Table 5.1 presents the means of Female and Male students in the L1 and L2 groups in each domain, along with the group means already reported in the text above. As with the gender analysis in section 3.6, girls outperform boys in reading, while boys outperform girls in maths and science. These gender effects appear to persist regardless of the L1 of the students.

Gender	L1 Reading	SE	L2 Reading	SE	L1 Maths	SE	L2 Maths	SE	L1 Science	SE	L2 Science	SE
Female	567	(5.47)	541	(5.56)	533	(4.50)	534	(4.35)	547	(4.82)	527	(4.49)
Male	555	(5.36)	526	(5.19)	557	(4.38)	563	(4.90)	559	(4.71)	543	(5.07)
All	561	(4.27)	534	(4.02)	545	(3.37)	549	(3.04)	553	(3.66)	535	(3.08)

5.2 Comparing percentile scores of L1 and L2 student populations

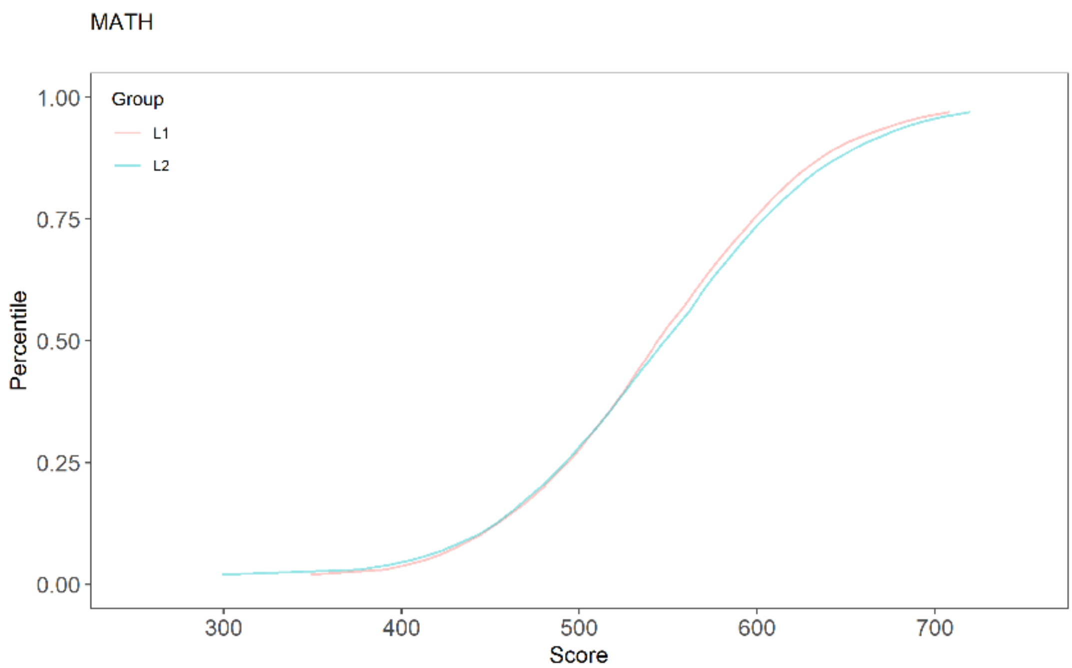
Another way of comparing the performance differences between the L1 and L2 populations is to examine the difference in scores for pairs of students in the same percentile of their respective groups. Percentiles are a way of expressing the distribution of a group by identifying 99 scores that divide the group into 100 equal groups of students. Thus, the 50th percentile score is equivalent to the median, as it represents the score of the students who ranked in the middle of the population.

Whereas the 80th percentile score is the score that divides a group into 80% of students below the score, and 20% of students above the score. The following top figures of Figures 5.4, 5.5 and 5.6 show the percentile scores of the L1 students (represented in red) and the L2 students (represented in blue), and the bottom figures denote the difference in the scores at the same percentile of the L1 and the L2 students, in which horizontal axis denotes the score of L2 students while the vertical axis represents the difference of the L1 students from the L2 students.
with the group means plotted as vertical dashed lines.

Figures 5.4-5.6 are complementary information to Figures 5.1-5.3. All of them demonstrate that language proficiency is largely irrelevant to the mathematics construct, that it is central to the reading construct, and that it has a significant effect in science for the majority of L2 students.

Figure 5.4 L1 and L2 mathematics percentile scores (top) and the difference of the scores at the same percentile (bottom)

It can be observed that in mathematics, the top figure shows that there is very little difference between L1 and L2 performance at any percentile. The apparent difference at lower scores in the bottom figure is an anomaly caused by there being few observations of L1 students scoring below 350 (for the same reason, it can be seen in the left-side figure that the blue line starts from 300, while the red line starts from 350).



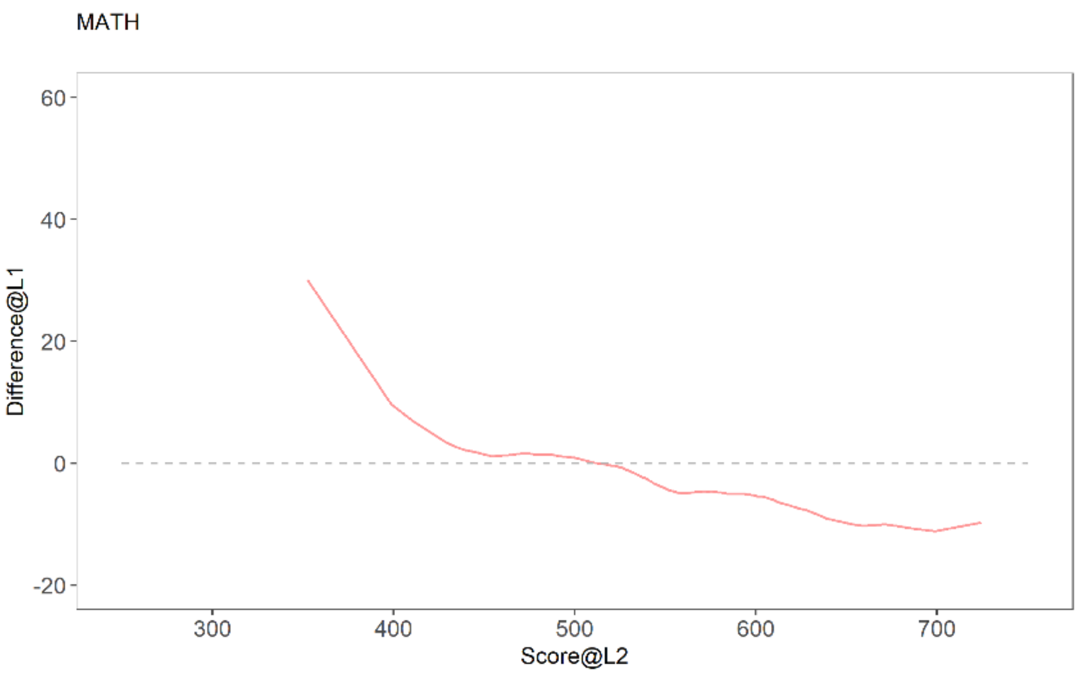
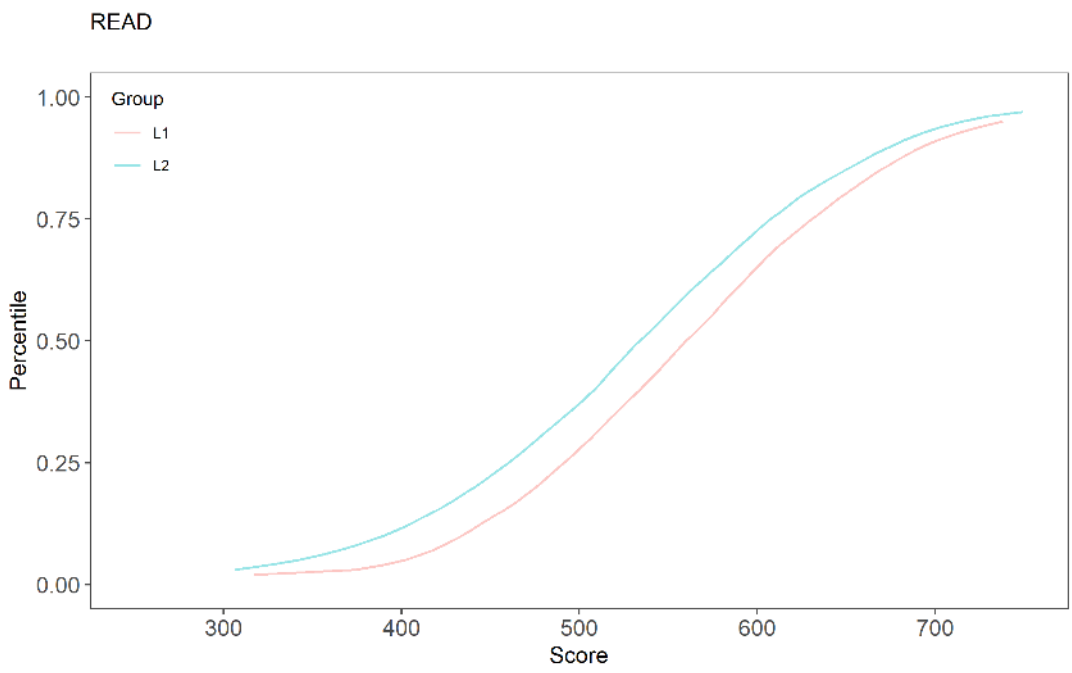


Figure 5.5 L1 and L2 reading percentile scores (top) and the difference of the scores at the same percentile (bottom)

In reading, there is a difference in performance between the L1 and L2 groups across the full range of scores. At the median, the score difference in approximately 25 scale score points. The difference reduces at higher percentiles, but does persist. To reiterate an observation from the previous section of the report: it is clear that there is a difference in two groups' ability to read in the language of the test, and this is not surprising.



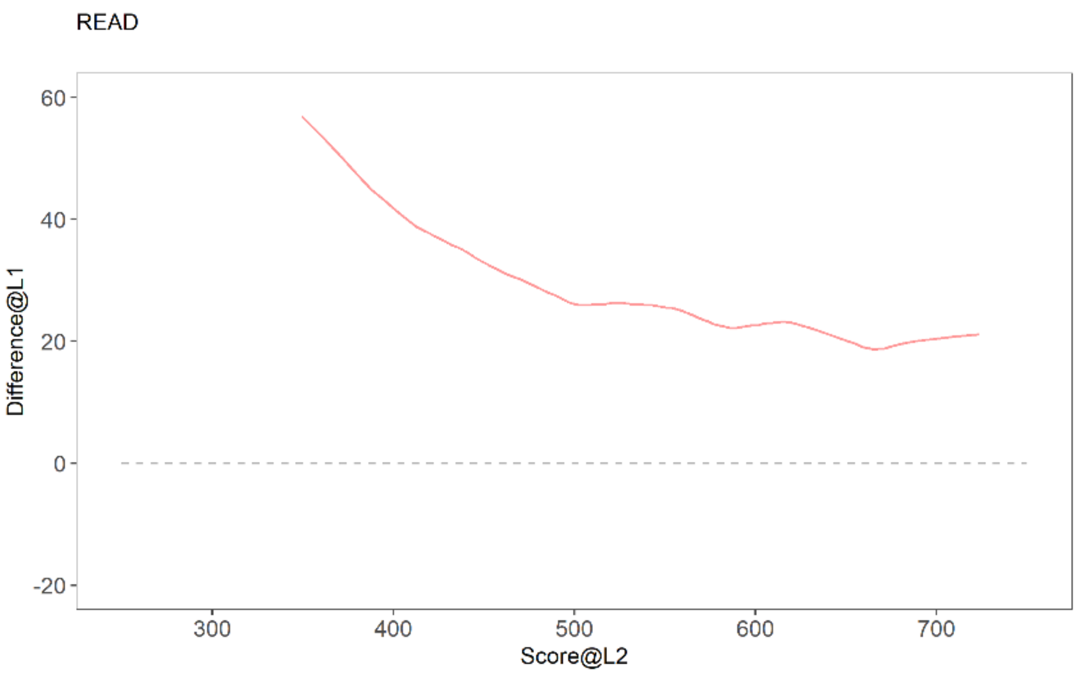
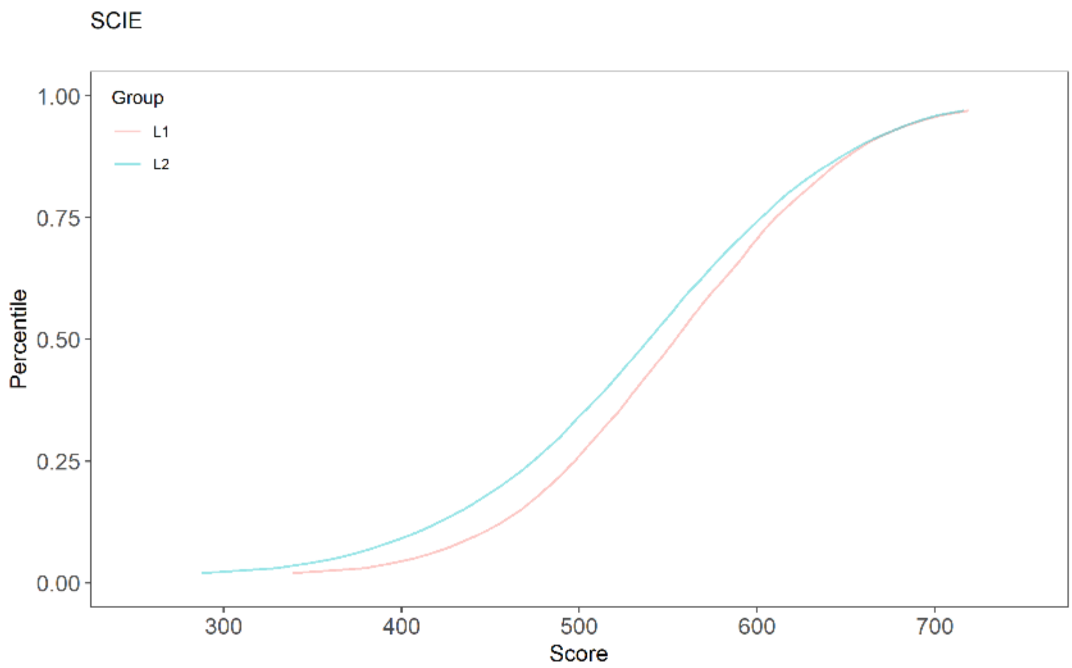
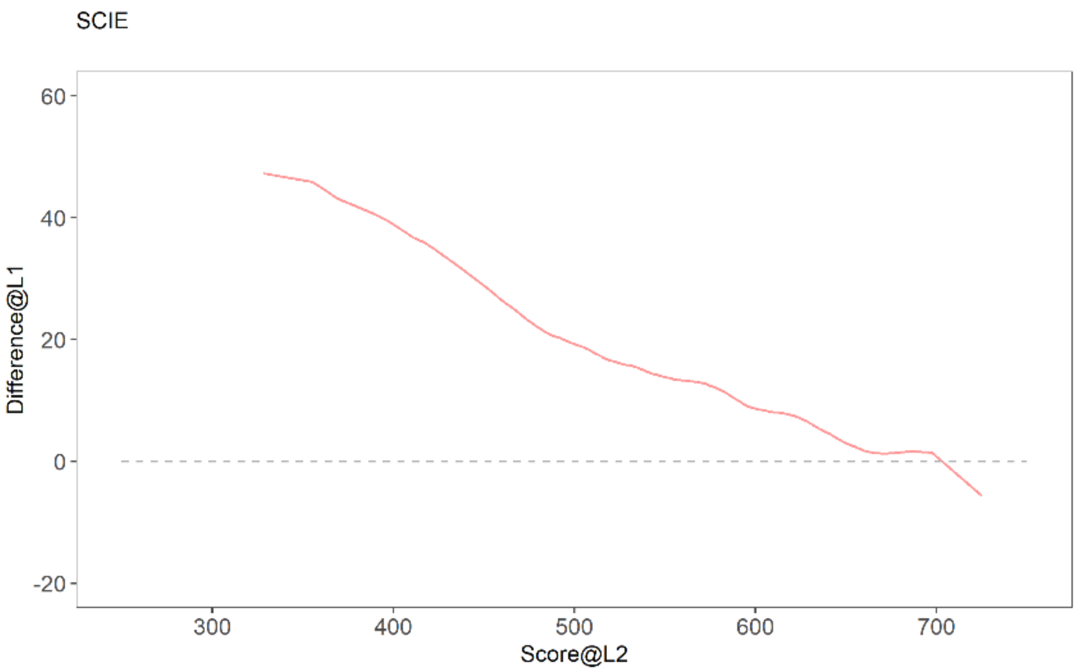


Figure 5.6 L1 and L2 science percentile scores (top) and the difference of the scores at the same percentile (bottom)

In science, it can be seen that below the 80th percentile score of approximately 650, L1 students score higher than L2 students. Above the 80th percentile score (representing the top 20% of students) there is little difference between the groups. As noted in the previous section, this is likely to be due to the test requiring a certain level of proficiency in the language of the test before students are able to demonstrate their skills and knowledge.





5.3 Comparing L1 and L2 students for each test langauge

Table 5.3 reports the average proficiency (in PISA scale score points) for the L1 and L2 students in Reading, Maths and Science, by language. The smallest difference between L1 and L2 groups is found in Maths for students taking the test in English and French. In Reading and Science, as has been reported in the previous sections, L1 students have outperformed L2 students in all languages by a significant amount. German appears a little different than the other two languages, with a large difference of 69.06 points in Reading, compared to differences of 41.55 for English and 29.34 for French. Unexpectedly, there is an 11.69 point difference in German maths favouring L1 students, compared to 2.73 points in English and 1.21 points in French. This means that in all three domains, the German L2 group are, on average, less able than the German L1 group. This may warrant further investigation.

Test Language	L1 Reading	SE	L2 Reading	SE	L1 Maths	SE	L2 Maths	SE	L1 Science	SE	L2 Science	SE
English	598	(7.52)	556	(5.83)	552	(6.27)	555	(4.27)	572	(8.92)	553	(4.64)
French	542	(5.97)	512	(8.68)	536	(4.47)	537	(6.53)	540	(4.72)	528	(8.15)
German	571	(6.59)	502	(8.21)	556	(5.82)	544	(7.23)	561	(5.62)	504	(6.73)

5.4 Comparing L2 students with and without a language section

The L2 group of students can be split into two: those students whose school has a language section for their L1 in which they can study a range of subjects in that language, and those students without a language section (SWALS) who join a different language section and study almost all of their subjects in their L2. In the data from the PBTS testing, there are 977 L2 students, of which 198 are SWALS. Figures 5.7, 5.8, and 5.9 show density plots of the

Figure 5.7 L2 and SWALS mathematics proficiency distributions and means

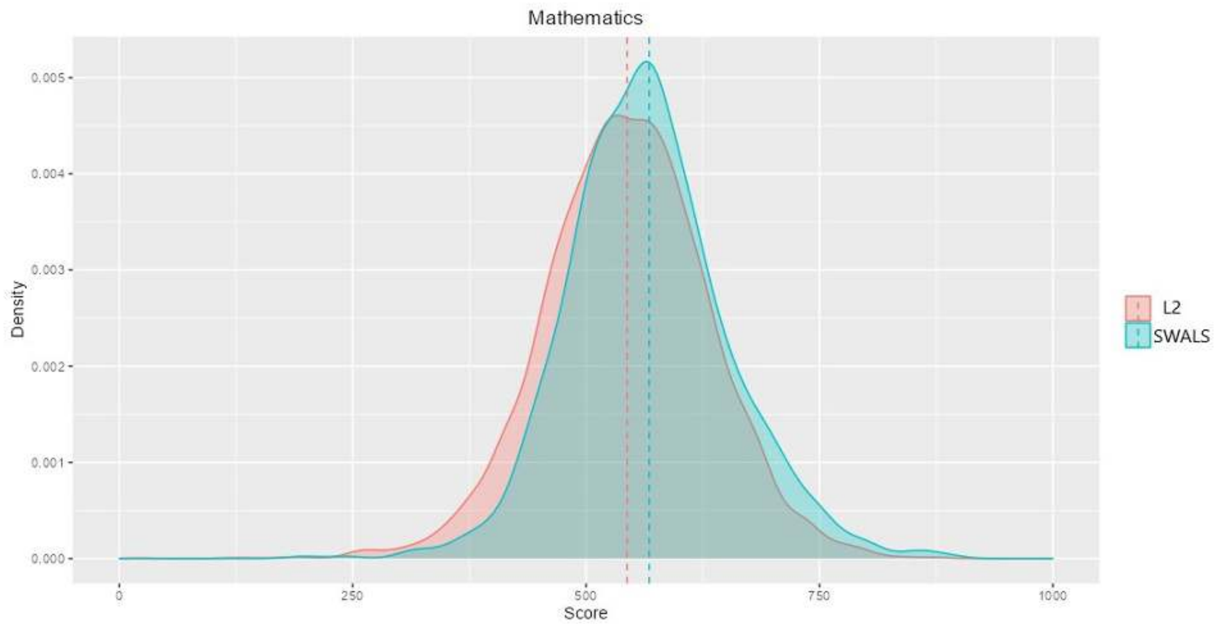


Figure 5.8 L2 and SWALS reading proficiency distributions and means

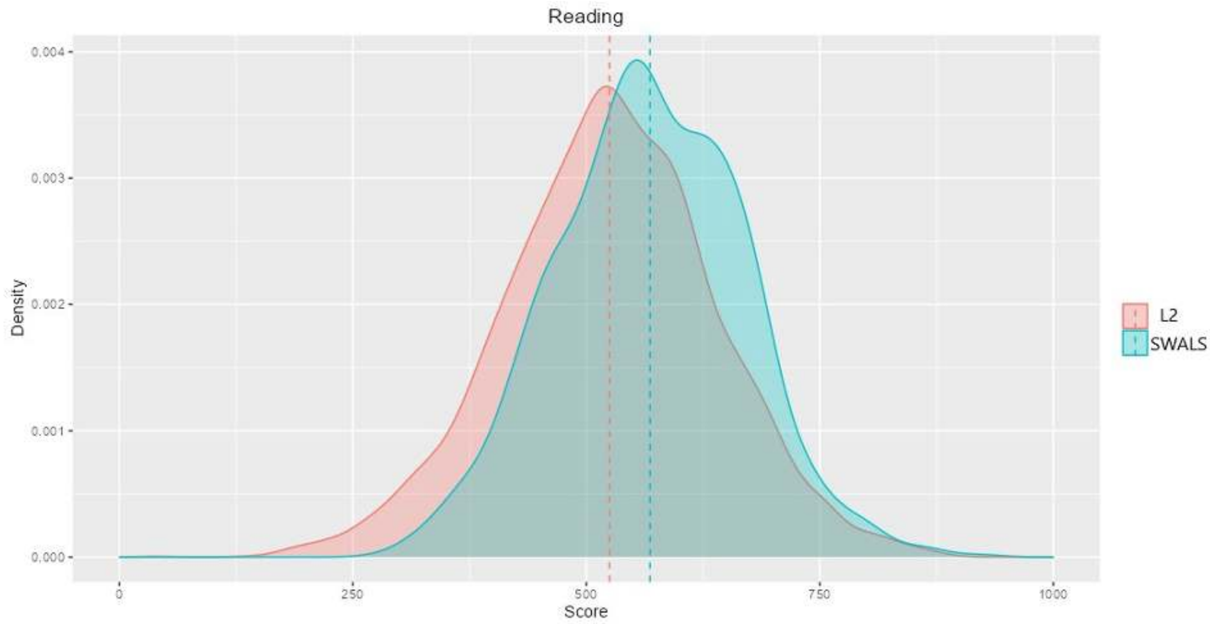


Figure 5.9 L2 and SWALS science proficiency distributions and means

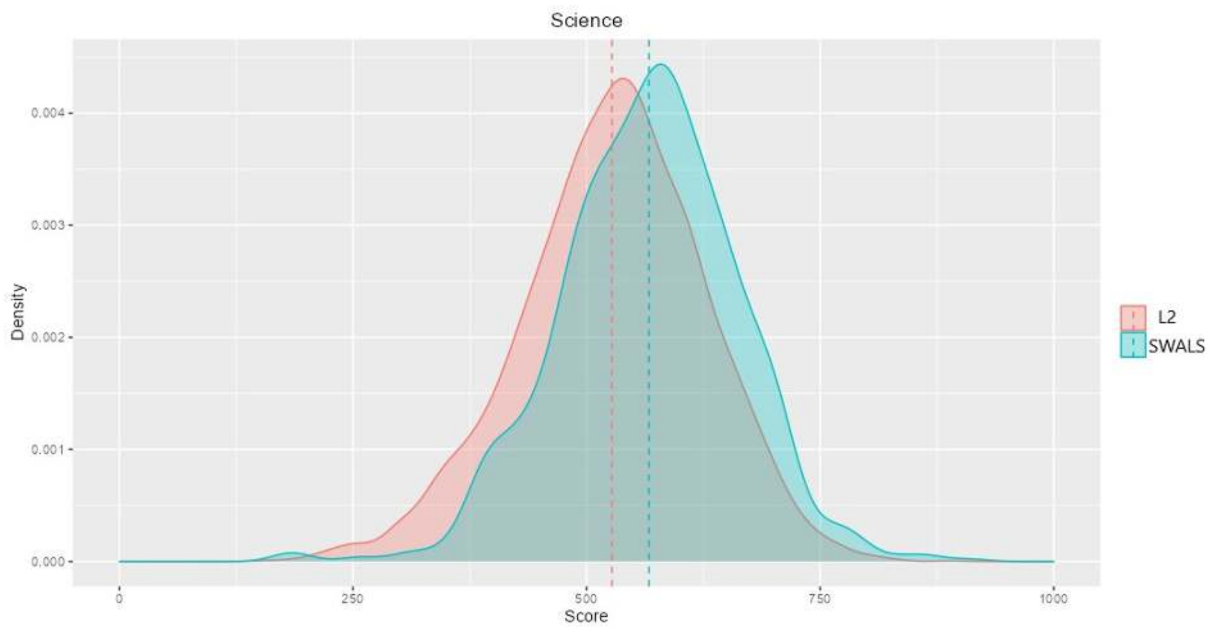


Figure 5.7 shows that there is approximately a 24 point difference between the means of the L2 group and the SWALS group in mathematics, with SWALS outperforming L2. In reading (Figure 5.8), the difference is approximately 43 points, and in science (Figure 5.9), the difference is approximately 40 points. These differences are quite large: larger in all cases than the difference between L2 and L1 groups. In fact, SWALS outperforms the L1 group in maths and science, as is shown in Table 5.4. For reading, the SWALS group performs similarly to the L1 group.

One question that warrants further analysis is why the SWALS group is so high performing.

Table 5.4 Average proficiency of L1, L2 and SWALS groups in each cognitive domain

Group	Reading	SE	Maths	SE	Science	SE
L1	561	(4.27)	545	(3.37)	553	(3.65)
L2	525	(4.51)	544	(3.45)	527	(3.61)
SWALS	568	(10.46)	568	(6.78)	567	(6.93)

ANNEX 1.

In this Annex you can find some additional data collected through the student questionnaire that were not analysed in this report. These data will be available for further exploration in the forthcoming interactive PISA for Schools Digital Dashboard.

Figure A.1 Students' career expectations (percentages)

	Your Group	EU	OECD
Managers	4%	3%	3%
Professionals	62%	40%	43%
Technicians and associate professionals	8%	11%	11%
Clerical support workers	0%	1%	1%
Service and sales workers	1%	9%	8%
Skilled agricultural, forestry and fishery workers	0%	1%	1%
Craft and related trades workers	0%	6%	5%
Plant and machine operators, and assemblers	0%	1%	1%
Elementary occupations	0%	0%	0%
Armed forces occupations	2%	2%	2%
Not in occupation	14%	13%	10%
Did not answer	9%	15%	17%

Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Figure A.2 Country of birth of students and parents (percentages)

		Your Group	EU	OECD
Student	In the country	52%	80%	79%
	Abroad	48%	16%	17%
	Did not answer	1%	4%	4%
Mother	In the country	18%	91%	90%
	Abroad	81%	6%	7%
	Did not answer	1%	3%	3%
Father	In the country	21%	80%	79%
	Abroad	77%	16%	17%
	Did not answer	1%	4%	3%

Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Figure A.3 Co-operation among students in the European Schools: how true is the statement "Students seem to value co-operation (e.g. working together)"? (percentages)

	Your Group	EU	OECD
Not at all true	5%	7%	6%
Slightly true	38%	29%	27%
Very true	40%	34%	34%
Extremely true	16%	10%	10%
Did not answer	1%	20%	22%

Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Figure A.4 Competition among students in the European Schools: how true is the statement "Students seem to value competition (e.g. competing with each other)"? (percentages)

	Your Group	EU	OECD
Not at all true	8%	9%	8%
Slightly true	41%	37%	34%
Very true	34%	28%	29%
Extremely true	17%	8%	10%
Did not answer	1%	17%	19%

Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Figure A.5 Life satisfaction (from a minimum of 0 meaning not at all satisfied to a maximum of 10 meaning completely satisfied)

	Your Group	EU	OECD
Life satisfaction	6.6	7.15	7.03
Did not answer	0%	13%	24%

Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

Figure A.6 Global competence (percentage of students who know something about this and could explain the general issue or are familiar with this and would be able to explain this well) (percentages)

	Your Group	EU	OECD
Climate change and global warming	95%		79%
Global health (e.g. epidemics)	87%		65%
Migration (movement of people)	87%		80%
International conflicts	73%		66%
Hunger or malnutrition in different parts of the world	83%		78%
Causes of poverty	81%		78%
Equality between men and women in different parts of the world	89%		83%
Did not answer	1%	1%	14%

Source: data for the EU and the OECD were obtained from OECD (2019), PISA 2018 database, oecd.org/pisa/data

A.

ANNEX 2.

In this Annex you can find some additional data collected through the PISA 2022 Global Crises Module that were not analysed in this report. The PISA 2022 Global Crises Module was developed by the OECD to provide information on the impact that the disruptions caused by the COVID-19 pandemic had on students.

You can find more information about the PISA 2022 Global Crises Module by reading the following OECD Working Paper.

Bertling, J., et al. (2020), "A tool to capture learning experiences during COVID-19 : The PISA Global Crises Questionnaire Module", OECD Education Working Papers Series, n° 232, Editions OECD, Paris, https://doi.org/10.1787/9988df4e-en.

Figure A.11 School closures during the last three years (percentages of students who reported school closures for *more than 6 months*)

	Your Group	EU	OECD
Because of COVID-19	**82%**		
For another reason (e.g. a natural disaster, strikes or demonstrations, poor air quality)	**4%**		
Did not answer	**2%**		

Notes: data for the European Union and for the OECD will be available in 2024.
students can provide none or more than one answer. Percentages may not add up to or exceed 100%.

Figure A.12 Interactions with school staff during COVID-19 school closures (percentages of students who reported the following interactions with school staff more than *once or twice a week*)

	Your Group	EU	OECD
Sent me learning materials to study on my own	**62%**		
Sent me specific assignments	**83%**		
Uploaded material on a learning management system or school learning platform (e.g. Blackboard®, Edmodo®, Moodle®, Google® Classroom™)	**72%**		
Checked in with me to ensure that I was completing my assignments	**58%**		
Offered live virtual classes on a video communication program (e.g. Zoom™, Skype™, Google® Meet™, Microsoft® Teams)	**85%**		
Asked me to submit completed school assignments	**79%**		
Gave me helpful tips about how to study on my own	**28%**		
Checked in with me to ask how I was feeling	**26%**		
Did not answer	**2%**		

Notes: data for the European Union and for the OECD will be available in 2024.
students can provide none or more than one answer. Percentages may not add up to or exceed 100%.

Figure A.13 Type of digital device used most often for schoolwork during COVID-19 school closures (percentages)

	Your Group	EU	OECD
My own laptop, desktop computer or tablet	83%		
My own smartphone	8%		
A digital device that was also used by other family members	6%		
A digital device that my school gave or lent me	0%		
I did not have any digital device for my school work.	1%		
Did not answer	2%		

Note: data for the European Union and for the OECD will be available in 2024.

Figure A.14 Subjective impression of learning during COVID-19 school closures (percentages)

	Your Group	EU	OECD
I learnt less when my school building was closed.	67%		
I learnt about as much when my school building was closed.	25%		
I learnt more when my school building was closed.	6%		
Did not answer	3%		

Note: data for the European Union and for the OECD will be available in 2024.

Figure A.15 Types of learning resources used during COVID-19 school closures (percentages of students who used the following learning resources once a week or more)

	Your Group	EU	OECD
Paper textbooks, workbooks, or worksheets	**61%**		
Digital textbooks, workbooks or worksheets	**78%**		
Real time lessons by a teacher from my school on video a communication program (e.g. Zoom™, Skype™, Google® Meet™, Microsoft® Teams).	**91%**		
Real time lessons by a private tutor on video a communication program (e.g. Zoom™, Skype™, Google® Meet™, Microsoft® Teams)	**41%**		
Learning material my teachers sent via SMS or WhatsApp™	**32%**		
Recorded lessons or other digital material provided by teachers from my school	**41%**		
Recorded lessons or other digital material from other sources (e.g. Khan Academy®, Coursera®)	**28%**		
Lessons broadcast over television or radio	**8%**		
Did not answer	**3%**		

Notes: data for the European Union and for the OECD will be available in 2024.
students can provide none or more than one answer. Percentages may not add up to or exceed 100%.

A.

Figure A.16 Problems with self-directed learning during COVID-19 school closures (percentages of students who reported the following problems when completing their schoolwork *about once or twice a week or every day or almost every day*)

	Your Group	EU	OECD
Problems with access to a digital device when I needed it	**13%**		
Problems with Internet access	**28%**		
Problems with access to school supplies (e.g. paper, pencil)	**7%**		
Problems with finding a quiet place to study	**15%**		
Problems with finding time to study because I had household responsibilities	**18%**		
Problems with motivating myself to do school work	**66%**		
Problems with understanding my school assignments	**38%**		
Problems with finding someone who could help me with my school work	**22%**		
Did not answer	**4%**		

Notes: data for the European Union and for the OECD will be available in 2024.
students can provide none or more than one answer. Percentages may not add up to or exceed 100%.

Figure A.17 Family support for self-directed learning during COVID-19 school closures (percentages of students who reported receiving the following forms of support from their family about once or twice a week or every day or almost every day)

	Your Group	EU	OECD
Help me with my school work	**30%**		
Ask me what I was learning	**55%**		
Help me create a learning schedule	**16%**		
Help me access learning materials online	**21%**		
Check whether I was completing my school assignments	**32%**		
Explain new content to me	**24%**		
Help me find additional learning resources	**24%**		
Teach me additional topics not part of my school assignments	**25%**		
Did not answer	**5%**		

Notes: data for the European Union and for the OECD will be available in 2024.
students can provide none or more than one answer. Percentages may not add up to or exceed 100%.

A.

Figure A.18 Feelings about learning at home during COVID-19 school closures (percentages of students who *agreed or strongly agreed with the following statements*)

	Your Group	EU	OECD
I felt lonely	**48%**		
I enjoyed learning by myself	**51%**		
My teachers were available when I needed help (e.g. through virtual office hours, email, chat)	**67%**		
I felt anxious about schoolwork	**54%**		
I was motivated to learn	**26%**		
I fell behind in my schoolwork	**48%**		
I improved my skill of learning with digital devices	**74%**		
My teachers were well prepared to provide instruction remotely	**48%**		
I was well prepared to learn on my own	**54%**		
I missed sports and other physical activities organised by my school	**57%**		
Did not answer	**5%**		

Notes: data for the European Union and for the OECD will be available in 2024.
students can provide none or more than one answer. Percentages may not add up to or exceed 100%.

Figure A.19 Self-directed learning self-efficacy during COVID-19 school closures (percentages of students who felt *confident or very confident* about doing the following things in case of new school closures)

	Your Group	EU	OECD
Using a learning management system or school learning platform (e.g. Compass®, Edmodo®, Moodle®, Google® Classroom™, Scootle®)	84%		
Using a video chat communication program (e.g. Zoom™, Skype™, Google® Meet™, Microsoft® Teams)	93%		
Finding learning resources online on my own	86%		
Planning when to do schoolwork on my own	76%		
Motivating myself to do schoolwork	52%		
Focusing on school work without reminders	61%		
Completing school work independently	80%		
Assessing my progress with learning	65%		
Did not answer	7%		

Notes: data for the European Union and for the OECD will be available in 2024.
students can provide none or more than one answer. Percentages may not add up to or exceed 100%.

Figure A.20 Feeling of preparedness for self-directed learning in case of new school closures (percentages)

	Your Group	EU	OECD
Not prepared at all	5%		
Not very prepared	20%		
Well prepared	51%		
Very well prepared	20%		
Did not answer	4%		

Note: data for the European Union and for the OECD will be available in 2024.

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PISA for Schools

How the European Schools Compares Internationally

How prepared are 15-year-old students in the European Schools to continue as lifelong learners, to find and fill jobs of the 21st century and compete and collaborate as citizens in a globalised economy?

The OECD Programme for International Student Assessment (PISA) has evaluated and compared education systems worldwide for more than a decade, highlighting education systems that have either repeatedly outperformed others or have shown considerable improvement – sometimes within a relatively short period of time.

Increasingly, however, local educators are just as interested in international benchmarking and improvement as policy makers. The OECD PISA-based Test for Schools and the Region results presented in this report allow local educators to do just that. The report presents performance results in reading, mathematics and science for Regions that participated in the assessment, along with contextual information collected from students. Each Region's results are presented in almost 40 figures that are unique to each Region. Along with performance results, the report attempts to show that the learning climate at school and students' engagement towards learning are important factors in understanding the overall performance of students.

Because benchmarking is one step towards improvement, the report draws upon school policies and practices from around the world to stimulate reflection and discussions among local educators. The report also includes links that allow the reader one-click access to relevant OECD research, reports and resources.

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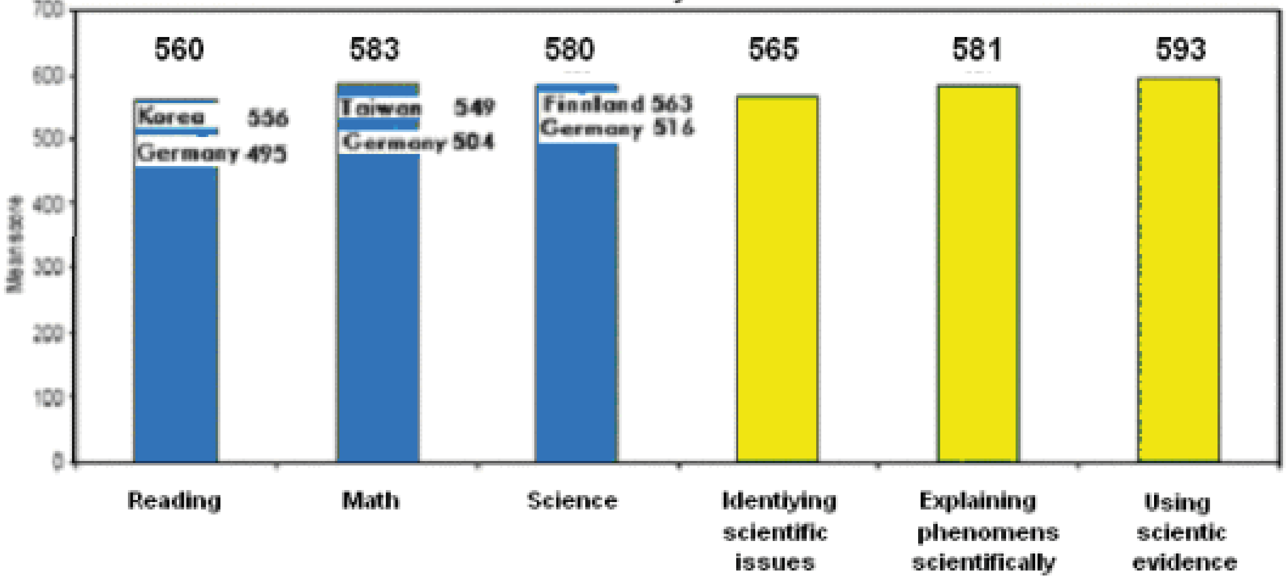


Europäische Schulen

Büro der Generalsekretärin

Az.: 2008-D-3410-de-1

Orig.: DE

PRÜFUNG DER SPRACHLICHEN KOMPETENZEN UND EINSTELLUNGSVERFAHREN NICHT MUTTERSPRACHLICHER LEHRPERSONEN

Gemischter Pädagogischer Ausschuss

Sitzung am 14. November 2008 in Brüssel

PISA – 2006
RESULTATE DER EUROPÄISCHEN SCHULE LUXEMBURG (I)

1. VORBEMERKUNGEN

Die PISA – Studie (Programme for International Student Assessment) ist dazu geschaffen, den Output von nationalen Bildungssystemen vergleichbar zu machen und Bildungspolitikern eine analytische Grundlage für die Überprüfung und Steuerung der Bildungspolitik zu geben. Die Studie ist an und für sich nicht dazu geschaffen, Schulprofile zu erstellen, da an den ausgewählten Testschulen jeweils nur etwa 35 Schüler teilnehmen. Nur in sehr kleinen Ländern wie im Großherzogtum Luxemburg mit seinen weniger als 4000 SchülerInnen der Altersgruppe der 15 – 16jährigen, wo alle Schulen mit allen ihren Schülern der Kohorte am Test teilnehmen, ist es möglich, auch Schulprofile zu erstellen und den einzelnen Schulen Rückmeldungen zu geben.

Zahl der Schüler der ES LUX I, die an der PISA - Studie 2006 teilgenommen haben (=am Tag Erhebung anwesend) waren[1]

	L1 students	L2 students
German	23	10*[2]
French	60	46
English	35	71
Total	**118**	**127**

Das Service de Coordination, de la Recherche, et de l'Innovation Pédagogiques et Technologiques (SCRIPT) des Ministeriums für Erziehung und Berufsausbildung Luxemburgs hat es zum zweiten Mal ermöglicht, dass die Schüler der Europäischen Schule Luxemburg in drei Sprachen, nämlich in den beiden Luxemburger Schulsprachen Deutsch und Französisch, aber auch in Englisch an der Studie teilnehmen konnten. Die SchülerInnen der deutschen, französischen und der englischen Sektion konnten also in ihrer Sprache I arbeiten (L1 students). Ihre Ergebnisse sind auch in die nationalen Resultate aufgenommen worden. Ausgehend von der Tatsache, dass sich die Abiturergebnisse und Repetentenzahlen der ES LUX I nicht wesentlich von denen der anderen ES unterscheiden, kann man durch diese PISA – Ergebnisse auch das Bildungssystem der Europäischen Schulen im Verhältnis zu anderen nationalen Bildungssystemen situieren.

Die SchülerInnen der anderen Sektionen und die SchülerInnen ohne Sprachsektion (SWALS) haben ebenfalls an der PISA – Studie teilgenommen, allerdings in ihrer Sprache 2 (L2 students), in der „Vehikularsprache", also ebenfalls in Deutsch, Französisch oder Englisch. Ihre Ergebnisse wurden gesondert ausgewertet. Diese Daten sind für unser System deshalb so wichtig und aufschlussreich, weil wir damit eine objektive, externe Überprüfung der Wirksamkeit des Fremdsprachenmodells der ES haben, das die Sprache 2 systematisch zur Arbeitssprache aufbaut. Es ist wichtig zu wissen, dass unsere Schüler zum Zeitpunkt der PISA – Studie, also in ihrem 15. Lebensjahr, normaler Weise seit knapp drei Jahren dem Unterricht in Geographie und Geschichte in ihrer Sprache II folgen. Eine

[1] Diese korrigierten Zahlen weichen von denen des Vorberichts („Pisa – Teilresultate")vom April 2006 ab

[2] Durch die geringe Zahl der Schüler, die in Deutsch L2 gearbeitet haben, sind die Resultate dieser Schülergruppe statistisch nicht zuverlässig

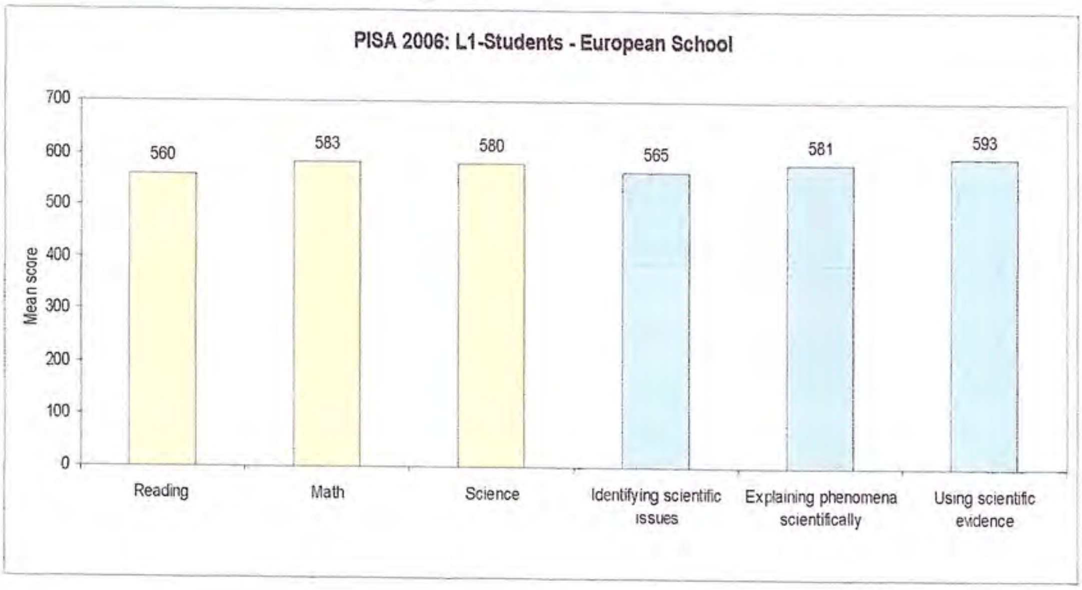
Auseinandersetzung mit mathematischen und naturwissenschaftlichen Fragestellungen in der Sprache 2 erfolgte zum ersten Mal und ohne jede Vorbereitung beim PISA - Test!

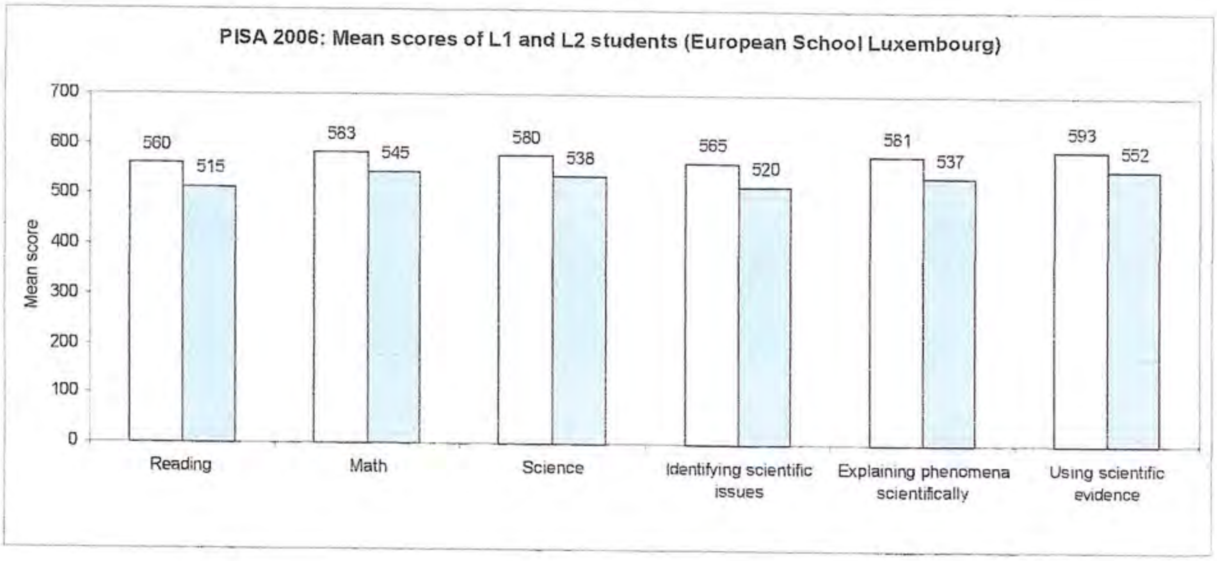
Bei der PISA –Studie 2006 standen die Naturwissenschaften im Vordergrund, denen der überwiegende Teil der Fragen gewidmet war. Deshalb sind die Aussagen zu diesem Bereich statistisch besonders zuverlässig. (2003 stand die Evaluation der mathematischen Kompetenz im Zentrum. Bei der ersten PISA – Studie 2000, an der die ES LUX I noch nicht teilgenommen hat, war es die Lesekompetenz.)

2. DIE GLOBALERGEBNISSE DER PISA - STUDIE 2006

Die SchülerInnen, die in ihrer **Sprache I** gearbeitet haben, liegen in alle drei Bereichen (Lesekompetenz [560], mathematische [583] und naturwissenschaftliche [580] Kompetenz) deutlich über den Resultaten der besten Länder. Sie haben damit in Mathematik und Naturwissenschaften um mehr als zwei Jahre Lernvorsprung im Vergleich zum OECD – Durchschnitt, im Leseverständnis mehr als eineinhalb Jahre (der ungefähre Zuwachs eines Lernjahres beträgt 38 Punkte)

Die Ergebnisse der SchülerInnen der **Sprache 2** liegen um durchschnittlich 43 Punkte (gut eine Lernjahr) unter denen ihrer KollegInnen der Sprache1, aber in Mathematik und den Naturwissenschaften immer noch um ein Lernjahr über dem OECD – Durchschnitt. In der Rangordnung der Länder (Schulsysteme) würden sie sich an der 3. Stelle (Naturwissenschaften), 5. Stelle (Mathematik) und 7. Stelle (Leseverständnis) einordnen.





	main scales			subscales science		
	Readin g	Mat h	Scienc e	Identifying scientific issues	Explaining phenomena scientifically	Using scientific evidence
L1 students	560	583	580	565	581	593
L2 students	515	545	538	520	537	552
Differenc e	45	38	42	45	45	40

Average difference of 43 points which correspond to an approximate increase in learning that is acquired in a little more than one year of schooling (38 points in the OECD – average)

3. DIE ERGEBNISSE DER DREI SPRACHSEKTIONEN (L1)

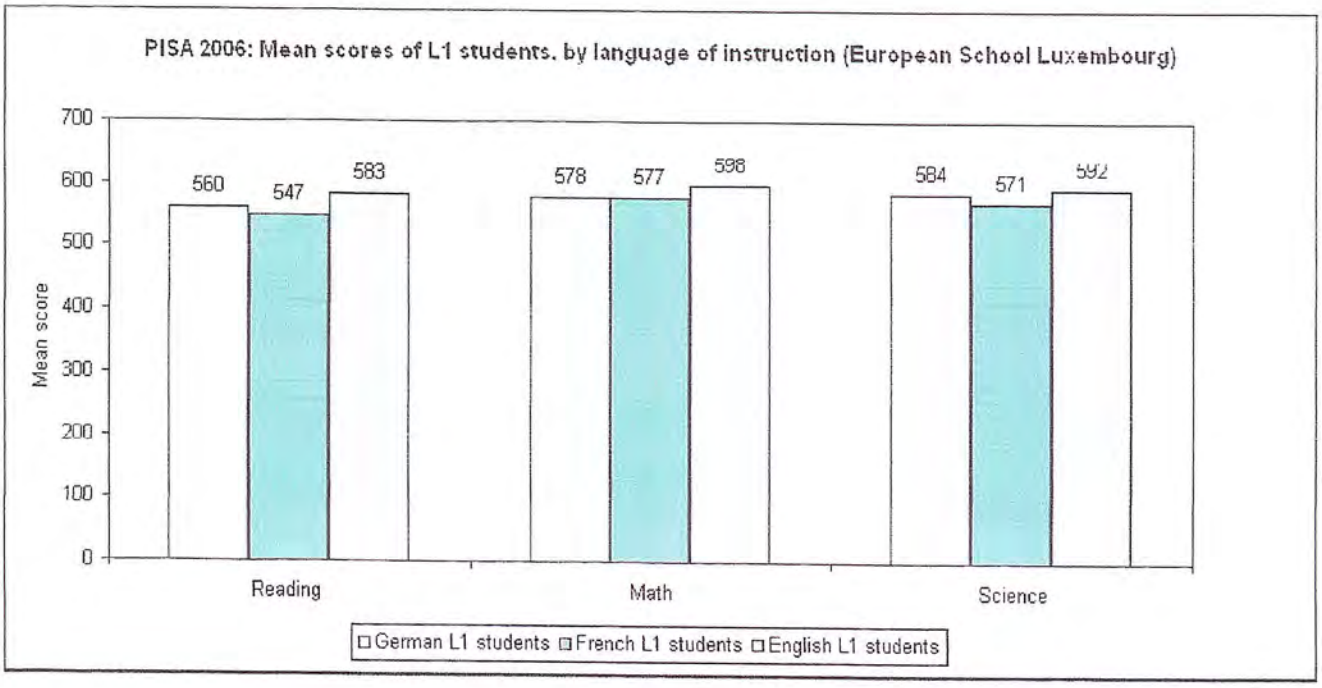
Die Durchschnittsergebnisse sind zwar in allen Bereichen und allen drei Sektionen sehr gut, es zeigen sich aber doch deutlich schwächere Ergebnisse in der Sprache 1 als in Mathematik und in den Naturwissenschaften und es zeigen sich deutlich bessere Durchschnittsleistungen in der anglophonen Sektion .

Die niedrigeren Ergebnisse in der Sprache 1 könnten als Preis für die Mehrsprachigkeit der Schüler und das multilinguale Umfeld gedeutet werden. Ein Preis, der durch die Kompetenzen in der Sprache 2 vermutlich mehr als aufgewogen wird.

Für die doch deutlich besseren Werte der anglophonen Sektion gibt es zumindest zwei Erklärungsversuche.
Der eine ist pädagogisch – spekulativer Natur: Der pragmatischere anglophone Unterrichtsstil zeige zumindest bis zu dieser Altersstufe bessere Ergebnisse als der eher theoretische und lernorientierte französische oder deutsche Unterrichtsstil.
Der andere Erklärungsversuch bezieht das schulische Umfeld mit in die Betrachtungen ein: Luxemburg hat einerseits ein sehr anspruchsvolles zweisprachiges Gymnasialsystem (Lycée classique) und ein gut eingeführtes Lycée français. das die franco – französischen

Schulansprüche bestens erfüllt. Wer in dem einen oder im anderen System gut zurecht kommt, wechselt nicht auf die „Europaschule", deren Profil und deren Qualitäten im Land wenig bekannt sind.
Für anglophone Schüler gibt es die International School als Alternative, die einerseits sehr teuer, andererseits weniger fremdsprachenorientiert ist und von den meisten Eltern nicht wirklich als bessere Alternative zur ES betrachtet wird.

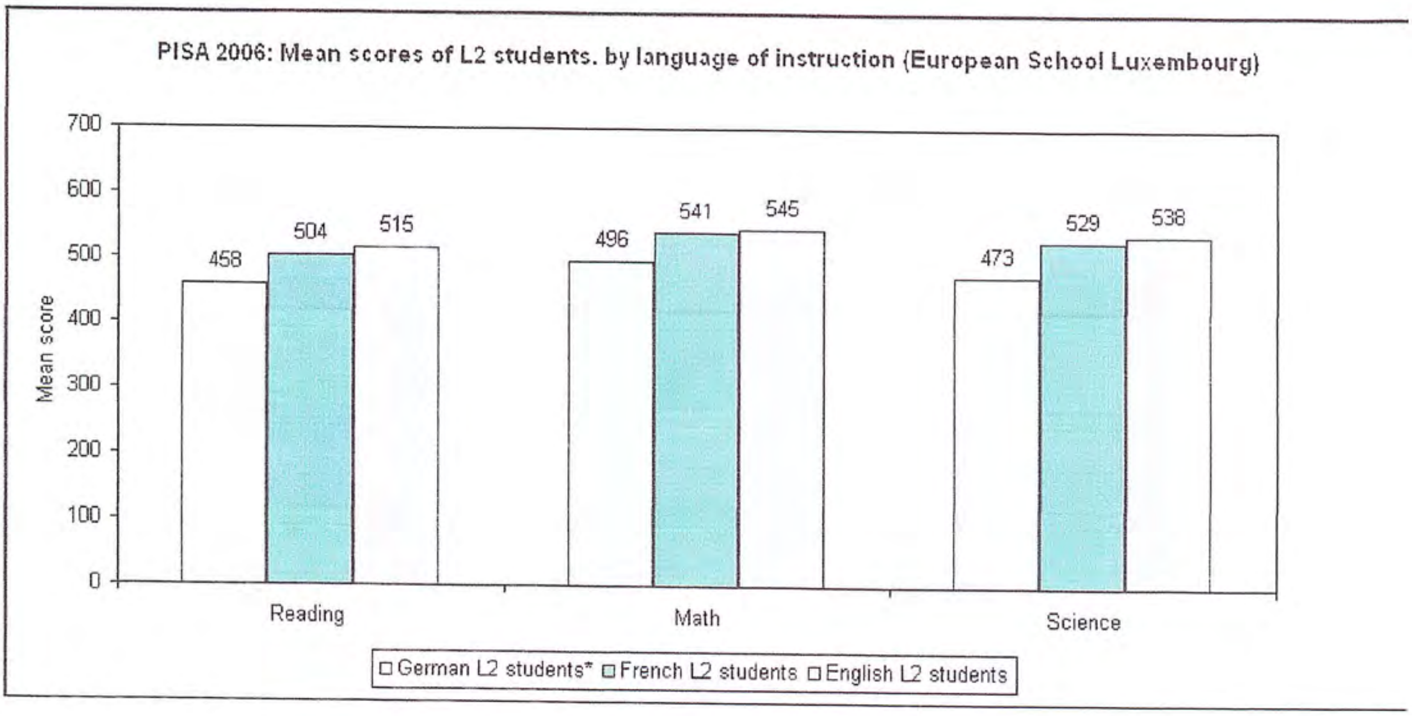
	Reading	Math	Science
German L1 students	560	578	584
French L1 students	547	577	571
English L1 students	583	598	592



4. DIE ERGEBNISSE DER SCHÜLER IN IHRER SPRACHE 2

Diese Ergebnisse geben sowohl Auskunft über das Leseverständnis in der Sprache 2 als auch über die naturwissenschaftliche Kompetenz der Schüler, die nicht in der deutschen, englischen oder französischen Sektion sind.
Die Schüler mit Englisch als 2. Sprache haben geringfügig bessere Ergebnisse erzielt als diejenigen mit Französisch. Auffallend sind die deutlich niedrigeren Durchschnittswerte der Schüler mit Deutsch als Sprache 2. Allerdings ist hier zu bedenken, dass die Resultate

dieser Gruppe wegen der geringen Teilnehmerzahl statistisch nicht aussagekräftig sind. Der Vergleich der Resultate von 2003 und 2006 wird diese Aussage erhärten.
Es ist dennoch die Aufgabe der Schule, derartige Diskrepanzen aufzuklären.



5. PISA – RESULTATE 2006 – 2003 IM VERGLEICH

Der Vergleich der PISA - Resultate von 2006 und 2003 ergibt ein auf den ersten Blick inhomogenes Bild.
Die bereits 2003 sehr guten Resultate der L1 Schüler haben sich von 2003 auf 2006 in allen drei Bereichen insgesamt, d. h. in der Durchschnittsnote noch etwas verbessert. In den einzelnen Sektionen ist das Bild nicht ganz so homogen. In der deutschen Sektion zeigt sich 2006 in den Naturwissenschaften mit -26 Punkten sogar eine deutliche und statistisch signifikante Verschlechterung.
Die Schüler, die in der Sprache 2 gearbeitet haben, haben zwar immer noch sehr gute Gesamtleistungen erzielt, die in Wirklichkeit hervorragend sind, wenn man bedenkt, dass sie erstmals in der Mathematik und den Naturwissenschaften in der 2. Sprache gearbeitet haben. Sie sind aber von den Ergebnissen von 2003, die zum Teil sogar über denen der Sprache 1 lagen, weit entfernt, insbesondere was die Deutschschüler betrifft.
Eine Erklärung für die 2003 unnatürlich guten Ergebnisse der L2 - Schüler kann darin liegen, dass die Teilnahme in der Sprache 2 aus organisatorischen Gründen auf die Schüler der 5. Klasse beschränkt war. Die Schüler, die mit 15 Jahren noch in der 4. Klasse saßen, weil sie einmal ein Jahr verloren hatten, haben 2003 nicht teilgenommen, was natürlich die Statistik sehr verändern kann, besonders wenn es sich um kleine Fremdsprachengruppen handelt wie bei der deutschen. (2003: 8 Schüler; 2006: 10 Schüler).

RESULTS PISA 2006 - [illegible] EUROPEAN SCHOOL LUX I COMPARATIVE PRESENTATION

EUROPEAN SCHOOLS (ES LUX I) RESULTS PISA 2006 ([illegible]):
READING PERFORMANCE

	2006	2003		2006	2003		2006	2003		2006	2003
L1	560	[illegible]	DE	560	[illegible]	**L2**	515	[illegible]	DE	458	[illegible]
			EN	583	[illegible]				EN	515	[illegible]
			FR	547	[illegible]				FR	504	[illegible]

EUROPEAN SCHOOLS (ES LUX I) RESULTS PISA 2006 ([illegible]):
MATHEMATICS PERFORMANCE

	2006	2003		2006	2003		2006	2003		2006	2003
L1	583	[illegible]	DE	560	[illegible]	**L2**	546	[illegible]	DE	496	[illegible]
			EN	583	[illegible]				EN	545	[illegible]
			FR	577	[illegible]				FR	541	[illegible]

EUROPEAN SCHOOLS (ES LUX I) RESULTS PISA 2006 ([illegible]):
SCIENCE PERFORMANCE

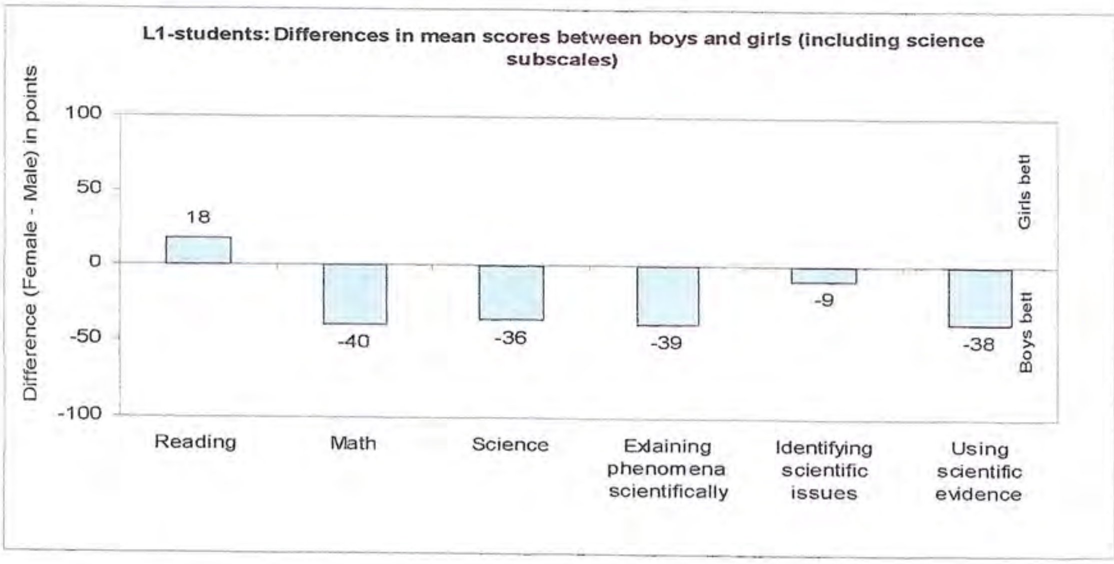
	2006	2003		2006	2003		2006	2003		2006	2003
L1	588	[illegible]	DE	548	[illegible]	**L2**	538	[illegible]	DE	473	[illegible]
			EN	592	[illegible]				EN	538	[illegible]
			FR	571	[illegible]				FR	528	[illegible]

Insgesamt kann man vielleicht sagen, dass mit einem Minus von 43 Punkten zwischen Sprache 1 und 2 ein Normalabstand hergestellt ist und sich auch die L2 - Schülergruppe immer noch im OECD – Spitzenfeld befindet.

6. Gender – Vergleich : Geschlechtsspezifische Unterschiede

Ein Vergleich der Durchschnittsergebnisse der Jungen und Mädchen zeigt ein überraschend traditionalistisches, anscheinend noch sehr geschlechtsbestimmtes Leistungsbild in den drei Sektionen, das bei den L – 2 SchülerInnen auf den ersten Blick weniger deutlich ausgeprägt scheint.

Die Mädchen der L1 zeigen deutliche Vorteile in der Lesekompetenz (+18 Punkte), aber, im Vergleich zu ihren Kameraden, im mathematisch – naturwissenschaftlichen Bereich deutlich weniger brillante Leistungen, was kaum auf geringere Fähigkeiten zurückzuführen sein dürfte (geringe Unterschiede in „Identifying scientific issues“), sondern wohl eher auf mangelnde Motivation.

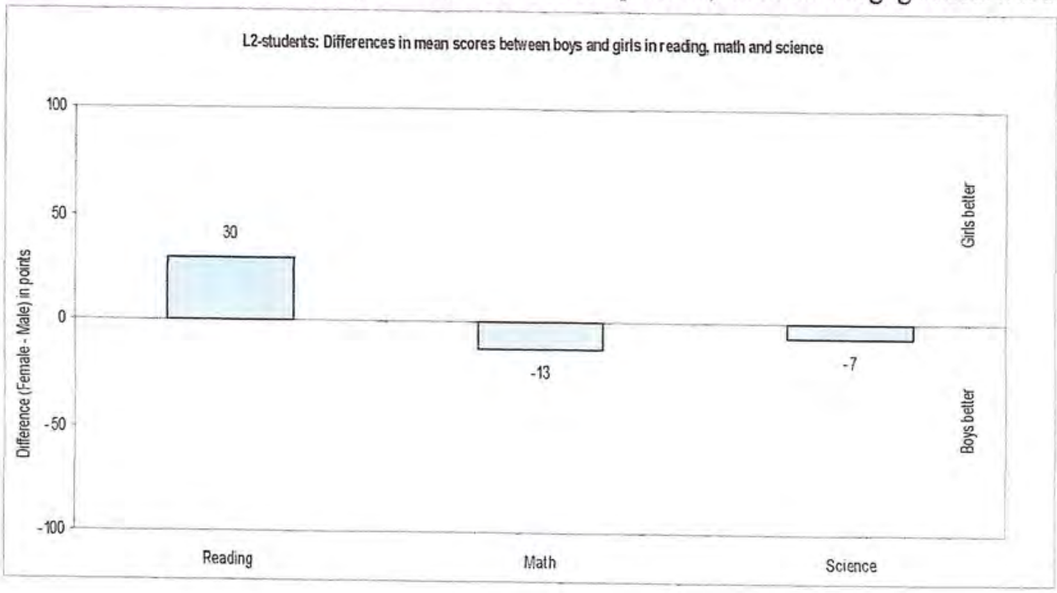


L1students	Reading	Math	Science	Exlaining phenomena scientifically	Identifying scientific issues	Using scientific evidence
Difference (Female - Male)	18	-40	-36	-39	-9	-38

Diese traditionalistische Verteilung der Geschlechterrollen auf den offensichtlich sehr stark männlich besetzten mathematisch – naturwissenschaftlichen Bereich und den deutlich weiblich besetzten sprachlich – literarischen Bereich ist sogar noch stärker als in den diesbezüglich bereits konservativen Luxemburger klassischen Gymnasien, wie die folgende Tabelle zeigt, die uns die Luxemburger Experten zum Vergleich mitgeliefert haben.

Students of Enseignement Secondaire (ES)	Reading	Math	Science	Explaining phenomena scientifically	Identifying scientific issues	Using scientific evidence
Difference (Female - Male)	16	-27	-23	-38	0	-18

Bei den Schülern und Schülerinnen, die in Ihrer Sprache 2 am Test teilgenommen haben, scheint sich die Fremdsprachenkompetenz der Mädchen, in der sie den Burschen noch überlegener sind als in der Sprache I, so auszuwirken, dass die Unterschiede in der mathematisch – naturwissenschaftlichen Kompetenz (in der Fremdsprache!) beinahe ausgeglichen werden.



7. PROZENTSATZ DER SCHÜLER AUF DEN JEWEILIGEN KOMPETENZSTUFEN

Dieses Kapitel ist durch die beigefügte Dokumentation das umfangreichste dieser Analyse der Schülerleistungen. Es geht hier um zwei sensible Bereiche, nämlich um die Begabtenförderung am oberen Ende der Skala und um den Bereich der weniger oder einseitig Begabten am unteren Ende. Beide sind für die Zukunft eines Landes entscheidend. Der eine für die wirtschaftliche, wissenschaftliche und kulturelle Zukunft, der andere für die soziale Entwicklung, die Kohäsion der Gesellschaft.

Die folgenden beiden Bilder zeigen die Verteilung der L1 und L2 Schüler auf die einzelnen Kompetenzstufen. Interessant sind dabei vor allem die beiden höchsten Stufen, die zeigen, wie gut ein Schulsystem seine begabten Schüler fördert, aber auch die beiden niedrigsten Kompetenzstufen bzw. der Prozentsatz der Schüler, die sich auf ihnen befinden. Die beiden anschließenden Bilder zeigen, wie diese Daten zu deuten sind und wie die Länderverteilung in diesem Bereich aussieht.

Man sieht, dass die ES LUX I 3,7% der Schüler auf der höchsten Kompetenzstufe hat, dabei aber noch von Finnland mit 3,9% leicht übertroffen wird, was vor allem für die Begabtenförderung des finnischen Schulsystems spricht, das sich in den letzten Jahren auf diesen Bereich konzentriert hat. Insgesamt befinden sich an der ES 21,8% auf den Stufen 5 – 6, in Finnland sind es 20,9%, im OECD – Durchschnitt 10,3 %.
Im unteren Bereich sieht man, dass sich niemand in L1 unter der Stufe 1 befindet. In L2 dürfte ein Schüler teilgenommen haben, dessen sprachliche Fähigkeiten noch nicht ausreichten, die Fragen zu verstehen.
Auf den Stufen 1 und 2 befinden sich in L1 8,6% der Schüler, deutlich mehr als die Rate der Schüler, die die Schule „aus zwingenden pädagogischen Gründen" am Ende der 5. oder 6. Klasse verlassen oder beim Abitur endgültig scheitern. Das bedeutet, dass die Schule einen Mehrwert schafft, indem sie mehr Kandidaten zu einem allgemein bildenden Abitur bringt, als das auf Grund der PISA – Analyse zu erwarten wäre. Sie kann sich dabei auf ein geschicktes Schulsystem stützen, das es erlaubt, Begabungen zu fördern und Schwächen durch Hilfestellungen zu überwinden oder durch gute Leistungen in anderen Bereichen zu kompensieren. In Ermangelung einer technischen oder beruflichen Ausbildungszweiges gehört unter Umständen auch das Wiederholen zu den Fördermaßnahmen, die es erlauben, das Ziel des Europäischen Abiturs doch noch zu erreichen.

PISA 2006

Table 1a: Percentage of L1-students at each proficiency level on the global science scale and on the science subscales.

L1-students	Below level 1 (below 334.94 score points)	Level 1 (from 334.94 to 409.54 score points)	Level 2 (from 409.54 to 484.14 score points)	Level 3 (from 484.14 to 558.73 score points)	Level 4 (from 558.73 to 633.33 score points)	Level 5 (from 633.33 to 707.93 score points)	Level 6 (above 707.93 score points)
	%	%	%	%	%	%	%
Science (global scale)	0	0,8	7,8	29,2	40,4	18,1	3,7
Explaining phenomena scientifically	0	6,3	10,5	27,0	37,6	19,7	4,9
Identifying scientific issues	0	1,9	11,4	34,0	37,4	14,9	1,2
Using scientific evidence	0	0,7	8,4	23,7	38,0	22,0	7,2

Table 1b: Percentage of L1-students at each proficiency level on the reading scale.

L1-students	Below level 1 (below 334.75 score points)	Level 1 (from 334.75 to 407.47 score points)	Level 2 (from 407.47 to 480.18 score points)	Level 3 (from 480.18 to 552.89 score points)	Level 4 (from 552.89 to 625.61 score points)	Level 5 (above 625.61 score points)
	%	%	%	%	%	%
Reading scale	0	1,2	12,2	30,2	38,4	17,9

Table 1c: Percentage of L1-students at each proficiency level on the mathematics scale.

L1-students	Below level 1 (below 357.77 score points)	Level 1 (from 357.77 to 420.07 score points)	Level 2 (from 420.07 to 482.38 score points)	Level 3 (from 482.38 to 544.68 score points)	Level 4 (from 544.68 to 606.99 score points)	Level 5 (from 606.99 to 669.30 score points)	Level 6 (above 669.30 score points)
	%	%	%	%	%	%	%
Mathematics scale	0	1,0	7,3	20,5	34,8	24,6	11,7

Die Verteilung der Schüler der Sprache 2 auf die Kompetenzstufen zeigt, wie es sich auf Prüfungssituationen und Schulleistungen auswirkt, wenn man nicht in seiner Sprache 1 arbeiten kann.
Diese Herausforderung ist am Ende 5. Klasse offensichtlich sogar gut zu schaffen, allerdings zeigt sich, das doch ein Nachteil existiert, wenn es um die Verwirklichung des gesamten Leistungspotentials geht und nur die objektive Leistung gemessen wird, ohne die erschwerten Ausgangsbedingungen in die Beurteilung mit einzubeziehen.
Die SWALS – Schüler, für die die L2 immer die Arbeitssprache ist, haben nach der 5. Klasse noch 2 Jahre Zeit, um dieses Handicap auszugleichen.

PISA 2006

Table 2a: Percentage of L2-students at each proficiency level on the global science scale and on the science subscales.

L2-students	Below level 1 (below 334.94 score points)	Level 1 (from 334.94 to 409.54 score points)	Level 2 (from 409.54 to 484.14 score points)	Level 3 (from 484.14 to 558.73 score points)	Level 4 (from 558.73 to 633.33 score points)	Level 5 (from 633.33 to 707.93 score points)	Level 6 (above 707.93 score points)
	%	%	%	%	%	%	%
Science (global scale)	0,9	4,7	19,7	35,1	28,0	9,9	1,6
Explaining phenomena scientifically	0,4	7,4	18,3	32,9	[illegible]	12,[illegible]	1,1
Identifying scientific issues	1,3	7,2	24,4	35,0	23,6	7,6	0,9
Using scientific evidence	1,7	4,7	15,3	30,6	27,6	16,4	3,8

Table 2b: Percentage of L2-students at each proficiency level on the reading scale.

L2-students	Below level 1 (below 334.75 score points)	Level 1 (from 334.75 to 407.47 score points)	Level 2 (from 407.47 to 480.18 score points)	Level 3 (from 480.18 to 552.89 score points)	Level 4 (from 552.89 to 625.61 score points)	Level 5 (above 625.61 score points)
	%	%	%	%	%	%
Reading scale	1,4	6,5	25,7	34,2	23,9	8,3

Table 2c: Percentage of L2-students at each proficiency level on the mathematics scale.

L2-students	Below level 1 (below 357.77 score points)	Level 1 (from 357.77 to 420.07 score points)	Level 2 (from 420.07 to 482.38 score points)	Level 3 (from 482.38 to 544.68 score points)	Level 4 (from 544.68 to 606.99 score points)	Level 5 (from 606.99 to 669.30 score points)	Level 6 (above 669.30 score points)
	%	%	%	%	%	%	%
Mathematics scale	0,9	3,5	15,9	26,7	31,3	14,6	5,2

Figure 2 Student proficiency in science

Level	Lower score limit	Percentage of students able to answer questions at each level or above (OECD average)	What students can typically do at each level on the science scale
6	707.9	1.3% of students across the OECD can answer questions at Level 6	At Level 6, students can consistently identify, explain and apply scientific knowledge and *knowledge about science* in a variety of complex life situations. They can link different information sources and explanations and use evidence from those sources to justify decisions. They clearly and consistently demonstrate advanced scientific thinking and reasoning, and they demonstrate willingness to use their scientific understanding in support of solutions to unfamiliar scientific and technological situations. Students at this level can use scientific knowledge and develop arguments in support of recommendations and decisions that centre on personal, socio-economic, or global situations.
5	633.3	9.0% of students across the OECD can answer questions at least at Level 5	At Level 5, students can identify the scientific components of many complex life situations, apply both scientific concepts and *knowledge about science* to these situations, and can compare, select and evaluate appropriate scientific evidence for responding to life situations. Students at this level can use well-developed inquiry abilities, link knowledge appropriately and bring critical insights to situations. They can construct explanations based on evidence and arguments based on their critical analysis.
4	558.7	29.3% of students across the OECD can answer questions at least at Level 4	At Level 4, students can work effectively with situations and issues that may involve explicit phenomena requiring them to make inferences about the role of science or technology. They can select and integrate explanations from different disciplines of science or technology and link those explanations directly to aspects of life situations. Students at this level can reflect on their actions and they can communicate decisions using scientific knowledge and evidence.
3	484.1	56.7% of students across the OECD can answer questions at least at Level 3	At Level 3, students can identify clearly described scientific issues in a range of contexts. They can select facts and knowledge to explain phenomena and apply simple models or inquiry strategies. Students at this level can interpret and use scientific concepts from different disciplines and can apply them directly. They can develop short statements using facts and make decisions based on scientific knowledge.
2	409.5	80.8% of students across the OECD can answer questions at least at Level 2	At Level 2, students have adequate scientific knowledge to provide possible explanations in familiar contexts or draw conclusions based on simple investigations. They are capable of direct reasoning and making literal interpretations of the results of scientific inquiry or technological problem solving.
1	334.9	94.8% of students across the OECD can answer questions at least at Level 1	At Level 1, students have such a limited scientific knowledge that it can only be applied to a few, familiar situations. They can present scientific explanations that are obvious and follow explicitly from given evidence.

Source: Figure 2.6, PISA 2006, *Science Competencies for Tomorrow's World.*

Table 1 Percentage of students at each proficiency level on the science scale

	Proficiency levels in science						
	Below Level 1	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6
Finland	0.5	3.6	13.6	29.1	32.2	17.0	3.9
Estonia	1.0	6.7	21.0	33.7	26.2	10.1	1.4
Hong Kong-China	1.7	7.0	16.9	28.7	29.7	13.9	2.1
Canada	2.2	7.8	19.1	28.8	27.7	12.0	2.4
Macao-China	1.4	8.9	26.0	35.7	22.8	5.0	0.3
Korea	2.5	8.7	21.2	31.8	25.5	9.2	1.1
Chinese Taipei	1.9	9.7	18.6	27.3	27.9	12.9	1.7
Japan	3.2	8.9	18.5	27.5	27.0	12.4	2.6
Australia	3.0	9.8	20.2	27.7	24.6	11.8	2.8
Liechtenstein	2.6	10.3	21.0	28.7	25.2	10.0	2.2
Netherlands	2.3	10.7	21.1	26.9	25.8	11.5	1.7
New Zealand	4.0	9.7	19.7	25.1	23.9	13.6	4.0
Slovenia	2.8	11.1	23.1	27.6	22.5	10.7	2.2
Hungary	2.7	12.3	26.0	31.1	21.0	6.2	0.6
Germany	4.1	11.3	21.4	27.9	23.6	10.0	1.8
Ireland	3.5	12.0	24.0	29.7	21.4	8.3	1.1
Czech Republic	3.5	12.1	23.4	27.8	21.7	9.8	1.8
Switzerland	4.5	11.6	21.8	28.2	23.5	9.1	1.4
Austria	4.3	12.0	21.8	28.3	23.6	8.8	1.2
Sweden	3.8	12.6	25.2	29.5	21.1	6.8	1.1
United Kingdom	4.8	11.9	21.8	25.9	21.8	10.9	2.9
Croatia	3.0	14.0	29.3	31.0	17.7	4.6	0.5
Poland	3.2	13.8	27.5	29.4	19.3	6.1	0.7
Belgium	4.8	12.2	20.8	27.6	24.5	9.1	1.0
Latvia	3.6	13.8	29.0	32.9	16.6	3.8	0.3
Denmark	4.3	14.1	26.0	29.3	19.5	6.1	0.7
Spain	4.7	14.9	27.4	30.2	17.9	4.5	0.3
Slovak Republic	5.2	15.0	28.0	28.1	17.9	5.2	0.6
Lithuania	4.3	16.0	27.4	29.8	17.5	4.5	0.4
Iceland	5.8	14.7	25.9	28.3	19.0	5.6	0.7
Norway	5.9	15.2	27.3	28.5	17.1	5.3	0.6
France	6.6	14.5	22.8	27.2	20.9	7.2	0.8
Luxembourg	6.5	15.6	25.4	28.6	18.1	5.4	0.5
Russian Federation	5.2	17.0	30.2	28.3	15.1	3.7	0.5
Greece	7.2	16.9	28.9	29.4	14.2	3.2	0.2
United States	7.6	16.8	24.2	24.0	18.3	7.5	1.5
Portugal	5.8	18.7	28.8	28.8	14.7	3.0	0.1
Italy	7.3	18.0	27.6	27.4	15.1	4.2	0.4
Israel	14.9	21.2	24.0	20.8	13.8	4.4	0.8
Serbia	11.9	26.6	32.3	21.8	6.6	0.8	0.0
Chile	13.1	26.7	29.9	20.1	8.4	1.8	0.1
Uruguay	16.7	25.4	29.8	19.7	6.9	1.3	0.1
Bulgaria	18.3	24.3	25.2	18.8	10.3	2.6	0.4
Jordan	16.2	28.2	30.8	18.7	5.6	0.6	0.0
Thailand	12.6	33.5	33.2	16.3	4.0	0.4	0.0
Turkey	12.9	33.7	31.3	15.1	6.2	0.9	0.0
Romania	16.0	30.9	31.8	16.6	4.2	0.5	0.0
Montenegro	17.3	33.0	31.0	14.9	3.6	0.3	0.0
Mexico	18.2	32.8	30.8	14.8	3.2	0.3	0.0
Argentina	28.3	27.9	25.6	13.6	4.1	0.4	0.0
Colombia	26.2	34.0	27.2	10.6	1.9	0.2	0.0
Brazil	27.9	33.1	23.8	11.3	3.4	0.5	0.0
Indonesia	20.3	41.3	27.5	9.5	1.4	0.0	c
Tunisia	27.7	35.1	25.0	10.2	1.9	0.1	0.0
Azerbaijan	19.4	53.1	22.4	4.7	0.4	0.0	c
Qatar	47.6	31.5	13.9	5.8	1.6	0.3	0.0
Kyrgyzstan	58.2	28.2	10.0	2.9	0.7	0.0	c

Source: OECD PISA 2006 database, Table 2.1a, *PISA 2006: Science Competencies for Tomorrow's World*.
Countries are ranked in descending order of percentage of students at Levels 2, 3, 4, 5 and 6.
StatLink http://dx.doi.org/10.1787/141844475532

- The number of students at Level 6 cannot be reliably predicted from a country's overall performance. Korea was among the highest-performing countries on the PISA science test, in terms of students' performance, with an average of 522 score points, while the United States performed below the OECD average, with a score of 489. Nevertheless, the United States and Korea had similar percentages of students at Level 6 (*Tables 2.1a, 2.1c*).
- Over one in five students in Finland (21%) and over one in six in New Zealand (18%) reached at least Level 5 (OECD average 9%). In Japan, Australia and Canada, and the partners Hong Kong-China and Chinese Taipei, this figure was between 14% and 16% (*Table 2.1a*).

8. DIE PISA – ERGEBNISSE DER ES LUXEMBURG I IM LÄNDERVERGLEICH

Table 4 **Range of rank of countries/economies on the reading scale**

Statistically significantly above the OECD average
Not statistically significantly different from the OECD average
Statistically significantly below the OECD average

	Reading scale					
			Range of rank			
			OECD countries		All countries/economies	
	Reading score	S.E.	Upper rank	Lower rank	Upper rank	Lower rank
Korea	556	(3.8)	1	1	1	1
Finland	547	(2.1)	2	2	2	2
Hong Kong-China	536	(2.4)			3	3
Canada	527	(2.4)	3	4	4	5
New Zealand	521	(3.0)	3	5	4	6
Ireland	517	(3.5)	4	6	5	8
Australia	513	(2.1)	5	7	6	9
Liechtenstein	510	(3.9)			8	11
Poland	508	(2.8)	6	10	7	12
Sweden	507	(3.4)	6	10	7	13
Netherlands	507	(2.9)	6	10	8	13
Belgium	501	(3.0)	8	13	10	17
Estonia	501	(2.9)			10	17
Switzerland	499	(3.1)	9	14	11	19
Japan	498	(3.6)	9	16	11	21
Chinese Taipei	496	(3.4)			12	22
United Kingdom	495	(2.3)	11	16	14	22
Germany	495	(4.4)	10	17	12	23
Denmark	494	(3.2)	11	17	14	23
Slovenia	494	(1.0)			16	21
Macao-China	492	(1.1)			18	22
Austria	490	(4.1)	12	20	15	26
France	488	(4.1)	14	21	18	28
Iceland	484	(1.9)	17	21	23	28
Norway	484	(3.2)	16	22	22	29
Czech Republic	483	(4.2)	16	22	22	30
Hungary	482	(3.3)	17	22	23	30
Latvia	479	(3.7)			24	31
Luxembourg	479	(1.3)	20	22	26	30
Croatia	477	(2.8)			26	31
Portugal	472	(3.6)	22	25	29	34
Lithuania	470	(3.0)			30	34
Italy	469	(2.4)	23	25	31	34
Slovak Republic	466	(3.1)	23	26	31	35
Spain	461	(2.2)	25	27	34	36
Greece	460	(4.0)	25	27	34	36
Turkey	447	(4.2)	28	28	37	39
Chile	442	(5.0)			37	40
Russian Federation	440	(4.3)			37	40
Israel	439	(4.6)			38	40
Thailand	417	(2.6)			41	42
Uruguay	413	(3.4)			41	44
Mexico	410	(3.1)	29	29	41	44
Bulgaria	402	(6.9)			42	50
Serbia	401	(3.5)			44	48
Jordan	401	(3.3)			44	48
Romania	396	(4.7)			44	50
Indonesia	393	(5.9)			44	51
Brazil	393	(3.7)			46	51
Montenegro	392	(1.2)			47	50
Colombia	385	(5.1)			48	53
Tunisia	380	(4.0)			51	53
Argentina	374	(7.2)			51	53
Azerbaijan	353	(3.1)			54	54
Qatar	312	(1.2)			55	55
Kyrgyzstan	285	(3.5)			56	56

Source: OECD PISA 2006 database, Figure 6.8b. PISA 2006: Science Competencies for Tomorrow's World.
StatLink http://dx.doi.org/10.1787/142046885031

EUROPEAN SCHOOL LUX I: RESULTS PISA 2006 L1: **READING** 560
L2: 515

Range of rank of countries/economies on the mathematics scale

Statistically significantly above the OECD average
Not statistically significantly different from the OECD average
Statistically significantly below the OECD average

	Mathematics scale					
	Mathematics score	S.E.	Range of rank			
			OECD countries		All countries/economies	
			Upper rank	Lower rank	Upper rank	Lower rank
Chinese Taipei	549	(4.1)			1	4
Finland	548	(2.3)	1	2	1	4
Hong Kong-China	547	(2.7)			1	4
Korea	547	(3.8)	1	2	1	4
Netherlands	531	(2.6)	3	5	5	8
Switzerland	530	(3.2)	3	6	5	9
Canada	527	(2.0)	3	6	5	10
Macao-China	525	(1.3)			7	11
Liechtenstein	525	(4.2)			5	13
Japan	523	(3.3)	4	9	8	13
New Zealand	522	(2.4)	5	9	8	13
Belgium	520	(3.0)	6	10	8	14
Australia	520	(2.2)	6	9	10	14
Estonia	515	(2.7)			12	16
Denmark	513	(2.6)	9	11	13	16
Czech Republic	510	(3.6)	10	14	14	20
Iceland	506	(1.8)	11	15	16	21
Austria	505	(3.7)	10	16	15	22
Slovenia	504	(1.0)			17	21
Germany	504	(3.9)	11	17	16	23
Sweden	502	(2.4)	12	17	17	23
Ireland	501	(2.8)	12	17	17	23
France	496	(3.2)	15	22	21	28
United Kingdom	495	(2.1)	16	21	22	27
Poland	495	(2.4)	16	21	22	27
Slovak Republic	492	(2.8)	17	23	23	30
Hungary	491	(2.9)	18	23	24	31
Luxembourg	490	(1.1)	20	23	26	30
Norway	490	(2.6)	19	23	25	31
Lithuania	486	(2.9)			27	32
Latvia	486	(3.0)			27	32
Spain	480	(2.3)	24	25	31	34
Azerbaijan	476	(2.3)			32	35
Russian Federation	476	(3.9)			32	36
United States	474	(4.0)	24	26	32	36
Croatia	467	(2.4)			35	38
Portugal	466	(3.1)	25	27	35	38
Italy	462	(2.3)	26	28	37	39
Greece	459	(3.0)	27	28	38	39
Israel	442	(4.3)			40	41
Serbia	435	(3.5)			40	41
Uruguay	427	(2.6)			42	43
Turkey	424	(4.9)	29	29	41	43
Thailand	417	(2.3)			43	46
Romania	415	(4.2)			43	47
Bulgaria	413	(6.1)			43	48
Chile	411	(4.6)			44	48
Mexico	406	(2.9)	30	30	46	48
Montenegro	399	(1.4)			49	50
Indonesia	391	(5.6)			49	52
Jordan	384	(3.3)			50	52
Argentina	381	(6.2)			50	53
Colombia	370	(3.8)			52	53
Brazil	370	(2.9)			53	53
Tunisia	365	(4.0)			53	53
Qatar	318	(1.0)			56	56
Kyrgyzstan	311	(3.4)			57	57

Source: OECD PISA 2006 database, Figure 6.20b. PISA 2006: Science Competencies for Tomorrow's World.
StatLink http://dx.doi.org/10.1787/142046885031

EUROPEAN SCHOOL LUX I: RESULTS PISA 2006 L1: **MATHEMATICS** 583
L2 545

Table 2 Range of rank of countries/economies on the science scale

	Statistically significantly above the OECD average
	Not statistically significantly different from the OECD average
	Statistically significantly below the OECD average

	Science scale					
			Range of rank			
			OECD countries		All countries/economies	
	Science score	S.E.	Upper rank	Lower rank	Upper rank	Lower rank
Finland	563	(2.0)	1	1	1	1
Hong Kong-China	542	(2.5)			2	2
Canada	534	(2.0)	2	3	3	6
Chinese Taipei	532	(3.6)			3	8
Estonia	531	(2.5)			3	8
Japan	531	(3.4)	2	5	3	9
New Zealand	530	(2.7)	2	5	3	9
Australia	527	(2.3)	4	7	5	10
Netherlands	525	(2.7)	4	7	6	11
Liechtenstein	522	(4.1)			6	14
Korea	522	(3.4)	5	9	7	13
Slovenia	519	(1.1)			10	13
Germany	516	(3.8)	7	13	10	19
United Kingdom	515	(2.3)	8	12	12	18
Czech Republic	513	(3.5)	8	14	12	20
Switzerland	512	(3.2)	8	14	13	20
Macao-China	511	(1.1)			15	20
Austria	511	(3.9)	8	15	12	21
Belgium	510	(2.5)	9	14	14	20
Ireland	508	(3.2)	10	16	15	22
Hungary	504	(2.7)	13	17	19	23
Sweden	503	(2.4)	14	17	20	23
Poland	498	(2.3)	16	19	22	26
Denmark	496	(3.1)	16	21	22	28
France	495	(3.4)	16	21	22	29
Croatia	493	(2.4)			23	30
Iceland	491	(1.6)	19	23	25	31
Latvia	490	(3.0)			25	34
United States	489	(4.2)	18	25	24	35
Slovak Republic	488	(2.6)	20	25	26	34
Spain	488	(2.6)	20	25	26	34
Lithuania	488	(2.8)			26	34
Norway	487	(3.1)	20	25	27	35
Luxembourg	486	(1.1)	22	25	30	34
Russian Federation	479	(3.7)			33	38
Italy	475	(2.0)	26	28	35	38
Portugal	474	(3.0)	26	28	35	38
Greece	473	(3.2)	26	28	35	38
Israel	454	(3.7)			39	39
Chile	438	(4.3)			40	42
Serbia	436	(3.0)			40	42
Bulgaria	434	(6.1)			40	44
Uruguay	428	(2.7)			42	45
Turkey	424	(3.8)	29	29	43	47
Jordan	422	(2.8)			43	47
Thailand	421	(2.1)			44	47
Romania	418	(4.2)			44	48
Montenegro	412	(1.1)			47	49
Mexico	410	(2.7)	30	30	48	49
Indonesia	393	(5.7)			50	54
Argentina	391	(6.1)			50	55
Brazil	390	(2.8)			50	54
Colombia	388	(3.4)			50	55
Tunisia	386	(3.0)			52	55
Azerbaijan	382	(2.8)			53	55
Qatar	349	(0.9)			56	56
Kyrgyzstan	322	(2.9)			57	57

Source: OECD PISA 2006 database, Table 2.1c and Figure 2.11c, PISA 2006: Science Competencies for Tomorrow's World.
StatLink http://dx.doi.org/10.1787/141844475532

EUROPEAN SCHOOL LUX I: RESULTS PISA 2006 L1: SCIENCE 580
L2: 538