

PISA
2003

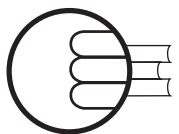
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**OECD
PISA**

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PISA 2003

Summary of the Basque Country Reports

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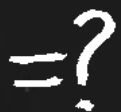
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INTRODUCTION

I believe that 'PISA 2003. Summary of the Basque Country Reports' has arrived at just the right moment. As you will no doubt already be aware, PISA is an international assessment carried out once every three years, and will be applied in our schools during 2006.

The aim of this summary is to raise awareness of the PISA project among the general public. The Department of Education, Universities and Research has published two very long reports on the issue and it seemed to us that one would have to be extremely motivated to read such complex texts containing so many data from cover to cover. We therefore decided to compile this more easy-to-read and user-friendly text.

This publication is located within the framework of the PISA Symposium 2006, the aim of which is to, on the one hand, hear the opinions and reflections of international experts regarding the PISA environment, and on the other, to raise awareness in our society of the importance of this assessment of key skills.

The PISA project also has an educational facet. Although our curricula are not expressed in terms of skills, they do encompass this philosophy, albeit implicitly. PISA establishes what students should know how to do in order to be able to develop as citizens, and this is the point of view that interests us, i.e. the ability to develop fully as a person within our modern knowledge society.

We believe that this type of initiative offers data and ideas for improving our system, thus enabling us to reinforce those skills that are weakest in our students and make the work carried out in our schools both better and more efficient. It is an undertaking that involves everyone, and that implies, on the one hand, innovation, training and the establishment of regulations, and on the other, the responsibility of each school to ensure proper timetable and support management, and more effective teaching and organisation.

I believe we are on the right path, but we still have a long way to go. Let us therefore make use of the wonderful opportunity presented by this symposium and our common undertaking.

Tontxu Campos Granados

Regional Minister for Education, Universities and Research



WEBSITES CONTAINING ADDITIONAL INFORMATION ABOUT:

PISA 2003 in the Basque Country:

<http://www.isei-ivei.net/cast/pub/indexpub.htm>

The PISA project:

<http://www.pisa.oecd.org>

Nationwide coordination of PISA 2003:

<http://www.ince.mec.es>

EXPLANATORY NOTES REGARDING SOME TERMS USED IN THE REPORTS:

Significant difference: indicates that two scores are statistically different, with a given confidence level (usually 95%).

Index: refers to information about characteristics, attitudes, etc. gathered through questionnaires and transformed into values that can be compared to those obtained for the OECD mean.

Degree of equity: refers to the capacity of an education system to offer all students a similar quality of education.

Degree of excellence: refers to the capacity of an education system to ensure that a greater percentage of its students obtain the highest performance levels.

WHAT ARE THE CHARACTERISTICS OF THE INTERNATIONAL PISA ASSESSMENT?

PISA is an international assessment promoted by the OECD that is carried out once every three years and aims to measure and compare the knowledge and skills of 15-year-old students in three areas: Reading Literacy, Mathematical Literacy and Scientific Literacy. It does not aim to assess students' knowledge in the strict sense of the term, but rather their ability to activate and apply their knowledge in diverse real-life situations.

Each cycle, the PISA assessment focuses primarily on one of the three aforementioned domains: PISA 2000 focused on Reading Literacy, PISA 2003 focused on Mathematical Literacy and included Problem Solving as a cross-curricular area, and PISA 2006 will focus on Scientific Literacy. Furthermore, in order to offer a periodical updating of results, each assessment also includes a smaller evaluation of the other two domains which have not been the main focus of attention.

From the PISA 2003 assessment, in which 40 countries participated, the following conclusions can be highlighted with regard to the Education System in the Basque Country:

Basque results for Reading, Mathematics and Problem Solving were on a par with the mean for OECD countries, while the results for Scientific Literacy were below average.

The scores obtained by Basque students with regard to Mathematical Literacy were mainly clustered in intermediate performance levels. This narrow range of results places our education system among those with the highest level of absolute equity. It means that all students have access to the same standard of education.

However, it also demonstrates a low level of excellence. In other words, the percentages of students at the top end of the performance scale in the different areas are lower than in other OECD countries.

15-year-old Basque boys generally achieve rather lower performance levels than girls in almost all the subjects analysed, with the performance differences by gender being among the largest of all the countries participating in the study.

As regards school autonomy level, Basque schools rank among the lowest of all the countries analysed.

The most relevant information revealed by the PISA 2003 study regarding the Basque Education System, along with some samples of the tests used, has been gathered together in a series of publications that are freely available on the Internet at: <http://www.isei-ivei.net/cast/pub/indexpub.htm>

**PISA ASSESSES
STUDENTS' SKILLS TO
APPLY THEIR
KNOWLEDGE TO
REAL-LIFE CONTEXTS**





MATHEMATICAL LITERACY IN PISA 2003

How is Mathematical Literacy measured?

PISA defines mathematical literacy as an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgements and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen.

PISA 2003 measures students' global performance in a wide range of curricular contents and varied mathematical skills, organised into four areas or subscales:

- **Space and shape:** involving spatial and geometric phenomena, as well as the properties of different objects.
- **Change and relationships:** focusing on the relationships between variables and an understanding of the ways in which they are represented.
- **Quantity:** referring to numeric phenomena and patterns, as well as quantitative relationships and patterns.
- **Uncertainty:** including statistical and probabilistic phenomena.

With the aim of distinguishing mathematical literacy levels, the PISA 2003 project organised all cognitive processes into 3 different groups, depending on the skill and ability required:

- **Level 1 skills: Reproduction.** Involves recognising familiar types of processes and common mathematical problems or carrying out routine operations.
- **Level 2 skills: Connection.** Requires students to go beyond routine problems, to interpret and establish interrelations in diverse situations.
- **Level 3 skills: Reflection.** Involves insight and reflection on the part of students, as well as creativity in identifying the mathematical elements in a problem and in making connections.

Finally, PISA 2003 establishes six levels for describing the different degrees of mathematical literacy, assigning each student a specific score at which they can usually perform tasks correctly. The full description of the different mathematical literacy levels used during this assessment can be consulted over the Internet in the following report:

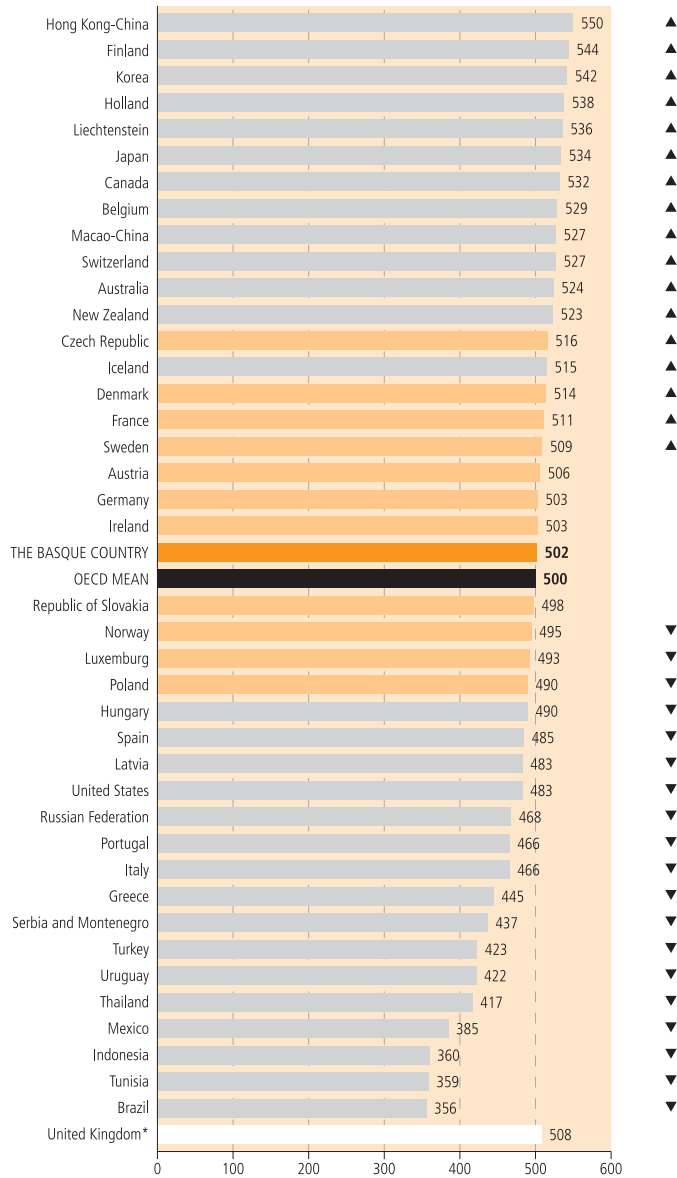
First PISA 2003 Report. Results for the Basque Country (p. 17).
<http://www.isei-ivei.net/cast/pub/PISA2003euskadic.pdf>

What are the Mathematical Literacy results for students in the Basque Country?

The average score for Mathematical Literacy obtained by 15-year-old students in the Basque Country is 1.6 points over the mean score obtained by all the OECD countries, although this difference is not significant. The Basque Country therefore scored on a par with the OECD mean, and above the mean obtained by Spain (see Fig. 1).

SCORES IN THE FIELD OF MATHEMATICS IN THE BASQUE COUNTRY ARE ON A PAR WITH THE MEAN LEVEL FOR OECD COUNTRIES

Figure 1. Mean results for Mathematics, in participating countries

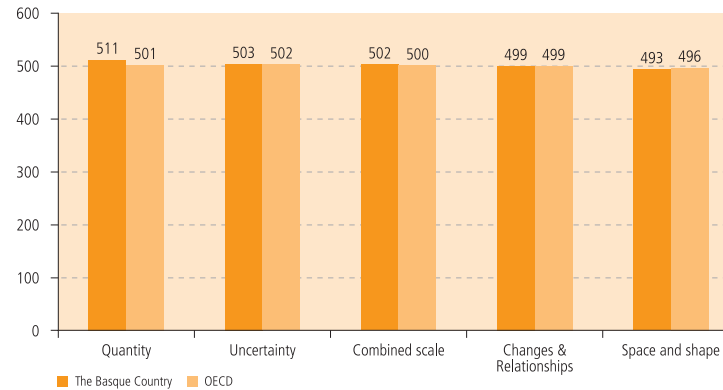


Significant differences at 95%:
 ▲ significantly higher score than the OECD mean
 ▼ significantly lower score than the OECD mean
 ■ significant difference with regard to the mean score for the Basque Country

* The response rate for the United Kingdom is too low to make comparison with other countries.

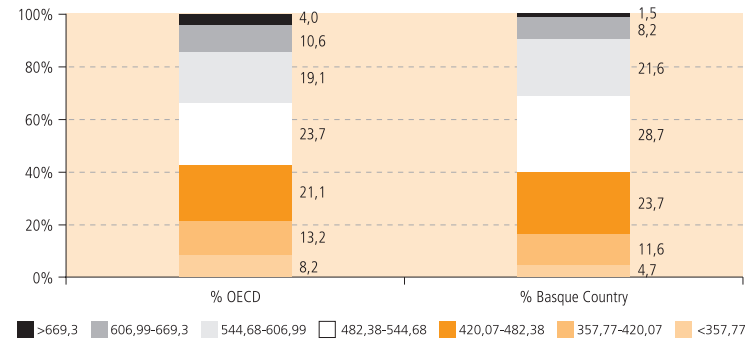
The highest results, which were significantly better than the OECD mean, were obtained in the *Quantity* subscale. The lowest results, although there was no significant difference with the OECD mean, corresponded to the *Space and Shape* subscale (see Fig. 2).

Figure 2. Results for Mathematics, according to type of PISA 2003 content



The majority of Basque students are clustered in the intermediate levels of mathematical literacy, while the percentage falling into the upper and lower levels is smaller than the mean for other OECD countries (9.7% in levels 5 and 6 as opposed to 14.6% in the OECD, and 16.3% in level 1 and below as opposed to 21.4% in the OECD). These data, along with the fact that the difference between 'good' and 'bad' results is lower than for the OECD in general, demonstrate the existence of a high level of *equity* in the Basque Education System (see Fig. 3).

Figure 3. Percentage of students in the PISA 2003 Mathematics levels



THE MAJORITY OF BASQUE STUDENTS ARE CLUSTERED IN THE INTERMEDIATE LEVELS OF MATHEMATICAL LITERACY



READING LITERACY IN PISA 2003

How is reading literacy measured?

PISA goes beyond the traditional notion of reading as linked to the retrieval and literal interpretation of information, seeing it rather as the ability to understand and interpret a wide variety of texts from different contexts of everyday life (personal, public, educational and occupational).

PISA uses a very diverse range of texts, including both *continuous* ones (narrations, expositions, argumentations, etc.) and *non-continuous* ones (lists, graphs, maps, schemes, diagrams, etc.). It then establishes a series of exercises related to each text, whose resolution requires certain specific cognitive skills:

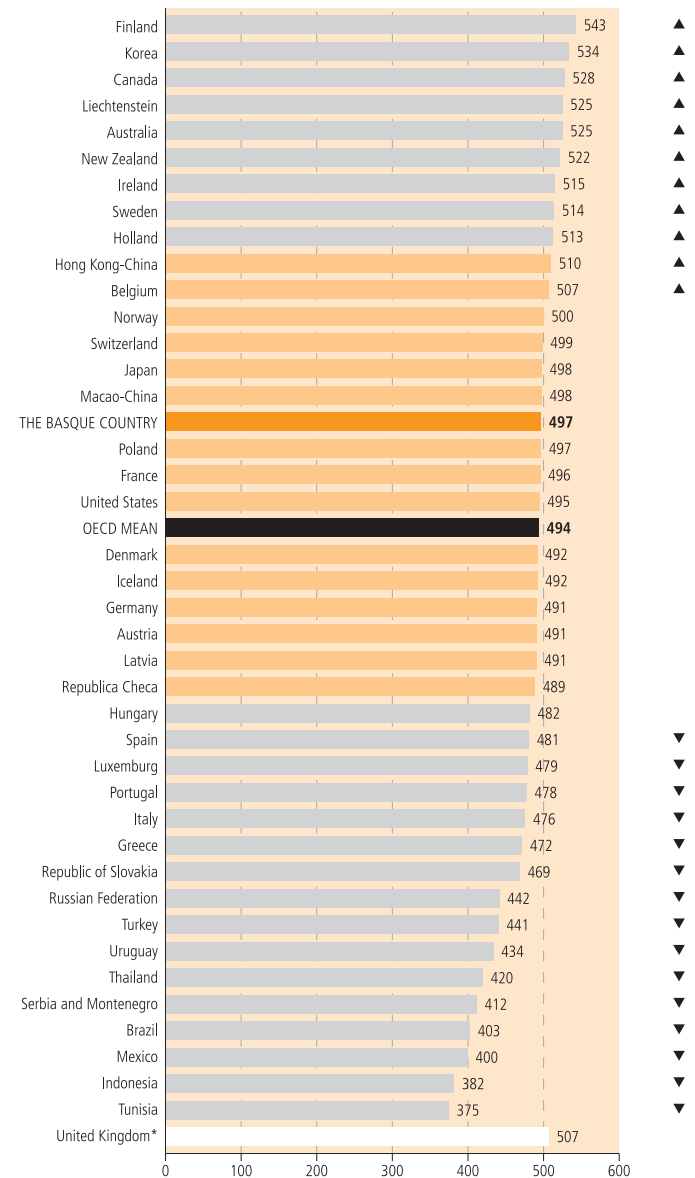
- **Retrieving information:** linked to the literal comprehension of the text and the student's ability to locate and retrieve the required information.
- **Interpreting texts:** requires students to extract meaning and infer implications from the information provided.
- **Reflecting and evaluating:** involves the non-literal interpretation of the text and requires students to relate the content and form of a text to their own experience, knowledge and ideas.

When measuring reading literacy, PISA places students into different proficiency levels (*levels 1-5*), depending on the difficulty of the tasks they are able to carry out successfully. The description of these reading proficiency levels can be found in the first report on the results of this assessment in the Basque Country (see complete report at: <http://www.isei-ivei.net/cast/pub/PISA2003euskadic.pdf>).

What are the Reading Literacy results for students in the Basque Country?

The average result for Reading Literacy in 15-year-old students in the Basque Country was higher than the OECD mean, although this difference is not significant. Furthermore, the results for the Basque Country are significantly higher than those for Spain as a whole (see Fig. 4).

Figure 4. Mean results for Reading Literacy, in participating countries



Significant differences at 95%:

▲ significantly higher score than the OECD mean

▼ significantly lower score than the OECD mean

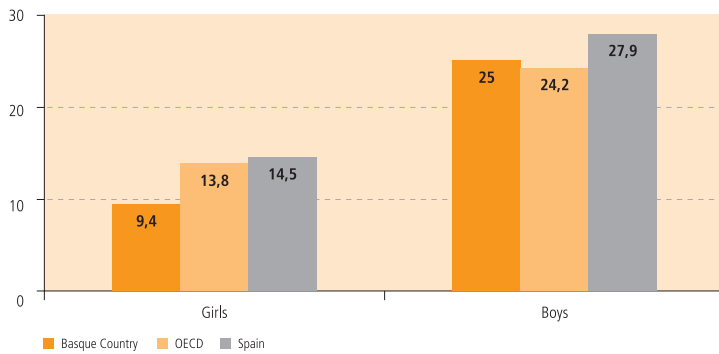
■ significant difference with regard to the mean score for the Basque Country

* The response rate for the United Kingdom is too low to make comparison with other countries.

As in other areas, there were only a few students with either very high or very low scores (6.6% in *level 5* as opposed to 8.3% for the OECD, and 17.1% in *level 1 or below* as opposed to 19.1% for the OECD), with the majority being located in the intermediate proficiency levels (*levels 2, 3 and 4*). These results can be again put down to an equitable education system.

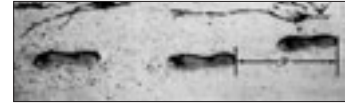
In this subject, Basque girls scored 45 points higher than the mean score for boys, one of the largest differences in the PISA study, only overcome by Iceland, Norway and Austria. Besides, there is a higher percentage of boys whose performance situates them in the lowest levels of reading comprehension.

Percentage of students in the lowest levels of reading, by gender (reading comprehension level ≤ 1)



Examples of items set in PISA 2003

WALKING



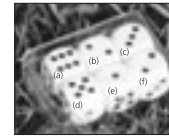
The picture shows the footprints of a man walking. The pacerlength P is the distance between the rear of two consecutive footprints.

For men, the formula $\frac{n}{P}$ gives an approximate relationship between n and P where, n = number of steps per minute, and P = pacerlength in metres.

QUESTION 1: WALKING M124Q01 - 0 1 2 9

If the formula applies to Heiko's walking and Heiko takes 70 steps per minute, what is Heiko's pacerlength? Show your work.

CUBES



QUESTION 3: CUBES M145Q01

In this photograph you see six dice, labelled (a) to (f). For all dice there is a rule: The total number of dots on two opposite faces of each die is always seven.

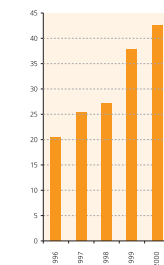
Write in each box the number of dots on the bottom face of the dice corresponding to the photograph.

(a)	(b)	(c)
(d)	(e)	(f)

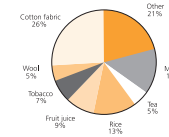
EXPORTS

The graphics below show information about exports from Zeiland, a country that uses zeds as its currency.

TOTAL ANNUAL EXPORTS FROM ZEILAND IN MILLIONS OF ZEDS, 1996-2000



DISTRIBUTIONS OF EXPORTS FROM ZEILAND IN 2000



QUESTION 14: EXPORTS M438Q01 - 0 1 9

What was the total value (in millions of zeds) of exports from Zeiland in 1998?

Answer:

RATHER THAN MEMORISING INFORMATION, THE BEST RESULTS ARE LINKED TO THE PROCESSING AND ELABORATION OF WHAT IS LEARNED



SCIENTIFIC LITERACY IN PISA 2003

How is Scientific Literacy measured?

PISA understands *scientific literacy* as the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help to make decisions about the natural world and the changes made to it as a result of human activity.

PISA identifies a set of mental processes involved in the resolution of a scientific problem, and, depending on the type of scientific procedure or process required to answer a series of questions, clustering students around three categories, depending on the difficulty of the problems they are able to solve:

- **Level I: Description**, explanation and prediction of scientific phenomena.
- **Level II: Comprehension** of scientific investigation.
- **Level III: Interpretation** of evidence and scientific conclusions.

PISA 2003 focuses the assessment on a sample of concepts belonging to 13 major scientific themes. These themes correspond to a wide range of disciplines such as Physics, Biology and Chemistry.

For a detailed description of the science proficiency levels and the selected units, see the first report on the results of this assessment in the Basque Country (view complete report at: <http://www.isei-ivei.net/cast/pub/PISA2003euskadic.pdf>).

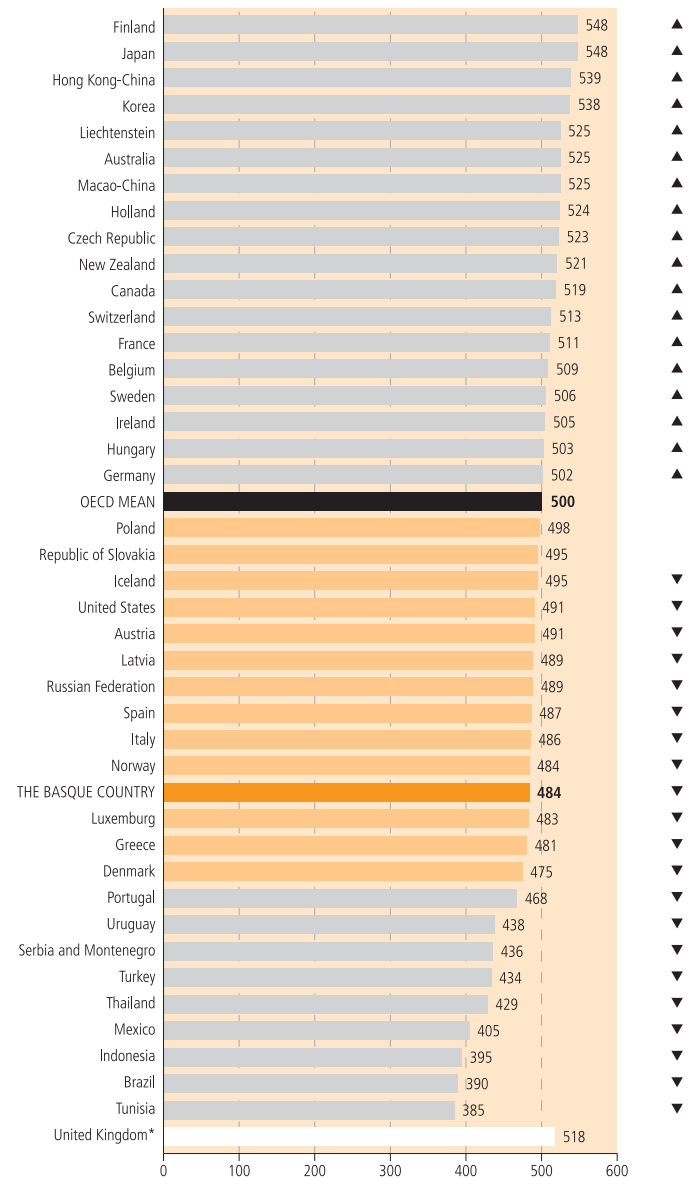
What were the Scientific Literacy results for students in the Basque Country?

The average score obtained by 15-year-old students in the Basque Country was lower than the OECD mean, and the same as for Spain as a whole.

Eighteen countries scored significantly higher than the Basque Country, nine scored significantly lower and the remaining thirteen obtained the same or similar scores, although the differences were not significant (see Fig. 5).

THE MEAN SCORE FOR SCIENCE OBTAINED BY 15-YEAR-OLD STUDENTS IN THE BASQUE COUNTRY WAS LOWER THAN THE OECD MEAN AND ON A PAR WITH SPAIN

Figure 5. Mean results for Science, in participating countries



Significant differences at 95%:

- ▲ significantly higher score than the OECD mean
- ▼ significantly lower score than the OECD mean
- significant difference with regard to the mean score for the Basque Country

* The response rate for the United Kingdom is too low to make comparison with other countries.

PROBLEM SOLVING IN PISA 2003

How is problem solving measured?

PISA defines problem solving as an individual's capacity to use cognitive processes to confront and resolve real, cross-disciplinary situations where the solution path is not immediately obvious and where the literacy domains or curricular areas that might be applicable are not within a single domain of mathematics, science or reading.

Three types of problems were used in the PISA 2003 assessment:

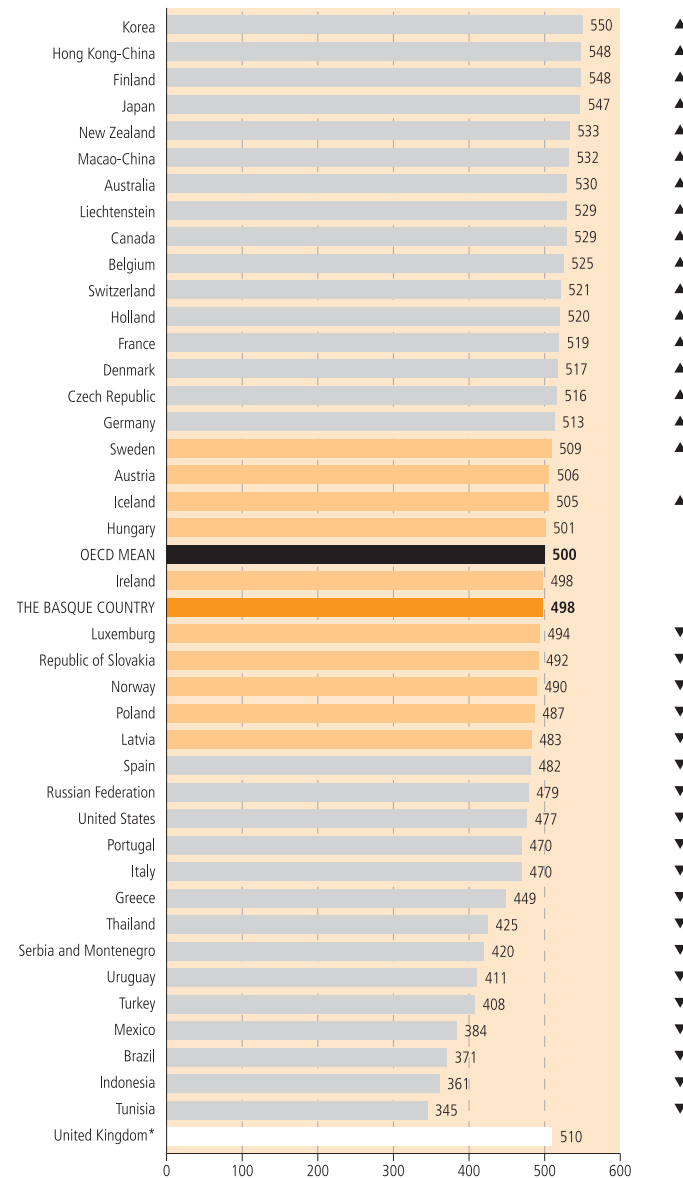
- **Decision making:** requires an understanding of the alternatives and the constraints to make a satisfactory decision, as well as the ability to handle information with different levels of complexity.
- **System analysis and design:** requires the analysis of complex situations in order to understand their logic or to design a resolution system that works and achieves certain goals, given that sometimes there is more than one possible solution.
- **Trouble shooting:** requires students to understand the features and logic of a system, to discover its faults and to understand the mechanism that will enable to reach a solution.

These three types of problem solving tasks were applied during PISA 2003 in different contexts, so that students are required to demonstrate skills that enable them to confront complex situations in an active and thoughtful manner. All this is described in further detail in the first report on the results of the PISA 2003 assessment in the Basque Country (view complete report at: <http://www.isei-ivei.net/cast/pub/PISA2003euskadic.pdf>).

What were the Problem Solving results for students in the Basque Country?

In the field of problem solving, which is a cross-curricular domain incorporated only into the 2003 assessment, the mean score obtained by Basque students was on a par with the OECD mean, and was significantly higher than for Spain as a whole (see Fig. 6).

Figure 6. Mean results for Problem Solving, in participating countries



Significant differences at 95%:

▲ significantly higher score than the OECD mean

▼ significantly lower score than the OECD mean

▲ significantly higher score with regard to the mean score for the Basque Country

* The response rate for the United Kingdom is too low to make comparison with other countries.



THE BASQUE EDUCATION SYSTEM OFFERS ALL STUDENTS A SIMILAR QUALITY OF EDUCATION, REGARDLESS OF THE SCHOOL THEY ATTEND



WHAT OTHER ASPECTS OF THE RESULTS FOR THE BASQUE COUNTRY COULD BE HIGHLIGHTED?

6.1. The Basque Education System is equitable, but lacks excellence

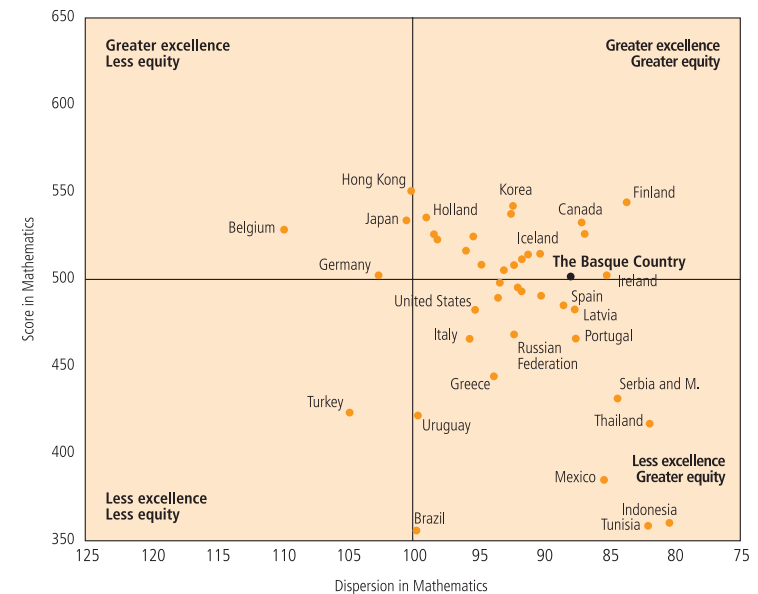
The Basque Education System shows a high level of equity; in other words, it offers all students a similar quality of education. This is evident in that, while the influence of the specific school attended on students' performance is low, the influence in the results of the socio-economic and cultural characteristics of each student is six times bigger.

As mentioned earlier, not only was there a low level of dispersion among the scores for the Basque Country, but also these results tended, to a large degree, to cluster around the intermediate proficiency levels, particularly as regards Reading and Mathematics.

However, as well as equity, the quality level of an education system is measured also by its excellence, i.e. by high performance levels scored by students. Figure 7 shows the mean score for Mathematics (vertical axis) and the dispersion of the results (horizontal axis), thereby illustrating the mean scores obtained by the various countries and classifying them according to both elements: equity and excellence.

FAMILY-LABOUR-SOCIO-ECONOMIC LEVEL, PARENTS' ACADEMIC LEVEL AND CULTURAL POSSESSIONS IN THE HOME ALL HAVE A STRONG INFLUENCE ON STUDENTS' SCHOOL PERFORMANCE

Figure 7.



Another way of measuring the level of equity is to compare the scores obtained by the students with the best and worst results, an aspect known as *relative equity*, in which the Basque Country is ranked fourth of all the countries participating in the PISA 2003 assessment, and first among all those belonging to the OECD.

6.2. The factors relative to students are those that most influence outcomes

In order to analyse the factors that may be relevant in both teaching and learning, firstly a series of *indicators* were created based on information provided by students through a questionnaire. The influence of these indicators on students' performance was then studied in the field of Mathematics.

Four factors relative to the students were found to have the greatest influence on the results for Mathematics: the socio-economic-labour level of the student's family; the parents' academic level; the level of home cultural assets and, finally, the student's perception of his/her self-efficacy and competence.

These factors have an 85% influence on the results for Mathematics, as opposed to the 15% attributed to the specific school ones.

It was also found that highest family socio-economic-labour levels corresponded to the best results. Similarly, students whose parents (either one or both) had a better academic level also tended to score higher. Nevertheless, unlike most of the OECD countries, the prospects were not found to be lower for children whose parents had only a Primary School Education than those of children of parents with a Secondary School Education (Fig. 8).

Figure 8a. Parents' academic level in the Basque Country and scores in Mathematics

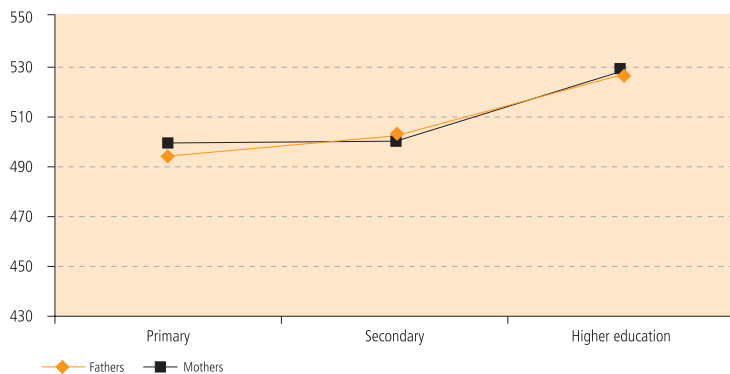
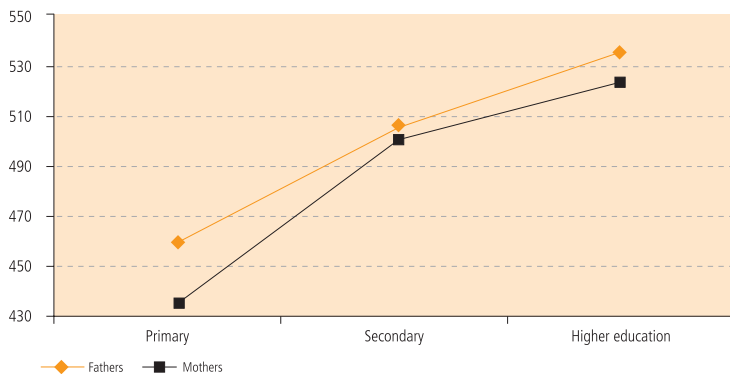
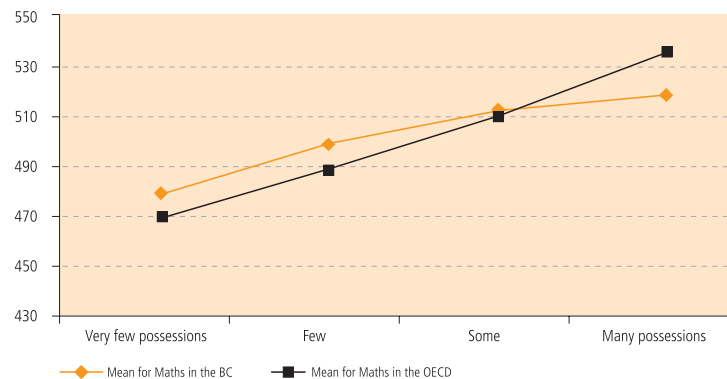


Figure 8b. Parents' academic level in the OECD and scores in Mathematics



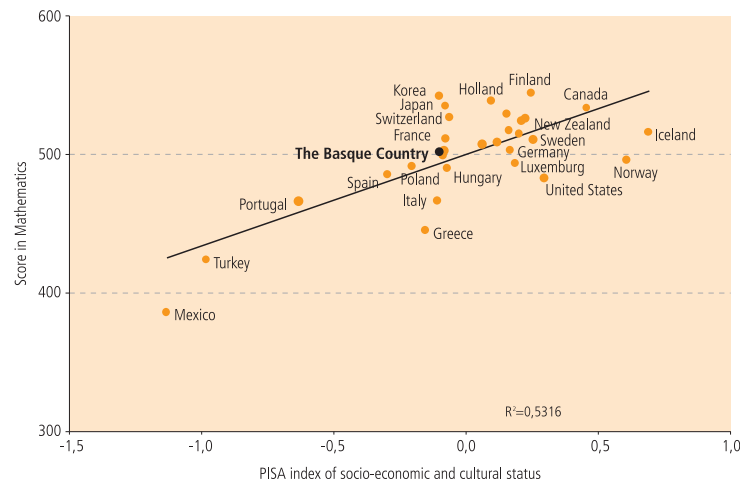
Also, the group with a greater degree of cultural possessions in the home scored better than the group with a lesser degree of such resources (Fig. 9).

Figure 9. Cultural possessions in the home and scores in Mathematics



The regression line shown in figure 10 indicates the expected score for a country with a given socio-economic and cultural status. In accordance with the students' socio-economic and cultural level, the Basque Country obtained a result that was slightly better than expected, since it is located slightly above the regression line.

Figure 10. Socio-economic and cultural status of OECD countries and performance in Mathematics



IN THE BASQUE COUNTRY, THE SCHOOL'S INFRASTRUCTURE AND EDUCATIONAL RESOURCES INFLUENCE LEARNING TO A LESSER EXTENT THAN THE OECD MEAN

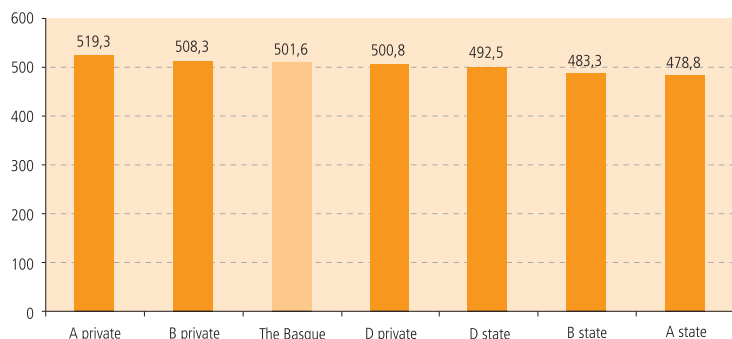
Factors related to individual motivation, as well as self-confidence and security during the performance of mathematical tasks, were also revealed as one of the indicators that most influenced the results, although it is not possible to say whether it is a cause or an effect.

6.3. Factors relative to the school had less influence on the results

The school-related variables with the highest level of influence on the results for Mathematics were: school size, educational resources and student commitment. It is worth highlighting that in the Basque Country, the influence of school infrastructure and educational resources on learning is lower than in the OECD countries.

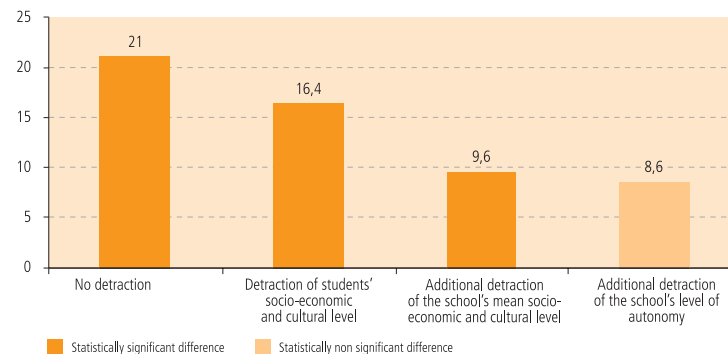
The socio-economic cultural indicator of the students and the average socio-economic cultural factor for the school both influenced performance. This effect was also observed when students' performance was studied in strata, in accordance with the linguistic model and the type of school (see Fig. 11).

Figure 11. Results for Mathematics according to PISA 2003 strata



En In state schools, the global performance is somewhat lower than in private schools (with state funding), although this difference disappears if we detract the effect of the socio-economic and cultural factors and that of the autonomy of the schools, as shown in figure 12.

Figure 12. Differences in type of schools, controlling the socio-economic-cultural level and autonomy of the centres



In comparison with other countries, the school autonomy is low, specially in the case of state schools.

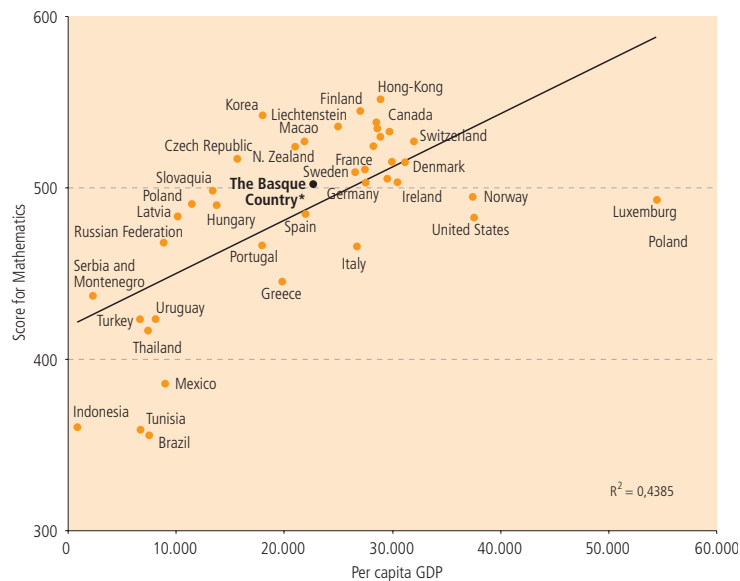
In the Basque Country, the school climate and the commitment of both the teachers and the students and their influence on learning show that the aspects which make up the school climate influence students' performance to a lesser extent than the OECD countries.

THE BASQUE COUNTRY OBTAINED HIGHER RESULTS FOR MATHEMATICS THAN EXPECTED IN RELATION TO ITS PER CAPITA GDP

6.4. There is a relationship between expenditure on education and achievement

In general, there is a link between a country's level of wealth, investment in education and the results obtained by students, although a high level of investment does not guarantee a high performance. The Basque Country obtained higher results for Mathematics than would normally be expected from a country with its per capita Gross Domestic Product (GDP) and investment in education, as shown by our location above the regression line in the following graphs (see Fig. 13).

Figure 13.



* Adaptation of: "PISA 2003 Assessment. Summary of the first results in Spain". INECSE Ministry of Science and Education.

6.5. Repeating a year is related to poorer results

76.3% of 15-year-old students completing the test were in year 4 of compulsory secondary education (CSE), 22% were in year 3 of CSE and 1.6% in year 2. These data are important since the year in which a 15-year-old student is in has a significant influence on their results in Mathematics.

In all subjects assessed by PISA 2003, students learning with others of their same age group obtained significantly higher results in Mathematics than those who had repeated one or two academic years. Only those 15-year-old students studying year 4 of CSE scored above the global mean for both the Basque Country and the OECD. This finding, in addition to the circumstances responsible for the students repeating a year, may be also influenced by the fact that this group of students are further left behind in the curriculum.

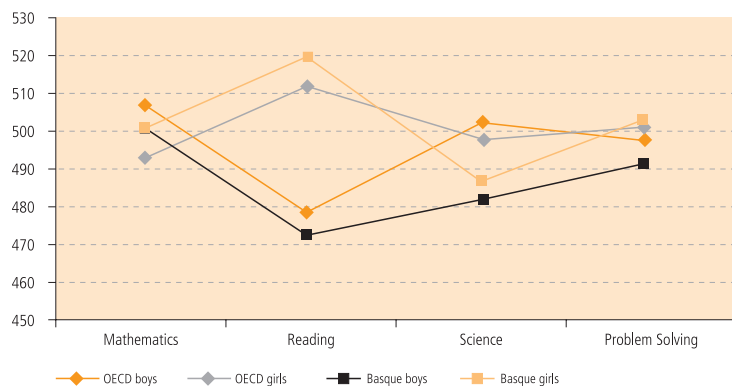
6.6. Females showed significantly higher performance than males in the Basque Country

The difference in performance between boys and girls in the Basque Country is the highest of all participating countries. In both Problem Solving and especially Reading, 15-year-old Basque girls performed significantly better than boys.

If we compare these results with the mean per gender for the OECD, we see that while Basque girls scored above the mean in the OECD in all domains except Science, boys obtained lower scores than the mean in the OECD in all domains (see Fig. 14).

BASQUE FEMALES SCORED OVER THE MEAN FOR FEMALES IN THE OECD IN ALL AREAS EXCEPT SCIENCE

Figure 14. Differences in scores for the domains, according to gender. The Basque Country and the OECD.



SCIENTIFIC LITERACY, DEGREE OF EXCELLENCE AND MALE STUDENT PERFORMANCE ARE JUST SOME OF THE ASPECTS TO BE IMPROVED IN THE BASQUE EDUCATION SYSTEM

Furthermore, there are a number of other important data; firstly, among the 15-year-old students participating in the PISA 2003 assessment, the number of boys repeating a year was higher than the number of girls; secondly, although the percentage of 15-year-old girls in year 4 of CSE (82.8%) is higher than the figure for boys (69.7%), boys obtained a higher mean score than girls at this level; finally, in all countries boys showed a greater degree of self-efficiency and self-confidence with regard to Mathematics.

7. What are the challenges for the basque education system?

Based on the aforementioned data and conclusions, the Basque Education System needs to rise to the following challenges:

- Improve Scientific Literacy performance, since in PISA 2003 it obtained lower results than the OECD results. This will be the main domain in the forthcoming PISA 2006 assessment.
- Improve results in the 'Space and Shape' area (Geometry) of the Mathematics subject, which were somewhat below the results for the other areas.
- Ensure that a greater percentage of students are located in the high performance levels, since although the Basque Education System is equitable, it needs to attain a greater degree of excellence.
- Improving boys' performance poses a greater challenge than improving girls' results, since they score lower than the OECD mean in all areas assessed. The proportion of boys located at the lowest levels of reading comprehension is particularly high.
- As a basic tool which enables all learning and provides access to any type of knowledge in any area, reading literacy deserves special attention. Efficient handling information for use in practical contexts, aimed at resolving situations that are as close to reality as possible, should be a constant objective in all our teaching methods.